5 Air Quality

5.1 Introduction

5.1.1 This Chapter presents the findings of the assessment of the likely significant effects from the ROP (as outlined in **Chapter 3**) with respect to air quality. The purpose of this Chapter is to describe and evaluate any likely significant air quality effects and classify them according to relevant national, regional and local guidance and regulations.

5.1.2 As detailed in the Scoping Opinion, the ROP (as outlined in **Chapter 3**) is not anticipated to have the potential to result in likely significant effects as a result of emissions due to traffic movements or odour from waste handling. Therefore, this Chapter only considers the potential effect of changes due to ROP on the impact of emissions to air from the main stack serving the thermal waste treatment process.

5.1.3 This Chapter has been prepared by Stantec. In accordance with Regulation 17 of the Electricity Works (Environmental Impact Assessment) (England and Wales) Regulations 2017 (as amended) a statement outlining the relevant expertise and qualifications of competent experts appointed to prepare this EIA Report is provided in **Appendix A.4**.

5.2 Policy, Legislation, Guidance and Standards

Air Quality Regulations (AQR)

5.2.1 The Air Quality (England) Regulations 2000 defined National Air Quality Objectives (NAQOs); a combination of concentration-based thresholds, averaging periods and compliance dates for a range of pollutants. Subsequent amendments in 2001 and 2002 incorporated ‘limit values’ and ‘target values’ for a wider range of pollutants as defined in EU Directives.

5.2.2 These amendments were consolidated by the Air Quality Standards Regulations 2010 ('AQSR') (with subsequent amendments, most notably in 2016 and for the devolved administrations), which transposed the European Union's (EU) Directive on ambient air quality and cleaner air for Europe (2008/50/EC).

5.2.3 Following the Transition Period after the UK's departure from the EU in January 2020, the Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019 (and subsequent amendments for the devolved administrations) have amended the AQSR 2010 to reflect the fact that the UK has left the EU. This does not change the pollutants assessed or the numerical thresholds.

National Air Pollution Plan for NO_2 in the UK

5.2.4 The National Air Quality Plan for NO_2 (DEFRA, 2018)[5] sets out how the Government plans to deliver reductions in NO_2 throughout the UK, with a focus on reducing concentrations to below the EU Limit Values throughout the UK within the 'shortest possible time'.

5.2.5 The plan requires all Local Authorities ('LAs') in England which DEFRA identified as having exceedances of the Limit Values in their areas after 2020 to develop local plans to improve air quality and identify measures to deliver reduced emissions, with the aim of meeting the Limit Values within their area within "*the shortest time possible*". Potential measures include changing road layouts, encouraging public and private ultra-low emission vehicle ('ULEV') uptake, the use of retrofitting technologies and new fuels and encouraging public transport. In

[5] Department of the Environment, Food and Rural Affairs (DEFRA) (2017). ‘UK Plan for tackling Roadside Nitrogen Dioxide Concentrations: Detailed Plan’. Available at: https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

cases where these measures are not sufficient to bring about the required change within *'the shortest time possible'* then LAs may consider implementing access restrictions on more polluting vehicles (e.g. Clean Air Zones ('CAZs')). A CAZ is defined within the plan as being "*an area where targeted action is taken to improve air quality and resources are prioritised and coordinated in a way that delivers improved health benefits and supports economic growth*" and may be charging or non-charging.

Air Quality Management

The Air Quality Strategy

5.2.6 Part IV of the Environment Act 1995 required the Secretary of State to prepare and publish a 'strategy' regarding air quality.

5.2.7 The UK Air Quality Strategy ('UKAQS')[6] establishes the policy framework for ambient air quality management and assessment in the UK (DEFRA, 2007). The primary objective of the Air Quality Strategy is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Air Quality Strategy sets out the NAQOs and Government policy on achieving these.

5.2.8 The Clean Air Strategy[7] aims to lower national emissions of pollutants, thereby reducing background pollution and minimising human exposure to harmful concentrations of pollution. The Strategy aims to create a stronger and more coherent framework for action to tackle air pollution (DEFRA, 2019a).

Local Air Quality Management

5.2.9 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management ('LAQM') which requires LAs to regularly and systematically review and assess air quality within their boundary and appraise development and transport plans against these assessments.

5.2.10 Where a NAQO is unlikely to be met, the local authority must designate an Air Quality Management Area ('AQMA') and draw up an Air Quality Action Plan ('AQAP') setting out the measures it intends to introduce in pursuit of the NAQO's within its AQMA.

5.2.11 The Local Air Quality Management Technical Guidance 2016[8] (LAQM.TG)(16); DEFRA, 2018 provides advice on where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year) as summarised in **Table 5.1**.

[6] Department of the Environment, Food and Rural Affairs (DEFRA) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland (2007). 'The Air Quality Strategy for England, Scotland, Wales, Northern Ireland' HMSO, London

[7] Department of the Environment, Food and Rural Affairs (DEFRA) (2019). 'Clean Air Strategy 2019'

[8] Department of the Environment, Food and Rural Affairs (DEFRA) (2018). Local Air Quality Management – Technical Guidance (TG16), 2018.

Table 5.1: Relevant Public Exposure

Averaging Period	NAQOs should apply at:	NAQOs don't apply at:
Annual mean	All locations where members of the public might be regularly exposed. For example: Building façades of residential properties, schools, hospitals, care homes etc.	Façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residences Kerbside sites Any other location where public exposure is expected to be short term.
24-hour mean and 8-hour mean	All locations where the annual mean NAQO would apply, together with hotels and gardens of residences.	Kerbside sites Any other location where public exposure is expected to be short term.
1-hour mean	All locations where the annual mean and 24 and 8-hour mean NAQOs apply as well as: Kerbside sites Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer.	Kerbside locations where the public would not be expected to have regular access.
15-minute mean	All locations (including those above) where members of the public might reasonably be regularly exposed for a period of 15 minutes or longer.	Locations where members of the public would not reasonably expected to be regularly exposed for a period of 15 minutes or longer.

Terrestrial Biodiversity Sites

5.2.12 The Conservation of Habitats and Species Regulations (2017) 'Habitat Regulations', transposed the Habitats Directive (European Council Directive 92/43/EEC) in England and Wales. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Statutory Instrument, 2019) amends the 2017 Regulations to reflect the UK's departure from the EU and came into force following the end of the Transition Period in December 2020.

5.2.13 The Habitats Regulations primarily provide measures for the protection of European Sites and European Protected Species, but also require local planning authorities to encourage the management of other features that are of major importance for wild flora and fauna. Special

Areas of Conservation ('SACs') are designated under these Regulations, as are Special Protection Areas ('SPAs').

5.2.14 The Habitats Regulations require the competent authority firstly to evaluate whether the development has the potential to give rise to a "*likely significant effect*" and where this is the case, an "*appropriate assessment*" is required to determine whether the development will adversely affect the integrity of the site.

5.2.15 Sites of national importance may be designated as Sites of Special Scientific Interest ('SSSIs') and improved provisions for the protection and management of SSSIs (in England and Wales) were introduced by the Countryside and Rights of Way ('CROW') Act 2000. If a development is "*likely to damage*" a SSSI, the CROW Act requires that a relevant conservation body (i.e. Natural England) is consulted. The CROW Act also provides protection to local nature conservation sites, which can be particularly important in providing 'stepping-stones' or 'buffers' to SSSIs and other sites designated under the Habitat Regulations.

Critical Levels

5.2.16 Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

5.2.17 Critical levels for nitrogen oxides ('NOx') and sulphur dioxide (SO_2) for the protection of vegetation and ecosystems have been set by the UK Government within the AQSR. Natural England applies them to all internationally designated conservation Sites and SSSIs.

Critical Loads

5.2.18 Critical loads for nitrogen deposition onto sensitive ecosystems have been identified by the United Nations Economic Commission for Europe ('UNECE'). They are defined as the amount of pollutant deposited to a given area over a year, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

5.2.19 Empirical critical loads for eutrophication (derived from a range of experimental studies) are assigned for different habitats, including grassland ecosystems, mire, bog and fen habitats, freshwaters, heathland ecosystems, coastal and marine habitats and forest habitats. These can be obtained from the UK Air Pollution Information System ('APIS') website (APIS, 2020)

5.2.20 Critical loads for acidification have been set in the UK using an empirical approach for non-woodland habitats on a 1km grid square based upon the mineralogy and chemistry of the dominant soil series present in the grid square, and the simple mass balance ('SMB') equation for both managed and unmanaged woodland habitats. These can be obtained from the UK Air Pollution Information System ('APIS') website (APIS, 2020).

Environmental Permitting Regulations (EPR)

5.2.21 The Environmental Permitting Regulations 2010 ('EPR') transposed the Industrial Emissions Directive (2010/75/EU) ('IED') which incorporated the requirements of seven previous directives, including the Waste Incineration Directive (2000/76/EC). The EPRs were amended by The Environmental Permitting (England and Wales) (Amendment) (EU Exit) Regulations 2019 to reflect the UK's departure from the EU and came into force following the end of the Transition Period in December 2020.

5.2.22 The EPR require that the design and operation of all thermal treatment plants must ensure compliance with Emission Limit Values ('ELVs') as defined by the Regulations and subsequent 'Best Available Technique' ('BAT') conclusions.

5.2.23 BAT conclusions for activities regulated by the IED are published by the European IPPC Bureau ('EIPPCB') and a Waste Incineration Best Available Techniques Reference ('BREF')[9] was published in 2019 (European Union, 2019. This document sets out current BAT for reducing pollution from waste incineration plants and includes a number of BAT-AELs (emission levels associated with the best available techniques).

5.2.24 The BAT-AELs will be applied by the Environment Agency ('EA') for new plant and adoption of these BAT-AELs will be required for the existing plant by the EA from November 2023 (unless a derogation is granted). As a result of the Proposed Changes at the Application Site the Applicant is proposing to comply with these BREF BAT-AELs in advance of the EA's implementation date.

5.2.25 The ELVs applicable to the waste incineration processes at the Application Site are shown in **Table 5.2.**

Table 5.2 Emission Limit Values for Waste Incineration Plant (mg/Nm3)

Substance	Daily Mean Emissions[a]			Half-hourly Mean Emissions[a]	
	IED ELV	BREF BAT-AEL (Existing Plant)	BREF BAT-AEL (New Plant)	100th percentile	97th percentile
Total dust (Particles)	10	2 - 5	2 – 5	30	10
Nitrogen Oxides (NO and NO_2)	200	20 – 150[(f), (g)]	50 – 120[(f)]	400	200
Sulphur Dioxide	50	5 – 40	5 – 30	200	50
Carbon Monoxide	50	10 – 50	10 – 50	100[(b)]	150[(c)]
Hydrogen Fluoride	1	<1	<1	4	2
Hydrogen Chloride	10	2 – 8	2 – 6	60	10
Total Organic Carbon (TOC)	10	3 – 10	3 – 10	20	10
Group I metals – Cd and Tl [(d)]	0.05	0.005 – 0.02	0.005 – 0.02	-	-
Group II metals – Hg [(d)]	0.05	0.005 – 0.02	0.005 – 0.02	-	-
Group III metals – Sb, As, Pb, Cr, Co, Cu, Mn, Ni and V [(d), (h)]	0.50	0.01 – 0.03	0.01 – 0.03	-	-
Dioxins and Furans [(e)]	0.1 ng I-TEQ/Nm^3	0.01 – 0.06	0.01 – 0.04	-	-

a. Emissions are mg/Nm^3. Normalised to 273 K, 101.3 kPa, dry, and 11% O_2
b. 100th percentile of half-hourly average concentrations in any 24-hour period
c. 95th percentile of ten-minute average CO concentrations
d. Average over a sample period between 30 minutes and a maximum of 8 hours
e. Average over a sampling period of 6 to 8 hours and calculated by multiplying with their toxic equivalence factor

[9] European Union, 2019. Waste Incineration Best Available Techniques Reference, European IPPC Bureau

f. The lower range is appropriate where Selective Catalytic Reduction is used and the upper range is appropriate where Selective Non-Catalytic Reduction is used.
g. For existing plant where SCR in not applicable the higher end of the BAT-AEL range is 180mg/Nm^3.
h. Other metals consist of antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V).

5.2.26 The daily mean emission limits have been used for the main assessment of the impacts of emissions from RRRF. There will however be short periods where the emissions could be higher over a half-hourly averaging period, albeit that the facility will be constrained to the daily emission limit values. For those pollutants (total dust, NOx, SO_2, CO, HF, HCl and TOC) with allowable short-term emissions, an assessment has also been undertaken against relevant short-term assessment levels.

5.2.27 It is also noted that a separate variation to the existing RRRF Environmental Permit is being made to the EA in parallel to the application to vary the S36 consent in order to take into account the proposed changes in the operational regime that would be brought about by ROP.

National Policy Statements (NPS EN-1, NPS EN-3)

5.2.28 As outlined in Chapter 5, the relevant National Policy Statements ('NPS') provide the primary basis for decisions by the Secretary of State on development consent applications for nationally significant infrastructure projects ('NSIPs'). ROP is not a NSIP and therefore a Development Consent Order ('DCO') is not being sought. However, NPS EN-1 and NPS-EN3 are material considerations relevant to the determination of the Proposed Changes.

5.2.29 In relation to the interaction between the planning and pollution control regimes, NPS EN-1 states:

> *4.10.1 Issues relating to discharges or emissions from a proposed project which affect air quality, water quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes.*
>
> *4.10.2 The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest. It plays a key role in protecting and improving the natural environment, public health and safety, and amenity, for example by attaching conditions to allow developments which would otherwise not be environmentally acceptable to proceed and preventing harmful development which cannot be made acceptable even through conditions. Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health.*
>
> *4.10.3 In considering an application for development consent, the IPC should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity, will be properly applied and enforced by the relevant regulator. It should act to complement but not seek to duplicate them."*

5.2.30 Specifically, in relation to air quality, NPS EN-1 states:

> *"5.2.1 Infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emission to air which could lead to adverse impacts on health, on protected species and habitats, or*

on the wider countryside. Air emissions include particulate matter (for example dust) up to a diameter of ten microns (PM10) as well as gases such as sulphur dioxide, carbon monoxide and nitrogen oxides (NOx). Levels for pollutants in ambient air are set out in the Air Quality Strategy which in turn embodies European Union [EU] legal requirements. The Secretary of State for the Environment, Food and Rural Affairs is required to make available up to date information on air quality to any relevant interested party".

5.2.3 A particular effect of air emissions from some energy infrastructure may be eutrophication, which is the excessive enrichment of nutrients in the environment. Eutrophication from air pollution results mainly from emissions of NOx and ammonia. The main emissions from energy infrastructure are from generating stations. Eutrophication can affect plant growth and functioning, altering the competitive balance of species and thereby damaging biodiversity. …..

5.2.4 Design of exhaust stacks, particularly height, is the primary driver for the delivery of optimal dispersion of emissions and is often determined by statutory requirements. The optimal stack height is dependent upon the local terrain and meteorological conditions, in combination with the emission characteristics of the plant. The EA will require the exhaust stack height of a thermal combustion generating plant, including fossil fuel generating stations and waste or biomass plant, to be optimised in relation to impact on air quality. The [decision maker] need not, therefore, be concerned with the exhaust stack height optimisation process in relation to air emissions, though the impact of stack heights on landscape and visual amenity will be a consideration.5

5.2.6 Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES).

5.2.7 The ES should describe:

- *any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*
- *the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;*
- *existing air quality levels and the relative change in air quality from existing levels; and*
- *any potential eutrophication impacts.*

5.2.9 The IPC should generally give air quality considerations substantial weight where a project would lead to a deterioration in air quality in an area or leads to a new area where air quality breaches any national air quality limits. However, air quality considerations will also be important where substantial changes in air quality levels are expected, even if this does not lead to any breaches of national air quality limits.

5.2.10 In all cases the IPC must take account of any relevant statutory air quality limits. Where a project is likely to lead to a breach of such limits the developers should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed. In the event that a project will lead to non-compliance with a statutory limit the IPC should refuse consent."

5.2.31 In addition to the requirements of NPS EN-1, NPS EN-3 states:

"2.5.39 In addition to the air quality legislation referred to in EN-1 the Waste Incineration Directive (WID) is also relevant to waste combustion plant. It sets out specific emission limit values for waste combustion plants."

2.5.40 The applicant's EIA should include an assessment of the air emissions resulting from the proposed infrastructure and demonstrate compliance with the relevant regulations (see Section 5.2 of EN-1).

2.5.42 The pollutants of concern arising from the combustion of waste and biomass include NOx, Sox, particulates and CO_2. In addition, emissions of heavy metals, dioxins and furans are a consideration for waste combustion generating stations but limited by the WID and regulated by the EA.

2.5.43 Where a proposed waste combustion generating station meets the requirements of WID and will not exceed the local air quality standards, the IPC should not regard the proposed waste generating station as having adverse impacts on health."

National Planning Policy Framework

5.2.32 The following paragraphs of the NPPF are considered relevant from and air quality perspective.

5.2.33 Paragraph 170 on conserving and enhancing the natural environment states:

"Planning policies and decisions should contribute to and enhance the natural and local environment by: …

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land stability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans, and…"

5.2.34 Paragraph 180 within ground conditions and pollution states:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."

5.2.35 Paragraph 181 states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

5.2.36 Paragraph 182 states that:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed".

National Planning Practice Guidance

5.2.37 Paragraph 005, Reference 32-005-20191101 (revision date 01.11.2019), of the PPG provides guidance on how considerations regarding air quality can be relevant to the development management process as follows:

"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity.

Where air quality is a relevant consideration the local planning authority may need to establish:

- *The 'baseline' local air quality, including what would happen to air quality in the absence of the development;*
- *Whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and*
- *Whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*

5.2.38 Paragraph 006, Reference 32-006-20191101 (revision date 01.11.2019), of the PPG identifies what specific air quality issues need to be considered in determining a planning application:

"Considerations that may be relevant to determining a planning application include whether the development would:

- *Lead to changes (including any potential reductions) in vehicle-related emissions in the immediate vicinity of the proposed development or further afield. This could be through the provision of electric vehicle charging infrastructure; altering the level of traffic congestion; significantly changing traffic volumes, vehicle speeds or both; and significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; could add to turnover in a large car park; or involve construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more;*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; biomass boilers or biomass-fuelled Combined Heat and Power plant; centralised boilers or plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area; or extraction systems (including chimneys) which require approval or permits under pollution control legislation;*

- *Expose people to harmful concentrations of air pollutants, including dust. This could be by building new homes, schools, workplaces or other development in places with poor air quality;*

- *Give rise to potentially unacceptable impacts (such as dust) during construction for nearby sensitive locations; and*

- *Have a potential adverse effect on biodiversity, especially where it would affect sites designated for their biodiversity value."*

5.2.39 Paragraph 007, Reference 32-007-20191101 (revision date 01.11.2019), of the PPG provides guidance on how detailed an assessment needs to be:

> *"Assessments need to be proportionate to the nature and scale of development proposed and the potential impacts (taking into account existing air quality conditions), and because of this are likely to be locationally specific".*

and

> *"The following could form part of assessments:*
>
> *A description of baseline conditions and any air quality concerns affecting the area, and how these could change both with and without the proposed development;*
>
> - *Sensitive habitats (including designated sites of importance for biodiversity);*
> - *The assessment methods to be adopted and any requirements for the verification of modelling air quality;*
> - *The basis for assessing impacts and determining the significance of an impact;*
> - *Where relevant, the cumulative or in-combination effects arising from several developments;*
> - *Construction phase impacts;*
> - *Acceptable mitigation measures to reduce or remove adverse effects; and*
> - *Measures that could deliver improved air quality even when legally binding limits for concentrations of major air pollutants are not being breached."*

5.2.40 Paragraph 008, Reference 32-008-20140306 (revision date 01.11.2019), of the PPG provides guidance on how an impact on air quality can be mitigated:

> *"Mitigation options will need to be locationally specific, will depend on the proposed development and need to be proportionate to the likely impact. It is important that local planning authorities work with applicants to consider appropriate mitigation so as to ensure new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.*

Regional Policy

The London Plan 2021

5.2.41 The London Plan 2021 includes the following air quality related policies.

5.2.42 Policy Planning for Good Growth 3 on creating a healthy City states:

"*To improve Londoners' health and reduce health inequalities, those involved in planning and development must:*

… DB seek to improve London's air quality, reduce public exposure to poor air quality and minimise inequalities in levels of exposure to air pollution..."

5.2.43 The Plan includes Policy Sustainable Infrastructure 1 (SI1) Improving Air Quality which aims to:

"...*ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits*".

5.2.44 Policy SI1 Improving Air Quality continues and states:

"A Development plans, through relevant strategic, site-specific and area-based polices should seek opportunities to identify and deliver further improvements to air quality and should not reduce air quality benefits that result from the Mayor's or boroughs' activities to improve air quality.

B To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed:

1) Development proposals should not:

a) lead to further deterioration of existing poor air quality.

b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits.

c) create unacceptable risk of high levels of exposure to poor air quality.

2) In order to meet the requirements in Part 1, as a minimum:

a) Development proposal must be at least air quality neutral.

b) Development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retrofitted mitigation measures.

c) Major development proposal must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1.

d) Development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality such as children or older people, should demonstrate that design measures have been used to minimise exposure. (underlined text - Panel recommendations October 2019).

C Masterplans and development briefs for large-scale development proposals subject to an Environmental Impact Assessment should consider how local air quality can be improved across the area of the proposal as part of an air quality positive approach. To achieve this a statement should be submitted demonstrating:

a) How proposals have considered ways to maximise benefits to local air quality, and

b) *What measures or design features will be put in place to reduce exposure to pollution, and how they will achieve this.*

In order to reduce the impact on air quality during the construction and demolition phase development proposals must demonstrate how they plan to comply with the Non-Road Mobile Machinery Low Emission Zone and reduce emissions from the demolition and construction of buildings following best practice guidance.

E Development proposals should ensure that where emissions need to be reduced to meet the requirements of Air Quality Neutral or to make the impact of the development on local air quality acceptable, this is done on-site. Where it can be demonstrated that emission cannot be further reduced by on-suite measures, off-site measures to improve local air quality may be acceptable, provided that equivalent air quality benefits can be demonstrated within the area affected by the development."

5.2.45 Paragraph 9.1.2A defines 'Poor Air Quality':

"Where this policy refers to 'existing poor air quality' this should be taken to include areas where legal limits for any pollutant, or World Health Organization targets for Particulate Matter, are already exceeded and areas where current pollution levels are within 5% of these limits"

London Environment Strategy

5.2.46 Chapter 4 of the London Environment Strategy includes a series of objectives, policies and proposals to improve air quality. Several key issues have been highlighted to be addressed in the Strategy:

- Achieving legal compliance as quickly as possible.
- Diesel vehicles, especially cars and vans.
- Tackling all sources of pollution.
- Government action.
- Maximising co-benefits between air quality and climate change policies.
- Further reductions are needed in PM_{10} and $PM_{2.5}$, particularly from transboundary pollution, tyre and brake wear, and wood burning.

Local Policy

5.2.47 The Bexley Unitary Development Plan ('UDP') (2004) Saved Policies (2012) contains Policy ENV41 – 'Air Quality Strategies' which states:

- *The Council will require an applicant to prepare an Air Quality Assessment where proposals:*
- *−"include industrial activities with potentially significant air borne emissions;*
- *−have the potential to increase significantly the volume of traffic flows or the ratio of heavy goods vehicles, or the level of congestion so as to place air quality objectives at risk;*
- *−have the potential to increase the personal exposure of individuals at non-occupational locations to levels of air pollution which are likely to exceed objectives set in either national or local Air Quality Strategies; and/or*

- *−are located in (or are likely to effect) an Air Quality Management Area, which would significantly change the pattern of traffic flows or could lead to emissions of one or more of the pollutants specified in the national Air Quality Strategy."*

5.2.48 The policy also states the "*The Council may resist or impose conditions on applications where an air quality assessment shows that the proposed development will have an adverse effect on the achievement of national or local air quality objectives*".

Emerging Guidance and Standards

Environment Bill and $PM_{2.5}$ Standards

5.2.49 The 2019 Clean Air Strategy includes a commitment to set a "*new, ambitious, long-term target to reduce people's exposure to $PM_{2.5}$*" which the proposed Environment Bill 2019-2021[10] commits the Secretary of State to setting. Additionally, the Mayor of London[11] has committed to meeting the World Health Organisation ('WHO') guideline of 10 μg/m^3 by 2030. The implications of potential future changes to the applicable standard for $PM_{2.5}$ has been considered in this ES.

Guidance

Environment Agency Guidance

5.2.50 The Environment Agency air emissions risk assessment ('AERA') guidance for environmental permitting (EA, 2020)[12] provides information on Environmental Assessment Levels ('EALs') against which the impacts of emissions to air can be assessed.

5.2.51 **Table 5.3** contains relevant EALs for the protection of human health.

Table 5.3: Relevant EALs for the Protection of Human Health

Pollutant	Averaging Period	EAL	Source
Particulate matter <10μm (PM_{10})	24-hour mean	50 μg/m^3 not to be exceeded more than 35 times a year	UKAQS objective and AQSR limit value
	Annual mean	40 μg/m^3	UKAQS objective and AQSR limit value
Particulate matter <2.5μm ($PM_{2.5}$)	Annual mean	20	UKAQS objective and AQSR target value
Nitrogen dioxide (NO_2)	1-hour mean	200 μg/m^3 not to be exceeded more than 18 times a year	UKAQS objective and AQSR limit value
	Annual mean	40 μg/m^3	UKAQS objective and AQSR limit value
Sulphur dioxide (SO_2)	15 minutes	266 μg/m^3 not to be exceed more than 35 times a year	UKAQS objective

[10] Yet to be enacted
[11] Mayor of London (2018). 'London Environment Strategy'
[12] Environment Agency (2020). Air emissions risk assessment for your environmental permit. Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)

Pollutant	Averaging Period	EAL	Source
	1-hour	350 µg/m^3 not to be exceeded more than 24 times a year	UKAQS objective and AQSR limit value
	24-hour	125 µg/m^3 not to be exceeded more than 3 times a year	UKAQS objective and AQSR limit value
1,3-butadiene	Running annual	2.25 µg/m^3	UKAQS objective
Benzene	1-hour mean	195 µg/m^3	EA AERA EAL
Carbon monoxide (CO)	1-hour mean	30 mg/m^3	EA AERA EAL
	8-hour running mean	10 mg/m^3 maximum daily value	UKAQS objective and AQR limit value
Hydrogen fluoride (HF)	1-hour mean	160 µg/m^3	EA AERA EAL
	Monthly mean	16 µg/m^3	EA AERA EAL
Hydrogen chloride (HCl)	1-hour mean	750 µg/m^3	EA AERA EAL
Ammonia (NH_3)	1-hour mean	2,500 µg/m^3	EA AERA EAL
	Annual mean	180 µg/m^3	EA AERA EAL
Cadmium (Cd)	Annual mean	5 ng/m^3	AQSR Target Value
Mercury (Hg)	1-hour mean	7.5 µg/m^3	EA AERA EAL
	Annual mean	0.25 g/m^3	EA AERA EAL
Antimony (Sb)	1-hour running mean	150 µg/m^3	EA AERA EAL
	Annual mean	5 µg/m^3	EA AERA EAL
Arsenic (As)	Annual mean	3 ng/m^3	EA AERA EAL. The AQSR Target Value is 6ng/m^3.
Lead (Pb)	Annual mean	0.25 µg/m^3	UKAQS objective. The AQSR Limit Value is 0.5 µg/m^3.
Chromium (Cr III)	1-hour mean	150 µg/m^3	EA AERA EAL
	Annual mean	5 µg/m^3	EA AERA EAL
Hexavalent Chromium (Cr VI)	Annual mean	0.2 ng/m^3	EA AERA EAL
Copper (Cu)	1-hour mean	200 µg/m^3	EA AERA EAL
	Annual mean	10 µg/m^3	EA AERA EAL
Manganese (Mn)	1-hour mean	1,500 µg/m^3	EA AERA EAL
	Annual mean	0.15 µg/m^3	EA AERA EAL
Nickel	Annual	20 ng/m^3	AQSR Target Value
Vanadium (V)	1-hour mean	1 µg/m^3	EA AERA EAL

Pollutant	Averaging Period	EAL	Source
	Annual mean	5 μg/m^3	EA AERA EAL
Polyaromatic hydrocarbons (PAH)	Annual	1 ng/m^3 of benzo(a)pyrene (BaP) total content within the PM_{10} fraction	AQSR Target Value
	Annual	0.25 ng/m^3 of benzo(a)pyrene (BaP)	EA AERA EAL
Polychlorinated biphenyls (PCBs)	1-hour mean	6 μg/m^3	EA AERA EAL
	Annual mean	0.2 μg/m^3	EA AERA EAL

5.2.52 **Table 5.4** presents the relevant EALs for terrestrial biodiversity receptors.

Table 5.4: Relevant EALs (critical levels) for the Protection of Vegetation and Ecosystems

Pollutant	Time Period	EAL
Ammonia (NH_3)	Annual mean (lichens or bryophytes)	1 μg/m^3
	Annual mean	3 μg/m^3
Sulphur Dioxide (SO_2)	Annual mean (lichens or bryophytes)	10 μg/m^3
	Annual mean	20 μg/m^3
Oxides of Nitrogen (NO_x)	24-hour mean	75 μg/m^3
	Annual mean	30 μg/m^3
Hydrogen Fluoride (HF)	24-hour mean	5 μg/m^3
	Weekly mean	0.5 μg/m^3

The Greater London Authority's 'London Local Air Quality Management Technical Guidance (LLAQM.TG (19))'

5.2.53 LLAQM.TG (19) was published for use by London local authorities in their LAQM review and assessment work (Greater London Authority, 2019a). The document provides key guidance in aspects of air quality assessment, including screening, use of monitoring data, and use of background data that are applicable to all air quality assessments.

EPUK / IAQM 'Land-Use Planning & Development Control: Planning for Air Quality'

5.2.54 Environmental Protection UK ('EPUK') and the Institute of Air Quality Management ('IAQM') have together published guidance (the 'IAQM guidance')[13] to help ensure that air quality is properly accounted for in the development control process (EPUK / IAQM 2017). It clarifies when an air quality assessment should be undertaken, what it should contain, and how impacts should be described and assessed including guidelines for assessing the significance of impacts.

[13] Environmental Protection UK and the Institute of Air Quality Management (EPUK / IAQM) (2017). 'Land-use Planning & Development Control: Planning for Air Quality'. V1.2. The Institute for Air Quality Management, London

IAQM 'Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites'

5.2.55 The IAQM has published guidance[14] on the assessment of air quality impacts on designated nature conservation sites (IAQM, 2019) which adopts a similar procedure to that detailed in EA AERA guidance on the assessment of point source emissions.

5.2.56 In addition to the above guidance documents, a review of studies relating to energy recovery facilities and health has also been undertaken and is summarised in **Appendix B.4**.

5.3 Consultation

5.3.1 As described in **Section 4.3** of this EIA Report, a Scoping Report was submitted in December 2020 which set out the proposed scope of the air quality assessment to be undertaken for ROP. A subsequent telephone consultation was then undertaken between Stantec and the Environmental Health Department at LBB in February 2021 to determine if they had any further requirements relating to the assessment approach or receptor locations.

5.3.2 The Scoping Opinion did not identify any issues or gaps with the proposed air quality scope of work and LBB did not identify additional requirements.

5.4 Methodology

Study Area

5.4.1 The study area has been defined by the distances from the RRRF stack over which the greatest risk of potential significant effects is considered likely to occur, as follows:

- For human health receptors, a study area of 5 km from the Application Site has been considered. Human health receptor locations were chosen where the impacts of emissions were likely to be greatest, as identified by the initial dispersion modelling;
- Internationally designated terrestrial biodiversity sites (SAC, SPA, and Ramsar sites) and nationally designated biodiversity sites (SSSI) within 15 km of the Application Site; and
- Locally designated nature sites within 2 km (ancient woodland, local wildlife sites, Sites of Importance for Nature Conservation ('SINCs') and national and Local Nature Reserves ('LNR')).

Baseline Data Collection

5.4.2 Information on existing air quality has been obtained by collating the results of monitoring carried out by LBB, LBBD, and LBH for pollutants such as NO_2, PM_{10} and $PM_{2.5}$. Background pollutant concentrations for other pollutants have been gathered from published data and national monitoring networks.

5.4.3 Background concentrations for the study area have been defined using the national pollution maps published by DEFRA which cover the whole country on a 1x1 km grid (DEFRA, 2020b).

5.4.4 Existing critical levels and critical loads for habitats within the study area were collated from the Air Pollution Information System website (APIS, 2020).

Atmospheric Dispersion Modelling

[14] IAQM (2019) Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

5.4.5 The ADMS 5 model has been applied for the atmospheric dispersion modelling assessment of the exhaust gases from the stacks serving the ERF at the Application Site, as summarised in the following sections.

Emission Discharge Characteristics

5.4.6 **Table 5.5** provides the physical emission discharge characteristics derived from monitoring data and design specifications.

Table 5.5: Emission Sources – physical discharge characteristics

Parameter	RRRF	
	Existing	Post ROP
Stack height (m)	90	
Internal Stack Diameter (m)	3.93[a]	
Flue gas velocity (m/s)	16.6	18.7
Oxygen (dry) (%v/v)	8.2	8.0
Moisture Content (%v/v)	19.8	20.4
Temperature (degrees Celsius)	126	129
Actual flow rate (Am^3/s)	201.7[b]	226.9[b]
Normalized flow rate, dry, 11% oxygen (Nm^3/s)	141.4[b]	160.0[b]

a) Combined stack diameter for 3 lines (2.27m individually)

b) Total flow rates for all 3 lines

5.4.7 The Proposed Changes result in an increased volumetric flow rate (by approximately 13%) of flue gas from RRRF; an accompanying increase in exit velocity and marginal changes in exit temperature, moisture and oxygen content.

Pollutant Emission Rates

5.4.8 The pollutant emission rates have been calculated from the 'normalised' volumetric flow rate (Nm^3) and corresponding daily average emission limits as presented in **Table 5.6**. It is assumed that there are no maintenance or shut-down periods and the source is emitting for 100% of the time at the applied emission limits.

Table 5.6: Applied pollutant emission rates

Pollutant	RRRF (current)				RRRF Post ROP (proposed)			
	Emission Limit		Emission Rate		Emission Limit		Emission Rate	
PM_{10} / $PM_{2.5}$	10	mg/Nm^3	1.41	g/s	5	mg/Nm^3	0.80	g/s
NOx	200	mg/Nm^3	28.3	g/s	180	mg/Nm^3	28.8	g/s
SO_2	50	mg/Nm^3	7.07	g/s	40	mg/Nm^3	6.40	g/s
CO	50	mg/Nm^3	7.07	g/s	50	mg/Nm^3	8.00	g/s
HCl	10	mg/Nm^3	1.41	g/s	8	mg/Nm^3	1.28	g/s
HF	1	mg/Nm^3	0.14	g/s	1	mg/Nm^3	0.16	g/s
TOC	10	mg/Nm^3	1.41	g/s	10	mg/Nm^3	1.60	g/s
NH_3	10	mg/Nm^3	1.41	g/s	10	mg/Nm^3	1.60	g/s
Hg	0.05	mg/Nm^3	7.07	mg/s	0.02	mg/Nm^3	3.20	mg/s
Cd & Tl	0.05	mg/Nm^3	7.07	mg/s	0.02	mg/Nm^3	3.20	mg/s
Group 3 Metals	0.5	mg/Nm^3	70.7	mg/s	0.3	mg/Nm^3	48.0	mg/s
Dioxins	0.1	ng I-TEQ/Nm^3	14.1	ng/s	0.06	ng I-TEQ/Nm^3	9.60	ng/s

Pollutant	RRRF (current)				RRRF Post ROP (proposed)			
	Emission Limit		Emission Rate		Emission Limit		Emission Rate	
PAH	0.21	μg/Nm^3	29.7	ug/s	0.21	μg/Nm^3	33.6	ug/s
PCBs	0.005	mg/Nm^3	0.71	mg/s	0.005	mg/Nm^3	0.80	mg/s

5.4.9 For the majority of pollutants, the Proposed Changes result in a decrease in the applicable emission limits) and a resultant decrease in calculated emissions compared to the current permitted ELVs, despite the increased volumetric flow rate. This is due to early adoption of the BREF BAT-AELs.

5.4.10 For some pollutants (NOx, CO, HF, TOC, NH_3, PAH and PCBs) the proportional decrease in applicable emission limits (again due to early adoption of the BREF BAT-AELs) is less than the proportional increase in volumetric flow rate; therefore the calculated emissions of these pollutants increases.

5.4.11 In relation to emission of PM_{10} and $PM_{2.5}$, whilst the EPR ELVs and BREF BAT-AELs relate to 'dust' or 'particulate' (i.e. no differentiation by particle size), for the purpose of this assessment it has been assumed that all particulate matter is both PM_{10} and $PM_{2.5}$ to ensure worst-case impacts are assessed.

5.4.12 The emission rate of each individual Group 3 metal has been calculated using the case specific screening approach within the EA guidance (EA, undated)[15] on releases from waste incinerators. Table A1 within the guidance contains a summary of 34 measured concentrations of metals between 2007-2015 at 18 municipal waste incinerators and waste wood co-incinerators in the UK. The maximum measured values for each metal have been used to calculate the emissions as shown in **Table 5.7**

5.4.13 It should be noted that whilst the BREF BAT-AEL for Group 3 metals is 40% lower (at 0.3mg/Nm^3) than the currently permitted ELV (at 0.5mg/Nm^3) calculated emission rates do not decrease. This is because the applied emission concentration for individual metals is based on measured data rather than the ELVs; therefore the calculated emission rate of individual Group 3 metals increases proportionally with volumetric flow rate.

Table 5.7: Group 3 Metals – Individual Emission Rates

Metal	EA measured maximum emission concentration (mg/Nm^3)	Current RRRF Emission Rate (mg/s)	RRRF post ROP Emission Rate (mg/s)
As	0.025	3.54	4.00
Cr	0.092	13.01	14.72
CrVI	1.30E-04	0.02	0.02
Co	0.0056	0.79	0.90
Cu	0.029	4.10	4.64
Pb	0.0503	7.11	8.05
Mn	0.06	8.48	9.60
Ni	0.22	31.11	35.19
Sb	0.0115	1.63	1.84
V	0.006	0.85	0.96

[15] Environment Agency (undated). Guidance on assessing group 3 metal stack emissions from incinerators. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/532474/LIT_7349.pdf

Model Domain Parameters

5.4.14 The ADMS 5 model also requires inputs for:

- Receptor locations;
- Building effects;
- Nature of the surface; and
- Meteorology.

5.4.15 A 10 km by 10 km Cartesian grid with 50 m spacing was used to predict the maximum predicted contribution to ground level concentrations. The pollutant concentrations were also predicted at specific human and terrestrial biodiversity receptor locations.

5.4.16 Buildings can influence the dispersion of pollutants from sources and can increase the maximum predicted ground level concentrations. The main effect of a building is to entrain pollutants into the cavity region in the immediate leeward side of the building, bringing them rapidly down to ground level. Therefore, concentrations near the building are increased but further away concentrations are decreased.

5.4.17 The buildings that are nearest (or attached) to the RRRF stack have been considered in the model. Buildings located horizontally within the distance equivalent to five stack heights of the stack and taller than approximately a third of the stack height have been included, in accordance with advice from the software provider. The building parameters used for the modelling are shown in **Table 5.8**.

Table 5.8: Buildings included within the model

Building	Coordinates (centre)	Length (m)	Width (m)	Height above Ground (m)
RRRF Building	549691, 180650	145	77	37

5.4.18 Terrain around the Application Site is relatively flat and is unlikely to influence the dispersion of pollutants. Previous modelling of the area was run with and without a digital terrain dataset and it was concluded that running the models with the terrain data does not influence the dispersion and ground level concentrations. For this reason, it has not been included in this model.

5.4.19 The nature of the surface may impact the dispersion of pollutants. The surface roughness length is a representation of the disruption of airflow close to the ground due to obstructions and protuberances, such as buildings, trees and hedges. To account for the surrounding nature of the Application Site, a surface roughness length of 0.5 m has been used, as recommended by the software provider for parkland, open suburbia.

Results Processing

5.4.20 Emissions of NO_x from combustion sources include both NO_2 and NO, with the majority being in the form of NO. In ambient air, NO is oxidised to form NO_2, and it is NO_2 which has the greater health impacts. For this assessment, the conversion of NO to NO_2 has been estimated using the worst-case assumptions set out in EA AERA guidance, namely that:

- For the assessment of long term (annual mean) impacts at receptors, 70% of NO_x is NO_2; and

- For the assessment of short term (hourly mean) impacts at receptors, 35% of NO_x is NO_2.

5.4.21 The oxidation of NO to NO_2 is not, however, an instantaneous process and where the maximum impacts occur within up to 1 km of the stacks, the EA assumptions lead to a conservative assessment.

5.4.22 In relation to 'Total Organic Carbon' ('TOC') as specified by the EPR and BREF, for the purposes of this assessment the predicted TOC impacts have been compared to the EALs for 1,3-butadine (annual average impacts) and benzene (hourly mean impacts).

5.4.23 The dry deposition velocities and conversion factors for NO_2, NH_3, SO_2, and HCl were taken from the EA's guidance document AQTAG 06 (EA, 2014)[16] and are set out in **Table 5.9**.

Table 5.9: Applied Deposition Velocities for Terrestrial Ecological Receptors

Substance	Habitat	Dry Deposition Velocity (mm/s)	Conversion µg/m²/s to kgN/ha/yr	Conversion µg/m²/s to keq/ha/yr
Nitrogen dioxide (NO_2)	Grassland	1.5	96.0	6.84
	Woodland	3.0		
Sulphur dioxide (SO_2)	Grassland	12.0	-	9.84
	Woodland	24.0		
Ammonia (NH_3)	Grassland	20.0	259.7	18.5
	Woodland	30.0		
Hydrogen Chloride (HCl)	Grassland	25.0	-	8.63
	Woodland	60.0		

5.4.24 In accordance with the EA's guidance document, wet deposition was only considered in the assessment for HCl and in accordance with their methodology, it was assumed to be twice the calculated dry deposition.

Limitations

5.4.25 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the plant data that have been inputted which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms. However, these limitations are not considered to result in an inaccurate assessment or significantly effect the results of the modelling.

Reasonable Worst-Case Parameters Used for Assessment

5.4.26 The potential operational effects have been considered on a worst-case basis. Realistic maximum emission rates have been calculated from monitoring data from the current RRRF provided by the Applicant.

[16] Environment Agency (2014). AQTAG 06, Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air, Ji Ping Shi, Environment Agency Air Quality Monitoring and Assessment Unit, Updated version

5.4.27 It is assumed that there are no maintenance or shut down periods and the source is emitting for 100% of the time. The emission rates have been calculated assuming that the source is emitting at full load at the emission limit value.

Significance Criteria

Human Receptors

5.4.28 There is no official guidance in the UK on how to assess the significance of the air quality impacts of a new development on existing receptors. The approach developed by EPUK and the IAQM (EPUK / IAQM, 2017), which considers the change in air quality as a result of a Proposed Development on existing receptors in combination with baseline concentrations at the receptors (to calculate the Predicted Environmental Concentration or PEC), has therefore been used. The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance.

5.4.29 Impact magnitude relates to the change in pollutant concentration. The impact description relates this change to the EAL and for annual average impacts is shown in **Table 5.10**.

Table 5.10: IAQM Annual Average Impact Significance Criteria

Long term average Concentration at receptor: Predicted Environmental Concentration (PEC)	% Changes in Concentration with development in relation to EAL			
	1*	2-5	6-10	>10
> 110 % [a]	Moderate	Substantial	Substantial	Substantial
>102% - ≤110% [b]	Moderate	Moderate	Substantial	Substantial
>95% - ≤102% [c]	Slight	Moderate	Moderate	Substantial
>75% - ≤95% [d]	Negligible	Slight	Moderate	Moderate
≤75% [e]	Negligible	Negligible	Slight	Moderate

Where concentrations increase the impact is described as adverse, and where it decreases as beneficial.
% change rounded to nearest whole number. Where the % change is 0 (i.e. Less than 0.5%) the impact will be Negligible.
[a] NO_2 or PM_{10}: > 44 µg/m^3 annual mean; $PM_{2.5}$ >27.5 µg/m^3 annual mean; PM_{10} >35.2 µg/m^3 annual mean (days).
[b] NO_2 or PM_{10}: > 40.8 – ≤ 44 µg/m^3 annual mean; $PM_{2.5}$ > 20.4 – ≤22 µg/m^3 annual mean; PM_{10} >32.64 – ≤35.2 µg/m^3 annual mean (days).
[c] NO_2 or PM_{10}: > 38 – ≤40.8 µg/m^3 annual mean; $PM_{2.5}$ >19 – ≤20.4µg/m^3 of annual mean; PM_{10} >30.4 – ≤32.64 µg/m^3 annual mean (days).
[d] NO_2 or PM_{10}: >30 - ≤38 µg/m^3 annual mean; $PM_{2.5}$ >15 - ≤19 µg/m^3 annual mean; or <24 - ≤ 30.4 µg/m^3 annual mean (days).
[e] NO_2 or PM_{10}: ≤30 µg/m^3 annual mean; $PM_{2.5}$ ≤15 µg/m^3 annual mean; PM_{10} ≤24 µg/m^3 annual mean (days).

5.4.30 In relation to peak short-term concentrations, the IAQM guidance identifies the following approach (**Table 5.11**).

Table 5.11: IAQM Impact descriptors for Short Term Impacts

Impact as % of EAL	Impact Descriptor	Impact Severity
> 50.5 %	Large	Major
>20.5% - ≤50.5%	Medium	Moderate
>10.5% - ≤20.5%	Small	Slight
≤10.5%	Negligible	Negligible

5.4.31 The IAQM guidance states that the overall assessment of significance should be based on professional judgement, taking into account factors including:

- the number of sensitive receptors affected by 'Slight', 'Moderate' or 'Substantial' adverse air quality impacts and a judgement on the overall balance;
- the magnitude of the changes and the descriptions of the impacts at the receptors;
- whether or not an exceedance of an NAQO or limit value is predicted to arise in the operational study area where none existed before, or an exceedance area is substantially increased;
- the uncertainty, comprising the extent to which worst-case assumptions have been made; and
- the extent to which an NAQO or limit value is exceeded.

5.4.32 In relation to the population exposure, Paragraph 7.8 of the IAQM guidance states:

> *'An individual property exposed to a moderately adverse impact might not be considered a significant effect, but many hundreds of properties exposed to a slight adverse impact could be. Such judgements will need to be made taking into account multiple factors and this guidance avoids the use of prescriptive approaches.'*

5.4.33 Paragraph 7.9 of the IAQM guidance goes on to state:

> *'A judgement of the significance should be made by a competent professional who is suitably qualified. The reasons for reaching the conclusions should be transparent and set out logically. Whilst the starting point for the assessment of significance is the degree of impact, as defined by Table 6.3, this should be seen as one of the factors for consideration, not least because of the outcome of this assessment procedure applies to a receptor and not to the overall impact.'*

5.4.34 Therefore, where impacts at an individual receptor are classified as 'Negligible' or 'Slight', effects would typically be considered 'not significant'. Conversely, where 'Moderate' or 'Substantial' adverse impacts are identified at individual receptors, the overall effect needs to be considered in the round taking into account the changes at all of the modelled receptor locations, with a judgement made as to whether the overall air quality effect of the development is 'significant' or not.

Ecological Receptors

5.4.35 In terms of the impact of emissions to air on ecological receptors, an impact of less than 1% of the critical level or load is accepted to be a pragmatic threshold for determining no likely significant effects (EA, 2020 & NE, 2018).

5.4.36 It should be noted that an impact of more than 1% is not, per se, an indication that a significant effect exists, only the possibility of one which would trigger the need for further, more detailed assessment of the ecological sensitivity and value of the habitat.

5.4.37 Where impacts cannot be classified as resulting in 'no likely significant effect' based solely on the PC, further consideration of the impacts and potential for likely significant effects will be undertaken by the Project Ecologist as reported in **Chapter 6**.

5.5 Baseline Conditions

Current Baseline

5.5.1 The whole of LBB, LBBD and RBG were designated as AQMAs with respect to NO_2 and PM_{10}, in 2007, 2008, and 2001 respectively. Where an AQMA is designated, LAs need to prepare Action Plans and work towards meeting the National Air Quality Strategy Objectives.

5.5.2 The Application Site is within the boundary of the Low Emission Zone ('LEZ') and more stringent requirements for HGVs will apply from March 2021. The Application Site is not however within the proposed expansion of the Ultra-Low Emission Zone ('ULEZ'), which is due for expansion in October 2021.

Measured Baseline Concentrations

5.5.3 A summary of the annual average measured concentrations of NO_2 measured at nearby automatic monitoring sites are presented in **Table 5.12** below:

Table 5.12: Local Authority Automatic Monitoring Stations – Annual Average NO_2 Concentrations

Monitoring Site	Site Type	Annual Mean µg/m³				
		2015	2016	2017	2018	2019
Slade Green (BX1)	Suburban background	26	25	25	23	22
Belvedere Primary School (BX2)	Urban background	24	29	28	28	23
Bexley Business (BQ7)	Urban background	22	24	21	21	21
Scrattons Farm (BG2)	Suburban	29	32	29	26	Not measured
Rainham (HV1)	Roadside	32	34	34	30	29
NAQO/EAL		40				

5.5.4 The monitoring data indicates for at these monitoring locations the NO_2 concentrations are compliant with the AQR limit values and meet the NAQO.

5.5.5 Particulate Matter (PM_{10} and $PM_{2.5}$) monitoring is also undertaken within the Study Area. A summary of the annual average measured concentrations of PM_{10} and $PM_{2.5}$ measured at nearby automatic monitoring sites is presented in **Table 5.13** and **Table 5.14**.

Table 5.13: Local Authority Automatic Monitoring Stations – Annual Average PM_{10} Concentrations

Monitoring Site	Site Type	Annual Mean µg/m³				
		2015	2016	2017	2018	2019
Slade Green (BX1)	Suburban background	14	18	17	18	17
Belvedere Primary School (BX2)	Urban background	14	14	17	19	19
Bexley Business (BQ7)	Urban background	18	15	15	15	14

Monitoring Site	Site Type	Annual Mean µg/m³				
		2015	2016	2017	2018	2019
Scrattons Farm (BG2)	Suburban	21	20	20	18	Not measured
Rainham (HV1)	Automatic Roadside	18	19	18	17	17
NAQO/EAL		40				

Table 5.14: Local Authority Automatic Monitoring Stations – Annual Average $PM_{2.5}$ Concentrations

Monitoring Site	Site Type	Annual Mean µg/m³				
		2015	2016	2017	2018	2019
Slade Green (BX1)	Suburban background	15	11	11	12	12
Rainham (HV1)	Roadside	11	12	12	11	11
NAQO/EAL		20				

Modelled Background Concentrations

5.5.6 Maps of annual mean background concentrations of NO_x, NO_2, PM_{10} and $PM_{2.5}$ are produced and are updated periodically by DEFRA (DEFRA, 2018)[17] for the purposes of the LAQM. They provide the estimates for present and future concentrations and are presented as 1 km x 1 km grid square averages. The most recent version of the background maps was released in 2018 (based on 2017 UK-wide modelling). Data for the Application Site location is presented in **Table 5.15**.

Table 5.15: DEFRA background map predicted annual average concentrations at the Application Site

Pollutant	Annual Average Concentration (µg/m³)		
	2018	2020	2022
NO_x	31.4	28.4	26.6
NO_2	21.1	19.5	18.5
PM_{10}	16.1	15.3	15.0
$PM_{2.5}$	11.0	10.5	10.2

Applied Baseline Concentrations

5.5.7 **Table 5.16** shows the baseline concentrations used in this assessment obtained primarily from monitoring networks operated by DEFRA and LAs.

Table 5.16: Summary of background concentrations selected for use in the assessment

Pollutant	Long term Background Concentration		Short term Background Concentration		Source
PM_{10}	20	µg/m³ annual	23.6	µg/m³ 24hr	Scrattons Farm (BG2), maximum of past 3 years
$PM_{2.5}$	12	µg/m³ annual	N/A	N/A	Slade Green maximum of past 3 years

[17] Department of the Environment, Food and Rural Affairs (DEFRA) (2020). '2018 Based Background Maps

Pollutant	Long term Background Concentration		Short term Background Concentration		Source
NO_2	28	µg/m^3 annual	56	µg/m^3 1 hour	Belvedere Primary School (BX2) maximum of past 3 years
SO_2	1.9	µg/m^3 annual l	1.3	µg/m^3 24 hour	APIS 2016-2018 average
			2.3	µg/m^3 1 hour	
			2.7	µg/m^3 15 minute	
CO	173	µg/m^3 annual	242	µg/m^3 8-hour	DEFRA 2001 based background maps projected to 2021
			346	µg/m^3 1-hour	
HF	0.5	µg/m^3 annual	1	µg/m^3 1 hour	EPAQS Guidelines for Halogen and Hydrogen Halides in Ambient Air.
HCl	0.3	µg/m^3 annual	0.6	µg/m^3 1 hour	Detling 2016 DEFRA UKEAP Acid Gases and Aerosol Network
TOC	0.13	µg/m^3 annual (1,3 butadiene)	0.96	µg/m^3 1 hour (benzene)	DEFRA 2001 based background maps projected to 2021
NH_3	2.9	µg/m^3 annual	5.9	µg/m^3 1 hour	APIS 2016-2018 average
Cd	0.34	ng/m^3 annual	0.68	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Hg	1.6	ng/m^3 annual	3.2	ng/m^3 1 hour	Chilbolton Observatory 2016
As	0.92	ng/m^3 annual	1.9	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Cr	2.1	ng/m^3 annual	4.2	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
CrVI	0.42	ng/m^3 annual	0.83	ng/m^3 1 hour	20% of Total Cr as per EA guidance
Co	0.11	ng/m^3 annual	0.21	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Cu	10.7	ng/m^3 annual	21.4	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Pb	10.6	ng/m^3 annual	21.2	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Mn	5.9	ng/m^3 annual	11.8	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Ni	1.3	ng/m^3 annual	2.5	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
Sb	1.3	ng/m^3 annual	2.6	ng/m^3 1 hour	Detling 2013 DEFRA Heavy Metals Network
V	1.5	ng/m^3 annual	2.9	ng/m^3 1 hour	Chadwell St Mary 2019 DEFRA Heavy Metals Network
PAH	0.16	ng/m^3 annual (BaP)	0.32	ng/m^3 1 hour	London Marleybone Road DEFRA PAH Network, 2019
Dioxins	9.0	fgTEQ/m^3 annual	18.0	fgTEQ/m^3 annual	London Ashdown House 2017 TOMPS network
PCBs	22.2	pg/m^3 annual	44.4	pg/m^3 annual	London Ashdown House 2018 TOMPS network

5.5.8 The appropriate conversion factor for each averaging period has been used in accordance the EA guidance[12]:

- 1-hour mean background concentrations have been estimated by multiplying the annual mean by a factor of 2;
- 24-hour mean background concentrations have been estimated by multiplying the 1-hour mean by a factor of 0.59;
- 8-hour mean background concentrations have been estimated by multiplying the 1-hour mean by a factor of 0.7; and
- 15-minute mean background concentrations have been estimated by multiplying the 1-hour mean by a factor of 1.34.

Human Receptors

5.5.9 The selected discrete human receptor locations are summarised in **Table 5.17** and shown in **Figure 5.2**.

Table 5.17: Modelled Discrete Human Receptors Locations

ID	Easting	Northing	Height (m)	Description
R01	548447.0	179561.5	1.5	The Business Academy
R02	548203.1	179698.7	1.5	Education Facility
R03	547979.0	179882.7	1.5	St. Katherine's Road (3 floors)
R04	547366.1	180533.9	1.5	Jubilee Primary School
R05	548054.2	181106.3	1.5	Cherbury Close, Thamesmead
R06	548067.0	181169.5	1.5	Lytham Close
R07	547291.1	181297.5	1.5	Voyagers Close
R08	546381.9	181625.3	60	Plot 401 Barking Riverside
R09	547721.9	182293.4	15	Plot 306 Barking Riverside
R10	546450.6	182313.9	1.5	George Carey CofE Primary School
R11	543831.4	183642.6	75	Freshwharf, Highbridge Road
R12	544321.4	184325.6	75	Oculus House, Cambridge Road
R13	547208.9	182982.5	1.5	Sovereign Road, Barking
R14	548137.3	183304.9	1.5	Shaw Gardens, near Scrattons
R15	548855.9	183584.5	1.5	St. Peter's Primary School, Dagenham
R16	549054.1	183047.2	75	Chequers Corner
R17	549389.3	183527.9	1.5	Marsh Green Primary School, Dagenham
R18	550566.4	182760.5	1.5	Beam Park Residential Development GF
R18A	550566.4	182760.5	20	Beam Park Elevated
R19	550872.9	182891.9	1.5	Spencer Road, South Hornchurch
R20	552160.1	182010.9	1.5	Lapwing House, Capstan Drive (1st floor)

ID	Easting	Northing	Height (m)	Description
R20A	552160.1	182010.6	16.5	Lapwing House, Capstan Drive (5th floor)
R21	552403.3	182326.3	1.5	Rainham Village Childrens Centre
R22	552498.7	181693.6	1.5	52, Elizabeth Road
R23	553035.5	181752.2	1.5	Brady Primary School, Rainham
R24	550667.7	178833.1	1.5	65, Lower Road
R25	549736.3	179858.2	4.5	Hackney House Apartments (1st Floor)
R25A	549736.3	179858.2	18	Hackney House Apartments (6th Floor)
R26	547786.2	180715.8	1.5	10, Wallace Close
R27	549632.1	179716.4	4.5	Jutland House Apartments
R28	549597.7	179652.7	1.5	Belvedere Park housing development

Terrestrial Biodiversity Receptors

5.5.10 DEFRA's MAGIC website[18] was used to identify the international and nationally designated sites within 15 km of the Application Site and the LNRs within 2 km. In addition, locally designated sites were identified within 2 km of the Application Site as per EA AERA guidance. Existing nitrogen and acid deposition rates within the study area were determined from the Air Pollution Information System ('APIS') website[19].

5.5.11 The locations assessed in this study are set out in **Table 5.18** below and shown in **Figure 5.3 and 5.4**. Impacts have been modelled at discrete receptors at the location of maximum impact resulting from emissions from RRRF and assessed against relevant critical levels and loads for the most sensitive habitat type present within the area of impact.

Table 5.18: Modelled Terrestrial Biodiversity Receptor Locations

Receptor ID	Designated Site	Identified Habitat Type
ER1	Crossness LNR	Neutral Grassland Scrub and Rough Grassland
ER2	Lesnes Abbey Wood LNR	Broadleaved, mixed and yew woodland
ER3	Inner Thames Marshes SSSI / Rainham Marshes LNR	Saltmarshes
ER4	Oxleas Woodlands SSSI	Broadleaved, mixed and yew woodland
ER5	Gilbert's Pit (Charlton) SSSI	Geological
ER6	Epping Forest SSSI	Acid Grassland
ER7	Epping Forest SSSI and SAC	Acid Grassland
ER8	Ingrebourne Marshes SSSI	Fen, marsh and swamp
ER9	Thorndon Park SSSI	Broad-leaved, mixed and yew woodland
ER10	Hainault Forest SSSI	Broad-leaved, mixed and yew woodland
ER11	Curtismill Green SSSI	Neutral Grassland
ER12	Hornchurch Cutting SSSI	Geological

[18] Available at https://magic.defra.gov.uk
[19] Air Pollution Information System (APIS) . 'Site relevant critical loads'. Available at: http://www.apis.ac.uk/

Receptor ID	Designated Site	Identified Habitat Type
ER13	Purfleet Chalk Pits SSSI	Geological
ER14	West Thurrock Lagoon & Marshes SSSI	Littoral Sediment
ER15	Lion Pit SSSI	Geological
ER16	Grays Thurrock Chalk Pit SSSI	Broad-leaved, mixed and yew woodland
ER17	Hangman's Wood & Deneholes SSSI	Broad-leaved, mixed and yew woodland
ER18	Swanscombe Skull Site SSSI	Geological
ER19	Baker's Hole SSSI	Geological
ER20	Darenth Wood SSSI	Broad-leaved, mixed and yew woodland
ER21	Farningham Wood SSSI	Broad-leaved, mixed and yew woodland
ER22	Ruxley Gravel Pits SSSI	Standing Open Water and Canals
ER23	Wansunt Pit SSSI	Geological
BxB103	Franks Park (SBINC)	Broadleaved, Mixed and Yew Woodland
M039	Wennington, Aveley and Rainham Marshes (SMINC)	Coastal and Floodplain Grazing Marsh
M031	River Thames and tidal tributaries (SMINC)	Rivers and Streams
B&DB103	Dagenham Breach and the lower Beam River in Dagenham (SBINC)	Standing Open Water and Canals
HvBI18	Lower River Beam and Ford Works Ditches (SBINC)	Rivers and Streams
B&DBI07	Goresbrook and the Ship & Shovel Sewer (SBINC)	Rivers and Streams
BxL07	Crossway Park and Tump 52 (SLINC)	Wood-Pasture & Parkland
BxBII02	Southmere Park and Woodland Way (SBINC)	Standing Open Water and Canals
BxL16	The Ridgeway (SLINC)	Broadleaved, Mixed and Yew Woodland
Lesnes Abbey	Lesnes Abbey Woods and Bostall Woods (SMINC)	Broadleaved, Mixed and Yew Woodland
M041	Erith Marshes (SMINC)	Coastal and Floodplain Grazing Marsh
M041_A	Erith Marshes (SMINC)	Coastal and Floodplain Grazing Marsh
BxBI14	Thamesview Golf Course (SBINC)	Acid grassland
BxBI02	Belvedere Dykes (SBINC)	Standing Open Water and Canals
BxBII26	Church Manorway Nature Area (SBINC)	Standing Open Water and Canals
BxBII25	Crossness Sewage Treatment Works Pond (SBINC)	Standing Open Water and Canals

5.5.12 The existing background levels and loads for these receptor locations were obtained from the APIS (APIS, 2020) website and are provided in the **Table 5.19**. The sites for which are designated on the basis of their geological interest only or are not sensitive to air pollution (i.e. standing open water of littoral sediment) have not been included as they are not considered sensitive to the effects of air pollution.

Table 5.19: Baseline Levels and Deposition Rates at the Identified Terrestrial Biodiversity Receptors

Receptor ID	NO_x (µg/m^3)	SO_2 (µg/m^3)	NH_3 (µg/m^3)	Nitrogen (kg N/ha/yr)	N (keq/ha/yr)	S (keq/ha/yr)
ER1	34.39	1.69	1.92	17.50	1.25	0.17
ER2	28.99	1.69	1.92	30.80	2.20	0.21
ER3	39.11	2.18	2.23	18.34	1.30	0.20
ER4	31.23	1.46	1.98	31.08	2.20	0.21
ER6	40.67	1.72	2.48	20.16	1.40	0.20
ER7	42.21	1.69	2.67	21.42	1.50	0.20
ER8	32.41	1.87	2.23	18.34	1.30	0.20
ER9	19.68	1.06	1.60	28.00	2.00	0.20
ER10	21.26	1.41	1.69	28.70	2.05	0.19
ER11	34.62	0.94	1.68	16.94	1.20	0.10
ER16	37.09	1.92	1.40	26.46	1.89	0.24
ER17	29.65	1.92	1.40	26.46	1.89	0.24
ER20	33.49	1.57	1.53	27.30	2.00	0.20
ER21	33.00	1.12	1.61	29.40	2.10	0.20
BxB103	29.58	1.69	1.92	30.80	2.12	0.21
M039	9.11	1.87	2.23	18.34	1.13	0.19
BxL07	32.79	1.89	2.95	39.62	2.83	0.25
BxL16	34.21	1.89	2.95	39.62	2.83	0.25
Lesnes Abbey	28.99	1.69	1.92	30.80	2.20	0.21
M041	28.88	1.89	2.95	21.56	1.54	0.20
BxBI14	36.74	1.89	2.95	21.56	1.54	0.20

Current RRRF Impacts

5.5.13 **Table 5.20** presents the maximum predicted (long-term averaging period) ground level impacts of pollutants anywhere within the receptor grid for any of the five years' of meteorological data modelled. The results are for the current RRRF, operating at the maximum daily emission limit values currently permitted.

Table 5.20: Maximum Predicted Long-term Averaging Period Process Contributions from Existing RRRF

Pollutant	Long-term EAL (µg/m^3)	Averaging Period	Max PC (µg/m^3)	Max PC as % of EAL
PM_{10}	40	Annual	0.13	0.3%
$PM_{2.5}$	20	Annual	0.13	0.7%
NO_2	40	Annual	1.86	4.7%
HF	16	monthly average	0.05	0.3%
TOC	2.25	annual (1,3-butadiene)	0.13	5.8%
NH_3	180	annual	0.13	0.1%
Cd	0.005	annual	6.64E-04	13.3%

Pollutant	Long-term EAL (µg/m^3)	Averaging Period	Max PC (µg/m^3)	Max PC as % of EAL
Hg	0.25	annual	6.64E-04	0.3%
As	0.003	annual	3.32E-04	11.1%
Cr	5	annual	1.22E-03	<0.1%
CrVI	0.0002	annual	1.73E-06	0.9%
Cu	10	annual	3.85E-04	<0.1%
Pb	0.25	annual	6.68E-04	0.3%
Mn	0.15	annual	7.97E-04	0.5%
Ni	0.02	annual	2.92E-03	14.6%
Sb	5	annual	1.53E-04	<0.1%
V	5	annual	7.97E-05	<0.1%
PAHs	0.001	annual (BaP)	2.79E-06	0.28%
	0.00025	annual (BaP)	2.79E-06	1.12%
Dioxins	N/A	annual	1.33E-09	N/A
PCBs	0.2	annual	6.64E-05	<0.01%

5.5.14 **Table 5.21** presents the maximum predicted (short-term averaging period) ground level impacts of pollutants anywhere within the receptor grid for any of the five years' worth of meteorological data modelled. The results are for the existing RRRF operating at the maximum daily emission limit values currently permitted.

Table 5.21: Maximum Predicted Short-term Averaging Period Process Contributions from existing RRRF

Pollutant	Short-term EAL (µg/m^3)	Averaging Period	Max PC (µg/m^3)	Max PC as % of EAL
PM_{10}	50	24-hr 90.41%ile	0.41	0.8%
NO_2	200	1-hour, 99.79%ile	8.81	4.4%
SO_2	125	24-hour 99.19%ile	4.12	3.3%
	350	1-hour 99.73%ile	6.10	1.7%
	266	15-min 99.9%ile	7.16	2.7%
CO	10000	8-hr running average	6.26	0.1%
	30000	1-hr max	8.02	<0.1%
HF	160	1-hr max	0.16	0.1%
HCl	750	1-hr max	1.60	0.2%
TOC	195	1-hr max (benzene)	1.60	0.8%
NH_3	2500	1-hr max	1.59	0.1%
Hg	7.5	1-hr max	8.02E-03	0.1%
Cr	150	1-hr max	1.48E-02	<0.1%
Cu	200	1-hr max	4.65E-03	<0.1%
Mn	1500	1-hr max	9.62E-03	<0.1%
Sb	150	1-hr max	1.84E-03	<0.1%
V	1	1-hr max	9.62E-04	0.1%
PCBs	6	1-hr max	8.02E-04	<0.1%

5.5.15 Detailed modelling of the calculated emissions from the current RRRF has been carried out to predict potential impacts of relevant pollutants at terrestrial biodiversity receptors. The results of the modelling are contained in **Appendix B.3**.

Baseline Evolution

5.5.16 Concentrations of the number of pollutants (particularly relating to emissions associated with fossil fuel combustion processes) are anticipated to decline over time due to compliance with national and international regulatory regimes.

5.5.17 For the purposes of this assessment, future baseline concentrations have not been predicted given that the earliest commencement year of the Proposed Changes is 2021.

5.6 Embedded Mitigation

5.6.1 This section describes the measures that are incorporated within the design of ROP to reduce or offset environmental effects. Embedded mitigation aims to design out adverse environmental effects where possible.

5.6.2 In terms of impacts on air quality, the following can be considered as embedded mitigation:

- **Site Location:** The Application Site is in an industrial location with the closest sensitive human receptors over 750 m to the south. This provides a buffer zone between the RRRF and sensitive human receptor locations.
- **Stack Height:** An elevated release height (90m) achieves better dispersion of air emissions resulting in lower concentrations at sensitive receptor locations.
- **Emission Limit Values:** Combustion emissions from RRRF are controlled by the requirements of the EPR and early adoption of the BREF BAT-AELs will reduce the maximum permitted emissions of many pollutants.

5.7 Assessment of Likely Effects

Long-term Averaging Period Impacts

5.7.1 **Table 5.21** provides the maximum predicted (long-term averaging period) ground level concentrations of pollutants anywhere within the receptor grid for any of the five years' of meteorological data modelled. The results are for the RRRF following implementation of ROP ('RRRF post-ROP') and operating at the maximum daily emission limit values from the BREF and compared to the maximum impacts from the existing RRRF (note this may not occur at the same location).

Table 5.22: RRRF Post- ROP Maximum Predicted Long-term Averaging Period Process Contributions

Pollutant	Max PC (μg/m^3)	Max PC as % of EAL	Change in Max PC (μg/m^3)	Change in Max PC as % of EAL
PM_{10}	0.07	0.2%	-0.065	-0.2%
$PM_{2.5}$	0.07	0.3%	-0.065	-0.3%
NO_2	1.70	4.2%	-0.163	-0.4%
HF	0.05	0.3%	0.001	+<0.1%
TOC	0.13	6.0%	0.003	0.1%
NH_3	0.13	0.1%	0.003	+<0.01%
Cd	2.69E-04	5.4%	-3.95E-04	-7.9%

Pollutant	Max PC (µg/m³)	Max PC as % of EAL	Change in Max PC (µg/m³)	Change in Max PC as % of EAL
Hg	2.69E-04	0.1%	-3.95E-04	-0.2%
As	3.37E-04	11.2%	4.54E-06	0.2%
Cr	1.24E-03	<0.1%	1.67E-05	+<0.01%
CrVI	1.75E-06	0.9%	2.36E-08	+<0.01%
Cu	3.91E-04	<0.1%	5.26E-06	+<0.01%
Pb	6.77E-04	0.3%	9.13E-06	+<0.01%
Mn	8.08E-04	0.5%	1.09E-05	+<0.01%
Ni	2.96E-03	14.8%	3.99E-05	0.2%
Sb	1.55E-04	<0.1%	2.09E-06	+<0.01%
V	8.08E-05	<0.1%	1.09E-06	+<0.01%
PAHs	2.83E-06	0.3%	3.85E-08	+<0.01%
	2.83E-06	1.1%	3.85E-08	+<0.01%
Dioxins	8.08E-10	N/A	-5.20E-10	N/A
PCBs	6.73E-05	<0.1%	9.07E-07	+<0.01%

5.7.2 The change in maximum long-term Process Contributions ('PC') resulting from the Proposed Changes are <1% of the EALs and considered to be ‘negligible’ for all pollutants except Cadmium where the decrease in impacts is over 1% of the EAL and is classified as ‘slight beneficial’.

5.7.3 The overall long-term impact of RRRF following the implementation of ROP is <1% of the EAL for most pollutants. Where the maximum total PC from RRRF post ROP exceeds 0.5% of the EAL, further consideration of the long-term impacts at discrete receptors is presented in **Appendix B.1** and **Appendix B.2**. for key pollutants (PM_{10}, $PM_{2.5}$, NO_2, TOC, cadmium, arsenic, chromium VI, nickel and PAHs).

5.7.4 In terms of PM_{10} and $PM_{2.5}$ impacts, the overall PC at discrete receptors due to RRRF post-ROP is presented in **Figure 5.5 (Appendix B.1**) and **Table B.2.1 (Appendix B.2)** and does not exceed 0.5% of the relevant EALs and total concentrations are well below the EALs. In relation to the WHO guideline value for $PM_{2.5}$ (of 10 µg/m³), overall PC at receptors locations would be <0.5% of this guideline. Therefore, based on the IAQM significance criteria the impacts are classified as **Negligible**.

5.7.5 The overall PC for nitrogen dioxide (NO_2) at discrete receptors due to RRRF post-ROP is presented in **Figure 5.6 (Appendix B.1)** and **Table B.2.2 (Appendix B.2)** and ranges from 0.1% to 1.8% of the annual EAL. Once background concentrations are considered, the PEC does not exceed 75% of the EAL and therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all receptor locations.

5.7.6 The overall PC for TOC at discrete receptors due to RRRF post-ROP is presented in **Figure 5.7 (Appendix B.1)** and **Table B.2.3 (Appendix B.2)** and ranges from 0.2% to 2.6% of the EAL for 1,3-butadiene. Once background concentrations are considered, the PEC does not exceed 10% of the EAL and therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all receptor locations.

5.7.7 The overall PC for cadmium (Cd) at discrete receptors due to RRRF post-ROP is presented in **Figure 5.8 (Appendix B.1)** and **Table B.2.4 (Appendix B.2)** and ranges from 0.2% to 2.3% of the EAL. Once background concentrations are considered, the PEC does not exceed 10% of the EAL and therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all receptor locations.

5.7.8 The overall PC for arsenic (As) at discrete receptors due to RRRF post-ROP is presented in **Figure 5.9 (Appendix B.1)** and **Table B.2.5 (Appendix B.2)** and ranges from 0.3% to 4.8% of the EAL. Once background concentrations are considered, the PEC does not exceed 40% of the EAL and therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all receptor locations.

5.7.9 For Chromium VI, the overall PC at discrete receptors due to RRRF post-ROP is presented in **Figure 5.10 (Appendix B.1)** and **Table B.2.6 (Appendix B.2)** and is below 0.5% of the EAL at all receptors; therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all receptor locations. Whilst the PEC exceeds the EAL, this is due to the high background concentration applied, which is based on very limited guidance as ambient monitoring of Chromium VI is not routinely undertaken in the UK.

5.7.10 The overall PC for nickel (Ni) at discrete receptors due to RRRF post-ROP is presented in **Figure 5.11 (Appendix B.1)** and **Table B.2.7 (Appendix B.2)** and ranges from 0.4% to 6.3% of the EAL. Once background concentrations are considered, the PEC does not exceed 15% of the EAL and therefore based on the IAQM significance criteria the impacts are classified as **Negligible** at all except 3 discrete receptor locations (R20, R20A and R22) where impacts are classified as **Slight Adverse** as the post-ROP PC marginally exceeds 5% of the EAL.

5.7.11 The overall PC for PAHs at discrete receptors due to RRRF post-ROP is presented in **Figure 5.12 (Appendix B.1)** and **Table B.2.8 (Appendix B.2)** and does not exceed 0.5% of the EAL for BaP. Once background concentrations are considered, the PEC does not exceed 65% of the EAL and based on the IAQM significance criteria the impacts are classified as **Negligible.**

Short-term Averaging Period Impacts

5.7.12 **Table 5.23** presents the maximum predicted ground level short-term averaging period concentrations of pollutants anywhere within the receptor grid for any of the five years' worth of meteorological data modelled. The results are for the RRRF post-ROP operating at the maximum daily emission limit values from the BREF and compared to the maximum impacts from the existing RRRF.

Table 5.23: RRRF post-ROP Maximum Predicted Short-term Averaging Period Process Contributions

Pollutant	Max PC (μg/m^3)	Max PC as % of EAL	Change in Max PC (μg/m^3)	Change in Max PC as % of EAL
PM_{10}	0.21	0.4%	-0.201	-0.4%
NO_2	7.96	4.0%	-0.85	-0.4%
SO_2	3.34	2.7%	-0.78	-0.6%
	4.88	1.4%	-1.21	-0.3%
	5.85	2.2%	-1.32	-0.5%
CO	6.36	0.1%	0.10	+<0.1%
	8.20	<0.1%	0.18	+<0.1%
HF	0.16	0.1%	0.005	+<0.1%
HCl	1.31	0.2%	-0.29	-<0.1%
TOC	1.64	0.8%	0.052	+<0.1%
NH_3	1.64	0.1%	0.052	+<0.1%
Hg	3.28E-03	<0.1%	-4.74E-03	-0.1%
Cr	1.51E-02	<0.1%	3.32E-04	+<0.1%
Cu	4.76E-03	<0.1%	1.05E-04	+<0.1%
Mn	9.84E-03	<0.1%	2.16E-04	+<0.1%
Sb	1.89E-03	<0.1%	4.14E-05	+<0.1%

Pollutant	Max PC (µg/m^3)	Max PC as % of EAL	Change in Max PC (µg/m^3)	Change in Max PC as % of EAL
V	9.84E-04	0.1%	2.16E-05	+<0.1%
PCBs	8.20E-04	<0.1%	1.80E-05	+<0.1%

5.7.13 The change in maximum short-term PC resulting from the Proposed Changes is <1% of the EAL and is therefore considered to be 'Negligible' for all pollutants.

5.7.14 None of the predicted short-term PCs associated with the overall impact of RRRF post-ROP are greater than 10% of the assessment level at the point of maximum concentration and based on the IAQM significance criteria the impacts are therefore classified as **Negligible.**

5.7.15 The EPRs allows for elevated emissions over half hourly periods, although compliance with the daily mean emission limit must be maintained. An assessment of the short-term impacts has been undertaken assuming that these allowable higher short-term emissions occur all year round; the predicted concentrations are therefore highly conservative.

Table 5.24: RRRF Post-ROP Short Term Impacts at half-hourly mean 100th percentile ELVs

Pollutant	Half hourly mean 100th percentile ELV (mg/Nm^3)	Max Process Contribution (PC) µg/m^3	PC as % of EAL
Nitrogen dioxide	400	15.9	8.0%
Sulphur dioxide (15 minute)	200	23.4	8.8%
Sulphur dioxide (hourly)	200	19.6	5.6%
Carbon monoxide	100	16.4	0.1%
Hydrogen chloride	60	7.9	1.0%
Hydrogen fluoride	4	0.7	0.4%
TOC	20	3.3	1.7%

5.7.16 None of the predicted short-term PCs associated with the half hourly emission limits of RRRF post-ROP are greater than 10% of the assessment level at the point of maximum concentration and based on the IAQM significance criteria the impacts are classified as **Negligible.**

Assessment of Significance of Air Quality Effects

5.7.17 In relation to the change in predicted impacts due to the Proposed Changes, for all pollutants and averaging periods assessed, these are classified as **Negligible** in accordance with the IAQM methodology based on the low additional (or reduction) in impacts.

5.7.18 It is therefore considered that the effect of the Proposed Changes on air quality can be classified as **Not Significant**.

5.7.19 In relation to the overall predicted impacts of RRRF post-ROP, for a majority of the pollutants and averaging periods assessed, the maximum impacts or those at receptor locations are classified as **Negligible** in accordance with the IAQM methodology. This is due to either the low contribution of the emissions compared to the EAL and/or the baseline air quality being well below the EAL. In these cases it is considered that the effect of RRRF post ROP on air quality can be classified as **Not Significant**.

5.7.20 The predicted impacts of some 'group 3' metals (specifically arsenic, chromium VI and nickel) are not classified as **Negligible** at all locations, although impacts of arsenic and chromium VI are classified as **Negligible** at all discrete receptor locations.

5.7.21 In relation to arsenic and nickel, as presented in **Figure 5.9** and **Figure 5.11 (Appendix B.1)** and **Table B.2.5 (Appendix B.2)** whilst the maximum predicted PC exceeds 5% of the EAL this extends over a limited area and the overall PEC is <50% of the EAL at all locations

5.7.22 In relation to Chromium VI, the predicted PC does not exceed 1% of the EAL at any location and whilst the PEC exceeds the EAL this is due to the applied background concentration, for which is based on very limited information as Chromium VI is not routinely monitored in the UK.

5.7.23 Furthermore, it is important to note that the modelled emission rate of these pollutants is based on the highest measured values from similar plant and does not fully reflect the application of the lower BAT-AELs.

5.7.24 It is therefore considered that effect of the emissions of these metals associated with RRRF post ROP can also be classified as **Not Significant**.

Terrestrial Biodiversity Receptors

5.7.25 Detailed modelling has been carried out to predict the PCs and PECs associated with RRRF post-ROP of relevant pollutants at the identified terrestrial biodiversity receptors. The results of the modelling are contained in **Appendix B.3.**

5.7.26 For all Terrestrial Biodiversity Receptors, the change in annual average impacts resulting from the Proposed Changes is <1% of the relevant critical levels or loads (or 10% of the short-term critical levels) and therefore considered **Negligible**.

5.7.27 Further discussion of the overall potential indirect effects of air quality on terrestrial biodiversity receptors of RRRF post-ROP is presented within **Chapter 6** as annual average impacts at some receptors exceed the 1% screening threshold.

5.8 Cumulative Effects

5.8.1 The potential for cumulative air quality effects is considered to be limited to the main stack emissions from the thermal waste treatment process at the adjacent Riverside Energy Park ('REP') given the similar pollutant emissions and discharge characteristics.

5.8.2 The cumulative impacts have therefore been quantified through atmospheric dispersion modelling with the following discharge characteristics applied to REP (**Table 5.25**).

Table 5.25: Cumulative Emission Sources – REP physical discharge characteristics

Parameter	REP
Stack height (m)	90
Internal Stack Diameter (m)	3.11[a]
Flue gas velocity (m/s)	19.6
Oxygen (dry) (%v/v)	6.4
Moisture Content (%v/v)	21.4
Temperature (degree C)	120
Actual flow rate (Am^3/s)	149.0[b]
Normalized flow rate, dry, 11% oxygen (Nm^3/s)	119.1[b]

a) Combined stack diameter for 2 lines (2.2m individually)
b) Total flow rates for all 2 lines

5.8.3 The following pollutant emission rates have been applied to REP based on the maximum daily average ELVs set in the Environmental Permit for the facility.

Table 5.26: REP Applied pollutant emission rates

Pollutant	REP			
	Emission Limit		Emission Rate	
PM_{10} / $PM_{2.5}$	5	mg/Nm^3	0.6	g/s
NOx	75	mg/Nm^3	8.9	g/s
SO_2	30	mg/Nm^3	3.6	g/s
CO	50	mg/Nm^3	5.9	g/s
HCl	6	mg/Nm^3	0.7	g/s
HF	1	mg/Nm^3	0.12	g/s
TOC	10	mg/Nm^3	1.2	g/s
NH_3	10	mg/Nm^3	1.2	g/s
Hg	0.02	mg/Nm^3	2.4	mg/s
Cd & Tl	0.02	mg/Nm^3	2.4	mg/s
Group 3 Metals	0.3	mg/Nm^3	35.7	mg/s
Dioxins	0.06	ng I-TEQ/Nm^3	7.1	ng/s
PAH	0.21	µg/Nm^3	9.5	ug/s
PCBs	0.005	mg/Nm^3	25.0	mg/s

Long-term Averaging Period Cumulative Impacts

5.8.4 **Table 5.27** presents the maximum cumulative (RRRF post-ROP + REP) ground level concentrations of pollutants for long-term averaging periods anywhere within the receptor grid for any of the five years' of meteorological data modelled. The results are for both RRRF post-ROP and REP operating at the relevant maximum daily emission limit values.

Table 5.27: RRRF Post-ROP + REP Maximum Predicted Long-term Averaging Period Process Contributions

Pollutant	Max long term PC (µg/m^3)	Max PC as % of EAL
PM_{10}	0.12	0.3%
$PM_{2.5}$	0.12	0.6%
NO_2	2.18	5.5%
HF	0.07	0.5%
TOC	0.23	10.4%
NH_3	0.23	0.1%
Cd	4.69E-04	9.4%
Hg	4.69E-04	0.2%
As	5.86E-04	19.5%
Cr	2.16E-03	<0.1%
CrVI	3.05E-06	1.5%
Cu	6.80E-04	<0.1%
Pb	1.18E-03	0.5%
Mn	1.41E-03	0.9%

Pollutant	Max long term PC (µg/m^3)	Max PC as % of EAL
Ni	5.15E-03	25.8%
Sb	2.69E-04	<0.1%
V	1.41E-04	<0.1%
PAHs	4.92E-06	0.5%
	4.92E-06	2.0%
Dioxins	1.41E-09	N/A
PCBs	1.17E-04	0.1%

5.8.5 The overall long-term cumulative impact of RRRF post-ROP and REP is <1% of the EALs for a majority of pollutants and further consideration of the long-term impacts at discrete receptors is presented in **Appendix B.2** for the following key pollutants: NO_2, PM_{10}, $PM_{2.5}$, TOC, cadmium, arsenic, chromium VI, nickel and PAHs.

5.8.6 The overall cumulative PC for nitrogen dioxide (NO_2) at discrete receptors ranges from 0.2% to 2.5% of the annual EAL. Once background concentrations are considered, the PEC does not exceed 75% of the EAL and therefore based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all receptors.

5.8.7 In terms of cumulative PM_{10} and $PM_{2.5}$ impacts, the overall PC at discrete receptors is below 0.5% of the relevant EAL at all receptors and total concentrations are well below the EAL. In relation to the WHO guideline value for $PM_{2.5}$ (of 10 µg/m^3), the cumulative PC at receptors locations would be <0.5% of this guideline. Therefore based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all receptors.

5.8.8 The overall cumulative PC for TOC at discrete receptors ranges from 0.3% to 4.7% of the EAL for 1,3-butadiene. Once background concentrations are considered, the PEC does not exceed 11% of the EAL. Therefore, based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all receptors.

5.8.9 The cumulative PC for cadmium (Cd) at discrete receptors ranges from 0.3% to 4.3% of the EAL. Once background concentrations are considered, the PEC does not exceed 12% of the EAL. Therefore based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all receptors.

5.8.10 The cumulative PC for arsenic (As) at discrete receptors ranges from 0.6% to 8.9% of the EAL. Once background concentrations are considered, the PEC does not exceed 45% of the EAL. Therefore based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all except 6 receptors (R20, R20A, R21, R22, R23 and R26) where cumulative impacts are classified as **Slight Adverse** as the cumulative PC exceeds 5% of the EAL.

5.8.11 For Chromium VI, the cumulative PC at discrete receptors only exceeds 0.5% of the EAL at 4 receptors (R20, R20A, R21 & R22) and the PEC exceeds the EAL at all receptors due to the high background concentration applied, which is based on very limited information as chromium VI is not routinely monitored in the UK. Therefore, the cumulative impacts at these receptors are classified as **Moderate Adverse** based on the IAQM methodology and **Negligible** at all others.

5.8.12 The cumulative PC for nickel (Ni) at discrete receptors ranges from 0.8% to 11.7% of the EAL. Once background concentrations are considered, the PEC does not exceed 20% of the EAL. Therefore based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all except 9 receptors (R03, R04, R18, R18A, R19, R21, R22, R23 & R26) where cumulative impacts are classified as **Slight Adverse** (as the cumulative PC exceeds

5% of the EAL**)** and as **Moderate Adverse** (as the cumulative PC exceeds 10% of the EAL) at 2 receptors (R20 & R20A).

5.8.13 For PAHs, the cumulative PC at discrete receptors does not exceed 1.0% of the EAL for BaP and the PEC does not exceed 65% of the EA. Therefore, based on the IAQM significance criteria the cumulative impacts are classified as **Negligible** at all receptors.

Short-term Averaging Period Cumulative Impacts

5.8.14 **Table 5.28** presents the maximum predicted cumulative ground level short-term averaging period concentrations of pollutants anywhere within the receptor grid for any of the five years' worth of meteorological data modelled. The results are for both RRRF post-ROP and REP operating at the applicable maximum daily emission limit values.

Table 5.28: RRRF Post-ROP + REP Cumulative Maximum Predicted Short-term Averaging Period Process Contributions

Pollutant	Max short term PC (µg/m^3)	Max PC as % of EAL
PM_{10}	0.34	0.7%
NO_2	9.93	5.0%
SO_2	4.28	3.4%
	7.23	2.1%
	8.16	3.1%
CO	9.91	0.1%
	15.22	0.1%
HF	0.30	0.2%
HCl	2.11	0.3%
TOC	3.05	1.6%
NH_3	3.05	0.1%
Hg	6.09E-03	0.1%
Cr	8.40E-03	<0.1%
Cu	2.65E-03	<0.1%
Mn	5.48E-03	<0.1%
Sb	1.05E-03	<0.1%
V	5.48E-04	0.1%
PCBs	1.52E-03	<0.1%

5.8.15 None of the predicted cumulative short-term PCs are greater than 10% of the assessment level at the point of maximum concentration and based on the IAQM significance criteria the impacts are classified as **Negligible.**

Assessment of Significance of Cumulative Air Quality Effects

5.8.16 In relation to the predicted cumulative impacts of RRRF post ROP + REP, for a majority of the pollutants and averaging periods assessed, the maximum impacts or those at receptor locations are classified as **Negligible** in accordance with the IAQM methodology. This is due to either the low contribution of the emissions compared to the EAL and/or the baseline air quality being well below the EAL. In these cases it is considered that the cumulative effect of RRRF post ROP + REP on air quality can be classified as **Not Significant**.

5.8.17 The predicted cumulative impacts of some 'group 3' metals (specifically arsenic, chromium VI and nickel) are not classified as **Negligible** at all locations and therefore further consideration is required to make a judgement as to the potential significance of their effect as per paragraph 7.7 of the IAQM guidance which states:

'Any judgement on the overall significance of effect of a development will need to take into account such factors as:

- *The existing and future air quality in the absence of the development;*
- *The extent of current and future population exposure to the impacts; and*
- *The influence and validity of any assumptions adopted when undertaking the prediction of impacts.'*

5.8.18 In relation to arsenic and nickel, whilst the predicted cumulative PC exceeds 5% or 10% of the EAL over a limited area (and therefore impacts classified as **Slight Adverse or Moderate Adverse** at locations within these areas), the overall PEC remains below 50% of the EAL at all locations.

5.8.19 In relation to Chromium VI, the predicted cumulative PC does not exceed 1% of the EAL at any receptor location and whilst the PEC exceeds the EAL this is due to the applied background concentration, for which there is very limited information as chromium VI is not routinely monitored in the UK.

5.8.20 Furthermore, it is important to note that the modelled emission rate of these pollutants is based on the highest measured values from similar plant and therefore does not fully reflect the typical emission rates or the application of the lower BAT-AELs to both RRRF post ROP and REP.

5.8.21 It is therefore considered, taking into account these factors that the cumulative effect of the emissions of these metals associated with RRRF post-ROP plus REP can also be classified as **Not Significant**.

Terrestrial Biodiversity Receptors

5.8.22 Detailed modelling has been carried out to predict the cumulative impacts of relevant pollutants at the identified terrestrial biodiversity receptors. The results of the modelling are contained in **Appendix 5.2.**

5.8.23 Further discussion of the potential cumulative indirect air quality effects on terrestrial biodiversity receptors of RRRF post-ROP and REP is presented within **Chapter 6** as annual averages impacts at some receptors exceed the 1% screening threshold.

5.9 Further Mitigation and Enhancement

5.9.1 No requirement for further mitigation or enhancement has been identified.

5.10 Residual Effects

5.10.1 The residual air quality effects due to the Proposed Changes are considered to be **Not Significant.**

5.10.2 The residual cumulative air quality effects due to the Proposed Changes and REP are considered to be **Not Significant.**

5.11 Monitoring

5.11.1 No monitoring of air quality effects will be necessary as no significant residual adverse effects have been identified. However, it should be noted that there are already existing air quality emission monitoring processes in place at the RRRF which are required as part of the Environmental Permit for the RRRF. The Applicant also has an agreement LBB in relation to wider ambient air quality monitoring.

5.12 Summary

5.12.1 A detailed air quality assessment utilising atmospheric dispersion modelling has been undertaken of the potential impact of emissions to air from the operation of the RRRF both before and after the Proposed Changes, and cumulatively with REP.

5.12.2 There are not considered to be any potentially significant air quality effects resulting from minor changes to vehicle movements or odour from waste handling associated with the Proposed Changes.

5.12.3 The current emissions to air from RRRF have been quantified from monitoring data (flow characteristics provided by the Applicant) and emission limits for individual pollutants from the Environmental Permit for the site. The emissions from RRRF post ROP have been calculated from design data (flow characteristics provided by the Applicant) and the application of the BAT-AELs that the Applicant will adopt prior to the EA’s implementation date.

5.12.4 In relation to the change in predicted impacts due to the Proposed Changes, for all pollutants and averaging periods assessed, these are classified as **Negligible** in accordance with the IAQM methodology based on the low additional (or reduction) in impacts.

5.12.5 It is therefore considered that the effect of the Proposed Changes on Air Quality can be classified as **Not Significant**.

5.12.6 In relation to the overall predicted impacts of RRRF post ROP, for a majority of the pollutants and averaging periods assessed, the maximum impacts or those at receptor locations are classified as **Negligible** in accordance with the IAQM methodology. This is due to either the low contribution of the emissions compared to the EAL and/or the baseline air quality being well below the EAL.

5.12.7 Whilst for some metals (arsenic, chromium VI and nickel) the predicted impact is not classified as **Negligible** at all locations, this is based on conservative assumptions as to their emissions and the magnitude and extent of the impacts are not considered to be Significant.

5.12.8 It is therefore considered that the effect of the emissions associated with RRRF post ROP on air quality can be classified as **Not Significant**.

5.12.9 For all Terrestrial Biodiversity Receptors, the change in annual average impacts resulting from the Proposed Changes is <1% of the relevant critical levels or loads (or 10% of the short-term critical levels) and therefore considered **Negligible**.

5.12.10 Further discussion of the overall potential indirect air quality effects on terrestrial biodiversity receptors as a result of emissions from RRRF post-ROP are presented within **Chapter 6** as annual average impacts at some receptors exceed the 1% screening threshold.

5.12.11 In relation to the predicted cumulative impacts of RRRF post ROP + REP, for a majority of the pollutants and averaging periods assessed, the maximum impacts or those at receptor locations are classified as **Negligible** in accordance with the IAQM methodology. This is due to either the low contribution of the emissions compared to the EAL and/or the baseline air quality being well below the EAL.

5.12.12 Whilst for some metals (arsenic, chromium VI and nickel) the predicted cumulative impact is not classified as **Negligible** at all locations, this is based on conservative assumptions as to their emissions and the magnitude and extent of the impacts are not considered to be significant.

5.12.13 It is therefore considered that the cumulative effect of the emissions associated with RRRF post ROP + REP on air quality can be classified as **Not Significant**.

5.12.14 Further discussion of the potential cumulative indirect air quality effects on terrestrial biodiversity receptors as a result of emissions from RRRF post-ROP and REP is presented within **Chapter 6** as annual averages impacts at some receptors exceed the 1% screening threshold.

5.13 References

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