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ADDENDUM TO THE ENVIRONMENTAL STATEMENT

TOWN AND COUNTRY PLANNING (EIA) REGULATIONS 2011 (AS AMENDED)

FORT PARKWAY ENERGY, CASTLE BROMWICH

ON BEHALF OF ROLTON KILBRIDE LTD

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List of Contributors

Preamble & Summary – Pegasus Group

Air Quality – AQC

Townscape / Landscape and Visual – Pegasus Group

Noise – L F Acoustics

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Appendix 5.8	**Birmingham City Council's Castle Vale Air Quality Survey 2009**
Appendix 5.9	**Construction Mitigation**
Appendix 6	**Wireframes and Winter Photomontages (Fig 6.2 and 6.5)**

PREAMBLE

1.1 An Environmental Statement was submitted to Birmingham City Council (BCC) in November 2015 accompanying a planning application concerning Fort Parkway Renewable Energy Centre (Application Reference 2015/09679/PA). The Proposed Development comprises demolition of existing buildings and erection of a renewable energy centre (gasification plant) and new industrial/warehouse buildings with ancillary plant/buildings/chimney stack together with associated works at Fort Industrial Park, Dunlop Way, Castle Bromwich, Birmingham.

1.2 Shortly after the grant of planning permission for the Fort Parkway Renewable Energy Centre in June 2016, the proposed technology providers for the development (Energos) went into administration.

1.3 Rolton Kilbride have therefore been investigating a range of Process Technology Companies and have developed a solution to incorporate an alternative plant solution into the building for which planning permission has been granted.

1.4 The replacement process plant has a more efficient steam boiler than before, which means output capacity is higher than the previous process plant where the gross power output will increase from 8.6MW to 12MW. This will be achieved with the same level of through-put of feedstock detailed in the planning permission and therefore no additional vehicle trips will be required.

1.5 As a result of the replacement process plant, there will be a modest increase in height to a small section of the roof area of the building as set out in Section 3 Development Proposals of this ES Addendum report.

1.6 A meeting was held with BCC on Tuesday 11 October 2016 to discuss the proposed changes and how they may affect the ES. Following the meeting BCC wrote to Pegasus to advise a material minor amendment application under Section 73 would be the most appropriate way of addressing the changes. The correspondence advised certain environmental information would require an update with reference specifically to Air Quality and Noise chapters which should be updated to reflect the change in technology of the plant. The Townscape and Visual chapter of the ES should also be updated and to include revised visuals (specifically to include updated Viewpoint 18 (Graveyard of St. Mary and St. Margaret's Church – Castle Bromwich Hall)).

1.7 The updated environmental information has been provided in the form of an ES Addendum to the original ES which was submitted with the consented planning application (Ref 2015/09679/PA).

1.8 The following environmental topics have been scoped out of this ES Addendum; Traffic and Transport; Hydrology and Flood Risk; Ground Conditions; Ecology and Nature Conservation; Archaeology and Cultural Heritage and Socio-Economics. A note has been provided under the corresponding chapter stating the reason for scoping out this topic from the ES Addendum.

1.9 All work undertaken as part of this ES Addendum is listed in the bullet points below:

- An update to the Introductory chapters of the ES to provide the detail of the new technology proposed and to set out the changes to the building from the approved plans to the revised versions;

- An update to the Air Quality assessment involving;
  - re-calculating the emissions from the flue;
  - re-running the dispersion models;
  - re-calculating the process contributions to pollutant concentrations from the facility's emissions;
  - updating the road traffic modelling to reflect the latest published emission factors and to incorporate the latest emissions sensitivity test approach;
  - re-calculating total concentrations at relevant receptors; and
  - updating the assessment text, figures and appendices into the ES Addendum with the updated results;

- An update to the Landscape / Townscape & Visual assessment involving:
  - a review and audit of the original ES chapter;
  - revisions to wirelines within 26 no. viewpoints in the ES Figure 6.2;
  - revisions to 2 no. photomontages for Viewpoints 4 and 6 in the ES Figure 6.3; and
  - updating the townscape character and visual amenity chapter / ES Addendum with the updated results

- An update to the Noise assessment involving;
  - an update to the noise model used in the original assessment

- re-run to of the noise model to ascertain whether there are any changes to noise levels
- analysis to confirm whether the noise levels remain within the acceptable limits
- including any updates to the noise assessment within the ES Addendum; and

- A summary update.

1.10 This ES Addendum has been set out in the same structure and order of the chapters within the ES it is supporting. The new information is provided under the corresponding chapter of this ES Addendum report. In addition, a note has been added under chapters where no additional information is required so it is clear to the reader which chapters of the ES have required more information to support them.

1.11 The Non-Technical Summary (NTS) submitted with the original ES has been updated and produced as a stand-alone document.

1. INTRODUCTION

1.1 The previous process plant had a gross power output of 8.6MW. The Proposed Development will now generate up to 12 megawatts (MW) gross of electricity as the replacement process plant has a more efficient steam boiler than before, which means the output capacity is now higher but achieved with the same level of through-put of feedstock detailed in the planning permission (there will be no additional vehicle trips).

1.2 The plant is capable of accepting 105,000 tonnes of waste per annum which would otherwise go to landfill.

2. SITE DESCRIPTION

2.1 No additional information is required as part of this ES Addendum to support Chapter 2 of the ES.

3. DEVELOPMENT PROPOSALS

3.1 The revised scheme parameters of the replacement process plant will include the following:

- An increase in height of part of the rear roof of the building from 23m to 29m, which will allow for the internal plant to be configured vertically as opposed to horizontally;
- A change to the configuration of the building involving the relocation of the delivery hall;
- Minor changes to the location of some of the external ancillary plant; and
- As a result of the incorporation of a vertical gasifier, to ensure the roof height is kept as low as possible, the section of the building where the gasifier is located will go underground to a depth of 8m (the same depth as already approved for the waste bunker on the original plans).

3.2 The height of the stack has not changed from the consented planning application and remains the same height of 55m.

3.3 The site layout plans and elevations are included in **Appendix 3** of this ES Addendum.

4. CONSIDERATION OF ALTERNATIVES

4.1 No additional information is required as part of this ES Addendum to support Chapter 4 of the ES.

5. AIR QUALITY

5.1 Introduction

5.1.1 This ES Addendum chapter sets out the air quality assessment for the Proposed Development and primarily focusses on the potential air quality impacts associated with emissions from the stack at the proposed Renewable Energy Centre (REC). The assessment also considers the potential for air quality impacts as a result of dust emissions during construction (including demolition), as well as additional road traffic emissions and odour and bioaerosol emissions during operation. It also takes into consideration emissions from the emergency diesel generator.

5.1.2 The incineration, gasification and combustion of waste can give rise to emissions of a number of pollutants with the potential to lead to air quality impacts. These pollutants, which are listed below, form the focus of the assessment.

5.1.3 The pollutants covered in this assessment in terms of human health impacts are:

- nitrogen dioxide (NO_2);
- sulphur dioxide (SO_2);
- fine airborne particulate matter (PM_{10} and $PM_{2.5}$);
- carbon monoxide (CO);
- hydrogen chloride (HCl);
- hydrogen fluoride (HF);
- Volatile Organic Compounds (VOCs);
- ammonia (NH_3);
- dioxins and furans; and
- the following trace metals:
    - cadmium (Cd);
    - thallium (TI);
    - mercury (Hg);
    - antimony (Sb);
    - arsenic (As);
    - lead (Pb);

- chromium (Cr);
- copper (Cu);
- manganese (Mn);
- nickel (Ni); and
- vanadium (V).

5.1.4 In addition, there is a Local Nature Reserve within 2 km of the site. The relevant pollutants with the potential to affect sensitive ecosystems are:

- nitrogen oxides (NOx);
- ammonia (NH_3);
- sulphur dioxide (SO_2);
- hydrogen fluoride (HF);
- nutrient nitrogen deposition (which is contributed to by nitrogen oxides and ammonia emissions); and
- acid deposition (which is contributed to by nitrogen oxides, ammonia, sulphur dioxide, and hydrogen chloride emissions).

5.1.5 In terms of road traffic emissions, the primary pollutants of concern are nitrogen dioxide and fine particulate matter (PM_{10} and $PM_{2.5}$). During construction, concern will be focussed on dust and particulate matter (PM_{10}) emissions. Waste handling during operation could potentially lead to emissions of bioaerosols and odour.

5.1.6 The facility will have a diesel-powered emergency generator installed, which will only be used in the unlikely event that a loss of grid power coincides with the turbine having to shut down. It will provide power for essential equipment during such an emergency shut down. It is unlikely that it will ever be required to operate for this purpose. It will, though, be tested weekly. Nitrogen oxides emissions from diesel generators have been identified as potentially having significant air quality impacts, thus the emissions from the proposed generator have also been considered.

5.1.7 **Appendix 5.1** provides references and **Appendix 5.2** a glossary.

5.2 Assessment Approach

Methodology

Assessment Criteria

Criteria to Protect Human Health

5.2.1 Table 5.1 defines the assessment criteria for human health used in this study. The UK Government's Air Quality Objectives for nitrogen dioxide and PM_{10} were to have been achieved by 2005 and 2004 respectively, and continue to apply in all future years thereafter. The $PM_{2.5}$ objective is to be achieved by 2020. The UK objectives for nitrogen dioxide, PM_{10} and $PM_{2.5}$ are the same as the EU limit values. The EU limit value for $PM_{2.5}$ is the same as the UK objective, but is to be met by 2015.

Table 5.1: Relevant Air Quality Objectives and Environmental Assessment Levels (EALs) for the Protection of Human Health

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	Number of Periods Allowed to Exceed per Year	AQO *
Nitrogen dioxide	Annual	40	n/a	X
	1 hour	200	18	X
PM_{10}	Annual	40	n/a	X
	24 hours	50	35	X
$PM_{2.5}$ [a]	Annual	25	n/a	X
SO_2	24 hours	125	3	X
	1 hour	350	24	X
	15 minutes	266	35	X
CO	8 hour rolling mean	10 (mg/m^3)	n/a	X
HF	Annual	16	n/a	
	1 hour	160	n/a	
HCl	Annual mean	20 [c]		

Pollutant	Averaging Period	Concentration (µg/m³)	Number of Periods Allowed to Exceed per Year	AQO *
	1 hour	750	n/a	
Benzene	Running annual mean	16.25	n/a	X
	Annual mean	5	n/a	X
1,3-butadiene	Annual Mean	2.25 [b]	n/a	
Dimethyl sulphate	1 hour	15.6 [b]	n/a	
Cadmium	Annual	0.005	n/a	X
Thallium	Annual	1 [c]	n/a	
	1hour	30 [c]	n/a	
Mercury	Annual	0.25	n/a	
	1hour	7.5	n/a	
Antimony	Annual	5	n/a	
	1hour	150	n/a	
Arsenic	Annual	0.003	n/a	
Chromium (III)	Annual	5	n/a	
	1hour	150	n/a	
Chromium (VI)	Annual	0.0002	n/a	
	1hour	15 [c]	n/a	
Cobalt	Annual	1 [c]	n/a	
	1hour	30 [c]	n/a	

Pollutant	Averaging Period	Concentration (µg/m³)	Number of Periods Allowed to Exceed per Year	AQO *
Copper	Annual	10	n/a	
	1hour	200	n/a	
Lead	Annual	0.25	n/a	X
Manganese	Annual	0.15	n/a	
	1hour	1,500	n/a	
Nickel	Annual	0.02	n/a	X
Vanadium	Annual	5	n/a	

* Those EALs which have the status of an air quality objective are indicated in this column.

[a] The $PM_{2.5}$ objective, which is to be met by 2020, is not in the 2000 or 2002 Amendment Regulations and there is no requirement for local authorities to meet it. The EU limit value is the same, but is to be met by 2015.

[b] TOCs are assessed against the EALs for benzene, 1,3-butadiene and dimethyl sulphate, since these are the most stringent EALs for any VOCs (See paragraph 5.2.4).

[c] Long- and short-term EALs for thallium and cobalt, the long-term EAL for HCl and the short-term EAL for chromium (VI) has been calculated from the exposure limits in EH4024, and converted to the respective EAL using guidance in H1 (Environment Agency, 2010a).

5.2.2 The objectives apply at locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective. Where there is no air quality objective, the Environment Agency's EALs have been applied. Defra explains where the objectives apply in its Local Air Quality Management Technical Guidance (Defra, 2016). Annual mean objectives and EALs are considered to apply anywhere with residential exposure. The 24-hour objective for PM_{10} is taken to apply at residential properties as well as the gardens of residential properties. The 1-hour mean objective for nitrogen dioxide, and those EALs for shorter time periods than the annual mean, are taken to apply anywhere where people may spend one hour or more (or fifteen minutes in the case of the 15-minute sulphur dioxide objective).

5.2.3 Where there is no EAL quoted in Environment Agency guidance, one has been derived from the Health and Safety Executive's workplace exposure limits (HSE, 2005).

This applies to the short term EAL for chromium VI, and the short- and long-term EALs for thallium and cobalt.

5.2.4 The Industrial Emissions Directive (IED) (Directive 2010/75/EU of the European Parliament and the Council on industrial emissions) specifies a maximum emission of Total Organic Carbon (TOC). In order to assess the potential emissions of TOCs, a worst-case approach has been taken, assuming that all TOCs are Volatile Organic Compounds (VOCs), and that all VOCs are both benzene and 1,3 butadiene with respect to annual mean concentrations, and that all VOCs are dimethyl sulphate with respect to short-term EALs. This situation would not happen in practice and provides an extremely conservative assessment.

5.2.5 There are no assessment criteria for dioxins and furans. The World Health Organisation (WHO, 2000) provides an indicator of the air concentrations above which it considers it necessary to identify and control local emission sources; this value is 0.3 pg/m^3 (300 fg/m^3). In the absence of suitable criteria, the process contributions have been compared against the relevant background concentration, as well as the WHO indicator concentration for which it is considered necessary to identify and control emission sources.

5.2.6 Table 5.1 shows that 18 exceedences of 200 µg/m^3 as a 1-hour mean nitrogen dioxide concentration are allowed before the objective is exceeded. For a typical year with complete data capture, the 19th highest hour is represented by the 99.79th percentile of 1-hour mean concentrations. Thus, comparing the 99.79th percentile of 1-hour mean concentrations with the 200 µg/m^3 standard identifies whether the 1-hour mean nitrogen dioxide objective is exceeded. A similar approach is applied to assessing other short-term objectives with a permitted number of exceedences, as outlined in Table 5.2.

Table 5.2: Equivalent Percentiles to the Air Quality Objectives

Pollutant	Averaging Period	Permitted Exceedences	Equivalent Percentile
NO_2	1 hour	18 per year	99.79th
PM_{10}	24 hour	35 per year	90.4th
SO_2	24 hour	3 per year	99.18th
	1 hour	24 per year	99.7th

	15 minute	35 per year	99.9th

Criteria to Protect Ecological Sites

5.2.7 Objectives for the protection of vegetation and ecosystems have been set by the UK Government. These are based on the European Union limit values. The limit values and objectives only apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built up areas of more than 5,000 people. These objectives and limit values do not, therefore, strictly apply within the study area, although Birmingham City Council and the Environment Agency require them to be considered. Critical levels and critical loads are the ambient concentrations and deposition fluxes below which significant harmful effects to sensitive ecosystems are unlikely to occur. The critical levels are set at the same concentrations as the objectives. Typically, the potential for exceedences of the critical levels and critical loads is considered in the context of the level of protection afforded to the ecological site as a whole. For example, the level of protection afforded to an internationally-designated site (such as a SAC) is significantly greater than that afforded to a Local Nature Reserve, reflecting the relative sensitivity of the sites as well as their perceived ecological value.

5.2.8 The Air Pollution Information System (APIS) database (APIS, 2015) has been searched to obtain relevant critical levels and critical loads. Where APIS does not provide critical levels for a given pollutant, they have been taken from the EA's targets for protected conservation areas (Environment Agency, 2016a). Different critical loads are available for different habitats; and in the case of acidity, different locations. For the Plantsbrook Reservoirs Local Nature Reserve, the lowest nutrient nitrogen critical load for any habitat has been taken, as a worst-case. A site-specific critical load for acid deposition in a wood-pasture and parkland habitat published on the APIS database has been used. The relevant critical levels and critical loads are set out in Table 5.3. The approach currently recommended by APIS for assessing acid deposition only refers to nitrogen and sulphur. In order to account for the acidifying input from hydrogen chloride, the sum of nitrogen, sulphur and chlorine acidity has been assessed directly against the 'N_{max}' values from APIS. This provides a conservative assessment.

Table 5.3: Relevant Assessment Criteria for the Protection of Sensitive Ecosystems at the Plantsbrook Reservoirs Local Nature Reserve [a]

Pollutant	Averaging Period	Species / Habitat	EAL

NH_3	Annual	All higher plants	3 µg/m^3
NOx	Annual	All sensitive communities (but does not apply as an objective or limit value within the study area)	30 µg/m^3
	24 hour	All sensitive communities	75 µg/m^3
SO_2	24 hour	All higher plants	20 µg/m^3
HF	1 hour	All sensitive communities	5 µg/m^3
	15 minute	All sensitive communities	0.5 µg/m^3
Nutrient Nitrogen Deposition Critical Loads	Annual	Plantsbrook Reservoirs Local Nature Reserve	5 kg-N/ha/yr
Acid Deposition Critical Load (Nmax) [b]	Annual	Plantsbrook Reservoirs Local Nature Reserve	1.8 keq/ha/yr

[a] Taken from the Air Pollution Information System (APIS) database (APIS, 2015) and from the EA's targets for protected conservation areas (Environment Agency, 2016a).

[b] APIS advises that where the total acid nitrogen deposition is greater than the N_{min}, the sum of acid nitrogen and sulphur deposition should be compared against the N_{max} value. In this assessment, the sum of acid nitrogen, sulphur and chlorine deposition has been compared with the N_{max} value. This is more conservative than the approach recommended by APIS.

Screening and Descriptive Criteria

Criteria Issued by the Environment Agency

5.2.9 The Environment Agency has adopted criteria (Environment Agency, 2016a) that allow health-related process contributions ('PC') to be screened out as insignificant regardless of the baseline environmental conditions. The emissions from a process can be considered to be insignificant if:

- the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
- the short-term (24-hour mean or shorter) process contribution is <10% of the short-term environmental standard.

5.2.10 It should be recognised that these criteria determine when an effect can be screened out as insignificant. They do not imply that effects will necessarily be significant above these levels, but that above these levels there is a potential for significant effects that should be assessed using a detailed assessment methodology, such as detailed dispersion modelling (as has been carried out for this project in any event), and taking into account background concentrations.

5.2.11 The next step in the Environment Agency's screening process for long-term contributions is to add the PC to the local background concentration to calculate the predicted environmental concentration (PEC). For short-term contributions the screening is to compare the PC against the short-term environmental standard minus twice the long-term background concentration. The emissions are insignificant if:

- the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration; and
- the long-term PEC is less than 70% of the long-term environmental standard.

5.2.12 However, the Environment Agency also advises that, where detailed dispersion modelling has been undertaken, no further action is required if resulting PECs do not exceed environmental standards.

5.2.13 In terms of the potential for ecological impacts on local (as opposed to national or European) wildlife sites, the Environment Agency discounts as insignificant any impacts where the PC is less than 100% of the long-term or short-term environmental standard (Environment Agency, 2013).

Environmental Protection UK and Institute of Air Quality Management Criteria

5.2.14 While the Environment Agency's criteria may be more relevant to this proposed development, given that the site will be permitted and regulated by the Environment Agency, consideration has also been given to the Environmental Protection UK (EPUK) and

Institute of Air Quality Management (IAQM) guidance document aimed specifically at planning applications.

5.2.15 The approach developed jointly by EPUK & IAQM (2015), as described in **Appendix 5.3**, is that any change in concentration smaller than 0.5% of the long-term environmental standard will be negligible, regardless of the existing air quality conditions. Where the change in concentration represents more than 0.5% of the standard, existing conditions are taken into consideration when describing the impacts. This is more stringent than the Environment Agency screening criterion of 1% set out above. With respect to changes in short-term concentrations, the guidance explains that:

"Where peak short term concentrations (those averaged over periods of an hour or less) from an elevated source are in the range 10-20% of the relevant Air Quality Assessment Level (AQAL), then their magnitude can be described as small, those in the range 20-50% medium and those above 50% as large. These are the maximum concentrations experienced in any year and the severity of this impact can be described as slight, moderate and substantial respectively, without the need to reference background or baseline concentrations. In most cases, the assessment of impact severity for a proposed development will be governed by the long-term exposure experienced by receptors and it will not be a necessity to define the significance of effects by reference to short-term impacts. The severity of the impact will be substantial when there is a risk that the relevant AQAL for short-term concentrations is approached through the presence of the new source, taking into account the contribution of other local sources".

Approach Used in Assessment

5.2.16 As a first step, the assessment has considered the predicted process contributions using the following criteria:

- is the long-term (annual mean) process contribution less than 0.5% of the long-term environmental standard?; and
- is the short-term (24-hour mean or shorter) process contribution less than 10% of the short-term environmental standard?

5.2.17 Where both of these criteria are met, then the impacts are negligible and thus insignificant. Where these criteria are breached then a more detailed assessment, considering total concentrations, has been undertaken.

Construction Dust Criteria

5.2.18 There are no formal assessment criteria for dust. In the absence of formal criteria, the approach developed by the Institute of Air Quality Management[1] (2014a) has been used. Full details of this approach are provided in **Appendix 5.4**.

Odour Criteria

5.2.19 There are currently no statutory standards in the UK covering the release and subsequent impacts of odours. This is due to complexities involved with measuring and assessing odours against compliance criteria, and the inherently subjective nature of odours.

5.2.20 It is recognised that odours have the potential to pose a nuisance for residents living near to an offensive source of odour. Determination of whether or not an odour constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the Environment Agency. The Environmental Protection Act 1990 (HMSO, 1990) outlines that a local authority can require measures to be taken where any:

"dust, steam, smell or other effluvia arising on an industrial, trade and business premises and being prejudicial to health or a nuisance…" or

"fumes or gases are emitted from premises so as to be prejudicial to health or cause a nuisance".

5.2.21 Odour can also be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act.

Bioaerosol Criteria

5.2.22 There is currently no guidance relevant to bioaerosol releases from the storage, disposal or thermal treatment of refuse derived fuel (RDF). All current guidance in the UK relates to composting activities, which have a much greater propensity for bioaerosol production than would be expected from RDF.

5.2.23 In 2001, the Environment Agency commissioned a study into the health effects of composting which included close examination of bioaerosols (Environment Agency, 2001). The study examined three major UK composting sites at which bioaerosol monitoring was undertaken for a number of sources at each site during visits at different times of year. The monitoring provided information on the concentration of bioaerosols, measured in

[1] The IAQM is the professional body for air quality practitioners in the UK.

colony forming units per cubic metre of air (cfu/m³), and the reduction in concentrations with distance from the source brought about by the dilution and dispersion of microorganisms during transport in air.

5.2.24 The study set out the following threshold limit values for short-term non-occupational exposure to bioaerosols:

- Bacteria = 1000 cfu/m³;
- Fungi – 1000 cfu/m³; and
- Gram-negative Bacteria – 300 cfu/m³.

5.2.25 Although these limit values were not supported by significant scientific evidence, they were accepted as being a conservative estimate of "safe" levels of exposure.

5.2.26 In addition, an Environment Agency position statement on the health effects of bioaerosols from composting (Environment Agency, 2010) states that bioaerosol concentrations *"generally decline to background levels within 250 m"* of composting activities. This statement was based on general consensus at the time of publication.

5.2.27 Until new, industry-specific guidance is released, the information and guidance available on bioaerosols from composting remains the only available guidance relating to bioaerosols that is applicable to the waste industry. However, it must be remembered that composting activities will have a much greater propensity for bioaerosol production than would be expected from the handling of RDF.

Approach- Existing Conditions

5.2.28 Information on existing air quality has been obtained by collating the results of monitoring carried out by the local authority and by Defra. The background concentrations across the study area have also been defined using the national pollution maps published by Defra (2016a), adjusted to local background monitoring data. These cover the whole country on a 1x1 km grid. Further information about background concentrations can be found in **Appendix 5.5**.

Approach- Stack Emissions

Study Area

5.2.29 The study area for consideration of the health impacts of emissions from the stack covers a number of specific receptors and a 2km x 2km area, centred on the proposed development.

5.2.30 The Environment Agency requires an assessment of the impacts of facilities such as this on European ecological sites (SPAs, SACs etc) within 10 km of the facility, of which there are none, and on national and local ecological sites within 2 km of the facility (Environment Agency, 2010a). The only relevant site is the Plantsbrook Reservoirs Local Nature Reserve, which is located approximately 1.6 km north of the proposed development.

Modelling Impacts from the Proposed REC

5.2.31 The impacts of emissions from the proposed REC have been modelled using the ADMS-5.1 dispersion model. ADMS-5.1 is a new generation model that incorporates a state-of-the-art understanding of the dispersion processes within the atmospheric boundary layer.

Receptors

5.2.32 Impacts have been predicted at a number of specific sensitive receptor locations, as well as over a 2 km x 2km square grid of receptors centred on the Proposed Development. The discrete human and ecological receptors used in the modelling are shown in **Figure 5.1**. The long-term (e.g. annual mean) objectives apply at receptors 1 to 46, while at receptors A to P only the short-term objectives apply. Receptors 1 to 46 have been modelled at heights of 1.5 and 4.5 m to represent ground and first-floor exposure. Receptors A to P (where there is only ground-level exposure) have all been modelled at a height of 1.5 m, while receptor I has also been modelled at heights 4.5 m, 7.5 m, 10.5 m and 13.5 m to represent the first to fourth floors of this hotel building. Receptors 47 to 49 represent the Plantsbrook Reservoirs Local Nature Reserve, and have been modelled at heights of 0 m and 1.5 m. Wherever multiple heights have been modelled, the maximum process contribution at any height at that receptor has been used throughout this assessment.

5.2.33 Impacts have also been predicted across a 2km by 2km square grid, centred on the Proposed Development, with receptors spaced 50m apart across this grid. These receptors have been modelled at a height of 1.5m, to represent ground-level human

exposure. The gridded receptors, along with the sensitive receptors that fall within this grid, are shown in **Figure 5.2**.

Meteorology

5.2.34 Five years of hourly-sequential meteorological data (2010 to 2014 inclusive) from Birmingham Airport have been used. **Appendix 5.6** provides a wind-rose for each meteorological dataset, and outlines the other meteorological parameters used in the model (such as surface roughness etc.). The maximum predicted process contribution during any year has been reported in the results section of this report. Data for 2016 were not available at the time of preparation of the report. The wind rose presented in Appendix 5.6 demonstrates that conditions in 2015 were not significantly different to those experienced 2010 to 2014.

Building Wake Effects

5.2.35 ADMS-5 has the ability to simulate the entrainment of exhaust plumes into the wake of nearby buildings. In order to ensure that the worst-case building configuration was covered, modelling has been carried out for two scenarios: 1) no buildings included in the model; 2) The main REC building included in the model. **Figure 5.3** shows the building modelled. The maximum predicted concentrations from the two scenarios have been used throughout this assessment.

Terrain Effects

5.2.36 In order to ensure that the impacts of terrain on dispersion are considered, the model has also been run both with and without terrain effects, and the maximum predicted concentrations from any of the scenarios have been used throughout this assessment.

Emissions

5.2.37 The operator has provided data on efflux volumes in Nm^3/s [2], as well as stack dimensions and the actual release conditions. The information provided by the operator, along with the actual release parameters calculated are set out in Table 5.4. The pollutant emission rates used in the assessment are derived from IED limits, which are set out in Table 5.5. Table 5.6 shows the emission rates entered into the dispersion model (to two significant figures).

[2] Throughout this report, 'normal' is used to refer to conditions recorded in the absence of moisture, at 11% oxygen, and at 0 degrees Celsius. These are the reference conditions at which the relevant IED emissions limits are expressed.

Table 5.4: Emission Parameters for the Proposed REC

Stack Parameter	Value [a]
Exit Velocity (m/s)	20.0
Normalised[2] Volume Flow Rate (Nm^3/s)	26.0
Actual Volume Flow Rate (m^3/s)	30.8
Moisture by volume (%)	15.6
Exhaust Temperature (^oC)	133
Oxygen by dry volume (%)	6.5
Stack Internal Diameter (m)	1.4
Stack Height Above Ground-Level (m)	55.0
Stack Location (O.S. x,y)	413617,290420

[a] rounded numbers are presented here but unrounded numbers were input into the model.

[b] Data were provided by the technology provider for two emissions scenarios, both with the facility operating at full load, but with different calorific values for the fuel, resulting in slightly different emissions. The maximum volume flow rate from either scenario has been used when calculating pollutant emissions, in order to ensure that these are worst-case, but the lower volume flow rate and exit velocity has been input into the model, which is again worst-case. These are conservative assumptions, in reality these characteristics are unlikely to occur together and thus dispersion of emissions will be greater and ground-level concentrations lower than presented in this report.

Table 5.5: Air Emission Limit Values

Pollutant	Emissions Averaging Period [a]	Emissions (mg/Nm^3)
Nitrogen Oxides	½ hour average	400
	daily average	200
PM_{10}	½ hour average	30
	daily average	10
SO_2	½ hour average	200

	daily average	50
CO	½ hour average	100
	daily average	50
TOC	½ hour average	20
	daily average	10
HCl	½ hour average	60
	daily average	10
HF	½ hour average	4
	daily average	1
Cd and TI	periodic over minimum ½ hour and maximum 8 hours	0.05
Hg	periodic over minimum ½ hour and maximum 8 hours	0.05
Group III metals [b]	periodic over minimum ½ hour and maximum 8 hours	0.5
NH_3	½ hour average and daily average	10
Dioxins and furans	periodic over minimum 6 hours and maximum 8 hours	0.0000001

[a] i.e. the averaging period over which emissions will be measured.

[b] Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V

Table 5.6: Modelled Emission Rates

Pollutant	**Concentration Averaging Period [a]**	**Emissions (g/s) [b]**
Nitrogen Oxides	1-hour mean	10.4
	24-hour mean	5.2
	annual mean	5.2 [c]

PM_{10}	24-hour mean	0.26
	annual mean	
SO_2	1-hour and 15-minute means	5.2
	annual mean	1.3
CO	rolling 8-hour mean	3.9
TOC	1-hour mean	0.52
	annual mean	0.26
HCl	1-hour mean	1.56
	annual mean	0.26
HF	1-hour mean	0.10
	24-hour and weekly means	0.026
Cd and TI	annual mean	0.0013
Hg	1-hour mean	0.0013
	annual mean	
Group III metals	1-hour mean	0.013
	annual mean	
NH_3	1-hour mean	0.26
	annual mean	
Dioxins and furans	Annual mean	0.0000000026

[a] i.e. the averaging periods set in the air quality objectives and EALs over which concentrations have been predicted.

[b] rounded numbers (to two significant figures) are presented here but unrounded numbers were input into the model.

[c] This is based on the 200 mg/Nm^3 IED limit. A NOx emission rate of 150 mg/Nm^3 has also been modelled, which equates to 3.9 g/s – see paragraph **Error! Reference source not found.**.

5.2.38 For most of the group III metals shown in Table 5.6, when assessing against each of the EALs for each metal in turn, it has been assumed that the total group III metals

emission rate is made up entirely of that metal. This is a worst-case approach. In the case of arsenic, chromium VI and vanadium it is not possible to screen out the potential for significant impacts using this method. Therefore, for these pollutants the more detailed approach set out by the Environment Agency in its Guidance Note for Metals (Environment Agency, 2016b) has been used. The next stage in the further screening for heavy metals is undertaken by assuming that emitted concentration of each metal is the maximum emission concentration listed in the guidance document[3]. The appropriate emission concentrations (0.025 mg/Nm^3 for arsenic, 0.006 mg/Nm^3 for vanadium and 0.00013 mg/Nm^3 for chromium VI) have therefore been used. These amended emission rates have been used later in this assessment (See Section 5.3.1 – Assessment of Likely Significant Effects).

Post-Processing

5.2.39 ADMS-5 has been run to predict the contribution of the proposed facility to annual mean concentrations of the pollutants for which there are annual mean objectives and EALs in Table 5.1, as well as to the 99.79th percentile of 1-hour mean nitrogen oxides concentrations, 90th percentile of 24-hour mean PM_{10} concentrations, 99.7th percentile of 1-hour mean sulphur dioxide concentrations, 99.9th percentile of 15-minute sulphur dioxide concentrations and 99.18th percentile of 24-hour mean sulphur dioxide concentrations.

5.2.40 The model has been run using the ADMS chemistry module to directly predict the contribution of the Proposed Development to nitrogen dioxide concentrations. To take account of the chemistry in the plume, background concentrations of nitrogen oxides, nitrogen dioxide and ozone have been taken from the rural background Aston Hill site, which forms part of the Automatic Urban and Rural Network (AURN), for 2010 to 2014. In order to determine the process contributions from the proposed plant, the model has been run once with a zero emission rate and once using the emissions shown in Table 5.6. The process contributions have then been calculated by taking the difference between the two scenarios.

5.2.41 The calculation of short-term nitrogen dioxide mean concentrations has been carried out on an hour-by-hour basis. The Aston Hill data have only been used to inform the chemistry routine, and as such, using a rural site (with relatively high ozone concentrations) provides a worst-case assessment as more of the emitted nitrogen oxides

[3] These are based on measurements at energy-from-waste facilities at the UK.

(NOx) will be converted to nitrogen dioxide (NO2). If background data from a more urban site (with lower ozone concentrations) had been used in the model, less nitrogen oxides would be assumed to be converted to nitrogen dioxide and the resultant impacts reported would have been smaller. Where relevant, the process contributions to nitrogen dioxide concentrations, derived using this method, have been added to local background concentrations. Thus, the use of background data from Aston Hill should not be taken to imply that the local background concentrations have been underestimated.

5.2.42 Deposition of pollutants to ecosystems has not been calculated within the dispersion model. Instead, deposition has been calculated from the predicted ambient concentrations using the following deposition velocities taken from AQTAG06 (Environment Agency, 2011a):

- NO_2 – 0.0015 m/s
- NH_3 – 0.03 m/s
- SO_2 – 0.024 m/s
- HCl – 0.025 m/s

5.2.43 The velocities are applied simply by multiplying a concentration ($\mu g/m^3$) by the velocity (m/s) to predict a deposition flux ($\mu g/m^2/s$). Subsequent calculations required to present the data as kg/ha/yr of nitrogen and as keq/ha/yr for acidity follow basic chemical and mathematical rules[4].

Approach- Emergency Diesel Generator

Impacts

5.2.44 The emissions from the diesel generator have been modelled using the ADMS-5 dispersion model.

5.2.45 The exact diesel generator to be installed within the facility is not known at this stage, thus a number of assumptions have been made in calculating the emission parameters. The assumed parameters are set out in Table 5.7, with the capacity of the generator being the upper end of the range anticipated by the technical specialists, who are assisting in the technical design of the facility. Where parameters have been estimated the approach has been to use the reasonable worst-case assumptions set out in Table 5.7, i.e. the combination of parameters that would lead to the highest ground-level

[4] For example, 1 kg N/ha/yr = 0.071 keq/ha/yr

concentrations has been assumed. It has been assumed that the flue for the generator will run up the external wall of the main building and exhaust vertically 1 m above the roof height of this section of the building.

Table 5.7: Emission Parameters for the Diesel Generator

Parameter	Value
Anticipated Electrical Output (MW)	2
Typical Generator Efficiency (%)	35
Estimated Net Fuel Input (MW)	5.714
Low-End Typical Generator Exhaust Temperature (oC)	475
Typical Generator Excess Air In (%)	90
Assumed NOx Emission Standard	EU Stage II [a]
Assumed NOx Emission Rate (mg/Nm^3) [b]	2,780
Assumed Flue Internal Diameter (m)	0.6
Calculated Exit Velocity (m/s)	29.0
Calculated Actual Volume Flow Rate (m^3/s)	8.2
Calculated NOx Emission Rate (g/s)	5.1
Stack Height Above Ground-Level (m)	24.0
Stack Location (O.S. x,y)	413605,290448
Assumed Annual Usage (Hours)	52 [c]

[a] This is a fairly conservative assumption, as it is likely that by the time the diesel generator is installed in the facility, it will be required to comply with the emission requirements of the Medium Combustion Plant Directive (Directive 2015/2193/EU of the European Parliament and of the Council, 2015), which sets a much lower NOx emission limit of 200 mg/Nm^3 to be applied to new plant from December 2018.

[b] In this instance, 'normal' conditions are dry, at 5% oxygen, and at 0°C.

[c] The emergency generator is unlikely to ever be required to operate, but will be tested weekly. It has been conservatively assumed that these tests will last for an hour each.

5.2.46 For the initial consideration of concentrations in relation to the short-term objectives, it has been assumed that the generator will run continuously at full load, a very much worst-case assumption. For the consideration of annual mean impacts it has been assumed that the generator will operate for 52 hours each year (1 hour of testing per week) and the model-output concentrations have been adjusted accordingly.

Approach- Road Traffic Emissions

Impacts

5.2.46 The approach taken in this assessment has been to screen the potential changes in traffic flows as a result of the development against criteria set out in the EPUK & IAQM guidance (EPUK & IAQM, 2015). Where the change in flows as a result of the scheme is below the published screening criteria no further assessment is required. Detailed dispersion modelling is, however, necessary where there is a need to assess total concentrations at a receptor.

Study Area

5.2.47 The impacts of additional road traffic emissions generated as a result of the development have been screened out of the assessment (see paragraphs 5.4.15 to 5.4.18). The road traffic modelling has, therefore, focussed on the area of greatest impact from the stack emissions assessment, where it is necessary to calculate total nitrogen dioxide concentrations.

Modelling

5.2.48 Concentrations have been predicted using the ADMS-Roads dispersion model. Details of the model inputs and the model verification are provided in Appendix 5.5, together with the method used to derive current and future year background nitrogen dioxide concentrations. The air quality modelling has been carried out based on a number of necessary assumptions, detailed further in Appendix 5.5. The main variable for road traffic modelling is the traffic data on which the model is based. Where possible a realistic worst-case approach has been adopted.

5.2.49 In addition to the set of 'official' vehicle emissions predictions, a sensitivity test has been carried out for nitrogen dioxide that involves assuming much higher nitrogen oxides emissions from certain vehicles than have been predicted by Defra, using AQC's Calculator Using Realistic Emissions for Diesels (CURED V2A) tool (AQC, 2016a). This is to address

the potential under-performance of emissions control technology on modern diesel vehicles (AQC, 2016b).

Receptors

5.2.50 Impacts have been predicted at selected sensitive receptor locations where the impacts of the stack emissions are greatest, and total concentrations expected to be highest (receptors 10-12, 16, 20-22, 24-27, 30 and 33-40). Receptors have been modelled at a height of 1.5 m, to represent worst-case ground level human exposure to emissions from roads.

Approach- Construction Dust

5.2.51 The construction dust assessment considers the potential for impacts within 350m of the site boundary; or within 50m of roads used by construction vehicles. The assessment methodology is that provided by the IAQM (Institute of Air Quality Management, 2014a). This follows a sequence of steps. Step 1 is a basic screening stage, to determine whether the more detailed assessment provided in Step 2 is required. Step 2a determines the potential for dust to be raised from on-site works and by vehicles leaving the site. Step 2b defines the sensitivity of the area to any dust that may be raised. Step 2c combines the information from Steps 2a and 2b to determine the risk of dust impacts without appropriate mitigation. Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts. Appendix 5.4 explains the approach in more detail.

Approach- Odour

5.2.52 Odour impact assessment is a challenging and subjective science. There are a number of odour assessment methods and tools that have been developed which are widely used in the UK, including desk-based methods, such as complaints analysis and qualitative risk assessment, through to field odour testing (sniff testing) and dispersion modelling. Each has its advantages and disadvantages and not all assessment methods are appropriate in every case; for example, where a potentially odorous process is

proposed rather than existing, then assessment methods such as sniff testing and odour sampling are less relevant than predictive methods such as odour risk assessment.

5.2.53 The approach to assessing the odour impacts from the proposed facility has been to utilise the qualitative risk-assessment approach described in the IAQM guidance on the assessment of odours for planning (IAQM, 2014b).

5.2.54 The odour risk assessment set out in the IAQM guidance follows a Source-Pathway-Receptor approach. This approach describes the concept that, in order for an odour impact (such as annoyance or nuisance) to occur, there must be a source of odour, a pathway to transport the odour to an off-site location, and a receptor (e.g. people) to be affected by the odour.

5.2.55 The risk of odour effects at a given receptor location may be estimated using the following fundamental relationship:

Effect ≈ Dose x Response

5.2.56 In this relationship, the **dose** is a measure of the likely exposure to odours, in other words the ***impact***. The **response** is determined by the sensitivity of the receiving environment and thus the overall ***effect*** is the result of changes in odour exposure at specific receptors, taking into account their sensitivity to odours.

5.2.57 In order to determine the risk of potential odour effects from the REC, the 'FIDOR' factors for odour exposure have been used. These factors are commonly used in the assessment of odours and are outlined in the IAQM guidance, but are also described in the Environment Agency's H4 guidance document on odour management (Environment Agency, 2011b), as well as Defra's odour guidance for local authorities (Defra, 2010). The FIDOR factors are:

- **F**requency – the frequency with which odours are detected;
- **I**ntensity – the intensity of odours detected;
- **D**uration – the duration of exposure to detectable odours;
- **O**ffensiveness – the level of pleasantness or unpleasantness of odours; and
- **R**eceptor – the sensitivity of the location where odours are detected, and/or the proximity of odour releases to an odour-sensitive location.

5.2.58 Odour emissions from the proposed REC have been assigned a risk-ranking based on the "effect ≈ dose x response" relationship, whereby the dose (impact) is determined by the "FIDO" part of FIDOR, and the response is determined by the "R" (receptor sensitivity). The risk of odour effects can therefore be described as:

Effect ≈ Impact (FIDO) x Receptor Sensitivity (R)

5.2.59 The key factors that will influence the effects of odours are the magnitude of the odour source(s), the effectiveness of the pathway for transporting odours, and the sensitivity of the receptor. The methodology set out in the IAQM guidance document describes in detail a Source-Pathway-Receptor approach to odour risk assessment, and includes tables and matrices to assist in determining the likely risk of odour effects. The IAQM methodology is outlined below. It includes an element of professional judgement.

5.2.60 The assessment examines the source odour potential (source magnitude) of the renewable energy centre, and then identifies the effectiveness of the pathway and receptor sensitivity at sensitive locations.

5.2.61 Table 5.8 describes the risk-rating criteria (high, medium and low) for source odour potential, pathway effectiveness and receptor sensitivity applied in this assessment. This table has been adapted from Table 8 in the IAQM odour guidance.

Table 5.8: Source-Pathway-Receptor Risk Ratings

Source Odour Potential	Pathway Effectiveness	Receptor Sensitivity
Large Source Odour Potential: Large-scale odour source and/or a source with highly unpleasant odours (hedonic tone -2 to -4); no odour control.	**Highly Effective Pathway:** Very short distance between source and receptor; receptor downwind of source relative to prevailing wind; ground level releases; no obstacle between source and receptor.	**High Sensitivity:** Highly sensitive receptors e.g. residential properties and schools.
Medium Source Odour Potential: Medium-scale odour source and/or a source with moderately unpleasant odours (hedonic tone 0 to -2); basic odour controls.	**Moderately Effective Pathway:** Receptor is local to the source; releases are elevated, but compromised by building effects.	**Medium Sensitivity:** Moderately sensitive receptors e.g. commercial and retail premises, and recreation areas.
Small Source Odour Potential: Small-scale odour source and/or a source with pleasant odours (hedonic tone +4 – 0); best practise odour controls.	**Ineffective Pathway:** Long distance between source and receptor (>500 m); receptors upwind of source relative to prevailing wind; odour release from stack/high level.	**Low Sensitivity:** Receptors not sensitive e.g. industrial activities or farms.

5.2.62 The risk ratings for source magnitude and pathway effectiveness (for each receptor) identified using the criteria in Table 5.8 are then combined using the matrix shown in Table 5.9 to estimate an overall risk of odour impact at each specific receptor location.

Table 5.9: Assessment of Risk of Odour Impact at a Specific Receptor Location

Pathway Effectiveness	Source Odour Potential (Source Magnitude)		
	Large	**Medium**	**Small**
Highly Effective	High Risk	Medium Risk	Low Risk

Moderately Effective	Medium Risk	Low Risk	Negligible Risk
Ineffective	Low Risk	Negligible Risk	Negligible Risk

5.2.63 The next stage of the risk assessment is to identify the potential odour effect at each receptor location. This is done using the matrix presented in Table 5.10, which combines the overall odour impact risk descriptor for each receptor with the receptor sensitivity determined using the criteria in Tables 5.8 and 5.9.

Table 5.10: Assessment of Potential Odour Effect at a Specific Receptor Location

Risk of Odour Impact	**Receptor Sensitivity**		
	High	**Medium**	**Low**
High Risk	Substantial Adverse Effect	Moderate Adverse Effect	Slight Adverse Effect
Medium Risk	Moderate Adverse Effect	Slight Adverse Effect	Negligible Effect
Low Risk	Slight Adverse Effect	Negligible Effect	Negligible Effect
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

5.2.64 As a final stage of assessment, an overall significance of odour effects is determined, based on professional judgment and taking into account the significance of effect at each specific receptor location.

Approach- Bioaerosols

5.2.65 A Qualitative approach has been taken to the bioaerosol assessment, based upon the likelihood of the generation of bioaerosols, the quantity likely to be generated, the potential for them to be released to the air outside of the facility, and the potential for such releases to lead to significant impacts at the nearest sensitive receptors.

Assessment of Significance

Construction Dust Significance

5.2.66 Guidance from the IAQM (Institute of Air Quality Management, 2014a) is that, with appropriate mitigation in place, the impacts of construction dust will be 'not significant'. The assessment thus focuses on determining the appropriate level of mitigation so as to ensure that impacts will normally be 'not significant'.

Operational Air Quality Impact Significance

5.2.67 There is no official guidance in the UK on how to describe air quality impacts, nor how to assess their significance. While the Environment Agency's guidance (Environment Agency, 2016a) does not set out a method of describing air quality impacts or determining how significant they are, it does set out screening criteria below which impacts can be considered insignificant (see paragraphs 5.2.9 and 5.2.10). These screening criteria have, therefore, been used in this assessment, along with the approach developed jointly by EPUK & IAQM (2015). The EPUK & IAQM approach includes defining descriptors of the impacts at individual receptors, which take account of the percentage change in concentrations relative to the relevant air quality objective, rounded to the nearest whole number, and the absolute concentration relative to the objective. The overall significance of the air quality impacts is determined using professional judgement, taking account of the impact descriptors. Full details of the EPUK/IAQM approach are provided in Appendix 5.3. The approach includes elements of professional judgement, and the experience of the consultants preparing the assessment is set out in **Appendix 5.7**.

5.2.68 It is important to differentiate between the terms impact and effect with respect to the assessment of air quality. The term impact is used to describe a change in pollutant concentration at a specific location. The term effect is used to describe an environmental response resulting from an impact, or series of impacts. Within this chapter, the air quality assessment has used published guidance and criteria described in the following sections to determine the likely air quality impacts at a number of sensitive locations. The potential significance of effects has then been determined by professional judgement, based on the frequency, duration and magnitude of predicted impacts and their relationship to appropriate air quality objectives.

Operational Odour & Bioaerosol Significance

5.2.69 The IAQM guidance document (IAQM, 2014b) is the only UK odour guidance document which contains a method for estimating the significance of potential odour impacts, and thus its methodology has been followed in determining the significance of potential odour impacts. There is no guidance that sets out how to determine the significance of bioaerosol impacts, thus a professional judgement has been made.

Policy Framework

European Legislation

European Framework Directive on Ambient Air Quality and Cleaner Air for Europe, 2008

5.2.70 The European Union has set limit values (concentrations which must not be exceeded) for a range of air pollutants. These limit values are set out in the EU Framework Directive (2008/50/EC, 2008). Achievement of these values is a national obligation and was required by 2010 for nitrogen dioxide and benzene, by 2005 for all other pollutants apart from $PM_{2.5}$, which was required by 2015.

Waste Framework Directive, 2008

5.2.71 The Waste Framework Directive (2008/98/EC, 2008) sets out the EU member state obligations for the planning, operation and management of waste sites and processes. With respect to air quality, the Directive states:

"Member States shall take the necessary measures to ensure that waste management is carried out without endangering human health, without harming the environment and, in particular:

without risk to water, air, soil, plants or animals;

without causing nuisance through noise or odours; and

without adversely affecting the countryside or places of special interest."

European Industrial Emissions Directive, 2010

5.2.72 The Industrial Emissions Directive (IED) (2010/75/EU, 2010) brings together seven existing directives, including the Waste Incineration Directive, into one piece of legislation. The IED sets total emission limit values (ELVs) for a number of pollutants typically emitted during waste incineration. These are nitrogen oxides, carbon monoxide, total dust, hydrogen chloride, hydrogen fluoride, sulphur dioxide, organic substances, trace metals, and dioxins and furans. The design and operation of all new waste incineration facilities must ensure compliance with the ELVs.

National Legislation

The Environmental Permitting Regulations in England and Wales, 2010

5.2.73 The Environmental Permitting Regulations (2010) sets the legislative background for environmental permitting in England and Wales. The Regulations include a commitment to minimise emissions to air from permitted processes, and include obligations for compliance with all legislated emissions limits for permitted processes, including the IED emission limits for waste incineration processes.

The Environmental Permitting Regulations in England and Wales (Amendment) Regulations, 2013

5.2.74 The requirements of the IED were transposed into UK law on 27th February 2013 by the Environmental Permitting (England and Wales) (Amendment) Regulations (2013). These make any new installation seeking a permit after 28th February 2013 subject to the IED.

The Waste (England and Wales) Regulations 2011

5.2.75 The Waste Framework Directive (2008/98/EC, 2008) and its obligations, including those on air quality, are transposed in English law by The Waste (England and Wales) Regulations (2011).

The UK Air Quality Strategy, 2007

5.2.76 The Air Quality Strategy published by the Department for Environment, Food, and Rural Affairs (Defra) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment (Defra, 2007). The 'standards' are set as pollutant concentrations below which health effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of an individual pollutant. The 'objectives' set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale.

5.2.77 The Strategy also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives (AQO). Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If

this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Clean Air Act 1993 & Environmental Protection Act

5.2.78 Small combustion plant of less than 20MW net rated thermal input are controlled under the Clean Air Act 1993 (HMSO, 1993a). This requires the local authority to approve the chimney height. Plant which are smaller than 366kW have no such requirement. The local authority's approval will, therefore, be required for this facility.

5.2.79 Measures to ensure adequate dispersion of emissions from discharging stacks and vents are included in Technical Guidance Note D1 (Dispersion) (HMSO, 1993b), issued in support of the Environmental Protection Act (HMSO, 1990).

Air Quality (England) Regulations, 2000 and Air Quality (England) (Amendment) Regulations 2002

5.2.80 These Regulations define the air quality objectives for the Local Air Quality Management (LAQM) Regime.

Air Quality Standards Regulations, 2010

5.2.81 The air quality limit values set out in EU Directive (2008/50/EC, 2008) are transposed in English law by the Air Quality Standards Regulations (2010). These impose duties on the Secretary of State relating to achieving the limit values.

National Policies to Protect Ecosystems

5.2.82 The Environment Act (1995) and the Natural Environment and Rural Communities Act (2006) both require the conservation of biodiversity. National planning policy on biodiversity and conservation is set out in the NPPF (National Planning Policy Framework, 2012). This emphasises that the planning system should seek to minimise impacts on biodiversity and provide net gains in biodiversity wherever possible as part of the Government's commitment to halting declines in biodiversity and establishing coherent and resilient ecological networks.

5.2.83 Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife sites will be judged, making distinctions between different levels of site designation. If significant harm from a

development cannot be prevented, adequately mitigated against, or compensated for, then planning permission should be refused.

National Planning Policy

National Planning Policy Framework, 2012

5.2.84 The National Planning Policy Framework (NPPF) (2012) sets out planning policy for the UK. It replaces previous Planning Policy Statements, including PPS23 on Planning and Pollution Control.

5.2.85 The NPPF contains advice on when air quality should be a material consideration in development control decisions. Existing, and likely future, air quality should be taken into account, as well as the EU limit values or national objectives for pollutants, the presence of any AQMAs and the appropriateness of both the development for the site, and the site for the development.

5.2.86 The NPPF places a general presumption in favour of sustainable development, stressing the importance of local development plans, and states that the planning system should perform an environmental role to minimise pollution. One of the twelve core planning principles notes that planning should *"contribute to…reducing pollution".* To prevent unacceptable risks from air pollution, planning decisions should ensure that new development is appropriate for its location. The NPPF states that the effects of pollution on health, and the sensitivity of the area and the development, should be taken into account.

5.2.87 The need for compliance with any statutory air quality limit values and objectives is stressed, and the presence of AQMAs must be accounted for in terms of the cumulative effects on air quality from individual sites in local areas. New developments in AQMAs should be consistent with local air quality action plans.

5.2.88 The NPPF also sets out the national planning policy on biodiversity and conservation. This emphasises that the planning system should seek to minimise effects on biodiversity and provide net gains in biodiversity wherever possible as part of the Government's commitment to halting declines in biodiversity and establishing coherent and resilient ecological networks.

Local Planning Policy

Birmingham Development Plan

5.2.89 The Draft Birmingham Development Plan (Birmingham City Council, 2013) sets out the statutory framework to guide decisions on development and regeneration in Birmingham up to 2031. Policies relevant to energy from waste plant along with relevant saved policies from the Birmingham Unitary Development Plan 2005 (Birmingham City Council, 2005) have been summarised in the Planning Statement which accompanies this ES and forms part of the planning application.

Air Quality Action Plan, 2011

5.2.90 In 2004 the whole of Birmingham City was declared an AQMA for exceedences of the nitrogen dioxide and PM_{10} objectives. In 2011 the Council produced an Air Quality Management Plan (Birmingham City Council, 2011) for the improvement of air quality within the city. The plan includes actions for the control of industry and emissions from chimneys, but these are not particularly detailed, simply stating that the Council will continue to strictly regulate industrial processes in the city and enforce the provisions of the Clean Air Act.

Guidance Notes

Environment Agency Air Emissions Risk Assessment for your Permit, 2016

5.2.91 The Environment Agency's Guidance (2016a) provides methods for quantifying the environmental effects of emissions to air. It contains long- and short-term Environment Assessment Levels (EALs) for releases to air derived from a number of published UK and international sources.

5.2.92 In addition, the Environment Agency's Guidance Note for Metals provides guidance for applicants for environmental permits, on how to consider the air quality effects from Group III metals in stack emissions from incineration and co-incineration plant (Environment Agency, 2016b).

Health and Safety Executive, Workplace Exposure Limits, 2005

5.2.93 The Health and Safety Executive's EH40/2005 Workplace exposure limits (HSE, 2005) document contains a list of the workplace exposure limits for substances hazardous to health. For pollutants assessed in this report which have no AQO or EALs, the occupational exposure emissions limits in EH40 have been used, following the advice set out in the EA's H1 guidance.

Odour Guidance

Defra Guidance

5.2.94 Defra released Odour Guidance for Local Authorities in March 2010 (Defra, 2010). This is a reference document aimed at environmental health practitioners and other professionals engaged in preventing, investigating and managing odours. The purpose of the guide is:

"…to support local authorities in their regulatory roles in preventing, regulating and controlling odours..."

5.2.95 The guidance outlines tools and methods which may be employed by environmental health practitioners in determining whether there is a statutory nuisance from odours; it covers the fundamentals of odours, the legal framework, assessment methods, mitigation measures and intervention strategies which may be adopted.

Environment Agency Guidance

5.2.96 The Environment Agency has produced a horizontal guidance note (H4) on odour assessment and management (Environment Agency, 2011b), which is designed for operators of Environment Agency-regulated processes (i.e., those which classify as Part A(1) processes under the Pollution Prevention and Control (PPC) regime). The H4 guidance document is primarily aimed at methods to control and manage the release of odours, but also contains a series of recommended assessment methods which can be used to assess potential odour impacts.

Institute of Air Quality Management Guidance

5.2.97 The latest UK guidance on odour was published by the Institute of Air Quality Management (IAQM) in 2014 (IAQM, 2014b). The IAQM guidance sets out assessment methods which may be utilised in the assessment of odours for planning applications. It is the only UK odour guidance document which contains a method for estimating the significance of potential odour impacts.

5.2.98 The IAQM guidance endorses the use of multiple assessment tools for odours, stating that, "best practice is to use a multi-tool approach where practicable". This is in order to improve the robustness of the assessment conclusions. Only one of the methods outlined in the IAQM guidance could realistically be adopted in this odour assessment.

Bioaerosol Guidance

5.2.99 The limited guidance addressing bioaerosols has been summarised in paragraphs 5.2.22 to 5.2.27.

Scoping Criteria

5.2.100 Birmingham City Council, in its scoping response, stated that *"the local planning authority does not object to the proposed methodology with regard to emissions, odour and construction dust"*. This assessment adheres to that proposed methodology. However, Birmingham City Council's Regulatory Services department has also stated that:

"In terms of air quality, this will be dealt with by the Environment Agency. The agency will have the responsibility for ensuring that all the air quality regulations applicable have been fully covered which should cover the extra journeys by vehicles to and from the site".

Limitations to the Assessment

5.2.101 There are many components that contribute to the uncertainty of modelling predictions. The point source model used in the assessment is dependent upon emission rates, flow rates, exhaust temperatures and other parameters for each source, all of which in reality are variable as the plant will operate at different loads at different times. There are then additional uncertainties, as the model is required to simplify real-world conditions into a series of algorithms. The road traffic emissions model used in this assessment is dependent upon the traffic data that have been input, which will have inherent uncertainties associated with them.

5.2.102 An important stage in the road traffic modelling process is model verification (this can only be done for the road traffic model), which involves comparing the model output with measured concentrations (see Appendix 5.5). The level of confidence in the verification process is necessarily enhanced when data from an automatic analyser (the reference method for measuring nitrogen dioxide) have been used, as has been the case for this assessment (see Appendix 5.5). Predicting pollutant concentrations from road traffic emissions in a future year is also subject to uncertainty. For obvious reasons, the model cannot be verified in the future, and it is necessary to rely on a series of projections provided by DfT and Defra as to what will happen to traffic volumes, background pollutant concentrations and vehicle emissions.

5.2.103 Historically, large reductions in nitrogen oxides emissions have been projected, which has led to significant reductions in nitrogen dioxide concentrations from one year to the next being predicted. Over time, it was found that trends in measured concentrations

did not reflect the rapid reductions that Defra and the DfT had predicted (Carslaw et al., 2011). This was evident across the UK, although the effect appeared to be greatest in inner London; there was also considerable inter-site variation. Emission projections over the 6 to 8 years prior to 2009 suggested that both annual mean nitrogen oxides and nitrogen dioxide concentrations should have fallen by around 15-25%, whereas monitoring data showed that concentrations remained relatively stable, or even showed a slight increase. Analysis of more recent data for 23 roadside sites in London covering the period 2003 to 2012 showed a weak downward trend of around 5% over the ten years (Carslaw and Rhys-Tyler, 2013), but this still falls short of the improvements that had been predicted at the start of this period. This pattern of no clear, or limited, downward trend is mirrored in the monitoring data assembled for this study, as set out in Paragraph 5.3.5.

5.2.104 The reason for the disparity between the expected concentrations and those measured relates to the on-road performance of modern diesel vehicles. New vehicles registered in the UK have had to meet progressively tighter European type approval emissions categories, referred to as "Euro" standards. While the nitrogen oxides emissions from newer vehicles should be lower than those from equivalent older vehicles, the on-road performance of some modern diesel vehicles has often been no better than that of earlier models. This has been compounded by an increasing proportion of nitrogen dioxide in the nitrogen oxides emissions, i.e. primary nitrogen dioxide, which has a significant effect on roadside concentrations (Carslaw et al., 2011) (Carslaw and Rhys-Tyler, 2013).

5.2.105 2.21 A detailed analysis of emissions from modern diesel vehicles has been carried out (AQC, 2016b). This shows that, where previous standards had limited on-road success, the 'Euro VI' and 'Euro 6' standards that new vehicles have had to comply with from 2013/16 are delivering real on-road improvements. A detailed comparison of the predictions in Defra's latest Emission Factor Toolkit (EFT) v7.0 against the results from on-road emissions tests has shown that Defra's latest predictions still have the potential to under-predict emissions from some vehicles, albeit by less than has historically been the case (AQC, 2016b). In order to account for this potential under-prediction, a sensitivity test has been carried out in which the emissions from Euro IV, Euro V, Euro VI, and Euro 6 vehicles have been uplifted as described in Paragraph A3.15 in Appendix A3, using AQC's CURED (V2A) tool (AQC, 2016a). This approach addresses the issues identified in Defra's modelling for the reporting of exceedences of the EU limit value as outlined by the High Court in the ClientEarth v Secretary of State case. The results from this sensitivity test are likely to over-predict emissions from vehicles in the future (AQC, 2016b) and thus provide a reasonable worst-case upper-bound to the assessment. There

is therefore confidence that this assessment relies on the most accurate information available at the time of preparation.

5.2.106 A number of assumptions have also had to be made regarding the stack emissions at the proposed REC. It has been assumed that the facility will operate continuously throughout the year, when the plant is only expected to operate for approximately 93% of the time, at most. A relatively worst-case approach to the conversion of NOx to NO_2 has also been adopted (see paragraphs 5.2.40, 5.2.41 and 5.4.34). IED emission rates have also been assumed (with the exception of the NOx emissions), when the gasification technology to be used is actually expected to result in emission rates far lower than these maxima permitted under IED. All of these assumptions ensure that the assessment undertaken is very worst-case, and that the actual impacts of the REC will be less than those shown later on in this chapter.

5.3 Baseline Conditions

Site Description and Context

5.3.1 The Proposed Development site is located within the Fort Industrial Park, in what is already a heavily industrialised area. There are numerous existing facilities with emissions to air, such as the Jaguar Land Rover plant and the Fort Dunlop Power Plant. There is also a very busy local road network, as well as the M6, which will represent a significant source of pollutant emissions. As a result, background pollutant concentrations are high, and there are several areas of poor air quality, in particular close to busy roads.

Baseline Information

Air Quality Review and Assessment

5.3.2 Birmingham City Council has investigated air quality within its area as part of its responsibilities under the LAQM regime. In July 2003 the whole city was declared an AQMA for exceedences of the nitrogen dioxide and PM_{10} objectives. Objective exceedences mostly occur alongside busy roads in the city.

Local Air Quality Monitoring

5.3.3 Birmingham City Council operates a number of automatic monitoring stations within its area. Two of these are located relatively close to the Proposed Development, some 2km to the west, close to Tyburn Road. These sites operate as part of the AURN network, with data having been downloaded from the Defra website (Defra, 2015a). Data for the

years 2009 to 2014 are summarised in Table 5.11 and the monitoring locations are shown in **Figure 5.4**.

Table 5.11: Summary of Nitrogen Dioxide (NO_2) Monitoring (2009-2014) [a]

Site No.	Site Type	Location	2009	2010	2011	2012	2013	2014
Annual Mean (µg/m³)								
BIRT	Roadside	Tyburn Roadside	**46.5**	**50.8**	**45.2**	**45.6**	**46.3**	**47.3**
BIR1	Urban Background	Tyburn	32.0	37.3	34.3	32.3	28.5	29.8
Objective			**40**					
No. of Hours > 200 µg/m³								
BIRT	Roadside	Tyburn Roadside	0	1	3	1	1	6
BIR1	Urban Background	Tyburn	0	7	4	0	0	0
Objective			**18**					

[a] Exceedences of the objectives are shown in bold.

5.3.4 Annual mean nitrogen dioxide concentrations at the Tyburn Roadside automatic monitor have consistently exceeded the objective over the past six years. Annual mean concentrations at the background monitor have consistently been below the objective, and the hourly objective has not been exceeded in any year at either site.

5.3.5 There are no clear trends in monitoring results for the past six years. This contrasts with the expected decline due to the progressive introduction of new vehicles operating to more stringent standards. The implications of this are discussed in paragraphs 5.2.103. to 5.2.105.

5.3.6 Birmingham City Council undertook a year-long monitoring study in Castle Vale in 2009 (see **Appendix 5.8**) using nitrogen dioxide diffusion tubes. The measured annual mean nitrogen dioxide concentrations are presented in Table 5.12 (the monitoring

locations can be seen in Appendix 5.8). Measured concentrations throughout the study area were below the objective, and background concentrations were well below it.

Table 5.12: Castle Vale Nitrogen Dioxide (NO_2) Monitoring (2009) [a]

Site No.	Location	Easting	Northing	2009 Annual Mean ($\mu g/m^3$)
CV1	Concorde Drive	413874	290737	38.0
CV2	Hurricane Way	414060	290786	32.1
CV3	Sopwith Croft	414082	290911	29.1
CV4	Cosford Crescent	414113	291235	27.7
CV5	Tangmere Drive	414707	291492	29.2
CV6	Davenport Drive	415106	291473	27.9
CV7	Manby Road	414513	291989	29.5
CV8	Manby Road (2)	414121	291624	29.1
CV9	Cadbury Drive	413935	290477	33.7
CV10	Cadbury Drive (2)	414389	290624	29.5

5.3.7 The automatic monitors also measure PM_{10} and $PM_{2.5}$. Data for 2009-2014 are presented in Table 5.13. Concentrations have been consistently below the objectives over the past six years. It is surprising that the roadside concentrations are so similar to those measured at the background site.

Table 5.13: Summary of PM_{10} and $PM_{2.5}$ Monitoring (2009-2014) [a]

Site No.	Site Type	Location	2009	2010	2011	2012	2013	2014
PM_{10} Annual Mean ($\mu g/m^3$)								
BIRT	Roadside	Tyburn Roadside	18.8	20.5	23.7	21.8	19.2	19.9
BIR1	Urban Background	Tyburn	20.5	23.8[b]	23.0	18.6	17.9	19.0
Objective			**40**					
PM_{10} No. of Days > 50 $\mu g/m^3$								
BIRT	Roadside	Tyburn Roadside	9	2	18	13	9	8
BIR1	Urban Background	Tyburn	8	2 [b] (37.7)	18	9	9	6
Objective			**35 (50)**					
$PM_{2.5}$ Annual Mean ($\mu g/m^3$)								
BIRT	Roadside	Tyburn Roadside	13.7	14.6	16.6	12.8	16.0	14.0
BIR1	Urban Background	Tyburn	13.6	21.3 [b]	15.6	13.6	17.9	13.5
Objective			**25**					

[a] Exceedences of the objectives are shown in bold.

[b] Data capture was 23.4% in 2010, and thus the 90th percentile of daily mean PM_{10} concentrations is provided in parentheses.

Exceedences of EU Limit Value

5.3.8 The Tyburn roadside AURN monitoring site lies 2 km west of the development site, and concentrations have exceeded the annual mean nitrogen dioxide limit value in each of the past six years (Table 5.10). The national map of roadside annual mean nitrogen dioxide concentrations (Defra, 2016a), used to report exceedences of the limit value to

the EU, identifies exceedences of the limit value along Fort Parkway and along Chester Road either side of Fort Parkway, as well as along several other nearby roads in 2015. However, the mapping for 2020 indicates that the limit values will be achieved at these locations in the opening year of the REC. The national maps of roadside PM_{10} and $PM_{2.5}$ concentrations show no exceedences of the limit values anywhere in the UK. These maps are for 2014 concentrations; detailed maps of predicted future year exceedences are not available.

Background Concentrations

5.3.9 Where necessary, estimated background concentrations in the study area have been determined. In the case of nitrogen dioxide, these have been determined for both 2014 and the opening year 2020 (Table 5.14), and two sets of future-year backgrounds are presented to take into account uncertainty in future year vehicle emission factors. 2014 background concentrations have been estimated based on measured concentrations from Birmingham City Council's Castle Vale Air Quality Survey undertaken in 2009. This is considered appropriate, as it represents a measured background concentration from very close to the development site. The measured annual mean nitrogen dioxide concentration at the Tyburn background automatic monitor was 7% lower in 2014 than it was in 2009 – see Table 5.11), and the values measured in 2009 have been adjusted to reflect this. The 2014 value has been adjusted to calculate the 2020 concentrations, with full details of this adjustment methodology provided in Appendix 5.5.

Table 5.14: Estimated Annual Mean Background NO_2 Concentrations in 2014 and 2020 ($\mu g/m^3$)

Year	NO_2
2014	25.8
2020 [a]	19.5
2020 Worst-case sensitivity test [b]	21.1
Objective	**40**

[a] In line with Defra's forecasts.

[b] Assuming higher emissions from modern diesel vehicles as described in Appendix A5.5

5.3.10 Estimated background concentrations of benzene and 1,3-butadiene in the study area have been determined from Defra's published maps of background concentrations.

The data have been taken for the year 2001 since this is the base year for the most recent set of published maps. Table 5.15 shows the maximum background concentrations in the study area, with these maximum values having been used at every receptor location throughout the assessment, rather than the individual gridded values, as a worst-case.

Table 5.15: Annual Mean Background Pollutant Concentrations Taken from Defra's Background Maps (Defra, 2016a) (µg/m³)

Pollutant	Maximum Background Concentration
Benzene	0.731
1,3-butatiene	0.315

5.3.11 Defra has undertaken monitoring of trace elements at a number of locations in the UK since 1976 as part of the UK Urban and Rural Heavy Metals Monitoring Networks. To provide an indication of trace metal concentrations in the study area, measured concentrations of selected heavy metals at the three nearest monitoring sites in 2014 are summarised in Table 5.16 (values are stated to the same number of significant figures as published by Defra). These data have been downloaded from the Defra website (Defra, 2016a). Where background concentrations of these heavy metals have been used in this assessment, the maximum value (in the final column of Table 5.16) has always been used as a worst-case. This is considered very worst-case, as measured concentrations at Walsall Bilston Lane and Runcorn Weston Point are generally much higher than other sites in the UK.

Table 5.16: Trace Metal Background Concentrations in 2014 (ng/m³) [a]

Pollutant	Harwell	Runcorn Weston Point	Walsall Bilston Lane	Maximum
Arsenic	0.63	0.68	1.2	1.2
Cadmium	0.099	0.13	2.5	2.5
Chromium	0.86	1.3	3.8	3.8
Lead	4.6	6.5	57	57
Nickel	2.1	3.5	2	3.5
Manganese	1	1	13	13
Vanadium	0.95	1.3	1.2	1.3

[a] 1,000 ng = 1 µg

5.3.1 The annual mean sulphur dioxide background concentration for 2014 has been taken from Defra's modelled PCM data (Defra, 2016b), with the highest concentration from any grid square within which a gridded or selected sensitive receptor is located used throughout the assessment. This value was 2.15 µg/m^3.

5.4 Assessment of Likely Significant Effects

Construction Phase

5.4.1 The construction works will give rise to a risk of dust impacts during demolition, earthworks and construction, as well as from trackout of dust and dirt by vehicles onto the public highway.

Potential Dust Emission Magnitude

Demolition

5.4.2 The existing industrial units on the site are to be demolished. These are up to around 9 m tall, with a total volume of approximately 65,000 m^3, and are mostly constructed of brickwork, steelwork and cladding. The method of demolition has not yet been decided, but crushing and screening on site is likely. Based on the example definitions set out in

Table A5.4.1 in Appendix 5.4, the dust emission class for demolition is considered to be *medium.*

Earthworks

5.4.3 The characteristics of the soil at the development site have been defined using the British Geological Survey's UK Soil Observatory website (British Geological Survey, 2015), as set out in Table 5.17. Overall, it is considered that, when dry, this soil only has the potential to be moderately dusty, or even just slightly dusty in the northern half of the site.

Table 5.17: Summary of Soil Characteristics

Category	Record
Northern Half of Site	
Soil layer thickness	Deep
Soil Parent Material Grain Size	Arenaceous[a] - Rudaceous[b]
European Soil Bureau Description	River Terrace Sand/Gravel
Soil Group	Light (silty) to Medium (Silty)
Soil Texture	Sand to Sandy Loam[c]
Southern Half of Site	
Soil layer thickness	Deep
Soil Parent Material Grain Size	Argillic[d] - Arenaceous
European Soil Bureau Description	Riverine Clay and Floodplain Sands and Gravels
Soil Group	All
Soil Texture	Clay to Sandy Loam

[a] grain size 0.06 – 2.0 mm.

[b] grain size > 2.0 mm.

[c] a loam is composed mostly of sand and silt.

[d] grain size < 0.06 mm.

5.4.4 The site covers 1.9 ha and most of this will be subject to earthworks, involving the removal of the foundations of the demolished buildings and breaking up of existing paved areas, then excavation, haulage, tipping, stockpiling and landscaping of the topsoil and subsoil. No bunds will be formed. The earthworks will last around 3-4 months and dust will arise mainly from vehicles travelling over unpaved ground and from the handling of dusty materials, such as dry soil. Based on the example definitions set out in Table A5.4.1 in Appendix 5.4, the dust emission class for earthworks is considered to be *medium*.

Construction

5.4.5 Construction will involve the laying of hard pavings and the building of the main REC building along with the industrial warehouse building fronting onto Dunlop Way. These buildings will primarily be constructed of steelwork, reinforced concrete, cladding and sheet roofing. Dust will arise from vehicles travelling over unpaved ground, the handling and storage of dusty materials, and from the cutting of concrete. The construction will take place over a 24-month period. Based on the example definitions set out in Table A5.4.1 in Appendix 5.4, the dust emission class for construction is considered to be *medium*.

Trackout

5.4.6 It is anticipated that there will be approximately 20 outward heavy vehicle movements per day during construction, with vehicles travelling over little more than 10 m of unpaved surface. Based on the example definitions set out in Table A5.4.1 in Appendix 5.4, the dust emission class for trackout is considered to be *medium*.

5.4.7 Table 5.18 summarises the dust emission magnitude for the proposed development.

Table 5.18: Summary of Dust Emission Magnitude

Source	Dust Emission Magnitude
Demolition	Medium
Earthworks	Medium
Construction	Medium
Trackout	Medium

Sensitivity of the Area

5.4.8 This assessment step combines the sensitivity of individual receptors to dust effects with the number of receptors in the area and their proximity to the site. It also considers additional site-specific factors such as topography and screening, and in the case of sensitivity to human health effects, baseline PM_{10} concentrations.

Sensitivity of the Area to Effects from Dust Soiling

5.4.9 The IAQM guidance explains that residential properties and long-term car parks are 'high' sensitivity receptors to dust soiling, while industrial and commercial premises and short-term car parks are 'medium' sensitivity receptors (see Table A5.4.2 in Appendix 5.4). The nearest residential properties lie over 300 m from the site, while the long-term car park for new cars to the west of the site is over 160 m away (see Figure 5.5). Far closer to the site are existing industrial units and associated car parking to the west, and an existing commercial warehouse (B&Q) and its associated short-term car park to the east. Using the matrix set out in Table A5.4.3 in Appendix 5.4, the area surrounding the onsite works is of 'low' sensitivity to dust soiling.

5.4.10 Table 5.17 shows that dust emission magnitude for trackout is 'medium' and Table A5.4.3 in Appendix 5.4 thus explains that there is a risk of material being tracked 200 m from the site exit. The first 200 m that any outbound construction traffic will travel will necessarily be westbound along Fort Parkway. There are no residential properties within 50 m of this stretch of road, and only a few industrial and commercial premises set back at least 10 m from the roads (see **Figure 5.6**). Table A5.4.3 in Appendix 5.4 thus indicates that the area is of 'low' sensitivity to dust soiling due to trackout.

Sensitivity of the Area to any Human Health Effects

5.4.11 Residential properties are also classified as being of 'high' sensitivity to human health effects, while places of work are of 'medium' sensitivity. The matrix in Table A5.4.4 in Appendix 5.4 requires information on the baseline annual mean PM_{10} concentration in the area. It is considered reasonable to use the measured concentration for 2014 of 19.9 $\mu g/m^3$ from the Tyburn roadside automatic monitor for this. Using the matrix in Table A5.4.4 in Appendix 5.4, the area surrounding the onsite works is of 'low' sensitivity to human health effects in terms of residential receptors. There are 'medium' sensitivity receptors in terms of nearby places of work within 20 m of the site. Using the matrix in Table A5.4.4 in Appendix 5.4, the surrounding area would be considered to be of 'medium sensitivity' to human health effects. This, however, does not take into account local PM_{10} concentrations. Taking into account that local PM_{10} concentrations are likely to be below 24 $\mu g/m^3$, it is the professional opinion of the consultants completing the assessment that

the sensitivity of the area to human health during the demolition phase will be 'low'. The area surrounding roads along which material may be tracked from the site is also of 'low' sensitivity to human health effects (Table 5.19).

Sensitivity of the Area to any Ecological Effects

5.4.12 The guidance only considers designated ecological sites within 50m to have the potential to be impacted by the construction works. There are no designated ecological sites within 50m of the site boundary or those roads along which material may be tracked, thus ecological impacts will not be considered further.

Table 5.19: Summary of the Area Sensitivity

Source	Sensitivity of the Surrounding Area	
	On-site Works	**Trackout**
Dust Soiling	Low Sensitivity	Low Sensitivity
Human Health	Low Sensitivity	Low Sensitivity

Risk and Significance

5.4.13 The dust emission magnitudes in Table 5.18 have been combined with the sensitivities of the area in Table 5.19 using the matrix in Table A5.4.6 in Appendix 5.4, in order to assign a risk category to each activity. The resulting risk categories for the four construction activities, without mitigation, are set out in Table 5.20. These risk categories have been used to determine the appropriate level of mitigation as set out in the next Section on mitigation.

Table 5.20: Summary of Risk of Impacts Without Mitigation

Source	Dust Soiling	Human Health
Demolition	Low Risk	Low Risk
Earthworks	Low Risk	Low Risk
Construction	Low Risk	Low Risk
Trackout	Low Risk	Low Risk

5.4.14 The IAQM does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant' (Institute of Air Quality Management, 2014a).

Operational Phase

Air Quality Impacts – Road Traffic Emissions

5.4.15 The EPUK & IAQM guidance summarised in Appendix 5.3 sets out screening criteria for traffic generation within an AQMA. It explains that development can be screened out as not requiring a detailed assessment of road traffic impacts on the local area where:

- the development will lead to a change in LDV flows of more than 100 AADT; and
- the development will lead to a change in HDV flows of more than 25 AADT.

5.4.16 The transport assessment work within Chapter 7 demonstrates that, overall, there will be a net reduction in vehicle trips as a result of the Proposed Development going ahead. This is because the proposed uses will generate less total vehicle trips than the current uses on the site. Further details on this can be found in the Transport Assessment Chapter 7 of this ES. Clearly the development can be screened out as not requiring a detailed assessment under the first of the criteria outlined above. HGV trips will, however, increase as a result of the development going ahead.

5.4.17 Trip distribution data used within Chapter 7 Transport Assessment show that HGV flows (2-way) will increase by 30 vehicles per day along Fort Parkway. This is above the second of the screening criteria set out above. However, there are no sensitive receptors along this stretch of Fort Parkway, thus no detailed assessment needs be undertaken. Beyond Fort Parkway, the maximum predicted increase in HGV flows is along the A452,

where they will increase by 16 movements per day (6 northbound and 10 southbound). This is below the screening criterion, thus no detailed assessment is required.

5.4.18 The impact of the Proposed Development on air quality in terms of road traffic vehicle trip generation has been screened out as insignificant.

Air Quality Impacts – Stack Emissions

Predicted Concentrations Relevant to Human Health

Screening of Maxima

5.4.19 Table 5.21 sets out the maximum predicted process contribution (PC) anywhere within the 2 km x 2km square grid of receptors and at any of the specific sensitive receptors, in any of the meteorological years. For most of the pollutants and averaging periods, the process contribution is less than 0.5% of the long-term EAL or less than 10% of the short-term EAL and the impacts of the facility can thus be discounted as insignificant without having to consider total concentrations (see paragraphs 5.2.9 to 5.2.17 on screening criteria).

Table 5.21: Maximum Predicted Process Contributions in the Study Area (µg/m^3) [a]

Pollutant	Averaging Period	Maximum PC		EAL
		PC	% of EAL	
NO_2	Annual Mean	**0.977**	**2.4%**	**40**
	99.79th%ile of 1-hour Means	17.0	8.5%	**200**
SO_2	99.7th%ile of 1-hour Means	3.44	2.8%	**350**
	99.18th%ile of 24-hour Means	23.4	6.7%	**125**
	99.9th%ile of 15-minute Means	**28.7**	**10.8%**	**266**
PM_{10}	Annual Mean	0.089	0.2%	**40**

	90.4th%ile of 24-hour Means	0.301	0.6%	**50**
$PM_{2.5}$	Annual Mean	0.089	0.4%	**25**
CO	Rolling 8-hour Mean	0.020	0.2%	**10,000**
HCl	Annual Mean	0.093	0.5%	**750**
	Max Hourly Mean	25.4	3.4%	**20**
HF	Annual mean	0.009	0.1%	**16**
	Max Hourly Mean	1.69	1.1%	**160**
VOCs (as benzene)	Annual Mean	**0.093**	**1.9%**	**5**
VOCs (as 1,3-butadiene)	Annual Mean	**0.093**	**4.1%**	**2.25**
VOCs (as dimethyl sulphate)	Max Hourly Mean	**8.46**	**54.2%**	**15.6**
Cd	Annual Mean	**0.0005**	**9.3%**	**0.005**
Tl	Annual Mean	0.0005	0.1%	**1**
	Max Hourly Mean	0.0212	0.1%	**30**
Hg	Annual Mean	0.0005	0.2%	**0.5**
	Max Hourly Mean	0.0212	0.3%	**7.5**
Sb	Annual Mean	0.0046	0.1%	**5**
	Max Hourly Mean	0.2115	0.1%	**150**
As	Annual Mean	**0.0046**	**154.6%**	**0.003**
Pb	Annual Mean	**0.0046**	**1.9%**	**0.25**
	Annual Mean	0.0046	0.1%	**5**

Total group 3 metals as Cr III	Max Hourly Mean	0.2115	0.1%	**150**
Total group 3 metals as Cr VI	Annual Mean	**0.005**	**2,319.3%**	**0.0002**
	Max Hourly Mean	0.2115	1.4%	**15**
Co	Annual Mean	0.0046	0.5%	**1**
	Max Hourly Mean	0.2115	0.7%	**30**
Cu	Annual Mean	0.0046	0.05%	**10**
	Max Hourly Mean	0.2115	0.1%	**200**
Mn	Annual Mean	**0.0046**	**3.1%**	**150**
	Max Hourly Mean	0.2115	0.1%	**1,500**
Ni	Annual Mean	**0.0046**	**23.2%**	**0.02**
V	Annual Mean	0.0046	0.1%	**5**
	Max Hourly Mean	**0.2115**	**21.2%**	**1**
NH_3	Annual Mean	0.0928	0.1%	**180**
	Max Hourly Mean	4.23	0.2%	**2,500**
Dioxins and furans	Annual Mean	0.000000001	0.3%	**0.0000003** [b]

[a] Where the PC as a% of the EAL is more than 0.5% of an annual mean EAL or more than 10% of a short-term EAL, it is shown in bold.

[b] This is the WHO indicator concentration (300 fg/m^3) above which it would be considered necessary to identify and control emissions.

5.4.20 For 15-minute mean sulphur dioxide, annual mean and 1-hour mean VOCs, annual mean cadmium, arsenic, lead, chromium VI, manganese and nickel, and for 1-hour mean vanadium, the process contributions exceed the screening criteria and so the Predicted Environmental Concentration (PEC) has been calculated by adding the local background

concentrations (see Tables 5.15 and 5.16), as shown in Table 5.22. Adding the background concentration shows that for every pollutant, with the exception of chromium VI and arsenic, the EAL will be achieved and the potential for significant impacts can thus be discounted. The process contribution to annual mean nitrogen dioxide concentrations also cannot be screened out at this stage, but this is assessed further separately in paragraph 5.4.27 onwards.

5.4.21 The arsenic, vanadium and chromium VI PCs cannot be scoped out at this stage and thus these metals are subject to further screening based on more realistic emission rates as set out by the Environment Agency (Environment Agency 2016b). The PCs to annual mean nitrogen dioxide concentrations also cannot be screened out at this stage, so these are subject to a detailed assessment as set out below.

Table 5.22: Maximum Predicted Environmental Concentrations in the Study Area ($\mu g/m^3$)[a]

Pollutant	Averaging Period	Maximum PEC		EAL[b]
		PEC	% of EAL	
VOCs (as benzene)	Annual Mean	0.824	16.5%	**5**
VOCs (as 1,3-butadiene)	Annual Mean	0.408	18.1%	**2.25**
VOCs (as Dimethyl sulphate) [c]	Max Hourly Mean	**8.461**	**54.2%**	**15.6**
Cd	Annual Mean	0.003	59.3%	**0.005**
As	Annual Mean	**0.006**	**194.6%**	**0.003**
Pb	Annual Mean	0.062	24.7%	**0.25**
Total group 3 metals as Cr VI	Annual Mean	**0.008** [d]	**4219.3%**	**0.0002**
Mn	Annual Mean	0.018	11.8%	**150**
Ni	Annual Mean	0.007	33.2%	**0.02**
V	Max Hourly Mean	**0.212**	**21.2%**	**1**
SO_2	99.9th %ile of 15-minute Means	28.7	11.0%	**261.7**

[a] Where the PEC exceeds the EAL it is shown in bold. Where the short-term PEC exceeds 20% of the adjusted EAL it is shown in bold.

[b] For hourly and 15-minute standards, an adjusted EAL is shown which is the short-term environmental standard minus twice the long-term background concentration.

[c] There is no background concentration available for dimethyl sulphate and so the background has been assumed to be zero. While this may under-predict the PEC, it is considered highly unlikely that the background concentration could be sufficient for the EAL to be exceeded.

[d] It should be noted that the background concentration added here is that for all forms of chromium, not just chromium VI. Chromium VI can be expected to make up a small fraction of the total chromium background, thus the PEC is likely to have been significantly over-estimated.

5.4.22 For long-term impacts, adding the background concentration shows that for every pollutant other than arsenic, and chromium VI, the PEC will be less than 70% of the EAL and the potential for significant impacts can thus be discounted. For short-term impacts, the 99.9th percentile of 15-minute sulphur dioxide PCs is less than 20% of the adjusted PEC, and thus can be discounted as insignificant. The PC of vanadium is just above 20% of the adjusted EAL, and thus requires further assessment. The PC of dimethyl sulphate is greater than 20% of the adjusted EAL, but this is based on the extremely unrealistic assumption that the entire emission of TOC from the facility is dimethyl sulphate. In reality dimethyl sulphate can be expected to form a small fraction of the TOC emissions, the PEC will not exceed the EAL and the PC is unlikely to exceed 10% of the EAL. As such, it is considered appropriate to conclude that the facility will have an insignificant impact on concentrations of this pollutant.

5.4.23 Environment Agency guidance (Environment Agency, 2016b) outlines that the next stage in the further assessment screening for heavy metals should be undertaken by assuming that emitted concentration of each metal is the maximum emission concentration listed in the guidance document[5]. The appropriate emission concentrations (0.025 mg/Nm^3 for arsenic, 0.006 mg/Nm^3 for vanadium and 0.00013 mg/Nm^3 for chromium VI) have therefore been used, generating new PCs, which are presented in Table 5.23.

[5] These are based on measurements at energy from waste facilities at the UK.

Table 5.23: Maximum Predicted Process Contributions in the Study Area (µg/m³)[a]

Pollutant	Averaging Period	Maximum PC		EAL
		PEC	% of EAL	
As	Annual Mean	**0.0002**	**7.7%**	**0.003**
Cr VI	Annual Mean	**0.000001**	**0.6%**	**0.0002**
V	Max Hourly Mean	0.002538	0.3%	**1**

[a] Where the PC as a % of the EAL is more than 0.5% of an annual mean EAL or more than 10% of a short-term EAL, it is shown in bold.

5.4.24 The predicted PC of vanadium is below the screening criterion of 10% of the EAL, thus impacts on concentrations of this pollutant can be discounted as insignificant.

5.4.25 The predicted PC of chromium VI is greater than the EPUK/IAQM guidance's screening criterion of 0.5% of the EAL, but below the Environment Agency's screening criterion of 1% of the EAL. The EPUK/IAQM guidance was produced with a focus on the primary pollutants targeted by the LAQM regime, these being nitrogen dioxide, PM_{10} and $PM_{2.5}$, and was not intended to be applied to rarer pollutants with limited sources, such as chromium VI. As such, it is considered more appropriate to apply the Environment Agency's screening criterion, developed specifically for industrial sources such as the proposed REC. Chromium VI process contributions can, therefore, be considered insignificant.

5.4.26 The predicted PC of arsenic is above the screening criterion, thus it is necessary to again calculate the PEC, and compare it to the screening criterion of 70% of the EAL Table 5.24). The predicted PEC of arsenic is below the screening criterion, so the impacts of emission of this pollutant can also be considered insignificant.

Table 5.24: Maximum Arsenic Predicted Environmental Concentrations Using Environment Agency Emission Rates (µg/m³)

Pollutant	Averaging Period	Maximum PEC		EAL
		PEC	% of EAL	
As	Annual Mean	0.0014	47.7%	0.003

5.4.27 The impacts of the facility on concentrations of all pollutants relevant to human health, with the exception of annual mean nitrogen dioxide, have been screened out as insignificant. In considering the annual mean nitrogen dioxide impacts it is useful to see where impacts are greatest, thus a contour plot of the process contribution has been generated, and is shown in **Figure 5.7**. It is clear from this figure that the impacts on nitrogen dioxide concentrations cannot immediately be screened out across an area of Castle Vale.

5.4.28 The process contribution is less than 0.5% of the objective (0.2 µg/m^3 – the EPUK/IAQM screening criterion) across parts of this area, and is less than 1% of the objective (0.4 µg/m^3 – the Environment Agency screening criterion) across most of it. The detailed assessment will focus on those areas where the impacts of the REC emissions can be expected to be greatest; these will be the areas close to busy roads where the PCs are relatively high and baseline concentrations are also high, which, when applying the EPUK/IAQM impact descriptor criteria set out in Table 5.3.1 in Appendix 5.3, will result in the most significant impacts.

5.4.29 **Figure 5.8** shows the location of the selected sensitive receptors considered in the assessment in relation to the annual mean nitrogen dioxide process contributions. Using this figure, receptors 10 12, 16, 20-22, 24-27, 30 and 33-40 have been selected for the detailed assessment, as they are in areas where the PC is relatively high and are also located close to busy roads. Baseline nitrogen dioxide concentrations in 2020 at these receptors have been determined using road traffic dispersion modelling, as described in Appendix 5.5.

5.4.30 The total annual mean nitrogen dioxide concentrations at these receptors, both with and without the Proposed Development, in its year of opening (2020), are detailed in Table 5.25. Table 5.25 also describes the impacts at each receptor using the impact descriptors given in Appendix 5.3. Results are presented for two scenarios so as to include a worst-case sensitivity test. Further details of the inputs to the road traffic emissions

models, as well as the verification factor applied to the output road-NOx, are provided in Appendix 5.5.

Table 5.25: Predicted Impacts on Annual Mean Nitrogen Dioxide Concentrations in 2020 (µg/m³) [a]

Receptor	With 'Official' Emissions Reduction [b]				Worst-case Sensitivity Test [c]			
	Without Scheme	With Scheme	% Change [d]	Impact Descriptor	Without Scheme	With Scheme	% Change [d]	Impact Descriptor
10	31.9	32.2	1	Negligible	36.0	36.3	1	Negligible
11	33.4	33.7	1	Negligible	37.6	38.0	1	Slight Adverse
12	**40.3**	**40.6**	1	Slight Adverse	**45.4**	**45.7**	1	Moderate Adverse
16	25.3	25.8	1	Negligible	27.9	28.5	1	Negligible
20	34.4	35.3	2	Slight Adverse	38.4	39.3	2	Moderate Adverse
21	34.1	35.1	2	Slight Adverse	38.1	39.0	2	Moderate Adverse
22	36.2	37.1	2	Slight Adverse	**40.3**	**41.2**	2	Moderate Adverse
24	35.0	36.0	2	Slight Adverse	39.0	40.0	2	Moderate Adverse
25	28.2	29.2	2	Negligible	31.5	32.4	2	Slight Adverse
26	26.8	27.7	2	Negligible	29.9	30.8	2	Slight Adverse
27	26.2	26.9	2	Negligible	29.4	30.1	2	Negligible
30	25.0	25.4	1	Negligible	28.2	28.6	1	Negligible

33	24.5	24.8	1	Negligible	27.6	27.9	1	Negligible
34	23.2	23.5	1	Negligible	26.5	26.7	1	Negligible
35	23.0	23.3	1	Negligible	26.3	26.6	1	Negligible
36	23.1	23.4	1	Negligible	25.8	26.1	1	Negligible
37	20.4	20.7	1	Negligible	22.3	22.6	1	Negligible
38	22.1	22.6	1	Negligible	25.0	25.5	1	Negligible
39	22.2	22.6	1	Negligible	25.4	25.8	1	Negligible
40	21.7	22.1	1	Negligible	24.7	25.0	1	Negligible
Objective	**40**		-	-	**40**		-	-

[a] Exceedences of the objective are shown in bold.

[b] In line with Defra's forecasts.

[c] % changes are relative to the objective and have been rounded to the nearest whole number.

[d] Assuming higher emissions from modern diesel vehicles as described in paragraph 5.2.49 in Appendix 5.5.

5.4.31 Using Defra's "official" emissions forecasts, concentrations will be below the objective at all but one of the selected sensitive receptors. Receptor 12 will experience an objective exceedence with or without the REC emissions. The changes in concentrations as a result of the main stack emissions, relative to the objective, will be 1% or 2% (when rounded) at all receptors. For most receptors, this results in a negligible impact. However, for receptors 12, 20, 21, 22 and 24 the impacts are slight adverse. Receptor 12 represents six properties adjacent to Kingsbury Road, while receptors 20, 21, 22 and 24 likely represent up to 28 properties near to Chester Road. In total, slight adverse impacts could affect up to 34 residences, although given the worst-case assumptions applied throughout the main stack emissions assessment it would be expected that fewer properties than this will actually experience such impacts.

5.4.32 Predicted total concentrations are higher using the worst-case sensitivity test. In this case, the modelling suggests that receptors 12 and 22 will experience an objective exceedence with or without the REC emissions. The potential exceedence of the objective is as a result of existing vehicle emissions on the local road network and would occur even if the proposed REC were not in place. The changes in concentrations as a result of the

main stack emissions, relative to the objective, will still be 1% or 2% (when rounded) at all receptors, but with the higher total concentrations (due to more pessimistic vehicle emission factors), the impacts are considered to be more adverse. Slight adverse impacts are predicted at receptors 11, 25 and 26 and moderate adverse impacts are predicted at receptors 12, 20, 21, 22 and 24. Moderate adverse impacts could therefore occur at up to 28 properties (the same 28 identified above), with slight adverse impacts at a further 20 (receptor 11 represents ten properties and receptors 25 and 26 approximately a further ten).

5.4.33 While the modelling suggests that up to 48 properties could experience adverse impacts in terms of annual mean nitrogen dioxide concentrations, it must be borne in mind that these impacts occur chiefly as a result of the high baseline concentrations at these properties, which are a result of the high levels of road traffic emissions in the area, with or without the REC. The contribution of the REC will represent a very small fraction of the total concentrations at these residences with road traffic emissions being a far more significant source, and away from these few busy roads total concentrations will be well below the objective and the impact of the REC emissions negligible.

5.4.34 It should also be borne in mind that these impacts are based on modelling that has incorporated a number of worst-case assumptions, and thus the actual process contributions will likely be lower than predicted. These assumptions include:

- assuming constant operation of the plant. In reality, the plant is only expected to operate for approximately 93% of the time, at most; and

- assuming a NOx to NO_2 conversion rate that would apply at very low background concentrations. The only appropriate available background concentrations of NOx, NO_2 and O_3 concentrations for use in the dispersion modelling were from Aston Hill, a very rural site in the Shropshire Hills, where background concentrations of NOx and NO_2 are very low, and O_3 high. Where these conditions occur, there tends to be a higher rate of conversion of NOx to NO_2, and the model will have applied this higher rate of conversion to the modelled process contributions. In reality, background NOx and NO_2 concentrations in Castle Bromwich are relatively high, which will make O_3 concentrations low, thus less NOx will be converted to NO_2, and the NO_2 process contribution will be less than that predicted. It should be recognised that these low background concentrations were only used for the calculation of the NOx to NO_2 conversion. Local background concentrations were used when calculating total concentrations.

5.4.35 It must also be noted that the A452 has been shown by Defra to be experiencing an exceedence of the limit value for annual mean nitrogen dioxide. Following a recent update to its Pollution Climate Mapping model, and assuming the introduction of a 'Clean Air Zone' in the area, Defra now expects that the limit values will be achieved throughout the West Midlands by 2020 (Defra, 2016c). The additional nitrogen dioxide that the Proposed Development will lead to along this road could slow the achievement of the limit value ever so slightly, but in reality the process contribution is small, and tiny in comparison to the road traffic contribution here. Thus the proposed development is unlikely to have a significant impact on the achievement of the limit values.

Emergency Generator Impacts

5.4.36 Table 5.26 sets out the maximum predicted PC from the diesel generator to nitrogen dioxide concentrations anywhere within the 2 km x 2km grid of receptors and at any of the specific sensitive receptors, in any of the meteorological years. The annual mean nitrogen dioxide PC presented has been calculated by multiplying the annual mean nitrogen oxides PC by 0.7, while the 99.79th percentile of 1-hour mean nitrogen dioxide PCs has been calculated by multiplying the 99.79th percentile of 1-hour mean nitrogen oxides PCs by 0.35, following Environment Agency guidance (Environment Agency, 2005).

Table 5.26: Predicted Maximum Diesel Generator NO_2 PCs in the Study Area ($\mu g/m^3$) a

Pollutant	Averaging Period	Maximum Grid Area PC		EAL
		PC ($\mu g/m^3$)	% of EAL	
NO_2	Annual Mean	0.18	0.46%	**40**
	99.79th %ile of 1-hour Means	**76.1**	**38.1%**	**200**

[a] Where the PC as a % of the EAL is more than 0.5% of an annual mean EAL or more than 10% of a short-term EAL, it is shown in bold.

5.4.37 The process contribution to the annual mean nitrogen dioxide concentration is less than 0.5% of the objective, thus the contribution of the generator can be immediately

discounted as insignificant. The process contribution to short-term concentrations cannot, however, be screened out, thus further assessment is required.

5.4.38 The ADMS-5 model has been re-run with both the REC main stack NOx emissions and the diesel generator NOx emissions in order to determine whether the hourly mean nitrogen dioxide objective could be exceeded in the study area as a result of the combined emissions. Concentrations have been predicted at all of the selected sensitive receptor locations where the 99.79th percentile of 1-hour nitrogen dioxide concentrations predicted in the initial screening assessment above were above the screening threshold of 20 µg/m^3 (10% of the objective), these being receptors 16, 20, 21, 22, 24, 25, 26, 27, 34, 35, 38, 39, A, B, C, D, E, F, G, H, I, J, K, L, M, N and O (see Figure 5.1).

5.4.39 The model has been run using the ADMS chemistry module to directly predict the hour-by-hour contribution to nitrogen dioxide concentrations. To take account of the chemistry in the plume, background concentrations of nitrogen oxides, nitrogen dioxide and ozone have been taken from the rural background Aston Hill site, which forms part of the Automatic Urban and Rural Network (AURN), for 2010 to 2014. In order to determine the process contributions from the proposed plant, the model has been run once with a zero emission rate and once using the emissions for the plant set out in Section 2. The process contributions have then been calculated by taking the difference between the two scenarios, on an hour-by-hour basis. The Aston Hill data have only been used to inform the chemistry routine, and as such, using a rural site (with relatively high ozone concentrations) provides a worst-case assessment as more of the emitted nitrogen oxides (NOx) will be converted to nitrogen dioxide (NO_2). If background data from a more urban site (with lower ozone concentrations) had been used in the model, less nitrogen oxides would be assumed to be converted in nitrogen dioxide and the resultant impacts reported would have been smaller. Where relevant, the process contributions to nitrogen dioxide concentrations derived using this method have been added to relevant local baseline concentrations. Thus, the use of background data from Aston Hill should not be taken to imply that the local background or baseline concentrations have been underestimated. Using the ADMS chemistry routine is considered more appropriate than applying the Environment Agency's conversion factors when undertaking a detailed assessment of short-term impacts, as it more accurately represents the hour-by-hour chemistry in the plume. It is also more appropriate when considering impacts close to a source, which are more likely with a shorter stack, such as that for the emergency generator.

5.4.40 The 1-hour mean nitrogen dioxide objective demands that a concentration of 200 µg/m^3 is exceeded no more than 18 times in any single calendar year. Given that the

diesel generator will only operate for 52 hours a year, a statistical model has been used to determine the likelihood of an exceedence of the objective as a result of the combined REC main stack and diesel generator emissions. The hour-by-hour total process contributions (calculated using the chemistry module as described above) have been input into a spreadsheet tool ('statistical model') that has been designed to select 52 of the hourly results at random. The 19th highest hourly process contribution from the 52 hours selected represents a realistic potential combined 99.79th percentile process contribution from the REC main stack and diesel generator for a random year (the 19th highest hour is significant as the objective allows 18 exceedences of 200 µg/m^3 per year).

5.4.41 The statistical model has been run 10,000 times, selecting 52 random hours during each run. This simulates 10,000 years of operation and provides a large enough dataset to determine the risk of impacts beyond any reasonable doubt. It should be noted that this methodology has been designed by the authors and is not contained in any UK guidance; nor, however, is any alternative approach that can be used. The professional experience of the consultants applying this approach is presented in Appendix 5.7.

5.4.42 The 19th highest hourly nitrogen dioxide process contribution from each of the 10,000 statistical model runs has been determined for each receptor. The maximum 99.79th percentile of total 1-hour nitrogen dioxide concentrations has then been calculated by adding this process contribution to two times the baseline annual mean nitrogen dioxide concentration at each receptor, which is common practice when considering 1-hour nitrogen dioxide concentrations. The baseline annual mean nitrogen dioxide concentrations used have been taken from the road traffic modelling worst-case sensitivity test, and include the annual mean nitrogen dioxide PC from the REC's main stack emissions as calculated in Table 5.25, in order to ensure that the total 99.79th percentile concentrations are conservative.

5.4.43 The maximum predicted total 99.79th percentile of 1-hour total process contributions (from both the diesel generator and the REC main stack combined) and the maximum total 99.79th percentile of 1-hour mean nitrogen dioxide concentrations at any receptor are presented in Table 5.27.

Table 5.27: Combined Impact of Main Stack and Diesel Generator Emissions on Short-Term NO_2 Concentrations (µg/m³)

Maximum of 10,000 Model Runs	Maximum 99.79th %ile Concentration (µg/m³)	% of EAL	Location
PC	40.2	20.1%	Receptor B
PEC	150.0	75.0%	Receptor D

5.4.44 The maximum PEC is below the objective level of 200 µg/m³, thus it can be concluded that the emissions from the diesel generator (plus those from the REC main stack) will not result in any exceedences of the hourly mean nitrogen dioxide objective, and can be considered insignificant.

Predicted Impacts on Designated Habitats

5.4.45 Table 5.28 sets out the maximum process contributions to the relevant pollutant concentrations at Receptors 47 to 49, which represent the Plantsbrook Reservoirs Local Nature Reserve. All of the process contributions are less than 100% of the EALs and can thus be considered insignificant (see Paragraph 5.2.13).

Table 5.28: Maximum Predicted Environmental Concentrations in the Plantsbrook Reservoirs Local Nature Reserve

Pollutant	Averaging Period	Maximum PC		EAL
		PC	% of EAL	
NH_3	Annual Mean	0.024	0.8%	3
NOx	Annual Mean	0.359	1.2%	30
	Max 24-hour Mean	3.692	4.9%	75
SO_2	Annual Mean	0.445	2.2%	20
HF	Max 24-hour Mean	0.074	1.5%	5
	Max Weekly Mean	0.033	6.6%	0.5

Nutrient Nitrogen Deposition [a]	Annual Mean	0.222	4.4%	5
Acid Nitrogen Deposition [b]	Annual Mean	0.159	8.8%	1.8

[a] Nutrient nitrogen deposition composed of the nitrogen component of both nitrogen dioxide and ammonia.

[b] Acid deposition calculated as the sum of the acidifying potentials from nitrogen dioxide, ammonia, sulphur dioxide and hydrogen chloride.

Odour Impacts

Odour Risk Assessment

Process Description

5.4.46 The Proposed Development will accept up to 105,000 tonnes of RDF per year. This will all be delivered by HGV, which will enter the reception hall through fast-acting doors. These doors will be open for as little time as possible, and the reception hall will be maintained under negative pressure to ensure that the escape of air is kept to an absolute minimum. The delivered waste will be unloaded into the waste bunker within the reception hall.

5.4.47 Unprocessed waste will be removed from the waste bunker and passed through a shredder before passing underneath an overhead magnet where metals will be removed (the recovered metal will be collected in a separate skip and periodically sent for further recycling). The shredded waste will then be conveyed to the adjoining fuel bunker.

5.4.48 Overhead fuel cranes operating on a pre-programmed cycle will move the waste around the fuel bunker to mix the fuel to create a more homogeneous mixture. The cranes will then deliver waste automatically to the fuel delivery chutes serving the gasification unit. From this point onwards the system is sealed, and there should be no escape of gases until they are exhausted from the flues.

5.4.49 The thermal conversion then takes place in two stages. Firstly drying, pyrolysis and gasification of the fuel will be carried out in the gasification unit creating the synthetic gas. The bottom ash produced is discharged from the gasification units and stored in an ash bays before being removed for offsite treatment. This bottom ash is not expected to be especially odorous, and will be stored within the process building. The synthetic gas is

passed to the high-temperature oxidation unit, where it is mixed with the air extracted from the reception hall, and there is complete combustion of the synthetic gas.

5.4.50 Having been generated in the dual stage gasification process and passed through the Heat Recovery Steam Generator, the flue-gas will enter a gas cleaning system. This will comprise a bag-house filter, a storage silo for lime and activated carbon and a filter dust silo. In simple terms the lime and activated carbon will be injected at the inlet of the bag house filter and this will absorb acid components in the flue-gas. The activated carbon adsorbs dioxin, organic carbons and heavy metals prior to release to the atmosphere. This released air is highly unlikely to be especially odorous, as most odorous compounds will be destroyed in the combustion process.

Source Odour Potential

5.4.51 The first step of the odour risk assessment is to identify the source odour potential or odour magnitude. This takes into account the scale and nature of the odorous processes; the continuity, intensity and offensiveness of odour releases; and any odour control measures that are used. In essence, it must consider the odour potential of the source with respect to the FIDO part of FIDOR.

5.4.52 The Proposed Development will handle waste, which has the potential to produce highly intense and highly offensive odours. However, the plant will accept a majority of RDF along with MSW and C&I, which will have been well-processed by the time it reaches the facility, and very different to waste handled at a household waste centre, for example. RDF is combustible waste that has been shredded, dried and baled, and will have had most of the potentially odorous organic matter originally mixed in with the waste removed during processing. Some organic matter, and thus odour-generating potential, will undoubtedly remain though, and thus the feedstock for the plant remains a potentially significant odour source.

5.4.53 Organic material is biodegradable, and biodegradation can result in odours being produced. The strength and nature of odours produced is dependent on a number of variables including the volume and composition of the waste, the length of time it has been stored, the influence of temperature and moisture, and mechanical action. Typically, fresh organic matter is less odorous than organic matter that is a number of days or weeks old and has had time for biological breakdown to begin (either aerobic or anaerobic). Conversely, organic matter which has been allowed to significantly biodegrade often becomes less odorous again (e.g. mature compost). Any residual organic matter within the RDF is likely to be at least a few weeks old, and could thus be quite odorous.

5.4.54 The feedstock for the plant is really the only source of odour, but there are three main ways in which odours may be released during the processes undertaken at the proposed facility. The first will be from the transport of the fuel to the facility, with odours released from the RDF as it is transported by road. The second will be from the process building itself, primarily the reception hall where the waste is stored, shredded and fed into the gasification units. The reception hall will be separate to the section of the building housing the gasifiers, oxidation units and generators; the latter part of the building will be naturally ventilated, as it is not expected to be a potential odour source, as the processes here are entirely sealed. The final potential odour source is the flues themselves, although the gases released here, at 55 m height, are not expected to be especially odorous, and will be released into a good environment for dispersion.

5.4.55 The main potential odour sources and overall source odour potential for the facility are described in Table 5.29.

Table 5.29: Identification of Odour Sources and Overall Odour Source Odour Potential

Odour Source	Description	Frequency and Duration	Intensity and Offensiveness
Transport of Feedstock	The delivery of the RDF / MSW / C&I feedstock to the facility by HGV.	This will take place between the hours of 7am and 7pm on weekdays and most likely between 7am and 2pm on Saturdays including public holidays, with a total of approximately 33 deliveries per day. This equates to a delivery every 18 minutes on average during these hours.	While most RDF is likely to be fairly benign, there is always the potential for a dirtier batch to produce moderately intense, highly offensive odours. Delivery vehicles will, however, be covered to minimise odorous emissions.

Process Building	Handling of the RDF / MSW / C&I.	The gasification process will be continuous, so waste will be moved and shredded 24/7.	As outlined above, there is the potential for the RDF / MSW & C&I to produce moderately intense, highly offensive odours. However, the process building will be maintained under negative pressure, so the potential for these odours to be released will be very low.
Flue Gases	The leftover gases from the combustion process, post-cleaning.	The gasification process will be continuous, so flue gases will be emitted 24/7.	The flue gas is expected to have a low intensity and low offensiveness, as most odorous compounds will be destroyed in the combustion process.
Overall Source Odour Potential	The overall source odour potential of the proposed facility is judged to be **Small**.		

Pathway Effectiveness

5.4.56 In order to consider the effectiveness of the pathway, it is important to consider receptor locations in terms of their proximity to the odour source(s) and the prevailing wind direction. A worst-case selection of the receptor locations used in the air quality dispersion modelling (receptors A, H, L, 10, 22, 27, and 35) have been selected for use in the odour risk assessment, along with a few additional receptors. These receptor locations are shown in **Figure 5.10**.

5.4.57 Individual wind roses from the Birmingham Airport meteorological station for the years 2010 to 2014, as well as a combined wind rose for the five years, are presented in Appendix 5.6. These demonstrate that the prevailing wind in the region is from the south and southwest, with occasional northwest and northeast components. In general, odours

will be transported by the wind and will not be detectable at locations upwind of a source. The exception to this is during very light wind conditions when odours may disperse against the wind direction, although typically only for relatively short distances.

5.4.58 The effectiveness of the odour pathway between the proposed facility and the nearby sensitive receptors is summarised in Table 5.30, which draws upon the guidance set out in Table 5.8.

Table 5.30: Effectiveness of Odour Pathway

Receptor		Distance from Source [a]	Direction from Source	% Winds from Source [b]	Pathway Effectiveness [c]
ID	Location				
A	Garden Centre	30 m	30°	4.7	Highly Effective
H	Restaurant	145 m	130°	3.8	Moderately Effective
L	Park	195 m	180°	2.1	Ineffective
10	Residence	740 m	340°	3.8	Ineffective
22	Residence	320 m	30°	4.7	Moderately Effective
27	Residence	300 m	80°	3.2	Moderately Effective
35	Residence	260 m	180°	2.1	Ineffective
R1	Warehouse	20 m	270°	1.1	Moderately Effective
R2	Jaguar	110 m	340°	3.8	Moderately Effective

[a] Measured as distance to the boundary of the renewable energy centre.

[b] Average wind frequency in each 10° sector is 2.8% across all wind directions.

[c] Overall pathway effectiveness is based on professional judgement, taking account of the distance between source and receptor, and frequency of winds with respect to the average.

5.4.59 The pathway to receptor A is clearly highly effective, being a very short distance away and downwind under prevailing wind conditions. Winds towards receptor H are less frequent, albeit not infrequent, and the receptor is considerably further away, thus the pathway is judged to be moderately effective. A similar logic applies for receptors 22, 27 and R2, which will be downwind fairly regularly, but are some distance from the source, and thus the pathway is also judged to be moderately effective. Receptor R1 is very close

to the Proposed Development, but will very rarely be downwind, so this pathway is also deemed moderately effective. The pathway to receptors L and 35 are deemed ineffective, as winds placing them downwind from the Proposed Development are not especially common and they are a relatively large distance away. Receptor 10 will regularly be downwind of the site, but is so far away that the pathway is deemed ineffective. It should also be borne in mind that, for receptors L, 10, 22, 27 and 35 in particular, there are numerous objects between them and the Proposed Development, such as buildings and trees, which will act as barriers to the wind and thus the odorous air, and reduce the effectiveness of the pathway.

Potential Odour Effects

5.4.60 The assessments of the potential odour effects at sensitive receptor locations are presented in Table 5.31. This brings together the source odour potential, effectiveness of pathway and receptor sensitivity identified using the criteria described in Table 5.8, to identify an overall potential for odour effects, using the matrices set out in Table 5.9 and Table 5.10.

Table 5.31: Effectiveness of Odour Pathway

Receptor	Risk of Odour Impact (Dose)			Receptor Sensitivity	Likely Odour Effect
	Source Odour Potential	Effectiveness of Pathway	Risk of Odour Impact		
A	Small	Highly Effective	Low	Medium	Negligible
H	Small	Moderately Effective	Negligible	High	Negligible
L	Small	Ineffective	Negligible	Medium	Negligible
10	Small	Ineffective	Negligible	High	Negligible
22	Small	Moderately Effective	Negligible	High	Negligible
27	Small	Moderately Effective	Negligible	High	Negligible
35	Small	Ineffective	Negligible	High	Negligible

R1	Small	Moderately Effective	Negligible	Low	Negligible
R2	Small	Moderately Effective	Negligible	Low	Negligible

5.4.61 The potential odour effects as set out in Table 5.31 have been identified using the effect ≈ dose x response relationship identified in paragraph 5.2.55. The process is described as follows:

1) Identify the impact:

5.4.62 Based on a *small* source odour potential, where the pathway is deemed to be *highly effective*, then the risk of odour impacts (dose) is judged to be *low* (see Table 5.8). Where the effectiveness of the pathway is deemed to be *moderately effective* or *ineffective*, the risk of odour impacts is *negligible*.

2) Consider the response:

5.4.63 Based on the matrix presented in Table 5.10, the odour effects at each receptor are identified as follows: a negligible risk of odour impacts will lead to a negligible odour effect regardless of receptor sensitivity; a low risk of odour impact at a medium sensitivity receptor will also lead to a negligible odour effect, thus all of the effects are *negligible*.

5.4.64 The final stage of the risk assessment is to make an overall judgement as to the likely significance of effects. In this case it is judged that that overall significance of odour effects is insignificant. This conclusion is based on the findings of the risk assessment that have identified a *negligible* or *low* risk of odour effects at all receptor locations, with the resultant odour effects all being *negligible*.

Bioaerosol Impacts

5.4.65 Fundamental to the breakdown of organic waste is microbiological activity, thus the handling of this waste is likely to make airborne significant quantities of those micro-organisms (referred to as bioaerosols). However, the pre-processed RDF handled at the proposed facility is expected to contain very little organic matter (although there will be a smaller proportion of municipal solid waste (MSW)), and thus the potential for bioaerosol generation is low. As described in the odour assessment, the reception hall will be maintained under negative pressure, ensuring that very little air escapes the building. The feedstock itself will be gasified at very high temperatures, which will kill all biological

material that enters the furnaces. The gas is then mixed with the air extracted from the reception hall and combusted, which will again kill all biological material in this air. It is thus anticipated that there will be little or no bioaerosols in the flue gas emissions. Combined with the very little air expected to escape from the buildings themselves, it can be concluded that the Proposed Development will not represent a significant source of bioaerosols, and will thus have an insignificant impact on local receptors in terms of bioaerosol concentrations.

5.5 Mitigation and Enhancement

Construction (including demolition)

5.5.1 Measures to mitigate dust emissions will be required during the construction phase of the development in order to reduce impacts upon nearby sensitive receptors.

5.5.2 The site has been identified as a Low Risk site during demolition, earthworks and construction, and Low Risk for trackout, as set out in Table 5.20. Comprehensive guidance has been published by IAQM (Institute of Air Quality Management, 2014a) that describes measures that should be employed, as appropriate, to reduce the impacts. This reflects best practice experience and has been used, together with the professional experience of the consultant and the findings of the dust impact assessment, to draw up a set of measures that should be incorporated into the specification for the works. These measures are described in **Appendix 5.9**.

5.5.3 The mitigation measures should be written into a dust management plan (DMP). The DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring. Where mitigation measures rely on water, it is expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.

Operation

5.5.4 The assessment has shown that the Proposed Development will, for the most part, not have a significant impact on local air quality in terms of pollutants from combustion, odours or bioaerosols. No additional mitigation has, therefore, been proposed for the operational impacts.

Good Design and Best Practice Measures

5.5.5 The EPUK & IAQM guidance advises that good design and best practice measures should be considered whether or not more specific mitigation is required. While the guidance is aimed at the operational air quality assessment rather than the assessment of construction dust or operational odour and bioaerosols, it is still useful to note where good design and best practice measures have been applied in terms of minimising these impacts, so they are also covered here. The Proposed Development incorporates the following good design and best practice measures:

- the use of the best available technology for the recovery of energy from waste in terms of emissions to air (gasification);
- the installation of appropriate mitigation in the form of a gas cleaning system for the exhaust air from the combustion process;
- the use of a tall stack to ensure good dispersion of emissions;
- voluntary introduction of a lower annual mean emission rate for nitrogen oxides;
- adherence to the best practice techniques set out in IAQM guidance during the construction phase;
- the use of fast-acting doors to minimise the escape of air during deliveries;
- the use of an extraction system to maintain the reception hall under negative pressure, again minimising the escape of odorous air from the building;
- using the extracted air in the combustion process to destroy odorous compounds and bioaerosols without the need for further abatement such as an odour control unit;
- continuous monitoring of emissions of several pollutants from the stack, allowing immediate identification of any breaches of the emissions limits;
- periodic monitoring of other pollutants to ensure compliance with emissions limits; and
- the introduction of a travel plan to minimise the impact of the scheme on local road traffic flows, and thus air quality.

5.6 Cumulative and In-Combination Effects

5.6.1 Dust impacts will generally only occur within 350 m of a construction site. Only one of the cumulative developments recommended to be considered by Birmingham City Council lies within 700 m of the Proposed Development, this being an application to extend the area of hardstanding at a green waste recycling facility some 100 m south of the Proposed Development. This extension has already been constructed, thus there is no risk of cumulative construction dust impacts.

5.6.2 Given that the impacts of the Proposed Development on concentrations of every pollutant bar nitrogen dioxide have been screened out as insignificant, it is highly unlikely that the Proposed Development would contribute to a significant impact in terms of these pollutants when considered cumulatively with other local developments. The cumulative impacts of other local developments on nitrogen dioxide concentrations would be unlikely to change the impacts described in Table 5.25, and would thus have no effect on the overall conclusions of this assessment.

5.6.3 The assessment has concluded that there is a negligible risk of odour or bioaerosol impacts, thus the contribution of the Proposed Development to any cumulative odour or bioaerosol impacts would also be negligible. This is not to say that other local developments will not have significant odour or bioaerosol impacts, merely that the proposed REC is highly unlikely to contribute to any local effects.

5.7 Summary

Introduction

5.7.1 The impacts of dust and PM_{10} emissions during the construction (including demolition) phase have been assessed qualitatively following published guidance. The operational impacts of the Proposed Development on air quality, odour and bioaerosol conditions for local receptors have also been assessed. Air quality impacts have been assessed quantitatively using dispersion modelling, while odour impacts have been assessed following a risk assessment technique outlined in published guidance. Bioaerosol impacts have been assessed qualitatively based upon the levels expected to be generated and the likelihood of their being emitted from the proposed facility.

Baseline Conditions

5.7.2 The local area is heavily industrialised, with numerous point sources of emissions to air, as well as having a very busy and congested road network. Local monitoring shows

roadside concentrations of nitrogen dioxide to be above the annual mean objective, but away from busy roads concentrations of all pollutants are below the objectives.

Likely Significant Effects

5.7.3 The odour risk assessment has demonstrated that the odour effects on all local receptors will be negligible, thus the Proposed Development is judged to be insignificant in terms of odour effects. The qualitative bioaerosol assessment has also demonstrated that the Proposed Development will have an insignificant effect on local receptors in terms of bioaerosol concentrations.

5.7.4 The impacts of road traffic generated by the Proposed Development have been screened out as insignificant, as the development will lead to less overall traffic being on the local roads than the site's current use, and only very marginally more HGV traffic.

5.7.5 In terms of emissions from the facility's stack, the assessment has demonstrated that these will result in an insignificant change in concentrations at all local sensitive receptor locations for all pollutants and all averaging periods, with the exception of annual mean nitrogen dioxide. Following Environment Agency guidance, the process contribution to annual mean nitrogen dioxide could also be screened out as insignificant, but EPUK and IAQM guidance employs a stricter screening criterion. Following this stricter guidance, the development will still have a *negligible* impact on annual mean nitrogen dioxide concentrations at most local receptors, but will likely have a *slight adverse* to *moderate adverse* impact at up to 48 properties nearest to the busy local road network. The facility will still contribute a fraction of the total concentration at these receptors (less than 1 $\mu g/m^3$ when total concentrations at some receptors are above 40 $\mu g/m^3$), with road traffic emissions being a far more significant source.

Mitigation and Enhancement

5.7.6 The construction works have the potential to create dust. During construction it will therefore be necessary to apply a package of mitigation measures to minimise dust emission. With these measures in place, it is expected that any residual effects will be 'not significant'. However, the guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance.

The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

5.7.7 No additional mitigation has been proposed for the operational impacts, other than the self-imposed emission limit of 150 mg/Nm^3 of NOx. The pollutant emissions from the proposed facility will most likely be significantly lower than those modelled, as the technology to be employed is very clean.

Conclusion

5.7.8 The assessment has demonstrated that the Proposed Development will not have a significant impact on dust and PM_{10} levels during construction, provided that the recommended mitigation is applied. Similarly, odour and bioaerosol emissions will be kept to a sufficiently low level that the local effects will be insignificant.

5.7.9 The overall operational air quality impacts of the development are judged to be 'not significant'. This judgement takes account of the uncertainties in future predictions of road traffic emissions, and the worst-case assumptions applied in the dispersion modelling assessment.

6. LANDSCAPE / TOWNSCAPE AND VISUAL ASSESSMENT

6.1 Introduction

6.1.1 This addendum to ES chapter 6 considers the likely significance of effects on landscape/townscape elements, character and visual amenity arising from the proposed modified development. The parameters for the modified development which would potentially give rise to effects on landscape/townscape character and visual amenity includes:

- The additional upstand section of roofline to the rear of the building which would be elevated by approximately 6m resulting in an overall maximum height of 29m height on this section;
- The new gasifier which would be sunken by approximately 8m depth allowing for a 'step down' in the overall building profile;
- The chimney flue/stack would remain at 55m in height; and
- The Application Site would cover 1.9 hectares as with the previously consented development.

6.1.2 This addendum should be read in conjunction with the following updated figures contained within **Appendix 6** of this ES addendum:

- Figure 6.2: Updated Photoviews and Wirelines 1 to 26
- Figure 6.5: Updated Winter Photomontages 4, 18 and 26

6.1.3 This addendum has been undertaken in accordance with the assessment approach discussed within ES chapter 6, paragraphs 6.2.1 to 6.2.7. The methodologies detailed for the assessment and significance of effects on landscape/townscape elements, character and visual amenity remains current and applicable to the modified development.

6.1.4 The relevant policy framework is further detailed within the accompanying planning statement submitted for the modified development.

6.1.5 The baseline conditions described in ES chapter 6 paragraphs 6.3.1 to 6.3.21 in terms of the site description, land use, vegetation, topography, PROW and watercourses has not materially changed and remains applicable to the modified development.

6.2 Effects on Landscape / Townscape Elements

6.2.1 Table 6.1 below summarises the likely significance of effects on landscape/townscape elements arising from the modified development and considers whether there would be

any material change to these effects in comparison to the consented development [in brackets]:

Table 6.1, Summary of Effects on Landscape / Townscape Elements

Landscape elements	Value	Suscept-ibility	Sensitivity	Magnitude	Effect / Significance
Trees and Vegetation	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible Beneficial (Not significant) [No change from consented]
				Operation: Low	*Operation:* Minor Beneficial (Not significant) [No change from consented]
Land Use	Low	Low	Low	*Construction:* Medium	*Construction:* Minor (Not significant) [No change from consented]
				Operation: Medium	*Operation:* Minor (Not significant) [No change from consented]
Topography	Low	Low	Low	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No change from consented]
				Operation: Negligible	*Operation:* Negligible (Not significant) [No change from consented]

6.2.2 The effects of the modified development on landscape/townscape elements including trees and vegetation, land use and topography in construction and operation would be minor or negligible and not significant. The modified development including the

replacement process plant would not change the overall building footprint in comparison to the consented development. Seven of the existing trees would be retained on the south west corner with ten existing trees requiring removal to the north of the Application Site. The modified development would also provide twenty-two trees along the south and west boundaries between the two parts of the Application Site resulting in a net gain and a minor beneficial (not significant) effect in the long term. The land uses surroundings the Application Site are influenced by large scale industrial buildings and infrastructure and the modified development would appear as a continuation of this land use resulting in a minor (not significant) effect. The modified development would require ground engineering and excavation to sink the gasifier by approximately 8m, however, this would be to the same depth as the waste bunker on the consented development again resulting in a minor (not significant) effect. There would be no significant changes to the effects on landscape/townscape elements arising from the modified development in comparison to the consented development.

6.3 Effects on Landscape / Townscape Character

6.3.1 Table 6.2 below summarises the likely significance of effects on landscape/townscape character arising from the modified development and considers whether there would be any material change to these effects in comparison to the consented development [in brackets]:

Table 6.2, Summary of Effects on Landscape / Townscape Character

Character Area	Value	Suscep-tibility	Sensitivity	Magnitude	Effect / Significance
Natural England, National Character Area 97, Arden	Low	Low	Low	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No change from consented]
				Operation: Negligible	*Operation:* Negligible (Not significant) [No change from consented]
Local Landscape/ Townscape Character	Low	Low	Low	*Construction:* Medium	*Construction:* Minor (Not significant) [No change from consented]

				Operation: Medium	*Operation:* Minor (Not significant) [No change from consented]

6.3.2 The effects of the modified development on landscape/townscape character during construction and operation would be minor or negligible and not significant. The Application Site is located within the Natural England, National Character 97, Arden which mostly covers the rural areas outside of the West Midlands conurbation. The Application Site is influenced in character terms by the surrounding industrial buildings and infrastructure including the Jaguar plant and the A47 Fort Parkway dual carriageway to the north and the existing stack/flue at approximately 60m height near the Fort Dunlop building to the west. The large scale B&Q superstore, the A452 Chester Road dual carriageway and the Castle Vale residential area are located to the east, with the M6 motorway and the railway line to the south. The mass, scale and form of the modified development would generally appear similar in character to the surrounding industrial buildings resulting in a minor (not significant) effect on landscape/townscape character. There would be no significant changes to the effects on landscape/townscape character arising from the modified development in comparison to the consented development.

6.4 Effects on Visual Amenity

6.4.1 Table 6.3 below summarises the likely significance of effects on visual amenity arising from the modified development and considers whether there would be any visible change to these effects in comparison to the consented development [in brackets]:

Table 6.3, Summary of Effects on Representative Viewpoints					
Representative Viewpoint	**Value**	**Suscep-tibility**	**Sensitivity**	**Magnitude**	**Effect / Significance**
Short Range Views (up to 500m from Application Site)					
Viewpoint 2, M6 motorway 'northbound' (but taken from 'southbound' hard shoulder), on bridge over A452	Medium	Low	Low	*Construction:* Negligible, increasing to medium over time	*Construction:* Negligible, increasing to minor (Not significant) [No visible change from consented]
				Operation Yr 5: Medium	*Operation Yr 5:* Minor (Not significant) [No visible change from consented]
Viewpoint 4, Spitfire Island to north-east of B&Q Superstore	Medium	Low (road users) Medium (pedestrians)	Low (road users) Medium (pedestrians)	*Construction:* Low, increasing to Medium	*Construction:* Road users: Negligible, increasing to Minor (Not significant) Pedestrians: Minor, increasing to Moderate (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Medium	*Operation Yr 5:* Road users: Minor (Not significant) Pedestrians: Moderate (Not significant) [Slight visible change from consented – Not significant]

Viewpoint 5, Spitfire Island on north side of Tangmere Drive exit	Medium	Low (road users) Medium (pedestrians and occupiers of residential properties)	Low (road users) Medium (pedestrians and occupiers of residential properties)	*Construction:* Low, increasing to Medium	*Construction:* Road users: Negligible, increasing to Minor (Not significant) Pedestrians and occupiers of residential properties: Minor, increasing to Moderate (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Medium	*Operation Yr 5:* Road users: Minor (Not significant) Pedestrians and occupiers of residential properties: Moderate (Not significant) [Slight visible change from consented – Not significant]
Viewpoint 6, Spitfire Island on south side of Tangmere Drive exit	Medium	Low (road users) Medium (pedestrians and occupiers of residential properties)	Low (road users) Medium (pedestrians and occupiers of residential properties)	*Construction:* Low, increasing to Medium	*Construction:* Road users: Negligible, increasing to Minor (Not significant) Pedestrians and occupiers of residential properties: Minor, increasing to Moderate (Not significant)

					[Slight visible change from consented – Not significant]
				Operation Yr 5: Medium	*Operation Yr 5:* Road users: Minor (Not significant) Pedestrians and occupiers of residential properties: Moderate (Not significant) [Slight visible change from consented – Not significant]
Viewpoint 7, Roundabout on A47 Fort Parkway, adjacent to Fort Dunlop	Medium	Low	Low	*Construction:* Road users: Negligible, increasing to Low Office workers: Low, increasing to Medium	*Construction:* Road users: Negligible (Not Significant) Office workers: Negligible, increasing to Minor (Not significant) [No visible change from consented]
				Operation Yr 5: Road users: Low Office workers: Medium	*Operation Yr 5:* Road users: Negligible (Not significant) Office workers: Minor (Not significant) [No visible change from consented]
Viewpoint 15, Informal green space to rear of Fort Jester pub/Castle Bromwich Inn and offices	Medium	Medium (train passengers) Low (hotel guests and office workers)	Medium (train passengers) Low (hotel guests and office workers)	*Construction:* Hotel guests and office workers: Low, increasing to high	*Construction:* Hotel guests and office workers: Negligible, increasing to Moderate (Not significant)

				Train passengers: Negligible, increasing to medium	Train passengers: Negligible, increasing to Moderate (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Hotel guests and office workers: High Train passengers: Medium	*Operation Yr 5:* Hotel guests and office workers: Moderate (Not significant) Train passengers: Moderate (Not significant) [Slight visible change from consented – Not significant]
Viewpoint 22, Greenspace to north of Bromford Drive	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant) [No visible change from consented]
Viewpoint 23, Greenspace to north of Papyrus Way	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant)

					[No visible change from consented]
Viewpoint 26, Junction of Fort Parkway and Dunlop Way	Medium	Low	Low	*Construction:* High	*Construction:* Moderate (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: High	*Operation Yr 5:* Moderate (Not significant) [Slight visible change from consented – Not significant]
Medium Range Views (between 500m and 2km from the Application Site)					
Viewpoint 1, M6 motorway 'southbound', close to Fort Dunlop	Medium	Low	Low	*Construction:* Negligible, increasing to low over time	*Construction:* Negligible (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Low	*Operation Yr 5:* Negligible (Not significant) [Slight visible change from consented – Not significant]
Viewpoint 3, M6 motorway 'northbound' (but taken from 'southbound' hard shoulder), due south of Castle Vale sports centre	Medium	Low	Low	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant)

					[No visible change from consented]
Viewpoint 8, Farnborough Road, at entrance to Castle Vale Sports Centre	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant) [No visible change from consented]
Viewpoint 9, Pype Hayes Park, east of A452	Medium	High	High	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 10, Holly Lane, adjacent to area of scrub land	Medium	Medium	Medium	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 11, A38 Tyburn Road, between Belvedere	Medium	Low (road users) Medium (occupiers of	Low (road users) Medium (occupiers of	*Construction:* No change	*Construction:* No effect (Not significant)

Road and Inland Road		residential properties)	residential properties)		[No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 12, A38 Kingsbury Road, close to Jaguar works entrance	Medium	Low	Low	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 13, Roundabout junction of A38 and A452, to north-east of Ravenside Retail Park	Medium	Low	Low	*Construction:* Low	*Construction:* Negligible (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Low	*Operation Yr 5:* Negligible (Not significant) [Slight visible change from consented – Not significant]
Viewpoint 14, Project Wagtail cyclepath, to north of Castle Vale Retail Park	Medium	Medium	Medium	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5:	*Operation Yr 5:*

				No change	No effect (Not significant) [No visible change from consented]
Viewpoint 16, Registered Park and Garden at Castle Bromwich Hall	High	High	High	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 17, St Mary and St Margaret's Church, to north of Castle Bromwich Hall	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant) [No visible change from consented]
Viewpoint 18, Graveyard of St Mary and St Margaret's Church, to north of Castle Bromwich Hall	Medium	Medium	Medium	*Construction:* Negligible, increasing to medium	*Construction:* Negligible, increasing to Moderate (Not significant) [Slight visible change from consented – Not significant]
				Operation Yr 5: Medium	*Operation Yr 5:* Moderate (Not significant) [Slight visible change from consented – Not significant]

Viewpoint 19, Castle Bromwich Hall	Medium	High (due to the setting provided by the Listed Building)	High	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 20, Footpath adjacent to Parkfield Drive, to south of A452	Medium	Medium	Medium	*Construction:* Negligible	*Construction:* Negligible (Not significant) [No visible change from consented]
				Operation Yr 5: Negligible	*Operation Yr 5:* Negligible (Not significant) [No visible change from consented]
Viewpoint 21, A452 Newport Road, to south-west of Castle Bromwich Hall	Medium	Low	Low	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect (Not significant) [No visible change from consented]
Viewpoint 25, Hodge Hill Common	Medium	High	High	*Construction:* No change	*Construction:* No effect (Not significant) [No visible change from consented]
				Operation Yr 5: No change	*Operation Yr 5:* No effect

					(Not significant) [No visible change from consented]
Long Distance Views (more than 2km from the Application Site)					
Viewpoint 24, Platform of Water Orton railway station (west end of platform)	Medium	Medium	Medium	*Construction:* This location: No change Views from trains approaching the site: Negligible, increasing to Low (see also VP15)	*Construction:* This location: No effect (Not Significant) Views from trains approaching the site: Negligible, increasing to Minor (Not significant) (see also VP15) [Slight visible change from consented – Not significant]
				Operation Yr 5: This location: No change Views from trains approaching the site: Low (see also VP15)	*Operation Yr 5:* This location: No effect (Not significant) Views from trains approaching the site: Minor (Not significant) (see also VP15) [Slight visible change from consented – Not significant]

6.4.2 The modified development would be partially visible to varying degrees within short, medium and long range views from the Application Site as described below:

6.4.3 Within short range views between 500m from the Application Site, the modified development would be visible between the A47 Fort Parkway and the Jaguar plant to the north (Viewpoint 26/Photomontage 26), the A47 Spitfire Island next to the B&Q superstore

to the east (Viewpoints 4, 5 and 6), the M6 motorway, railway line and Holiday Inn Express to the south (between Viewpoints 1, 2 and 3), and the Fort Dunlop building and existing stack to the west (Viewpoint 7). Within these short range views, the mass, scale and form of the modified development would be visible to varying degrees although the architectural character of the building would appear in keeping and compatible with the surrounding industrial land uses.

6.4.4 Within the medium range views between 500m and 2km from the Application Site, the modified development would be visible from Viewpoints 1, 13 and 18. The upstand section on the building roofline and the stack/flue would be visible from the A38 and A452 junction near the Ravenside Retail Park at Tyburn to the north (Viewpoint 13). From Viewpoint 13, the modified development would be largely screened by intervening industrial buildings at the Jaguar plant although the upstand section and the stack/flue would be visible on the industrialised skyline. The modified development would appear of similar architectural character to the intervening industrial buildings within the Jaguar plant with the stack/flue visible in the same direction of view as other vertical elements including the pylons and transmission lines in the medium distance.

6.4.5 The modified development would be visible within the medium range views from the slightly elevated ground at the graveyard of St Mary and St Margret's Church to the north of Castle Bromwich Hall located to the south east of Application Site (Viewpoint 18). From Viewpoint 18, the upstand section and the stack/flue would be visible beyond the M6 motorway flyover between the Fort Dunlop building and the Jaguar plant. The upstand section of the building roofline would not breach the already industrialised skyline and the stack/flue would be visible near the existing stack and the pylons and transmission lines in the same direction of view.

6.4.6 The modified development would be intermittently visible in views travelling along the M6 motorway between Viewpoints 1, 2 and 3 in views towards the Fort Dunlop building and the Jaguar plant to the north. The industrial character of the views or the driver experience when travelling along the M6 motorway would not significantly change as a result of the modified development.

6.4.7 Within the long range views beyond 2km from the Application Site, the mass, form and scale of the modified development would generally integrate with the surrounding industrial character. The upstand section of the building roofline together with the stack/flue may be perceptible to varying degrees in distant views, however, would not significantly affect the already industrialised skyline in the context of the existing stack

and the pylons and transmission lines. Within the long range views, the modified development would form a less perceptible element in the townscape and would effectively integrate with the surrounding industrial land uses.

6.4.8 The modified development would result in a limited number of changes to the representative viewpoints in comparison to the previously consented development. Representative viewpoints 1, 3, 4, 5, 6, 13, 15, 18 and 26 would be slightly affected although the visible changes would not affect the degree or significance of the effects on visual amenity as previously assessed within ES chapter 6.

6.5 Mitigation and Enhancement

6.5.1 The modified development would also include the mitigation and enhancement measures proposed for the consented development as described in ES chapter 6, paragraphs 6.5.1 to 6.5.7. Due to the already industrialised character of the site and its surroundings, there would be no further requirements for mitigation and enhancement in relation to townscape/landscape elements, character and visual amenity.

6.6 Cumulative and In-Combination Effects

6.6.1 The other developments considered as part of the cumulative assessment were confirmed within the scoping opinion provided by the Council. The other developments identified within the scoping opinion are already in existence and operational therefore were visible in the baseline condition for the modified development. The modified development would not give rise to any significant cumulative or in-combination landscape/townscape and visual effects given the industrial character of the Application Site and its surroundings.

6.7 Summary

6.7.1 The proposed modified development includes the addition of a small upstand section on the building roofline which would be elevated to an overall maximum height of 29m with a reduced section of roofline over the new gasifier resulting in a 'step down' in the overall building profile by approximately 8m. The proposed flue/stack would remain at 55m in height and the Application Site would cover 1.9 hectares as for the previously consented development.

6.7.2 The effects of the modified development on landscape/townscape elements including trees and vegetation, land use and topography would be minor or negligible and not significant. There would be no significant changes to the effects on landscape/townscape

elements arising from the modified development in comparison to the consented development.

6.7.3 The effects of the modified development on landscape/townscape character would be minor or negligible and not significant. The Application Site is influenced in character terms by the surrounding industrial buildings and infrastructure including the Jaguar plant and the A47 Fort Parkway dual carriageway to the north and the existing stack near the Fort Dunlop building to the west. The mass, scale and form of the modified development would generally appear in keeping and compatible with the character of the industrialised surroundings. There would be no significant changes to the effects on landscape/townscape character arising from the modified development in comparison to the consented development.

6.7.4 The effects of the modified development on visual amenity during construction and operation would range from moderate to negligible (not significant) within short, medium and long range views. Within short and medium range views, the mass, scale and form of the modified development would be visible to varying degrees although the architectural character would appear in keeping and compatible with the surrounding industrial buildings, infrastructure and land uses. Within long range views, the roofline of the modified development would generally appear screened or integrated with other industrial buildings.

6.7.5 The modified development would result in a limited number of changes to the representative viewpoints in comparison to the consented development. Representative viewpoints 1, 3, 4, 5, 6, 13, 15, 18 and 26 would be slightly affected although the visible changes would not affect the degree or significance of the effects previously identified in ES chapter 6.

6.7.6 The modified development would not give rise to any significant cumulative or in-combination landscape/townscape and visual effects given the industrial character surrounding the Application Site.

7. TRAFFIC AND TRANSPORT

7.1 As described in the Preamble and Section 1 of this ES Addendum the existing volume of through-put of feedstock as detailed in the original planning application will not change so there will be no additional vehicle movements in or out of the site. As a result of this no changes will be required to the traffic and transport assessment, therefore, no additional information is required as part of this ES Addendum to support Chapter 7 of the ES.

8. HYDROLOGY AND FLOOD RISK

8.1 As described in Section 3 of this ES Addendum the section of the building where the gasifier is located will go underground to a depth of 8m (the same depth as already approved for the waste bunker on the original plans). The original ES has already considered the potential effects which may arise from deep excavations and any associated engineering operations. There are also no significant changes in the overall impermeable area. The proposed changes are unlikely to alter the findings and conclusions of the hydrology and flood risk chapter of the original ES, therefore, no additional information is required as part of this ES Addendum to support Chapter 8 of the ES.

9. GROUND CONDITIONS

9.1 As described in Section 3 of this ES Addendum the section of the building where the gasifier is located will go underground to a depth of 8m (the same depth as already approved for the waste bunker on the original plans). The original ES has already considered the potential effects which may arise from deep excavations and any associated engineering operations. The proposed changes are unlikely to alter the findings and conclusions of the ground conditions chapter of the original ES, therefore, no additional information is required as part of this ES Addendum to support Chapter 9 of the ES.

10. NOISE

10.1 Introduction

10.1.1 This chapter assesses the likely significant effects of the Proposed Development with respect to noise. In particular, it considers the potential effects of the future operation of the Proposed Development, which would operate on a 24-hour basis.

10.1.2 The change in plant design has required some minor modifications to the building and external plant, which has been assessed within this updated chapter.

10.1.3 This assessment comprises the following elements:

- identification of sensitive receptors;
- establishment of baseline conditions;
- establishment of noise design aims for the operation of the site;
- outline assessment of noise and vibration generated during the demolition and construction phase;
- calculation and assessment of noise levels in the operational phase of the Proposed Development (with principal reference to the NPPF, BS 4142 and local authority guidance); and
- where appropriate, indicative proposals for mitigation.

10.1.4 This approach is standard practice for conducting an assessment of noise relating to this type of development.

10.2 Assessment Approach

10.2.1 A description of the noise and vibration units referred to is provided in Appendix 10.1 of the original ES.

Principal Standards and Guidance

Construction

10.2.2 BS 5228 Parts 1[1]and 2[2] provides guidance for assessing noise and vibration during the construction of the development. The standard describes procedures for estimating noise levels from construction activities and vibration attributable to piling activities. It also provides guidance on minimising potential impacts through the use of mitigation and the adoption of Best Practicable Means (BPM) or Best Available Techniques Not Entailing Excessive Cost (BATNEEC).

10.2.3 BPM or BATNEEC both seek to ensure that the contractors adopt best practice measures to reduce noise and vibration from site activities. The use of BPM to control emissions constitutes a ground of defence against charges that a nuisance is being caused under Part III of the Environmental Protection Act.

10.2.4 Whilst BS 5228 does not provide specific guidance with regards acceptable noise levels associated with construction activities, it provides guidance on limits adopted for a number of previous schemes, which were considered to provide satisfactory levels of noise for construction projects.

10.2.5 Based on this guidance, it is often appropriate to set noise Action Levels to provide an indication of the noise levels that can be generated from construction activities, which should minimise the potential for complaints. A level of 10 dB(A) above the existing ambient (L_{Aeq}) noise level is often specified, subject to a minimum level of 70 dB $L_{Aeq,T}$ for rural areas and 75 dB $L_{Aeq,T}$ within urban areas. By adopting noise limits of this order of magnitude, contractors are generally seen to be adopting best practice to reducing construction noise levels to an acceptable standard.

10.2.6 With regards acceptable levels of vibration, BS 5228 advises that at a Peak Particle Velocity (PPV) level of 0.3 mm/s vibration might just be perceptible within residential environments, with levels of 1.0 mm/s having the potential to cause complaint, but can be tolerated if prior warning is given to residents. At levels of 10 mm/s, the activity would be intolerable for any more than a brief exposure.

10.2.7 BS 73853[3] defines criteria for two different types of building structure, brick-built residential and more heavily-built industrial. The standard advises that there is a

[1] British Standards Institute. Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise. BS 5228+A1: 2014.
[2] British Standards Institute. Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 2: Vibration. BS 5228+A1: 2014.
[3] British Standards Institute. Evaluation and Measurement for Vibration in Buildings. Part 2. Guide to Damage Levels from Groundborne Vibration. BS 7385: Part 2. 1993.

minimal risk of cosmetic damage (i.e. the formation of hairline cracks on drywalls, plaster or in mortar joints) at the specific guidance levels.

10.2.8 For residential buildings the limit for cosmetic damage varies with frequency and a conservative level of 12.5 mm/s PPV, as defined in BS 7385, has been adopted.

Operation of the Completed Development

British Standard BS 4142

10.2.9 The principal guidance for assessing noise from industrial and commercial noise sources can be found in BS 4142[4] . BS 4142 provides an objective method for rating the magnitude of adverse impacts from industrial and commercial operations and also provides a means of determining noise levels from fixed building services plant installations and prevailing background noise levels on, and around, industrial developments.

10.2.10 BS 4142 is a comparative standard in which the estimated noise levels from the industrial development are compared to the background noise level from other surrounding existing land uses. The Standard relates the magnitude of any adverse impacts to the difference between the Rating Level of the noise being assessed and the background noise level. The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed.

10.2.11 The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of corrections for tonality or should the noise exhibit any particular characteristics. During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a reference time period of 15 minutes being adopted at night.

10.2.12 If the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is an indication of a significant adverse impact. A difference between background level and Rating Level of around 5 dB is likely to result in an adverse impact, depending upon the context. The lower the Rating Level is relative to the background noise level, the less likely the specific source would have an adverse impact. Where the Rating level does not exceed the

[4] British Standards Institute. Methods for Rating and Assessing Industrial and Commercial Sound. BS 4142. 2014.

background noise levels, would be an indication of the sound source having a low impact.

World Health Organisation (WHO) Guidelines

10.2.13 The World Health Organisation guidance[5] provides additional guidance upon potential effects in relation to noise.

10.2.14 The guidance advises:

- few people are moderately annoyed by noise levels of below 50 dB $L_{Aeq,T}$ during the daytime;
- for a good night's sleep, noise levels within bedrooms should not exceed 30 dB $L_{Aeq,T}$, with individual noise events not exceeding 45 dB L_{Amax}; and
- special attention should be given to noise sources in an environment with low background noise levels and to noise sources with low frequency components.

10.2.15 Assuming an open window provides a reduction in noise levels of between 10 – 15 dB(A), during the night-time the Who guidance indicates that external noise levels should remain below 40 – 45 dB $L_{Aeq,T}$ to maintain the restorative processes of sleep.

10.2.16 The WHO produced additional noise guidance in relation specifically to night-time noise in 2009[6] . This report provides a description of the 'no observed adverse effect level' (NOEL) and advises for night-time noise (which is considered to be the most sensitive period of the day) that this concept is less useful, as the adversity of effects are less clear. Instead, it advises the use of the observed effects thresholds, above which an effect starts to occur or shows itself to be dependent upon the exposure level.

10.2.17 The guidance is presented in terms of external and internal recommendations to minimise any potential adverse effects. Externally, the guidance advises that an average night-time noise level L_{night} (the $L_{Aeq,\ 8\ hour}$) of 40 dB is equivalent to the lowest observed adverse effect level and advises this guideline value is recommended for the protection of public health from night-noise. However, below this level there was no change in the small number of

[5] World Health Organisation. Guidelines for Community Noise. 1999. WHO Geneva.
[6] World Health Organisation. Night Noise Guidelines for Europe. 2009.

awakenings identified and hence a reason for considering that the NOEL was not an appropriate descriptor in noise terms for identifying adverse effects and hence recommend the use of the observed effects threshold as an appropriate descriptor to identify the potential for the onset of adverse effects.

10.2.18 The guidance, however, advises that an external night-time noise level of 30 $L_{Aeq, 8\ hour}$ would be equivalent to the NOEL, as their research indicated that there were no detectable effects internally, below a level of 32 dB L_{Amax}, with no physical awakenings identified below a level of 42 dB L_{Amax} internally.

Road Traffic

10.2.19 Changes in road traffic noise levels have been considered against the guidance presented in the Design Manual for Roads and Bridges (DMRB)[1]. Whilst not strictly appropriate in this case, as no new roads are proposed outside of the Proposed Development, the guidance provides a methodology to assess potential noise impacts associated with road traffic.

10.2.20 The guidance proposed the following assessment criteria, which have been adopted for the purposes of this assessment to assess potential effects associated with changes in road traffic flows on surrounding roads as a result of this and other committed developments in the surrounding area.

Table 10.1: Classification of Magnitude of Road Traffic Noise Impacts

Noise Change $L_{Aeq, 16\ Hour}$	**Magnitude of Impact**
Decrease of More than 10	Major Beneficial
Decrease of 5 – 9.9	Moderate Beneficial
Decrease of 3 – 4.9	Minor Beneficial
Decrease of 0.1 – 2.9	Negligible Beneficial (not significant)
0	No Change (not significant)
Increase of 0.1 – 2.9	Negligible Adverse (not significant)
Increase of 3 – 4.9	Minor Adverse
Increase of 5 – 9.9	Moderate Adverse
Increase of More than 10	Major Adverse

[1] Highways Agency. Design Manual for Roads and Bridges. Volume 11. Section 3. Part 7. HD 213/11 – Revision 1. Noise and Vibration. November 2011.

10.2.21 Significant effects have been identified when changes in noise levels of more than 3 dB(A) have been identified, i.e. at an impact threshold of minor and above. A 3dB(A) change in noise levels is considered to be the lowest change detectable under normal listening conditions.

Policy Framework

National Planning Policy Framework

10.2.22 The National Planning Policy Framework (NPPF) seeks to simplify the planning system and advises that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life from new development;
- Mitigate and reduce to a minimum other adverse impacts on heath and quality of life arising from noise from new development, including through the use of conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established;
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

10.2.23 The accompanying planning policy guidance to the NPPF, published in March 2014, provides a description of a significant adverse impact, as follows:

"The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

Local Planning Guidance

10.2.24 Officers at Birmingham City Council were consulted on the requirement for the noise assessment and criteria they would seek to be adopted during July 2015[8] .

10.2.25 The officer consulted advised that they would adopt the guidance within their local Planning Consultation Guidance document[9] .

10.2.26 For noise of an industrial or commercial nature, the guidance makes reference to BS 4142:1997, as the appropriate standard to adopt. They would normally seek to ensure developments are designed to achieve the Lowest Adverse Effects Level (LOAEL). (Note that the Rating Level in the context of the 1997 version of BS 4142, assumes a single 5 dB(A) penalty should the noise be tonal or characteristic in nature. Following further discussions with officers in 2015, it was agreed to adopt this approach within the current assessment).

10.2.27 Further consultation was carried out with officers in respect of the scoping report submitted to BCC[10] to address comments raised and provide additional information in relation to the baseline noise monitoring exercise.

Scoping Criteria

Construction Phase

10.2.28 A Construction Environmental Management Plan will be adopted to minimise potential disturbance to local residents in the surrounding area during the demolition and construction of the Proposed Development.

10.2.29 For construction activities, it is common practice to define a Noise Action Level of 10 dB(A) above the existing ambient L_{Aeq} noise levels (subject to a minimum daytime level of 70 dB $L_{Aeq,T}$ in rural areas) at noise-sensitive properties during the daytime, above which complaints may be expected to be received. Noise levels above this criterion can be considered as a minor adverse impact if the

[8] Emails between L Jephson, LFA, and J Dunsford, BCC, 2 July 2015.
[9] Birmingham City Council. Planning Consultation Guidance No. 1. Noise and Vibration. January 2013.
[10] Emails between L Jephson, LFA, and N Tinsdeall, BCC, 16 & 21 September 2015.

activity is for a short duration (up to a few weeks) or a moderate/high adverse impact if noise levels continue above this limit for a prolonged period.

10.2.30 BS 5228 provides guidance on acceptable levels of vibration associated with construction activities. Based on the information provided within the guidance, a significant adverse impact has been identified where levels of vibration regularly exceed 1 mm/s at vibration sensitive receptors.

Operational Phase

10.2.31 Noise levels attributable to the operation of the Proposed Development would be controlled in accordance with the requirements of Condition 24 of the current planning consent (Application Ref. 2015/09679/PA), which meets the requirements of local and national policies and guidance and specifies:

The rating levels for cumulative noise from all plant and machinery shall not exceed 5dB below the existing L_{A90} background levels and 10dB below the existing L_{Aeq} at any noise sensitive premises as assessed in accordance with British Standard 4142 (2014).

10.2.32 By maintaining equivalent noise limits would ensure that the noise levels generated by the operation of the Gasification plant would not generate any significant adverse effects upon the occupants of surrounding noise-sensitive premises.

Road Traffic

10.2.33 The assessment of potential effects at surrounding noise-sensitive receptors associated with the changes in road traffic on the local road network has been undertaken on the basis of the assessment criteria presented in Table 10.1.

10.3 Baseline Conditions

Application Site Description and Context

10.3.1 The Application Site is located within an existing industrial / commercial area to the south of Fort Parkway.

10.3.2 There are existing industrial / commercial units directly to the west and east of the Application Site, with the Jaguar Land Rover plant to the north of Fort Parkway.

10.3.3 The closest residential receptors are located to the south of the site, beyond the M6 viaduct, along Wanderer Walk, Bromfield Drive and Papyrus Way, with noise levels at these locations principally influenced by road traffic using the M6. These dwellings are approximately 250 metres from the southern site boundary.

10.3.4 The other potentially affected residential properties are located to the east beyond the A452, approximately 300 metres from the eastern site boundary, with the Proposed Development screened from the properties by the existing commercial (B&Q) unit. Noise levels at these dwellings are also principally influenced by road traffic from the M6 and A452 both during the day and night-time periods.

Baseline Noise Surveys

10.3.5 In order to ascertain the existing noise environment at noise sensitive receptors surrounding the Application Site and to inform the design of the Proposed Development, a noise monitoring exercise was carried out between 23 – 28 July 2015. The survey comprised an unattended noise survey, carried out at one location representative of the dwellings to the south and east of the Proposed Development, which was supplemented with attended measurements taken at positions adjacent to the dwellings.

10.3.6 The monitoring positions were chosen to enable the typical background noise levels to be determined at the dwellings. A fuller description of the monitoring exercise is provided in Appendix 10.1 of the original ES.

10.3.7 Given the short time span between the original ES and the current assessment, it is considered that the monitoring data obtained previously remains valid, with noise levels at the surrounding properties principally attributable to traffic travelling along the M6.

10.3.8 The results of the unattended and sample noise monitoring have been evaluated using the methodology within BS 4142:2014, to ascertain the existing day and

night-time noise levels at the potentially affected receptors, which are presented in Table 10.2.

Table 10.2 Period Noise Levels

Location	Period Free-field Noise Levels [dB]				Principal Noise Sources
	$L_{Aeq,T}$		Typical L_{A90}		
	Daytime	Night-time	Daytime	Night-time	
Dwellings to the South (Papyrus Way, Wanderer Walk, Bromfield Drive)	62	58	59	56	Road traffic noise from traffic travelling along M6
Dwellings to the East (Cadbury Drive)	59	55	53	50	Road traffic noise from traffic travelling along M6 and A452

10.4 Assessment of Likely Significant Effects

Construction

10.4.1 The change in plant design would not result in any significant changes to the demolition and construction phasing, with the equivalent construction plant required. On this basis, no updates to the following construction noise and vibration assessment have been made.

10.4.2 Demolition and construction activities would be typical for an industrial development.

10.4.3 The main phases of the redevelopment, identified as giving rise to the greatest potential for adverse effects upon the existing residents of surrounding properties are as follows:

- Demolition of the existing buildings;
- Initial ground works;
- Piling;
- General construction activities; and
- Vehicle movements.

10.4.4 It is anticipated that works would commence on site, with the demolition of the existing units likely to commence in 2017.

10.4.5 During this stage, plant required on site, would include, excavators fitted with munching and breaking tools and HGV movements. Typical noise levels associated with this type of plant would be of the order of 75 – 85 dB L_{Aeq} at a distance of 10 metres.

10.4.6 Noise levels associated with piling operations are likely to be of the order of 85 – 90 dB L_{Aeq} at a distance of 10 metres, although this would be dependent upon the type of piling required, with noise levels associated with the general construction activities, lower and generally unlikely to exceed a level of 80 dB L_{Aeq} at a distance of 10 metres.

10.4.7 Based upon this source noise level, calculations have been made to assess at what distance a 70 dB L_{Aeq} effect threshold would be exceeded, which would result in a minor adverse effect. The assessment indicates that the limit would be exceeded at a distance of approximately 100 metres as a worst case, with noise levels at the dwellings, which are considerably further from the site, likely to be at least 10 dB(A) lower.

10.4.8 Noise levels associated with the demolition and construction works would therefore remain below 70 dB L_{Aeq} at noise sensitive receptors and result in a negligible effect.

10.4.9 Appropriate site controls would, however, be adopted in line with the requirements of Birmingham City Council, which would further seek to reduce noise levels from site operations.

Changes in Road Traffic Noise Levels on Roads Surrounding the Proposed Development

10.4.10 There would be no changes in the proposed traffic generation to the site, as the additional generation capacity would be gained from the use of the more

efficient gasification plant. It has therefore not been necessary to update this section.

10.4.11 The Traffic Assessment within Chapter 7 provides details of the existing and future road traffic on roads surrounding the Proposed Development, associated with the existing and Proposed use.

10.4.12 The assessment indicates with the Proposed Development, whilst there would be a slight increase in HGV movements, there would be a slight overall reduction in traffic, compared to the existed permitted development.

10.4.13 An assessment of the with and without development options indicates that there would be No Change in overall road traffic noise levels as a result of the operation of the Proposed Development and thus no adverse effects have been identified.

Noise Associated with the Operation of the Proposed Development

10.4.14 The Proposed Development would be operational on a 24 hour basis, with deliveries (which remain unchanged) made throughout the day between the hours of 07:00 and 19:00 in the week and between the hours of 07:00 and 14:00 on Saturdays.

10.4.15 The majority of the plant on site would be contained within the buildings, which will seek to effectively reduce any noise break out. The construction of the building would be of typical single skinned steel cladding.

10.4.16 Source term noise levels have been provided by the technology provider for the assessment. The technology provider has advised that the noise levels within the buildings would be equivalent to those assessed previously. The main change externally, is in relation to the noise generated by the air-cooled condensers, with a level of 70 dB(A) at a distance of 1 metre assumed within this updated assessment.

10.4.17 There would be regular deliveries made to the site throughout the daytime periods, typically by articulated vehicles, which would tip within the northern part of the building. It is anticipated that there would be 33 deliveries made to the site daily, based upon the annual throughput of the site. These vehicle movements

would be distributed evenly throughout the day, resulting in between 3 - 4 deliveries per hour.

10.4.18 Calculations of the operational noise levels have been made using Soundplan, which implements the calculation methodology from ISO 9613. The methodology is equivalent to that used for the initial ES. The results of the daytime noise levels are presented on **Figure 10.1**, with the night-time noise levels presented on **Figure 10.2**. The calculated levels are summarised for the potentially most affected dwellings in Table 10.3 below. The site would be operational on a 24 hour basis, with deliveries made only during the daytime periods, with little variation between day and night-time noise levels attributable to the operation.

Table 10.3: Calculated Operational Noise Levels

Location	Calculated Façade Noise Level	
	Daytime [dB $L_{Aeq,\ 1\ hour}$]	**Night-time [dB $L_{Aeq,\ 15\ minute}$]**
Cadbury Drive	33	33
Hyperion Road	34	33
Papyrus Way	36	35
Wanderer Walk	32	31

10.4.19 The calculated noise levels have been assessed against the noise limits specified within Condition 24 of a Rating Level of 5 dB(A) below the prevailing background noise levels. As indicated previously, a 5 dB(A) penalty has been applied to account for the potential tonal characteristics associated with the operation of the plant, in accordance with the requirements of BCC, agreed previously.

10.4.20 The assessment, is summarised in Table 10.4 below.

Table 10.4: Assessment of Operational Noise Levels Against Background Noise Levels

Location	Rating Level [dB $L_{Aeq,T}$]		Difference re Background (L_{A90}) Noise Level [dB]	
	Daytime	**Night-time**	**Daytime**	**Night-time**
Cadbury Drive	38	38	-15	-12

Hyperion Road	39	38	-20	-18
Papyrus Way	41	40	-18	-16
Wanderer Walk	37	36	-22	-20

10.4.21 Condition 24 additionally seeks to ensure that the noise levels attributable to the operation of the Proposed Development do not exceed a level of more than 10 dB(A) below the prevailing ambient (L_{Aeq}) noise Levels and an assessment has also been made in this regards, as follows.

Table 10.5: Assessment of Operational Noise Levels Against Ambient Noise Levels

Location	Rating Level [dB $L_{Aeq,T}$]		Difference re Ambient (L_{Aeq}) Noise Level [dB]	
	Daytime	Night-time	Daytime	Night-time
Cadbury Drive	38	38	-21	-17
Hyperion Road	39	38	-23	-20
Papyrus Way	41	40	-21	-18
Wanderer Walk	37	36	-25	-22

10.4.22 The assessment, provided in Tables 10.4 and 10.5, indicates that noise levels associated with the operation of the Proposed Development would generate Rating Levels at least 10 dB(A) below both the background and ambient noise levels at the surrounding properties during the day and night-time periods. The calculated noise levels meet the requirements of Condition 24 of the current planning permission and are substantially below those which would result in a LOAEL with reference to the BCC guidance and would indicate a negligible impact when considered against the guidance contained in BS 4142.

10.5 Mitigation and Enhancement

Construction

10.5.1 No adverse effects have been identified during the demolition and construction of the Proposed Development. Appropriate site controls would, however, be adopted in accordance with BCC guidelines, which seek to ensure that noise and vibration levels associated with the works are controlled.

Road Traffic Noise

10.5.2 Changes in road traffic noise levels on surrounding roads would result from the operation of the Proposed Development. The assessment indicated that there would be a small reduction in traffic with the Proposed Development and thus not result in any significant adverse effects. Consequently, no additional noise mitigation measures have been identified to be required.

Operation of the Proposed Development

10.5.3 The assessment indicated that with the proposed construction and plant, the operation of the Proposed Development would result in negligible noise impacts at surrounding noise sensitive receptors.

10.5.4 Further assessments would be undertaken during the detailed design of the Proposed Development to ensure that the operation of the plant and machinery on the site ensure compliance with the requirements of Condition 24. If necessary, additional noise mitigation measures would be implemented, e.g. by enclosing certain items of plant, to ensure that noise levels attributable to the operation of the site did not exceed the noise limits.

10.6 Cumulative and In-Combination Effects

10.6.1 No cumulative noise effects have been identified within this assessment, associated with other surrounding land uses.

10.7 Summary

Introduction

10.7.1 A noise assessment has been carried out for the Proposed Development.

10.7.2 The assessment has taken account of potential effects during the demolition, construction and operation of the Proposed Development, upon surrounding residential receptors and has been updated to consider the minor amendments resulting from the change from an Energos to a different technology provider.

10.7.3 The gasification plant is more efficient in terms of generation and would enable up to 12MW to be exported compared to 8.6MW considered previously. The increased

efficiency is attributable to the plant and there would be no requirements for any additional vehicle movements.

Baseline Conditions

10.7.4 Noise surveys have been previously undertaken to determine the existing noise levels at properties which would be potentially affected by the construction and operation of the Proposed Development.

10.7.5 The surveys indicated that noise levels at the properties are principally influenced by road traffic using the M6 (and A452) throughout the day and night-time periods.

Likely Significant Effects

10.7.6 The Proposed Development is located some distance from the surrounding noise sensitive receptors. An assessment of the noise levels associated with the demolition of the existing buildings and construction of the Proposed Development remains unchanged to that assessed previously and indicates that noise associated with the works would result in a negligible effect.

10.7.7 Noise levels associated with the operation of the Proposed Development are anticipated to be low and below the limits specified within Condition 24 of the current planning permission. The operation would therefore not result in any significant adverse noise impacts, with noise associated with the operation resulting in a negligible effect at surrounding properties.

10.7.8 There would be regular deliveries made to the site during the daytime periods. Compared to the existing permitted development there would be an overall reduction in traffic, although the number of HGV movements would increase slightly. This would result in no change in road traffic noise levels on roads surrounding the Proposed Development, with a negligible effect identified.

Mitigation and Enhancement

10.7.9 No additional noise mitigation measures have been identified at this stage, in addition to those which would be incorporated as standard into the design of the Proposed Development. Further assessments would be made during the detailed design stage to ensure that the noise levels attributable to the operation of the

plant achieved the requirements of Condition 24 of the present planning permission.

Conclusion

10.7.10 In summary, the construction and operation of the Proposed Development would not give rise to any adverse noise impacts at surrounding properties.

11. ECOLOGY AND NATURE CONSERVATION

11.1 The proposed design changes are considered unlikely to have additional effects on ecological features above those considered as part of the original ecology and nature conservation assessment. The proposed development will largely be confined to the same footprint as the original proposal and therefore no further effects on habitats or species is considered likely.

11.2 The Site is not located within a SSSI Impact Risk Zone (IRZ) where air pollution or combustion waste is considered likely to impact on statutory designated sites (i.e. SSSIs, SACs, SPAs) and where the Local Planning Authority would need to consult Natural England.

11.3 No additional information is required as part of this ES Addendum to support Chapter 11 of the ES.

12. ARCHAEOLOGY AND CULTURAL HERITAGE

12.1 Within the archaeology and cultural heritage chapter of the original ES no adverse effects on the setting of heritage assets were concluded. As part of the original assessment the stack was a key element of the design in terms of potential change. As stated in Section 3 of this ES Addendum the stack height will remain the same as within the consented planning application, as a result of this no additional information is required as part of this ES Addendum to support Chapter 12 of the ES.

13. SOCIO ECONOMICS

13.1 The number of jobs created will not alter as a result of the changes to the proposed development therefore no changes are required to the socio-economic analysis within the original ES of the consented planning application, as a result of this no additional information is required as part of this ES Addendum to support Chapter 13 of the ES.

14. SUMMARY

14.1 An Environmental Statement was submitted to Birmingham City Council (BCC) in November 2015 accompanying a planning application concerning Fort Parkway Renewable Energy Centre (Application Reference 2015/09679/PA). The Proposed Development comprises demolition of existing buildings and erection of a renewable energy centre (gasification plant) and new industrial/warehouse buildings with ancillary plant/buildings/chimney stack together with associated works at Fort Industrial Park, Dunlop Way, Castle Bromwich, Birmingham.

14.2 Shortly after the grant of planning permission for the Fort Parkway Renewable Energy Centre in June 2016, the proposed technology providers for the development (Energos) went into administration. Rolton Kilbride have therefore been investigating a range of Process Technology Companies and have developed a solution to incorporate an alternative plant solution into the building for which planning permission has been granted.

14.3 The previous process plant had a gross power output of 8.6MW. The Proposed Development will now generate up to 12 megawatts (MW) gross of electricity as the replacement process plant has a more efficient steam boiler than before, which means output capacity is now higher but achieved with the same level of through-put of feedstock detailed in the planning permission (there will be no additional vehicle trips).

14.4 The plant is capable of accepting 105,000 tonnes of waste per annum which would otherwise go to landfill.

14.5 The revised scheme parameters of the replacement process plant will include the following:

- An increase in height of part of the rear roof of the building from 23m to 29m, which will allow for the internal plant to be configured vertically as opposed to horizontally;
- A change to the configuration of the building involving the relocation of the delivery hall;
- Minor changes to the location of some of the external ancillary plant; and

- As a result of the incorporation of a vertical gasifier, to ensure the roof height is kept as low as possible, the section of the building where the gasifier is located will go underground to a depth of 8m (the same depth as already approved for the waste bunker on the original plans).

14.6 The height of the stack has not changed from the consented planning application and remains the same height of 55m.

14.7 As the change in process plant has necessitated alterations to the design, a minor-material amendment application under Section 73 has been submitted to Birmingham City Council (BCC). Updated environmental information has been provided in the form of an ES Addendum to the original ES submitted with the consented planning application (Ref 2015/09679/PA).

14.8 All work undertaken as part of this ES Addendum is listed in the bullet points below:

- An update to the introductory chapters of the ES to provide the detail of the new technology proposed and to set out the changes to the building from the approved plans to the revised versions;

- An update to the Air Quality assessment involving;
  - re-calculating the emissions from the flue;
  - re-running the dispersion models;
  - re-calculating the process contributions to pollutant concentrations from the facility's emissions;
  - updating the road traffic modelling to reflect the latest published emission factors and to incorporate the latest emissions sensitivity test approach;
  - re-calculating total concentrations at relevant receptors; and
  - updating the assessment text, figures and appendices into the ES Addendum with the updated results;

- An update to the Landscape / Townscape & Visual assessment involving:
  - a review and audit of the original ES chapter;
  - revisions to wirelines within 26 no. viewpoints in the ES Figure 6.2;
  - revisions to 2 no. photomontages for Viewpoints 4 and 6 in the ES Figure 6.3; and
  - updating the townscape character and visual amenity chapter / ES Addendum with the updated results

- An update to the Noise assessment involving;
  - an update to the noise model used in the original assessment
  - re-run to of the noise model to ascertain whether there are any changes to noise levels
  - analysis to confirm whether the noise levels remain within the acceptable limits
  - including any updates to the noise assessment within the ES Addendum; and

- A summary update.

14.9 As a result of the findings from this ES Addendum the changes to the overall conclusions of the Townscape and Visual; Air quality and Noise chapters of the Environmental Statement have not altered. In addition, there are no changes to any of the other chapters of the original ES which have been scoped out of this ES Addendum in agreement with BCC.

14.10 The Non-Technical Summary (NTS) submitted with the original ES has been updated and produced as a stand-alone document.

FIGURES

FIGURE 5.1 - SENSITIVE RECEPTORS

FIGURE 5.2 - GRIDDED AND NEARBY SENSITIVE RECEPTORS

FIGURE 5.3 - MODELLED BUILDING HEIGHT

FIGURE 5.4 - TYBURN AUTOMATIC MONITORING SITES

FIGURE 5.5 - DISTANCE BANDS AROUND PROPOSED DEVELOPMENT

FIGURE 5.6 - ROADS ALONG WHICH MATERIAL MAY BE TRACKED

FIGURE 5.7 - PREDICATED MAXIMUM NITROGEN DIOXIDE CONCENTRATIONS

FIGURE 5.8 - PREDICATED MAXIMUM NITROGEN DIOXIDE CONCENTRATIONS AND RECEPTOR LOCATIONS

FIGURE 5.9 - SELECTED SENSITIVE RECEPTORS AND MODELLED ROAD NETWORK

FIGURE 5.10 - ODOUR RISK ASSESSMENT RECEPTORS

FIGURE 10.1 - CALCULATED DAYTIME NOISE LEVELS

FIGURE 10.2 - CALCULATED NIGHT-TIME NOISE LEVELS

APPENDICES

APPENDIX 3 – SITE PLANS, ELEVATIONS & VEHICLE TRACKING

APPENDIX 5.1 - AIR QUALITY REFERENCES

APPENDIX 5.2 - GLOSSARY

APPENDIX 5.3 - EPUK & IAQM PLANNING FOR AIR QUALITY GUIDANCE

APPENDIX 5.4 - CONSTRUCTION DUST ASSESSMENT PROCEDURE

APPENDIX 5.5 - MODELLING METHODOLOGY

APPENDIX 5.6 - METEOROLOGICAL DATA

APPENDIX 5.7 - PROFESSIONAL EXPERIENCE

APPENDIX 5.8 - BIRMINGHAM CITY COUNCIL'S CASTLE VALE AIR QUALITY SURVEY 2009

APPENDIX 5.9 - CONSTRUCTION MITIGATION

APPENDIX 6 – UPDATED VISUALISATIONS