CONTENTS

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INTRODUCTION

6.1 This chapter of the ES considers the potential for the construction and operation of Parc Adfer to impact upon air quality in the vicinity of the application site. The chapter describes the scope, relevant legislation, assessment methodology and the baseline conditions currently existing at the application site and its surroundings. It then considers any potential significant environmental effects the proposed ERF would have on this baseline environment; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual impacts after these measures have been employed.

6.2 As part of the air quality assessment, detailed dispersion modelling of combustion emissions from the ERF has been undertaken. This detailed assessment will be reviewed in detail by Natural Resources Wales (NRW) during determination of the application for an Environmental Permit to ensure that the facility would not cause significant pollution to the environment or harm human health. The assessment is provided as a technical report in Appendix 6/1.

SCOPE OF THE ASSESSMENT

6.3 The air quality assessment is focussed on the following potential air impacts:

- During the construction phase:
  - fugitive dust from traffic movements and construction; and
  - combustion pollutants (particulate matter, oxides of nitrogen, etc) from construction traffic.
- During the site operational phase:
  - combustion pollutants (particulate matter, oxides of nitrogen, etc) from traffic;
  - combustion pollutants from the stack;
  - fugitive odours and bioaerosols from waste handling operations; and
  - fugitive dust from storage and handling of ash.

6.4 The assessment has not specifically considered the potential environmental effects associated with the decommissioning phase. However, the effects are likely to be similar to those arsing through the construction phase.

6.5 Some of these issues are matters for the Environmental Permitting (EP) regime and the detail can therefore be found in the accompanying technical appendix (such as combustion pollutants from the stack, for example) rather than presenting duplication of the two regimes. This requirement is described in paragraph 2.12 of TAN 21[1].

[1] Technical Advice Note (TAN) 21: Waste (2014)

RELEVANT LEGISLATION, STANDARDS AND GUIDANCE

National Air Quality Strategy

6.6 The Air Quality Strategy (UKAQS) 2007 for England, Scotland, Wales and Northern Ireland[2] sets out the Government's policies aimed at delivering cleaner air in the UK. It sets out a comprehensive strategic framework within which air quality policy will be taken forward in the short to medium term, and the roles that Government, industry, Natural Resources Wales, local government, business, individuals and transport have in protecting and improving air quality.

6.7 Current EU Air Quality 'limit values' are defined within Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe; these have been transposed into UK legislation in the Air Quality Standards (Wales) Regulations 2010, Statutory Instrument 2010 No. 1433 (W. 126).

6.8 The UKAQS actually includes more exacting objectives for some pollutants than required by EC legislation. This assessment refers only to UK air quality standards, as compliance with these standards will ensure that the less demanding European Air Quality limit values are also being met.

Environmental Permitting (England and Wales) Regulations

6.9 Industrial process emissions to air, such as those from the proposed ERF are controlled under the Environmental Permitting (England and Wales) Regulations 2010 by NRW.

6.10 Guidance Notes produced by DEFRA provide a framework for regulation of installations and additional Technical Guidance Notes produced by NRW are used to provide the basis for permit conditions in relation to releases to air and mitigation measures. The proposed ERF would be classed as a Part A(i) process under these regulations, amongst other conditions of operation would be emission limits for various pollutants produced by the process, which must be demonstrated through various monitoring requirements as prescribed by the Directive on Industrial Emissions (IED)[3]. The relevant Sector Guidance Note is EPR5.01[4].

6.11 Of particular relevance to the assessment of air quality impacts is the guidance document Horizontal Guidance Note H1 - Environmental risk assessment for permits[5]. The purpose of this guidance note is to assist operators to assess risks to the environment and human health when applying for a permit under the Environmental Permitting Regulations. Annex F[6] of the H1 Guidance Note is specifically concerned with emissions to air

[2] The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, DEFRA. July 2007
[3] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).
[4] Environment Agency (Natural Resources Wales), The Incineration of Waste (EPR5.01) (2009)
[5] Environment Agency (Natural Resources Wales), Horizontal Guidance Note H1 - Environmental risk assessment for permits
[6] Environment Agency (Natural Resources Wales),, Horizontal Guidance Note H1 - Annex (f) Air Emissions.

and the process of carrying out a bespoke risk assessment. Included in Annex F are Environmental Assessment Levels (EALs) for each pollutant in air against which impact may be assessed.

Standards and Guidance Relating to Odour Nuisance

6.12 Currently, in the UK there are no statutory standards for assessing odour nuisance. Even outside the UK, few standards exist owing to the difficulty in defining odour nuisance and problems associated with the measurement of odour and assessing compliance with any odour nuisance standards that may be applied.

6.13 Guidance on odour[7] assessment and management has been released by the Environment Agency (EA)/NRW. The Institute of Air Quality Management (IAQM) has also recently released '*Guidance on the assessment of odour for planning*'.

6.14 Both guidance documents use a standard source–pathway–receptor approach for identifying mitigation requirements and residual environmental impacts. These general principals have been applied in this assessment.

Standards and Guidance Relating to Bio-aerosols

6.15 Currently, in the UK there are no statutory standards relating to bio-aerosols.

6.16 The EA (before NRW was formed) has issued guidance in the form of a position statement[8] that is specific to composting sites and therefore not directly relevant to the proposed ERF. The recommended standoff distance of 250m for sensitive receptors is based upon studies that show that bioaerosols reduce to background levels at this distance from composting sources. As this relates to composting operations, then the guidance note is not of direct relevance to the proposed development.

Standards and Guidance Relating to Dust

6.17 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist – 'nuisance' is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

6.18 Guidance for the control of dust from construction sites has been produced by the IAQM[9]. This guidance document provides site evaluation guidelines based upon the size in square metres (or number of properties) of a development to rate the application site between a low risk to high risk once local sensitivity has been taken into account.

[7] Environment Agency (Natural Resources Wales), Technical Guidance Note H4 (March 2011)
[8] Environment Agency (Natural Resources Wales), Our position on composting and potential health effects from bioaerosols, Policy number: 405_07 (2009)
[9] IAQM (2014) *Assessment of dust from demolition and construction 2014*

6.19 On the basis of the evaluation of risk the guidance prescribes a range of best practice mitigation measures to be applied at the application site.

Regulations and Guidance for Protection of Habitats

6.20 The Conservation of Habitats and Species Regulations 2010 transpose Council Directive 79/409/EEC on the conservation of wild birds ('Birds Directive') and Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('Habitats Directive') into national law (in conjunction with the Wildlife and Countryside Act). The Habitats Directive introduces the precautionary principle for protected areas, *i.e.* that projects can only be permitted to proceed, having ascertained that there will be no adverse effect on the integrity of the designated site. It requires an assessment to determine if significant effects are likely, followed by an '*appropriate assessment*' by the competent authority, if necessary.

6.21 Environmental Permitting guidance indicates that these same principles are applicable to ecological sites which are not protected at the European level, such as Sites of Special Scientific Interest (SSSI's) and other protected sites such as Nature Reserves, Ancient Woodlands and Local Wildlife Sites. However, the implications of a significant impact at these local sites is regarded as being of less national concern than a site covered by European protection (e.g. an Special Area of Conservation or Special Protection Area, for example) despite the site being of some local importance. The acceptability thresholds for impacts reflect this difference in the Environmental Permitting regime.

Planning Policy Context

6.22 National and local planning policy documents have been reviewed for policies relevant to the EIA. This has been set out in Chapter 4 above; policies relevant to air quality are identified in the following paragraphs.

TAN21

6.23 The Welsh Government's advice on waste planning makes it clear that it is important to avoid unnecessary or confusing duplication of control. For example, paragraph 2.12 of TAN 21 states (emphasis added):

"The operational impact of a proposed waste disposal or waste recovery operation falling within the definition of a regulated facility under the Environmental Permitting (England and Wales) Regulations 2010 (as amended) will be considered by the permitting authority and controlled through conditions established in the environmental permit. ***Planning authorities should take into account the ability of environmental permits to control the operations of waste facilities and its interactions with the environment and should not duplicate control more appropriately imposed as part of the permit.*** *However, it will be appropriate to consider the complementary conditions which should be attached to a planning consent. It would be good practice to parallel track*

applications for planning permission and authorisations required under environmental permitting legislation where this is appropriate".

Flintshire County Council Unitary Development Plan (UDP)

6.24 Relevant policies in the UPD (adopted September 2011) relating to air quality include the strategic policies Policy STR1 and STR7, together with policies EWP12 and EWP13.

Flintshire Local Development Plan

6.25 Flintshire are continuing to progress the Local Development Plan at the time of writing.

ASSESSMENT METHODOLOGY

General

6.26 A staged approach has been adopted; this ensures that the approach taken for the assessment of risk is proportional to the risk of an unacceptable impact being caused. As such, where a simple review of the situation shows that risk of a health or nuisance impact is negligible, this will be sufficient. In cases where the risk cannot be regarded as insignificant, a more detailed assessment may be required, such as a quantitative screening assessment or an advanced dispersion modelling exercise (as appropriate). This approach is in accordance with the EIA Regulations, which require '*a description of the likely significant effects of the development on the environment'* (refer to Chapter 1).

6.27 Each of the activities associated with the proposal have been assessed for potential air quality impacts. The methodology used in each assessment is presented in the sub-sections below.

Dust Assessment

6.28 Given the construction activities and handling of waste materials during the operation phase, there is a potential risk for the generation of dust. For such operations the common concern regarding dust emissions is their potential '*nuisance'* effect.

6.29 The potential nuisance effects of dust emissions are related to emissions of large and fine particles, generally larger than 30 micrometers in diameter. Deposition of these particles onto surfaces, such as windows and cars, can cause soiling that, if sufficiently great, will sometimes be considered to be a nuisance. An assessment of finer particulates that results from combustion sources, *i.e.* particles of less than 10 microns in diameter (PM_{10} and $PM_{2.5}$) has been carried out as part of the assessment of traffic emissions and stack dispersion modelling.

6.30 A qualitative risk-screening assessment of the dust generation potential of the operations has been carried out. This assessment takes account of:

- the potential magnitude of released dust ;
- buffer distances between sources and receptors; and
- receptor sensitivity.

6.31 There is also the potential for dust release from handling of ash and these are discussed in terms of potential for release.

Odour and Bioaerosol Risk Assessment

6.32 A qualitative assessment of the potential for generation of odour and bioaerosols has been carried out on the basis of the proposed process. Where significant releases of odours or bioaerosols are identified an assessment of impact is undertaken on the basis of:

- the potential magnitude of released odours and bioaerosols;
- buffer distances between sources and receptors; and
- receptor sensitivity.

Traffic Exhaust Emissions Risk Assessment

6.33 The assessment of impact of traffic has been carried out using the UK Design Manual for Roads and Bridges (DMRB) methodology (2007)[10]. The DMRB methodology facilitates the prediction of pollutant concentrations near to roads as a result of vehicle emissions. Predicted concentrations at receptors are made using an empirical relationship using different emission factors for different vehicle types. These emission factors change from year to year as the technology in the vehicle fleet improves.

6.34 The criterion for assessment of air quality contained within the latest DMRB guidance (207/07) focuses on roads with relatively high changes in flows or high proportion of Heavy Duty Vehicle (HDV) traffic. Affected roads are defined as those that meet any of the following criteria:

- road alignment will change by 5 m or more; or
- daily traffic flows will change by 1,000 Annual Average Daily Trips (AADT) or more; or
- HDV flows will change by 200 AADT or more; or
- daily average speed will change by 10 km/hr or more; or
- peak hour speed will change by 20 km/hr or more.

6.35 Only properties and Designated Sites (such as SSSI's for example) within 200m of roads affected by the project need be considered.

6.36 If none of the roads in the network meet any of the traffic/alignment criteria or there are no properties or relevant Designated Sites near (within 200m) the affected roads, then the impact of the scheme can be considered to be 'neutral' in terms of local air quality and no further air quality assessment is required. For roads where the criteria are met the predicted environmental

[10] Design Manual for Roads and Bridges Vol. 11 Environmental Assessment (Consolidated Edition), Section 3, Part 1 Air Quality (May 2007)

concentration at receptors within 200m will be predicted using the '*DMRB screening method v1.03c*' and '*NO_2 from NO_x calculator*'.

ERF Combustion Emissions Risk Assessment

6.37 Detailed atmospheric dispersion modelling has been undertaken in relation to emissions from the stack serving the thermal waste treatment process as detailed in Appendix 6/1, with due consideration to relevant guidance[11,12]. The modelling approach is based upon the following stages:

- identification of sensitive receptors;
- review of emissions from other existing and proposed local industrial sources;
- review of process design proposals and emission sources;
- compilation of the existing air quality baseline with due regard to Review and Assessment of local air quality and site specific monitoring;
- calculation of process contribution to ground level concentrations and deposition of pollutants emitted from the process;
- evaluation of effects on ecological receptors; and
- sensitivity analyses of model input data.

6.38 For this assessment the BREEZE AERMOD model has been used. The AERMOD dispersion modelling program is widely used and accepted by NRW for undertaking such assessments and its predictions have been validated for dispersion from tall stacks against real-time monitoring data by the USEPA[13]. It is therefore considered a suitable model for this assessment.

6.39 Receptor locations for assessment against objectives or standards for protection of human health considered within this assessment includes locations within a 5km radius of the application site. According to the LAQM TG (09)[14], air quality standards only apply to locations where members of the public may be reasonably likely to be exposed to air pollution for the duration of the relevant objective. Thus short term standards such as the 1 hour standard for NO_2 should apply to footpaths at site boundaries and other areas which may be frequented by the public even for a short period of time. Longer term standards such as the 24 hour for PM_{10}, or annual means, should apply at houses or other locations which the public can be expected to occupy on a continuous basis. These standards do not apply to exposure at the workplace.

Assessment of Human Health Effects

6.40 The Health Protection Agency (HPA) was an independent UK organisation that was set up by the government to protect the public from threats to their

[11] Air Dispersion modelling report requirements (for detailed air dispersion modelling). AQMAU, Environment Agency (not dated).
[12] Guidelines for the Preparation of Dispersion Modelling Assessment for Compliance with Regulatory Requirements – an update to the 1995 Royal Meteorological Society guidance. UK Atmospheric Dispersion Modelling Committee (ADMLC), Version 1.4, 2004.
[13] AERMOD: Latest Features and Evaluation Results. USEPA Report: EPA-454/R-03-003 June 2003, (http://www.epa.gov/scram001/dispersion_prefrec.htm#aermod)
[14] DEFRA (2009) Local Air Quality Management - Technical Guidance.

health from infectious diseases and environmental hazards. It did this by providing advice and information to the general public, to health professionals (such as doctors and nurses) and to national and local government. The HPA provided advice that was relevant to the whole of the UK, including Wales.

6.41 In September 2009 the HPA reviewed the latest scientific evidence on the health effects of modern municipal waste incinerators[15] (such as the proposed Parc Adfer ERF) which concluded that:

"While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable."

6.42 As part of the Permitting process for the ERF, NRW will consider the potential for health effects as they cannot issue a permit for a facility that will harm human health. In tis respect, a 'Human Health Risk Assessment' (HHRA) is being submitted.

6.43 The potential effects of emission to air from the ERF on human health have been assessed within the detailed dispersion modelling assessment by comparison of predicted impacts against health based air quality objectives. These air quality objectives are set for the protection of health in relation to direct exposure via inhalation.

6.44 Persistent Organic Pollutants ('POPs') are more relevant to the soil uptake pathway, however they may be transmitted to the soil through emissions to air which then deposit on the surrounding environment, which are an issue addressed in the Environmental Permit. This group of priority pollutants includes unintentional by-products of industrial processes (such as dioxins and furans). These are assessed using different methods than air pollutants due to their ingestion pathway and are assessed at the Environmental Permitting stage using the Human Health Risk Assessment Protocol (HHRAP). There is no 'likely significant effect' from bioaccumulation of POPs from the ERF and therefore this approach is consistent with the requirements of the EIA Regulations. For completeness, a copy of the HHRA is included at Appendix 6/2

Assessment of Impacts on Vegetation and Ecosystems

6.45 The potential impacts on identified sensitive ecosystems have been assessed by reference to critical levels and critical loads. Both are set with respect to values below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

6.46 Critical levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form. Critical levels for the protection of vegetation and ecosystems are specified within relevant European air quality directives and corresponding UK air quality regulations.

[15] Impact on Health of Emissions to Air from Municipal Waste Incinerators. Health Protection Agency, September 2009.

6.47 Critical loads are a quantitative estimate of exposure to deposition of one or more pollutants. Critical loads are set for the deposition of various substances to sensitive ecosystems.

6.48 Protected sites within the study area (defined as a 10km radius for Natura 2000 sites and 2km for SSSI's and other protected sites from the proposed development) have been identified. Process contributions and predicted environmental concentrations have been calculated for comparison against relevant critical level and critical load thresholds at these sites.

6.49 Deposition rates were calculated using dispersion modelling results processed by following empirical methods recommended by the Environment Agency (before the formation of NRW) in AQTAG06[16], as detailed in Appendix 6/1.

Significance Criteria

6.50 The EIA Regulations require '*a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development*'. The approach to impact significance and judgements on effect is described below.

Emissions from Industrial Processes

6.51 Environmental Permitting Guidance Note H1 proposes criteria to identify significant impacts. This guidance has been used as the basis to determine the significance of the process contribution (i.e. magnitude of emissions). To determine the significance of the resultant predicted environmental concentration (PEC), (i.e. process contribution added to background), the example thresholds in guidance issued by the Environmental Protection UK (EPUK)[17] have been applied.

6.52 The H1 guidance states that '*process contributions can be considered insignificant if*:

- the long term process contribution is <1% of the long term environmental standard;
- the short term process contribution is <10% of the short term environmental standard.

6.53 On this basis the process contribution is described as either 'insignificant' or not insignificant, ('potentially significant'). This in combination with the resultant Predicted Environmental Concentration (PEC) as a percentage of the applied limit value, has been used to determine the significance descriptors as described in Table 6-1.

[16] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency.
[17] Environmental Protection UK, Development Control: Planning For Air Quality (2010 Update)

Table 6-1
Significance Criteria

Significance Criteria	Descriptor of Significance
PC is insignificant and PEC below EAL	Negligible
PC is potentially significant but PEC below 75% of EAL	Negligible
PC is potentially significant and PEC >75% and <90% of EAL	Minor Adverse
PC is potentially significant and PEC >90% and <100% of EAL	Moderate Adverse
PC is potentially significant and PEC >100%	Major Adverse

Emissions from Transport

6.54 In the case of significance criteria for the assessment of traffic emissions, the example criteria described within guidance issued by Environmental Protection UK (EPUK)[18] has been used as presented in Table 6-2 and Table 6-3. This terminology should be used where a quantitative assessment is undertaken (i.e. the vehicle trips exceed the screening threshold).

Table 6-2
EPUK Magnitude of Change for PM_{10} and NO_2

Magnitude of Change	Annual Mean NO_2 / PM_{10}
Large	+/- >10%
Medium	+/- 5-10%
Small	+/- 1-5%
Imperceptible	+/- <1%

Table 6-3
Significance Criteria for Annual PM_{10} and NO_2

Magnitude of Change	Small	Medium	Large
Above Objective/Limit Value *With* Scheme (>100% of AQO)	Minor Adverse	Major Adverse	Major Adverse
Just Below Objective/Limit Value *With* Scheme (>90% of AQO)	Minor Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value *With* Scheme (>75% <90% of AQO)	Negligible	Minor Adverse	Minor Adverse
Well Below Objective/Limit Value *With* Scheme (<75%)	Negligible	Negligible	Minor Adverse

[18] Environmental Protection UK, Development Control: Planning For Air Quality (2010 Update)

BASELINE ENVIRONMENT

Location

6.55 The application site is located within the Deeside Industrial Park, Flintshire. The Deeside Industrial Park lies within an area bounded by the River Dee to the south, the A548 to the west and north and the A494 to the east.

6.56 The nearest residential areas are located in Connah's Quay (in the vicinity of the B5129) just over 2km from the application site boundary to the south, with Garden City (off Sealand Avenue) to the southeast being at a distance of around 2.3km from the application site boundary. The villages of Puddington and Burton, which are within England, are also just over 2km from the application site boundary to the northeast and north respectively. Examination of aerial photography and OS mapping show individual properties lying to the south of Burton, in the vicinity of Burton Mere Fisheries, which are around 1.7km from the northern boundary of the proposed application site.

Baseline Air Quality

6.57 Baseline pollutant concentrations have been obtained from a range of sources where they have been used to derive a Predicted Environmental Concentration. The derivation of these background concentrations is detailed in Appendix 6/1.

6.58 No Air Quality Management Areas (AQMA) have been declared in Flintshire. Cheshire West and Chester Council designated an AQMA on the A5032 in Ellesmere Port in May 2005 and in the Tarvin Road / Christleton Road area of Boughton, Chester in February 2008. As a result of the 2010 Detailed Assessment of Air Quality the Boughton AQMA was extended in 2011.

6.59 Flintshire Council monitors levels of NO_2 passively at a number of diffusion tube locations within its administrative area. Those most relevant to the application site are shown below.

Table 6-4
Flintshire Council Monitoring Results (NO_2 µg/m^3)

Tube No.	Type	NGR (m) North	NGR (m) East	2010	2011	2012	2013*
6	Rural background	327307	369858	11.9	10.6	12.7	13.5
7	Kerbside	327165	371208	17.7	15.6	16.8	20.2
8	urban background	328032	370647	16.3	15.2	16.1	18.3
9	urban background	328249	370142	13.7	8.6	13.9	n/a
10	Rural background	327976	369437	10.2	8.3	10.4	n/a
13	urban	328988	369409	14.9	13.0	13.3	n/a
14	Rural background	329409	368225	12.2	9.1	9.5	12.3

Tube No.	Type	NGR (m) North	NGR (m) East	2010	2011	2012	2013*
16	urban	331664	368029	30.2	29.8	30.0	35.7
17	Kerbside	330598	368922	32.3	25.8	26.7	30.8
18	urban background	330319	368812	16.4	16.8	15.6	19.4
21	urban background	332549	369135	16.2	14.5	15.9	18.9
22	Rural background	333645	370898	20.9	22.0	26.1	23.7
23	Kerbside	332773	370984	33.7	29.8	31.8	34.7
25	industrial	332044	371564	22.3	19.7	20.2	23.5
26	industrial	329922	370830	19.9	18.2	16.4	20.4
27	urban background	333038	369050	23.8	20.8	24.3	30.0
28	industrial	331100	372200	19.7	22.8	19.7	23.5
29	industrial	330500	371800	20.7	17.3	18.9	23.4
30	Kerbside	332226	367725	32.5	31.4	32	34.8
36	Kerbside	331806	368271	27.8	37.3	25.5	29.2
40	Kerbside	333732	369087	19.8	25.2	17.2	20.9

*Not yet ratified or bias adjusted by FC therefore all 2013 results must be regarded as provisional. All tubes marked n/a were moved on 31st July 2013 hence no full years data is available.

6.60 There are no council monitoring locations where the 40µg/m^3 annual average NO_2 limit is exceeded.

6.61 In summary, there is no AQMA in Flintshire and monitoring results indicate that levels of traffic pollutants at receptor locations (i.e. away from the kerbside) are well within relevant limits.

Sensitive Receptors

6.62 The term '*sensitive receptors*' includes any persons, locations or systems that may be susceptible to changes as a consequence of the proposed development.

Human Receptors

6.63 The detailed dispersion modelling assessment has used a receptor grid across the study area. This method allows the exposure at any location in the study area to be determined and presented graphically. The receptor grid spacing used was 100m to 5km and 200m to 10km.

Ecological Habitats - Designated Sites

6.64 There are a number of European[19] and national sites[20] designated for their ecological interest within 10km and 2km of the application site respectively. For full details of these designations refer to Chapter 11 (Ecology) of this ES.

Table 6-5
Designated Habitat Sites within the Study Area

Name	Habitat Type (APIS categories)	Designation
Halkyn Mountain / Mynydd Helygain (UK0030163)	6130 Calaminarian grasslands of the *Violetalia calaminariae.* These are generally open natural or semi-natural grasslands on native rock, rich in heavy metals.	SAC / SPA
Deeside and Buckley Newt sites (UK0030132)	91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles	SAC / SPA
River Dee and Bala Lake (UK0030252)	3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	SAC / SPA
Dee Estuary / Aber Dyfrdwy (England) (UK0030131)	1140 Mudflats and sandflats not covered by seawater at low tide 1310 Salicornia and other annuals colonizing mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	SAC / SPA
Afon Dyfrdwy (River Dee)	Afon Dyfrdwy (River Dee) is of special interest for its fluvial geomorphology, Carboniferous geology, range of river habitat types, saltmarsh transition habitats, populations of floating water plantain *Luronium natans*, slender hare's-ear *Bupleurum tenuissimum*, sea barley *Hordeum marinum* and hard-grass *Parapholis strigosa*,	SSSI
Dee Estuary (Afon Dyfrdwy)	Intertidal mud and sandflats, saltmarsh and transitional habitats; the hard rocky sandstone cliffs of Hilbre Island and Middle Eye with their cliff vegetation and maritime heathland and grassland; its assemblage of nationally scarce plants.	SSSI
Inner Marsh Farm	The site now consists of a complex of open water and wetland habitats. Specifically, it comprises three shallow, but permanent, water bodies which were excavated in the late 1980s. These are bordered by fringing swamp vegetation typically comprising sea club-rush *Bolboschoenus maritimus*, reedmace *Typha latifolia*, grey club-rush *Schoenoplectus tabernaemontani*, soft rush *Juncus effusus* and hard rush *J. inflexus*. The pools lie within a complex of damp grassland, which floods in winter, dominated by marsh foxtail *Alopecurus geniculatus*, floating sweet-grass *Glyceria fluitans*, creeping bent *Agrostis stolonifera* and	SSSI

[19] Special Protection Areas (SPA) and Special Areas of Conservation (SAC)
[20] Sites of Special Scientific Interest (SSSI)

Name	Habitat Type (APIS categories)	Designation
	soft rush.	
Shotton Lagoons and Reedbeds	Shotton Lagoons and Reedbeds are of special interest for their breeding population of common tern, *Sterna hirundo* and their reedswamp vegetation characterised by common reed *Phragmites australis*.	SSSI

Meteorological Conditions

6.65 The most important meteorological parameters governing the atmospheric dispersion of pollutants are as follows:

- wind direction determines the broad transport of the emission and the sector of the compass into which the emission is dispersed;
- wind speed will affect ground level concentrations of emissions by increasing the initial dilution of pollutants in the emission; and
- Atmospheric stability; a measure of the turbulence, particularly of the vertical motions present.

6.66 The impact has been modelled using a five year Global Forecasting System (GFS) resolution Numerical weather prediction (NWP) meteorological data set for the years 2009 – 2013. This meteorological data is accepted for use in dispersion modelling assessments in the UK and provides the advantage of a more site-focussed data set than would be the case for data collected by the Met Office in the UK.

6.67 A windrose providing the frequency of wind speed and direction for the five years of data is presented in Figure 6-1. It is apparent from this windrose that the predominant wind direction is from the west southwest. Wind from the north, northwest and southeast occur relatively infrequently.

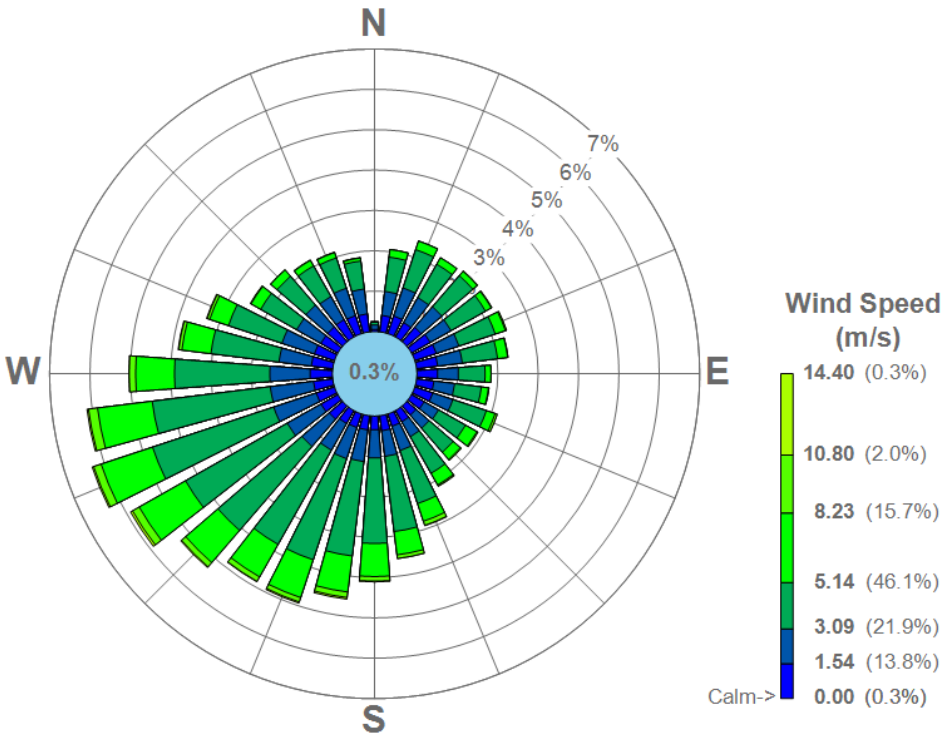

Figure 6-1
NWP Windrose (2009 – 2013)

Topography

6.68 The presence of elevated terrain can significantly affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

6.69 The application site has an elevation of between 5m and 10m Above Ordnance Datum. The majority of the application site is level and occupied by rough grassland with 3m to 5m raised mounds/embankments in the central and eastern parts of the proposed application site. Elevation data has been included in the dispersion model as described in Appendix 6/1.

ASSESSMENT OF IMPACTS

Construction Phase

Construction Dust

6.70 During the construction phase there is potential for the generation of construction dust (primarily coarse, or 'deposited' dust). Construction traffic

associated with the development would contribute to existing traffic levels on the surrounding road network.

6.71 The construction activities most likely to generate dust are:

- excavations;
- removal of spoil/made ground;
- earthworks (landscaping);
- haulage routes;
- storage of materials;
- grading and levelling of the ground prior to construction of the buildings;
- grading and levelling of the ground prior to construction of the new roads; and
- internal / external finishing.

6.72 Indirect transport of particles, due to dust adhering to the wheels of construction vehicles exiting the site, may lead to increased dust emissions along access routes. The likelihood of this occurring would depend on the following factors:

- number of vehicles exiting the site;
- the cleanliness of site-haul routes; and
- the weather conditions.

6.73 There are no residential receptors within 1500m of the boundary of the application site; however there are industrial receptors to the east of the application site within 150m of the site boundary.

6.74 IAQM guidance on the assessment of dust from demolition and construction[21] requires an assessment if residential receptors are located within 350m of the site boundary. Therefore, given the lack of local, sensitive residential receptors, no detailed assessment is required to determine potential dust impact associated with demolition, earthworks, construction or trackout.

6.75 The construction phase for the facility is expected to last approximately 38 months and would involve the following:

- excavation and installation of services;
- construction of new foundations;
- construction of concrete and asphalt surfaces;
- erection of steelwork and cladding for buildings;
- installation of process equipment and ancillary infrastructure; and
- provision of landscaping and fencing.

6.76 Specific details of the construction phase are not known at this stage, and traffic generation is likely to depend on the successful contractors preferred construction methodology and techniques. However, the level of HGV traffic generated during the construction phase is anticipated to be well within the

[21] IAQM (2014) *Assessment of dust from demolition and construction 2014.*

daily fluctuation of operational site traffic, and also within the daily fluctuations of traffic volumes on the main access roads. This is described further in Chapter 8 (Transport) of this ES.

6.77 The developer would be expected to apply mitigation measures appropriate for a site with 'low' dust risk effects. With mitigation in place the risk of a significant dust impact is considered to be 'negligible'.

6.78 The duration of potential impact is 36 months and this risk would cease once construction is complete.

6.79 Mitigation measures would be employed during the construction phase and may include, as appropriate:

- damping down dusty surfaces;
- controlling the speed of mobile plant crossing un-surfaced areas;
- mechanical road sweeper on public road; and
- covering HGV's carrying dusty materials.

6.80 These measures would be detailed in a Construction Environmental Management Plan (CEMP) prior to construction.

Construction Traffic

6.81 The impact of construction traffic on air quality would be below the DMRB screening criteria of 200 HGV movements per day.

6.82 The potential effect on air quality due to the additional emissions from construction traffic is therefore considered as being 'neutral'. No further mitigation is therefore required and effects would cease once construction is complete.

Operational Effects

Dust and Litter

Potential Sources of Dust and Litter

6.83 During operation of the proposed ERF the potential for dust and litter generation would arise from the handling and processing of incoming waste, and export of residual materials (IBA, metals and APCRs).

6.84 Ash would be a product of the combustion process. This takes two forms:

- 'fly ash' which has the highest potential for release as it consists of the smallest ash particles. This, when mixed with activated carbon and lime for pollution control is known as Air Pollution Control (APC) residue; and
- 'Incinerator bottom ash' which is a large grained material with a high initial moisture content resulting from the quenching process.

Designed in Mitigation Measures

6.85 The following dust mitigation measures have been designed in to the proposed ERF:

- materials (waste, recyclate etc) imported or exported from the application site would be transported in enclosed or covered vehicles. Waste vessels that are not enclosed would be sheeted (or netted) to ensure no escape of waste materials during transit;
- incoming waste to the ERF would be unloaded directly into the waste bunker inside the waste reception building;
- all vehicle movements would take place on surfaced roadways and manoeuvring areas and a programme of periodic road sweeping/cleaning would be in place;
- all storage and handling of APC materials, both raw and used, would be undertaken within the building in enclosed vessels and silos, and transported from the ERF in enclosed tankers; and
- IBA from the ERF would be quenched and directed by covered conveyor to a processing (sorting, screening etc) area prior to storage and then recycling into an aggregate product. Spray suppression would be used to prevent fugitive emission, where required, from the IBA storage area, which is enclosed by a wall.

Assessment of Dust and Litter Impacts

6.86 Given the high degree of designed in mitigation in the form of containment of potential sources of dust and litter from the proposed ERF, there are no sources of dust or litter from waste handling exposed to the ambient atmosphere. Consequently, the potential for fugitive release of dust or litter is low. Although the IBA is stored outside, it is a large grained and moist material which rapidly forms a tenacious crust. These physical characteristics prevent the release of dust.

6.87 On this basis the risk of dust and litter impact is considered negligible and no further mitigation is therefore required.

Odour and Bioaerosols

Potential Sources of Odour and Bioaerosols

6.88 The receipt, storage and handling of waste at the proposed ERF represents a potential source for the generation of odour and bioaerosols.

Designed in Mitigation Measures

6.89 HGVs importing waste would be weighed when entering the site and directed to the tipping bays, with all HGVs being covered during transit to prevent waste and odour releases to the environment during the journey. Incoming waste vehicles would enter the manoeuvring area and reverse up to their

designated tipping bay. HGVs would then tip inside the enclosed building into the bunker via a dedicated waste chute.

6.90 Measures that would mitigate the generation and fugitive release of odours and bioaerosols designed in to the proposed ERF are as follows:

- the waste would be delivered in enclosed or covered vessels prior to discharge into the bunker within the reception area in the main ERF building;
- the reception area employs a double door system, whereby an internal door to the bunker only opens when the external door to the tipping hall is closed;
- waste would be present at the ERF for no more than a few days pending treatment, and therefore the potential for the generation of odour and bio-aerosols due to biological activity would be minimised; and
- air from the waste reception area would be actively extracted to serve as combustion air, thus maintaining a degree of negative pressure in this part of the building, and achieving a high degree of containment of any generated odours or bioaerosols within the reception area.

Assessment of Odour and Bioaerosol Impact

6.91 The risk of generation of odour and bioaerosols from the waste material would be relatively low and the potential for emission would be mitigated by the enclosure of all operations and the extraction of air from the tipping hall.

6.92 Therefore, given the high degree of designed in mitigation in the form of containment of potential sources of odour and bioaerosols from the proposed ERF, it is considered that the risk of fugitive release of odour and bioaerosol generation is low.

6.93 Allied to this, the buffer distance to residential receptor locations is over 1500m from the waste reception area of the ERF and thus is considered to be sufficient to allow for the dispersion of any odour. There are no nearby quaternary industries which could be particularly sensitive to odours (such as vehicle sales showrooms). Overall therefore, the risk of impact is considered to be negligible. No further mitigation is therefore required.

Traffic Exhaust Emissions

Sources of Traffic Exhaust Emissions

6.94 As described in the Transport Assessment (Chapter 8) all material imports and exports would be transported to the application site by road.

6.95 At the design point of 175,000tpa it is estimated that the operation of the ERF an average of 60 annual average daily traffic (AADT) movements:

- 15 Refuse collection vehicle movements per day
- 14 bulker movements per day
- 21 third party movements per day; and

- up to 10 other movements per day (IBA, consumables etc).

6.96 Should this increase to 200,000tpa, then the average movements would rise to 134 HGVs (i.e. 67 in and 67 out). With the exception of local collections, all bulk transport vehicles would use the A55 trunk road. Refuse collection vehicles (for example from Flint) would use defined routes such as the A548.

Assessment of Traffic Emissions

6.97 The predicted trip generation is below the criteria defined (of 200 HDV's AADT) in the DMRB guidance. Therefore according to the DMRB guidance, impacts can be classified as 'neutral' and no further assessment is required for any road link.

6.98 The significance of impacts due to additional emissions from operational traffic is classified as 'negligible'. No further mitigation is therefore required.

Emissions from ERF Process Stack

6.99 The detailed assessment of impact from the proposed ERF process stack is set out in Appendix 6/1 and an overview is presented in the following paragraphs.

Sources

6.100 The stack serving the proposed ERF's thermal waste treatment process would consist of a single flue of 85m in height. The process conditions used to determine the pollutant emission rates were calculated from design data provided by the manufacturer, as detailed in Appendix 6/1.

6.101 The applied emission rates were calculated from these process conditions and the appropriate IED emission limits (or typical emission rates where pollutants are not prescribed by the IED) as detailed in Appendix 6/1.

Predicted Impacts on Air Quality

6.102 The results of the atmospheric dispersion modelling are provided in the tables below.

6.103 Table 6-4 presents the maximum ground level predictions for short-term averages. Full results are presented in Appendix 6/1.

Table 6-4
Maximum Predicted Short-Term Impacts

Pollutant	Applied Standard	Av. Period	PC Max	PC Max as % of EAL	significance
Nitrogen Dioxide	200.0	1 hour	2.7	1.4%	Negligible

Pollutant	Applied Standard	Av. Period	PC Max	PC Max as % of EAL	significance
Particulate Matter	50.0	24 hour	0.1	0.1%	Negligible
Sulphur Dioxide	266.0	15 min	2.6	1.0%	Negligible
Sulphur Dioxide	350.0	1 hour	1.9	0.5%	Negligible
Sulphur Dioxide	125.0	24 hour	0.8	0.7%	Negligible
Carbon Monoxide	10000.0	8 hour	1.9	0.02%	Negligible
Hydrogen Chloride	750.0	1 hour	0.5	0.1%	Negligible
Hydrogen Flouride	160.0	1 hour	0.0	<0.01%	Negligible
Organics (1,2 Dichloroethane)	700.0	1 hour	0.5	0.1%	Negligible
Mercury	7.5	1 hour	0.002	0.03%	Negligible
Antimony	150.0	1 hour	0.003	<0.01%	Negligible
Chromium III	150.0	1 hour	0.003	<0.01%	Negligible
Copper	200.0	1 hour	0.003	<0.01%	Negligible
Manganese	1500.0	1 hour	0.003	<0.01%	Negligible
Vanadium	1.0	1 hour	0.003	0.3%	Negligible
Ammonia	2500.0	1 hour	0.5	<0.01%	Negligible

6.104 Table 6-5 presents the maximum ground level predictions for long-term averages. Full results are presented in Appendix 6-1.

Table 6-5
Maximum Predicted Long-Term Concentrations

Pollutant	Applied Standard	PC Max	PC Max as % of EAL	magnitude	significance
Nitrogen Dioxide	40.0	0.275	0.69%	Imperceptible	Negligible
Particulate Matter	40.0	0.020	0.05%	Imperceptible	Negligible
Hydrogen Fluoride	16.0	0.002	0.01%	Imperceptible	Negligible

Pollutant	Applied Standard	PC Max	PC Max as % of EAL	magnitude	significance
Organics	5.0	0.020	0.39%	Imperceptible	Negligible
Cadmium	0.005	4.9E-05	0.98%	Imperceptible	Negligible
Mercury	0.3	9.8E-05	0.04%	Imperceptible	Negligible
Arsenic	0.003	9.8E-06	0.33%	Imperceptible	Negligible
Antimony	5.0	9.8E-06	<0.01%	Imperceptible	Negligible
Chromium III	5.0	9.8E-06	<0.01%	Imperceptible	Negligible
Chromium VI	0.0002	2.6E-07	0.13%	Imperceptible	Negligible
Copper	10.0	9.8E-06	<0.01%	Imperceptible	Negligible
Lead	0.3	9.8E-06	<0.01%	Imperceptible	Negligible
Manganese	0.2	9.8E-06	0.01%	Imperceptible	Negligible
Nickel	0.02	9.8E-06	0.05%	Imperceptible	Negligible
Vanadium	5.0	9.8E-06	<0.01%	Imperceptible	Negligible

6.105 The significance of impacts at the location of maximum ground level concentration for all pollutants is assessed as negligible. The overall impact in the study area from combustion emissions from the proposed ERF is considered to be negligible.

Predicted Impacts on Sensitive Ecosystems

6.106 The predicted process contribution (PC) from the ERF is presented in Technical Appendix 6/1.

6.107 Predicted impacts (PC) must be less than 100% of the critical levels at sites of local importance. The predicted PC from the ERF is less than 1% of the long-term and 10% of the short-term applied critical levels for oxides of nitrogen (NOx), sulphur dioxide (SO_2), hydrogen fluoride (HF) and ammonia (NH_3) at all sensitive ecological receptors when typical operating hours and emissions are considered, therefore no further assessment is considered to be required.

6.108 The maximum predicted PC of Nitrogen (N) or Sulphur (S) to acid deposition from the proposed ERF are less than 100% of the relevant critical loads at all locations and therefore not considered to be significant, even when assuming

even assuming emission at the IED limit and the habitat at the location of maximum Ground Level Concentration (GLC).

6.109 This screening assessment shows that the predicted Nitrogen deposition process contribution is less than 2% of the applied critical load for each habitat type even assuming emission at the IED limit and the habitat at the location of maximum GLC. No further assessment is considered to be required in relation to potential eutrophication effects at the identified sites of ecological interest and the predicted impact is therefore considered to be negligible.

IN-COMBINATION EFFECTS

6.110 Where relevant, the assessment may need to consider the potential Cumulative Effects (or in-combination effects) that the proposed development may have with other planned developments.

6.111 The traffic generated NO_2 and PM_{10} associated with the development is 'imperceptible' and there is therefore no requirement for further consideration to be given to the potential for combined impacts from traffic movements and the same pollutants from the ERF stack.

6.112 The air quality impact of the existing industrial facilities in the area (such as the Shotton paper mill, TATA Steel and Deeside gas fired power station for example) is encompassed within the monitoring data collected by Flintshire and SLR Consulting. The Shotton gas-fired Combined Heat and Power (CHP) generating station ceased generating power in June 2012.

6.113 There are no other consented (but yet to be developed) schemes in the area with the potential to lead to significant 'in combination' effects given that the impacts of the ERF are 'imperceptible'.

MITIGATION MEASURES

Construction Phase

6.114 As the construction phase has been classified as a high risk site against the Site Evaluation Guidelines contained within the Best Practice Guidance; the following industry standard mitigation measures would be applied during the construction phase to reduce the potential dust effects:

- erect solid barriers (i.e. hoarding) to site boundary in close proximity to receptors where dusty operation may lead to an impact;
- careful management of stockpiled material and if possible enclose or use dust suppression as necessary;
- all stockpiled material sited away from existing residential receptors where possible;
- all completed earthworks re-vegetated as soon as possible;
- all site equipment carefully maintained and kept clean;
- deliveries of soils to site covered;

- hard surface all major haul routes through the site as soon as practicable;
- limited vehicle speeds on unpaved roads;
- roads regularly cleaned to prevent dust being transported off site;
- drop heights minimised for all transfer activities;
- all mechanical cleaning or road sweeping undertaken as a wet process or another suitable system capable of suppressing dust;
- wheel washing facilities (*e.g.* hose) installed at the site exit;
- strict speed limits enforced on access roads; and
- vehicles routed to avoid sensitive receptors.

RESIDUAL IMPACTS

Construction Phase

6.115 Given the mitigation techniques available it is considered that dust from construction would be effectively controlled. On this basis, it is predicted that the impact of dust during construction operations at all receptors would not give rise to significant adverse impacts.

CONCLUSIONS

6.116 An assessment of the air quality impacts associated with the proposed ERF has been undertaken. The assessment has focussed on the principal emissions to air, including:

- Air Quality Strategy Pollutants from vehicle exhausts;
- Air Quality Strategy and IED Pollutants from point sources (ERF Stack);
- Dust and litter emissions during the construction and operational phases; and
- Odours and bioaerosols arising from the operational phase.

6.117 Due to the low additional number of HDV trips during the construction and operational phases, there is predicted to be a negligible impact on air quality from road vehicle exhaust emissions.

6.118 The assessments of dust, litter, odour and bioaerosols during the construction and operation for the ERF have been undertaken qualitatively and have found that the risk of significant generation of emissions is low, and considered to be negligible. These issues would be regulated by the Environmental Permit.

6.119 The magnitude of short term impacts at the location of maximum ground level concentration for all pollutants is assessed as negligible. The magnitude of long term impacts at the location of maximum ground level concentration for all pollutants is also assessed as negligible. All short and long term impacts are regarded as insignificant when backgrounds are taken into account. Furthermore the assessment assumes that the ERF emits at the limit on a continuous basis and research indicates that this will not be the case.

Notwithstanding these points, these issues will be regulated by the Environmental Permit.

6.120 The impact of emissions on sensitive ecosystems are not predicted to be significant as process contributions are a very small increase on current levels, typically less than 1% of the applied critical level or load when typical operating hours and emissions are considered.

6.121 In summary the proposed ERF is not predicted to give rise to significant adverse air quality effects for either human or ecological receptors.

6.122 The EIA Regulations require '*a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development*'. The proposed ERF is not predicted to result in any likely significant effects in relation to air quality once mitigation is in place.