9 Air Quality

9.1 Introduction

9.1.1 This chapter of the ES was prepared by Entran Ltd and presents an assessment of the likely significant effects of the Development on Air Quality. Mitigation measures are identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The nature and significance of the likely residual effects are reported.

9.1.2 The chapter is supported by the following appendices:

- Appendix 9.1: Air Quality Assessment Levels;
- Appendix 9.2: Dust and Particulate Emission Management Plan;
- Appendix 9.3: Emission Parameters;
- Appendix 9.4: Comparison of Results using Alternative Model;
- Appendix 9.5: Comparison or Results using Coastal Effects Module;
- Appendix 9.6: Environmental Assessment Levels for the Protection of Vegetation and Ecosystems;
- Appendix 9.7: Committed / Proposed Development Results; and
- Appendix 9.8: Human Health Risk Assessment Report.

Competence

9.1.3 This chapter has been prepared by Entran Ltd. The work has been completed by Alison Banks (MSc, BSc (Hons), PG Dip) who is a Chartered Environmentalist and a member of the Institute of Air Quality Management (IAQM) and the Institute of Environmental Science (IES). Alison is a Technical Director with 25 years' experience as an Environmental Consultant.

9.1.4 The Human Health Risk Assessment (HHRA) was prepared by Dr Amanda Gair (PhD, BSc) of Gair Consulting Ltd. Dr Gair is a Chartered Environmentalist and a member of the IAQM and IES. Dr Gair has over 30 years' experience in environmental consultancy, she specialises in providing technical support to permit and planning applications for major projects via the completion of detailed air quality assessments and health risk assessments.

9.1.5 The assessment has also been subject to peer review.

9.2 Legislation, Policy and Guidance

Relevant Legislation and Policy

9.2.1 The following legislation, air quality policy and guidance are relevant to the Development:

- Well-being of Future Generations (Wales) Act 2015[1];
- The European Directive on Ambient Air and Cleaner Air for Europe[2];

- Air Quality Strategy for England, Scotland, Wales and Northern Ireland[3];
- Air Quality (Wales) Regulations 2000[4];
- Air Quality (Wales) (Amendment) Regulations 2002[5];
- Air Quality Standards (Wales) Regulations 2010[6];
- Environment Act 1995 (Part IV)[7;] and
- Industrial Emissions Directive (IED) (2010/75/EU)[8].

Planning Policy Context

Wales

9.2.2 The following planning policy is relevant to the Development:

- Planning Policy Wales (2021)[9;] and
- Future Wales: The National Plan 2040.

Vale of Glamorgan

9.2.3 The following local planning policy is relevant to the Development:

- Vale of Glamorgan Local Development Plan (LDP) 2011 – 2026[10].

Guidance

9.2.4 The following guidance is relevant to the Development:

- Technical Advice Note (Wales) 21 Waste (Feb 2014)[11];
- Environmental Permitting Regulations & Best Available Techniques (BAT) Reference Document for Waste Incineration (BREF)[12;]
- Environmental Protection UK and Institute of Air Quality Management. Land Use Planning and Development Control[13;]
- Institute of Air Quality Management (2014). Guidance on the assessment of dust from demolition and construction version 1.1;[14]
- Air Emissions Risk Assessment for your Environmental Permit[15];
- AQTAG06 – Technical guidance on detailed modelling approach for an Appropriate Assessment for emissions to air[16];
- A guide to the assessment of air quality impacts on designated nature conservation sites[17;] and
- Environment Agency (June 2016). Releases from Waste Incinerators. Guidance on assessing group 3 metal stack emissions from incinerators v 4.[18]

9.3 Assessment Methodology

Consultation

9.3.1 Consultation with VoGC has not been undertaken for the purposes of preparing this ES Chapter. However, the scope of the assessment has been informed to some extent by previous scoping correspondence with the Welsh Government in relation to the 2021 VES and the WSP review of previously prepared ESs.

Scope of the Assessment

Potential sources of impact

9.3.2 The Development has been constructed, although during the construction phase, there was the potential for impacts on local air quality to occur as a result of dust and PM_{10} emissions. A retrospective assessment of the impacts during the construction phase has been undertaken.

9.3.3 There is the potential for impacts on local air quality to arise as a result of emissions from the operation of the Development. The Development comprises a gas boiler utilising synthetic gas (Syngas) generated from the gasification of waste wood. The high-pressure steam generated by the boiler would be directed to a steam turbine and used to generate electricity for supply to the Local Distribution Network The Facility is assumed to operate 24 hours a day, 365 days per year. Emissions to air are via a single 43m stack.

9.3.4 An assessment of impacts arising from the operational emissions from the Development has been undertaken using detailed dispersion modelling, details of which are provided below. The assessment considers the impact of emissions of:

- Nitrogen oxides;
- Carbon monoxide;
- Particulate Matter (as PM_{10} and $PM_{2.5}$)
- Gaseous and vaporous organic substance, expressed as total organic carbon;
- Sulphur dioxide;
- Hydrogen chloride
- Hydrogen fluoride;
- Twelve trace metals;
- Dioxins;
- Ammonia;
- Polycyclic Aromatic Hydrocarbons (PAH as Benzo[a]pyrene); and
- Polychlorinated biphenyls (PCBs)

9.3.5 In addition to emissions from the main stack, there is also a diesel powered start up generator. This generator will only be used when there is absolutely no power available on Site such as a total grid failure or transformer failure to bring the Plant into a safe shutdown scenario. The generator is sized to enable the safe operation of the boiler feed water pumps and combustion fans to allow the Facility to 'fail safe'. The generator is tested for 30 minutes per week. Emissions from this generator have been included in the assessment.

Matters scoped out

Construction Traffic

9.3.6 Guidance provided by the EPUK & IAQM provides threshold criteria for establishing when significant impacts on local air quality may occur and when a detailed assessment of potential impacts is required. At locations outside an Air Quality Management Area (AQMA), a change in light duty vehicles (LDV) of more than 500 per day and / or a change

in heavy duty vehicles (HDV) of more than 100 per day is considered to result in potentially significant impacts on air quality. At locations within or adjacent to an AQMA, a change in LDVs of more than 100 per day or a change in HDVs of more than 25 per day is considered potentially significant. The Site is not located within or adjacent to an AQMA.

9.3.7 Construction traffic will have contributed to existing traffic levels on the surrounding road network. The greatest potential for impacts on air quality from traffic associated with this phase of the Development would have been in the areas immediately adjacent to the principal means of access for construction traffic.

9.3.8 Data provided by the project team indicate that during the construction phase there were approximately 30 2-way HGV trips per day on average over the construction period, which is below the thresholds defined above.

9.3.9 For a short period of approximately 3 to 4 months during the muck shifting phase, the additional traffic flow arising from the construction phase was estimated to be 100 2-way trips per day. In addition to the HGV movements, a small number of car and light goods vehicle movements were also associated with the construction workers and deliveries accessing the Site. The impact of the construction vehicles is therefore considered to have been negligible and effects temporary and not significant. Assessment of traffic movements during the construction phase is therefore not considered further.

Operational Traffic

9.3.10 A single mobile loading shovel will be operating within the fuel hall and reception shed. Emissions from a single mobile plant are considered to be insignificant and are not considered further within this assessment.

9.3.11 There is also the potential for impacts on local air quality to arise as a result of emissions from road vehicles associated with the operation of the Development.

9.3.12 The Site itself is not within an AQMA. Data provided by the project team indicates that the operation of the Development will result in an increase in traffic flows of up to a maximum of 19 HGVs per day and a maximum of 8 LGVs per day (see Appendix 3.10: Transport Technical Note for further details). An assessment of the impacts arising from exhaust emissions from road vehicles associated with the operation of the Development has therefore been excluded from the assessment as they are below the screening criteria set out above.

Dust

9.3.13 There is also the potential for impacts to air to arise as a result of dust and particulate matter generated from on-site operations. The Site lies within a predominantly industrial setting, the closest existing residential properties are located off Dock View Road which is approximately 250m to the northwest of the Site. A committed development, Barry Waterfront, includes the provision of residential properties at a location approximately 100m to the southwest of the Site. The site operations that may potentially result in emissions of dust and particulate matter are the delivery and unloading of waste wood (fuel) into the Facility, the processing of the waste wood and the transfer of material from the storage bays to the plant via mechanical loading shovels.

9.3.14 The waste wood would be delivered in covered vehicles which would be sealed to prevent escape of material and the materials accepted will not be inherently dusty. Unloading will be undertaken within the Fuel Storage Building and at low speed and low tipping height to reduce the potential for dust release.

9.3.15 A Dust and Particulate Emission Management Plan (DMP) (Appendix 9.2) has been produced for the Site which is regulated through the Environmental Permit, which provides details of the dust control measures that will be implemented. The DMP concluded that there is a very low risk of nuisance or exposure of the local receptors to dust and particulate matter arising from the Site. Due to these measures, it is considered that the emissions of dust from the operation of the Facility will be minimal. An assessment of the impacts of dust and particulate matter arising from on-site operations has therefore been scoped out of this assessment.

Odour

9.3.16 The waste wood fuel that will be accepted at the Site is not inherently odorous. All waste wood will be delivered to the Site via covered HGV's or within containers. The HGVs will deliver the waste wood directly into an enclosed storage building. There will be no waste wood storage outside. The waste storage building is a sealed building with electronically operated roller shutter doors which would be kept closed at all times other than when deliveries are being received as a requirement of Condition 30 of the 2015 Permission. It is considered that these measures are sufficient to prevent the fugitive release of odours from the Facility. It should also be noted that these measures were deemed sufficient within the Environmental Permit and that no odour management plan was requested as a condition of the Permit.

9.3.17 An assessment of the impacts of odour arising from the Site is therefore not considered necessary and therefore has been scoped out of this assessment. Consideration has been given to the likelihood of the emissions arising from the stack leading to a visible plume. The emissions will not include dark smoke emissions. The only visible plume that may arise would be a steam emission that may be visible under certain weather conditions, such as cold winter mornings. As the plume mixes with ambient air the water vapour within the plume may condense. A visible plume would only potentially occur for emissions with a high moisture content and only on occasions such as cold winter mornings where the wind speed is particularly low. The moisture content of the emissions will be dependent on the feedstock and therefore is likely to be variable. It is considered unlikely that a plume would be visible for any significant amount of time. An assessment of plume visibility has therefore been scoped out of the assessment.

Spatial Scope

9.3.18 Guidance provided by the IAQM includes the following criteria for assessing the effects of construction dust:

- A sensitive 'human receptor' within 350m of the Site boundary or within 50m of the route used by construction vehicles on public highways up to 500m from the site entrance; and/or
- A sensitive 'ecological receptor' within 50m of the Site boundary or within 50m of the route used by construction vehicles on the public highway, up to 500m from the site entrance.

9.3.19 Human receptors are located within 350m of the Site, but there are no dust sensitive ecological habitats in the vicinity of the Site. A retrospective assessment of the impacts of the construction of the Development on human receptors has therefore been included. An assessment of the impacts of the construction on ecological receptors has not been considered further as there are no sensitive ecological receptors within proximity of the Site.

9.3.20 For the operational assessment, the spatial scope of the detailed air quality dispersion modelling included specific sensitive receptors (existing and future) within the immediate vicinity of the Site and a cartesian grid of 65m resolution (1.5 times the stack height, which was requested by Natural Resources Wales) centred on the Site. Ecological habitats were considered up to a distance of 10km from the Site in accordance with the recommendations set out in the Environment Agency's guidance.

Temporal Scope

9.3.21 For the purposes of the construction assessment, the existing conditions in the year 2016 were assumed as the baseline. Historical maps were reviewed to establish the presence of sensitive receptors and pre-construction conditions at the Site at that time.

9.3.22 For the purposes of operational assessment, it is assumed that the Development will be operational in the year 2022. As background pollutant concentrations are likely to reduce in future years due to improvements in technology etc, the worst-case assessment year is the opening year.

9.3.23 For the purposes of the decommissioning assessment, an operational period of 25 years has been assumed for assessment purposes. The Facility could operate for longer as there are no controls that limit its operational lifetime although this is unlikely to affect the conclusions of the assessment.

Establishing Baseline Conditions

Pre-Construction Baseline

9.3.24 In order to establish the pre-construction baseline, the background PM_{10} concentrations in the vicinity of the Site were obtained for the year 2016. Historical maps were reviewed to establish the presence of sensitive receptors at the time and also to establish the structures on Site prior to the construction works commencing.

Current Baseline

9.3.25 In order to establish the current baseline, a review of air quality data for the area surrounding the Site has been undertaken. This included any local monitoring data, data from the Defra Air Quality Information Resource (UK-Air) and background pollutant maps.

9.3.26 Local pollutant concentrations comprise a contribution from local sources such as the emissions from a road or chimney stack and the contribution that is transported into an area from further away. If all local sources were removed, all that would remain would be the contribution transported into the area which is termed the 'background' concentration. The current baseline is the existing pollutant concentrations which will include the background concentration and any contribution from existing local emissions such as local roads.

9.3.27 For the majority of pollutants considered in this assessment the baseline can be considered to be the background concentration. The exception to this is the pollutants that are also emitted from road traffic i.e. nitrogen dioxide and particulate matter.

9.3.28 As a number of sensitive receptors are located close to a roadside, consideration has also been given to the contribution arising from the emissions from road vehicles using these roads. The baseline concentrations for these pollutants are assumed to be concentrations measured at roadside monitoring stations rather than the background concentration for the area.

9.3.29 For the purposes of this ES, the opening year of the Development is 2022. It is a generally accepted trend that air pollutant concentrations will reduce in future years with improvements in technology and tighter controls. In order to determine a worst-case baseline concentration for the assessed opening year (2022), the latest historical data available for each pollutant has been reviewed and is detailed under the Baseline Conditions section.

9.3.30 Due to the travel restrictions associated with the COVID-19 pandemic in the years 2020 and 2021, it is considered that the measured concentrations especially in locations close to busy roads may be uncharacteristically low. For this reason, when determining the baseline concentrations for the year 2022, concentrations measured pre-pandemic (2019) are considered more likely to provide suitable estimates than measurements undertaken in 2020 and 2021.

9.3.31 The location of sensitive receptors was determined by reviewing current mapping. The location of future sensitive receptors was determined by reviewing details of committed and proposed developments in the vicinity of the Site.

Decommissioning

9.3.32 As discussed above, it is generally accepted that air pollutant concentrations will reduce in future years with improvements in technology. In order to determine a worst-case baseline concentration of PM_{10}, at the time of any decommissioning, the current baseline concentration as detailed under the Baseline Conditions section was assumed.

Identifying Likely Significant Effects

Construction (Retrospective)

9.3.33 To assess the potential impacts associated with dust and PM_{10} releases during the construction phase and to determine any necessary mitigation measures, an assessment based on the latest guidance from the IAQM has been undertaken.

9.3.34 The assessment is based on information made available by the project team on the construction programme and methods, as set out in Chapter 6: Construction and Decommissioning. The assessment approach divides construction activities into the following dust emission sources:

- Demolition;
- Earthworks;
- Construction; and

- Trackout.

9.3.35 The risk of dust effects (low, medium or high) is determined by the scale (magnitude) and nature of the works and the proximity of sensitive human and ecological receptors.

9.3.36 The significance of the dust effects is based on professional judgement, taking into account the sensitivity of receptors which were present at the time that construction took place and existing air quality.

Dust Emission Magnitude

9.3.37 The magnitude of the dust impacts for each source is classified as Small, Medium or Large depending on the scale of the works. Table 9.1 summarises the IAQM criteria that may be used to determine the magnitude of the dust emission. These criteria are used in combination with site specific information and professional judgement.

Table 9.1: Dust Emission Magnitude Criteria

Source	Large	Medium	Small
Demolition	▪ Total building volume >50,000m^3 ▪ Potentially dusty material (e.g. concrete) ▪ Onsite crushing and screening ▪ Demolition activities >20m above ground level.	▪ Total building volume 20,000 - 50,000m^3 ▪ Potentially dusty material ▪ Demolition activities 10 - 20m above ground level.	▪ Total building volume <20,000m^3 ▪ Construction material with low potential for dust release ▪ Demolition activities <10m above ground level ▪ Demolition during wetter months
Earthworks	▪ Total site area >10,000m^2 ▪ Potentially dusty soil type (e.g. clay) ▪ >10 heavy earth moving vehicles active at any one time ▪ Formation of bunds >8m in height ▪ Total material moved >100,000 tonnes	▪ Total site area 2,500 -10,000m^2 ▪ Moderately dusty soil type (e.g. silt) ▪ 5 - 10 heavy earth moving vehicles active at any one time ▪ Formation of bunds 4 - 8m in height ▪ Total material moved 20,000 - 100,000 tonnes	▪ Total site area <2,500m^2 ▪ Soil type with large grain size (e.g. sand) ▪ <5 heavy earth moving vehicles active at any one time ▪ Formation of bunds <4m in height ▪ Total material moved <20,000 tonnes ▪ Earthworks during wetter months
Construction	▪ Total building volume >100,000m^3 ▪ On site concrete batching ▪ Sandblasting	▪ Total building volume 25,000 - 100,000m^3 ▪ Potentially dusty construction material (e.g. concrete) ▪ On site concrete batching	▪ Total building volume <25,000m^3 ▪ Material with low potential for dust release (e.g. metal cladding or timber)

Trackout	▪ >50 HGV movements in any one day (a) ▪ Potentially dusty surface material (e.g. high clay content) ▪ Unpaved road length >100m	▪ 10 - 50 HGV movements in any one day (a) ▪ Moderately dusty surface material (e.g. silt) ▪ Unpaved road length 50 - 100m	▪ <10 HGV movements in any one day (a) ▪ Surface material with low potential for dust release ▪ Unpaved road length <50m

(a) HGV movements refer to outward trips (leaving the site) by vehicles of over 3.5 tonnes

Receptor Sensitivity

9.3.38 Factors defining the sensitivity of a receptor are presented in Table 9.2.

Table 9.2: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human (health)	Human (dust soiling)	Ecological
High	▪ Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM10 (a) ▪ Examples include residential dwellings, hospitals, schools and residential care homes.	▪ Regular exposure ▪ High level of amenity expected. ▪ Appearance, aesthetics or value of the property would be affected by dust soiling. ▪ Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	▪ Nationally or Internationally designated site with dust sensitive features (b) ▪ Locations with vascular species (c)
Medium	▪ Locations where workers are exposed over a time period relevant to the air quality objectives for PM10 (a) ▪ Examples include office and shop workers (d)	▪ Short-term exposure ▪ Moderate level of amenity expected ▪ Possible diminished appearance or aesthetics of property due to dust soiling ▪ Examples include parks and places of work	▪ Nationally designated site with dust sensitive features (b) ▪ Nationally designated site with a particularly important plant species where dust sensitivity is unknown
Low	▪ Transient human exposure ▪ Examples include public footpaths, playing fields, parks and shopping streets	▪ Transient exposure ▪ Enjoyment of amenity not expected. ▪ Appearance and aesthetics of property unaffected ▪ Examples include playing fields, farmland (e),	▪ Locally designated site with dust sensitive features (b)

Sensitivity	Human (health)	Human (dust soiling)	Ecological
		footpaths, short-term car parks and roads	

(a) In the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day.
(b) Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).
(c) Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.
(d) Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.
(e) Except commercially sensitive horticulture.

9.3.39 The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

Area Sensitivity

9.3.40 The sensitivity of the area to dust soiling and health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. Tables 9.3 and 9.4 summarise the criteria for determining the overall sensitivity of the area to dust soiling and health impacts respectively. Table 9.5 summarises the criteria for determining the sensitivity of an area to ecological impacts.

Table 9.3: Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the source (a)			
		<20m	<50m	<100m	<350m
High	**>100**	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	**>1**	Medium	Low	Low	Low
Low	**>1**	Low	Low	Low	Low

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

Table 9.4: Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} ($\mu g/m^3$)	Number of Receptors	Distance from the source (a)				
			<20m	<50m	<100m	<200m	<350m
High	**>32**	**>100**	High	High	High	Medium	Low

Receptor Sensitivity	Annual Mean PM_{10} ($\mu g/m^3$)	Number of Receptors	Distance from the source (a)				
			<20m	<50m	<100m	<200m	<350m
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32	**>100**	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28	**>100**	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	**>100**	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	**>32**	**>10**	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28 - 32	**>10**	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<28	**-**	Low	Low	Low	Low	Low
Low	**-**	**>1**	Low	Low	Low	Low	Low

(a) For trackout, the distance is measured from the side of roads used by construction traffic. Beyond 50m, the impact is negligible.

Table 9.5: Sensitivity of the Area to Ecological Impacts

Receptor Sensitivity	Distance from the Source	
	<20m	<50m
High	High Risk	Medium Risk
Medium	Medium Risk	Low Risk
Low	Low Risk	Low Risk

9.3.41 For each dust emission source (demolition, construction, earthworks and trackout), the worst-case area sensitivity is used in combination with the dust emission magnitude to determine the risk of dust impacts.

Risk of Dust Impacts

9.3.42 The risk of dust impacts prior to mitigation for each emission source is presented in Tables 9.6, 9.7 and 9.8.

Table 9.6: Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 9.7: Risk of Dust Impacts – Earthworks and Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 9.8: Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Operation

9.3.43 Air pollutant concentrations associated with the operation of the Development at and in the vicinity of the Site has been predicted using the detailed dispersion model Breeze Aermod. This is a commercially available dispersion model and has been widely validated for this type of assessment. The model uses detailed information regarding the emissions and local meteorological conditions to predict pollutant concentrations at specific locations selected by the user.

Normal Operational Emission Scenario

9.3.44 Emission limits obtained from the Industrial Emissions Directive (IED) have been assumed for the purposes of the modelling assessment. The IED (2010/75/EU) came into force in January 2011, replacing the seven existing Directives including the Waste Incinerator Directive (WID) and Large Combustion Plant Directive (LDPD) and was implemented through the Environmental Permitting Regulations (EPR). The IED provides emission limit

values (ELVs) which must be complied with. It should be noted that the use of the IED emission limits ensures a worst-case assessment as they are higher than the likely emission concentrations.

9.3.45 Although emission limits are not included in the IED for emissions of polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) or ammonia (NH_3), emissions of these pollutants have been included in the modelling. For these pollutants, advice provided within the BAT BREF Note for Waste Incinerators has been used to determine an appropriate emission concentration for use in the modelling.

9.3.46 For the purposes of this assessment the Development is also assumed to be operating at full load, continually throughout the year. Stack emission parameters (i.e. flow rate, temperature etc.) have been provided by the operator, PCML. The input parameters and ELVs for the exhaust stack are provided in Appendix 9.3.

9.3.47 The assessment of metals has been undertaken in accordance with the Environmental Agency's (EA) metals guidance note, which provides a two step approach to assessing Group III trace metals. Step 1 comprises a worst case screening assessment which assumes that each of the group III metals are emitted from the stack at the maximum IED ELV (0.5 mg/Nm^3). The same approach has also been adopted for the Group I and II metals.

9.3.48 Where the screening criteria set out in Step 1 of the guidance are not met, Step 2 which is a case specific screening, is undertaken. This comprises modelling using the worst case measured concentrations obtained from monitoring at 18 Municipal Waste Incinerators and Waste Wood Co-Incinerators, as specified in the guidance. As the Development operates on waste wood rather than municipal waste and is newer than the majority of the incinerators sampled in the guidance, it is considered likely that this will provide a worst-case assessment.

9.3.49 The stack height of 43m is based on the stack height screening assessment that has been undertaken for the Facility[19]. This aligns with the stack height as detailed in the 'As Built' topographic survey.

Abnormal Emission Scenarios

9.3.50 Consideration has been given to the potential impacts of the Facility in the event of failure of a number of processes associated with the abatement of emissions at the Facility as follows:

- Failure of Urea Injection Operation (for control of SO_2 and HCl emissions);
- Failure of Lime Dosing Operation (for control of SO_2 and HCl emissions);
- Failure of Activated Carbon Dosing (for control of heavy metals emissions); and
- Failure of Bag Filter (for control of particulates).

9.3.51 A summary of the emission parameters for each abnormal emission scenario is presented in Appendix 9.3.

9.3.52 As defined in the Environmental Permit for the Facility, the maximum allowable period for any one episode of abatement or monitoring equipment failure (separately or together) is 4 hours. In addition, the total allowable period for all such events aggregated over a year

must not exceed 60 hours. On this basis, impacts due to abnormal emissions have been assessed against short-term EALs for the protection of human health only.

Modelling Risk Assessment

9.3.53 In response to comments received for the Environmental Permit application, a sensitivity test was undertaken to establish the likely difference in the predicted results if an alternative air dispersion model was used. Modelling of emissions arising from the Facility was undertaken for inclusion in the 2021 VES using an alternative model (ADMS 5.2). This sensitivity test has not been repeated using the model inputs included in this assessment, however the comparison between the two sets of results can be relied on to provide an indication of the likely difference in predicted concentrations if an alternative model (ADMS 5.2) was used. The findings of the sensitivity test concluded that there was an insignificant difference between the two sets of results, a summary comparison table is provided in Appendix 9.4.

Assessment of Coastline Effects

9.3.54 Also in response to comments received for the Environmental Permit application, additional modelling was undertaken for inclusion in the 2021 VES using the coastal module of the ADMS 5.2 air dispersion model in order to determine the impact of the presence of the nearby coastline. The coastal module enables the effect of the coastline to be modelled by taking into account the temperature of the sea in the vicinity of the Site. A limitation of the coastline module of ADMS 5.2 is that the model cannot be run considering the effects of the coastline and buildings and terrain simultaneously. Therefore, to assess the impact of the coastline, the model was run twice, once with the coastline module activated and once without. For both model runs the effect of buildings and terrain were excluded and the results were compared to provide a quantitative assessment of the impact of the coastline. This coastline modelling has not been repeated using the model inputs included in this assessment, however the comparison between the two sets of results can be relied on to establish whether the use of the coastline module has any affect on the predicted results. The results indicated that the differences in the predicted concentrations with and without considering the effects of the coastline are minimal. As the effect of the coastline modules is minimal and the effects of the presence of buildings on the dispersion of the plume are likely to be more significant, the use of a coastal module is not considered necessary. Summary comparison tables of the results with and without the coastline module are provided in Appendix 9.5.

Local Meteorological Data

9.3.55 The dispersion modelling has been carried out using five years of hourly sequential meteorological data (2017 to 2021) in order to take account of inter-annual variability and reduce the effect of any atypical conditions. Data from the meteorological station at Cardiff Airport (Rhoose) (approximately 6 km west of the Site) have been used for the assessment. This is the closest meteorological station to the Site and at a similar proximity to the coast, it is therefore considered to be the most representative data currently available for the area.

Topography

9.3.56 The presence of elevated terrain can significantly affect the dispersion of pollutants by increasing turbulence and reducing the distance between the plume centre line and the ground level.

9.3.57 A terrain data file relating to the topography of the area surrounding the Development has been used in the dispersion modelling to assess the impact of terrain features on the dispersion of emissions. The terrain file comprises Land-Form Panorama data in NTF format which was converted to Digital Elevation Model (DEM) format for use in the model. The terrain data file used covered an area of 20km by 20km with 50m spacing centred on the Site.

Building Downwash / Entrainment

9.3.58 The presence of buildings close to emission sources can significantly affect the dispersion of pollutants by leading to a phenomenon called downwash. This occurs when a building distorts the wind flow, creating zones of increased turbulence. Increased turbulence causes the plume to come to ground earlier than otherwise would be the case and result in higher ground level concentrations closer to the stack.

9.3.59 Downwash effects are only significant where building heights are greater than 30 to 40% of the emission release height. The downwash structures also need to be sufficiently close for their influence to be significant.

9.3.60 The potential downwash structures included in the model and their heights are summarised in Table 9.9 below. Lower structures are included in the vicinity of the back-up generator stack.

Table 9.9: Structures included in the Model

Building Name	Height (m)
Welfare & Turbine Building	10.80
Reception Building	12.23
Main Process Building	23.11
ACC Structure	18.08
Silo	13.23
Plant	15.86
Diesel Generator Cabin	3.5
Ash Silo 1	18.16
Ash Silo 2	18.04
Air Blast Coolers	4.56

Nitric Oxide (NO) to Nitrogen Dioxide (NO_2) Conversion

9.3.61 Oxides of nitrogen (NO_x) emitted to atmosphere as a result of combustion will consist largely of nitric oxide (NO), a relatively innocuous substance. Once released into the atmosphere, NO is oxidised to NO_2. The proportion of NO converted to NO_2 depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as ozone (O_3).

9.3.62 A conversion ratio of 70% NO_x:NO_2 has been assumed for comparison of predicted concentrations with the long-term objectives for NO_2. A conversion ratio of 35% has been

utilised for the assessment of short-term impacts, as recommended by Environment Agency guidance[20].

Habitats Assessment

9.3.63 The modelled ground level pollutant concentrations are compared to the relevant Critical Levels for airborne pollutant concentrations. Critical levels are thresholds of airborne pollutant concentrations above which damage may be sustained to sensitive plants and animals. The critical levels for the protection of vegetation and ecosystems are provided in Appendix 9.6.

9.3.64 The modelled pollutant levels are also used to predict deposition rates, using typical deposition velocities obtained from the EA guidance AQTAG06 as recommended in the IAQM guidance for assessment of air quality impacts on nature conservation sites. A summary of typical NO_2, SO_2, NH_3 and HCl dry deposition velocities is presented in Table 9.10.

Table 9.10: Dry Deposition Velocity (m/s)

Pollutant	Grassland	Woodland
Nitrogen Dioxide (NO_2)	0.0015	0.0030
Sulphur Dioxide (SO_2)	0.012	0.024
Hydrogen Chloride (HCl)	0.025	0.06
Ammonia (NH_3)	0.02	0.03

9.3.65 The predicted nitrogen deposition rates assume a 100% NO_x: NO_2 conversion. This represents a worst-case for the assessment since nitric oxide (NO) has a lower deposition velocity than NO_2 and consequently results in lower deposition rates.

9.3.66 A total rate (wet + dry deposition) for HCl has been calculated using the following ratio presented for metals deposition within the EA Guidance.

HCl total deposition rate = HCl dry deposition rate x 3

9.3.67 Predicted ground level concentrations and acidification/ deposition rates were calculated following the methodology provided in the AQTAG guidance are compared with relevant air quality standards, critical levels and critical loads for the protection of sensitive ecosystems and vegetation as obtained from the APIS website, these are provided in Appendix 9.6.

Decommissioning

9.3.68 In the event of any potential decommissioning, emissions of dust and particulate matter may be generated as a result of the dismantling of the plant and buildings on the Site. As any decommissioning is considered likely to generate similar emissions to the demolition activities during construction an assessment using the IAQM guidance has been undertaken as described above.

Cumulative Effects

9.3.69 Cumulative effects can potentially be experienced during both the construction and operational phases.

9.3.70 During the construction phase, cumulative effects of dust and particulate matter generated from on-site activities may be experienced in locations in close proximity to two or more development sites and the timing of the construction phases overlap. There may also be an effect due to increased construction traffic on local roads if construction vehicles are to use the same routes to access the sites. As the construction of the Site is complete, a quantitative cumulative assessment against the currently committed / proposed developments has not been undertaken. However, a qualitative consideration of the likely cumulative effects associated with the development of the Site in combination with any nearby development activities has been undertaken in the context of the advice provided in the IAQM Guidance.

9.3.71 During the operational phase, cumulative effects may be experienced due to additional emissions in the area from proposed industrial facilities or emissions from additional road traffic on the surrounding roads. Information regarding the location and type of development for the committed developments described in Chapter 3: EIA Methodology, has been reviewed.

Determining Effect Significance

Construction (Retrospective) and Decommissioning Phases

9.3.72 The IAQM assessment methodology recommends that significance criteria are only assigned to the identified risk of dust impacts occurring from a construction activity following the application of appropriate mitigation measures. For almost all construction activities, the application of effective mitigation should prevent any significant effects occurring to sensitive receptors and therefore the residual effects will normally be negligible. Professional judgement has therefore been applied to whether effective mitigation was or will be in place during the construction phase and decommissioning phase, retrospectively.

Operational Phase

9.3.73 The significance of the predicted impacts has been determined following the advice provided in the EPUK & IAQM planning guidance, in combination with professional judgement. The EPUK & IAQM guidance recommends that the impact at individual receptors described by expressing the magnitude of incremental change in pollution concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with assessment criterion as summarised in Table 9.11 below.

Table 9.11: Impact Descriptors for Individual Receptors

LONG TERM AVERAGE CONCENTRATION AT RECEPTOR IN ASSESSMENT YEAR	% CHANGE IN CONCENTRATION RELATIVE TO AIR QUALITY ASSESSMENT LEVEL (AQAL) (A)			
	1	2-5	5-10	>10
75% OF LESS OF (AQAL	Negligible	Negligible	Slight adverse	Moderate adverse

76-94% OF AQAL	Negligible	Slight adverse	Moderate adverse	Moderate adverse
103-109% OF AQAL	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
110% OF MORE OF AQAL	Moderate adverse	Moderate adverse	Substantial adverse	Substantial adverse

(A) A CHANGE IN CONCENTRATION OF LESS THAN 0.5% OF THE AQAL IS CONSIDERED NEGLIGIBLE, HOWEVER CHANGES BETWEEN 0.5% AND 1% ARE ROUNDED UP TO 1%.

9.3.74 The EPUK & IAQM guidance notes that the criteria in Table 9.12 should be used to describe impacts at individual receptors and should be considered as a starting point to make a judgement on significance of effects that the assessment of overall significance should be based on professional judgement, taking into account several factors, including:

- 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.

9.3.75 The EPUK & IAQM guidance also provides a range of impact descriptors for determining the magnitude of short term impacts which are defined for averaging periods of 1-hour or less. The EPUK & IAQM guidance refers to the EA threshold criteria of 10% as a screening criterion. For point sources short term impacts of less than 10% of the AQAL are described as 'negligible', regardless of existing air quality. Where the short-term process concentrations are 11% to 20% of the AQAL, the magnitude of the impact can be described as small and the severity of the impact is described as 'slight'. The magnitude of impacts of 21% to 50% are described as 'medium' and the severity of the impact is described as 'moderate' and the magnitude of impacts over 51% are described as 'large' and the severity of the impact as 'substantial'.

9.3.76 For the Group III metals, the significance of emissions is determined following the EA guidance on releases from Waste Incinerators, which recommends a two step approach to screening Group III metals, which is as follows:

Step One – predict metal concentrations assuming each metal is being emitted at 100% of the group emission limit value. The results are compared against the following criteria:

- Where the Process Contribution (PC) of any metal exceeds 1% of the long term or 10% of the short term AQAL, the Predicted Environmental Concentrations (PEC) should be compared to the AQAL; and
- Where the PEC exceeds 100% of the Air Quality Assessment Level (AQAL), then the assessment should proceed to Step Two.

Step Two – make predictions for the metals exceeding the criteria in Step One, using emission factors provided in the guidance. Where the PC of any metal exceeds 1% of the long term or 10% of the short term AQAL, then the PEC should be compared to the AQAL. Where the PEC is less than 100% of the AQAL, then the impact of the metal can be screened out.

9.3.77 In order to determine the likely significance of the impacts at designated ecological sites, the EA guidance criteria have been used. These are outlined in Table 9.12 below.

Table 9.12: Significance Criteria for Ecological Sites

Ecological Site/Habitat	Stage One	Stage Two
SPAs, SACs, Ramsar sites or SSSIs	The impact is considered insignificant if: ▪ Long term PC < 1% of the long term Critical Level; ▪ Short term PC < 10% of the short term Critical Level	The impact is considered to be insignificant if: ▪ Long term PC > 1% and predicted environmental concentrations (PEC) < 70% of the long term Critical Level
Local Nature Sites (ancient woodlands, local wildlife sites, national and local nature reserves)	The impact is considered to be insignificant if: ▪ Long term PC < 100% of the long term Critical Level ▪ Short term PC < 100% of the short term Critical Level	

A Ramsar Site is a wetland site designated to be of international importance under Ramsar Convention

9.3.78 The EA criteria are intended to screen emissions in order to determine if the impacts are insignificant. If the screening criteria are exceeded, advice should be sought from a suitably qualified ecologist to determine if the impact is likely to be significant as a result of the sensitivity of the individual habitat to the relevant pollutants.

9.3.79 The IAQM guidance for the assessment of ecological habitats, suggest that local nature sites should be treated the same as SSSIs and European sites.

Assumptions and Limitations

9.3.80 The detailed modelling was undertaken using IED Emission Limits rather than actual emission concentrations, as such the modelled concentrations are likely to be worst case.

9.4 Baseline Conditions

Pre-Construction Baseline

9.4.1 The pre-construction baseline for consideration within the construction phase assessment was obtained from the historical Defra background pollutant maps. The background PM_{10} concentration in the vicinity of the Site in 2016 is considered to have been 13.8µg/m^3.

Current Baseline

Local Air Quality Management

9.4.2 Vale of Glamorgan Council (VoGC) carries out frequent review and assessments of air quality within the area and produces reports in accordance with the requirements of Defra, as summarised below.

Nitrogen Dioxide

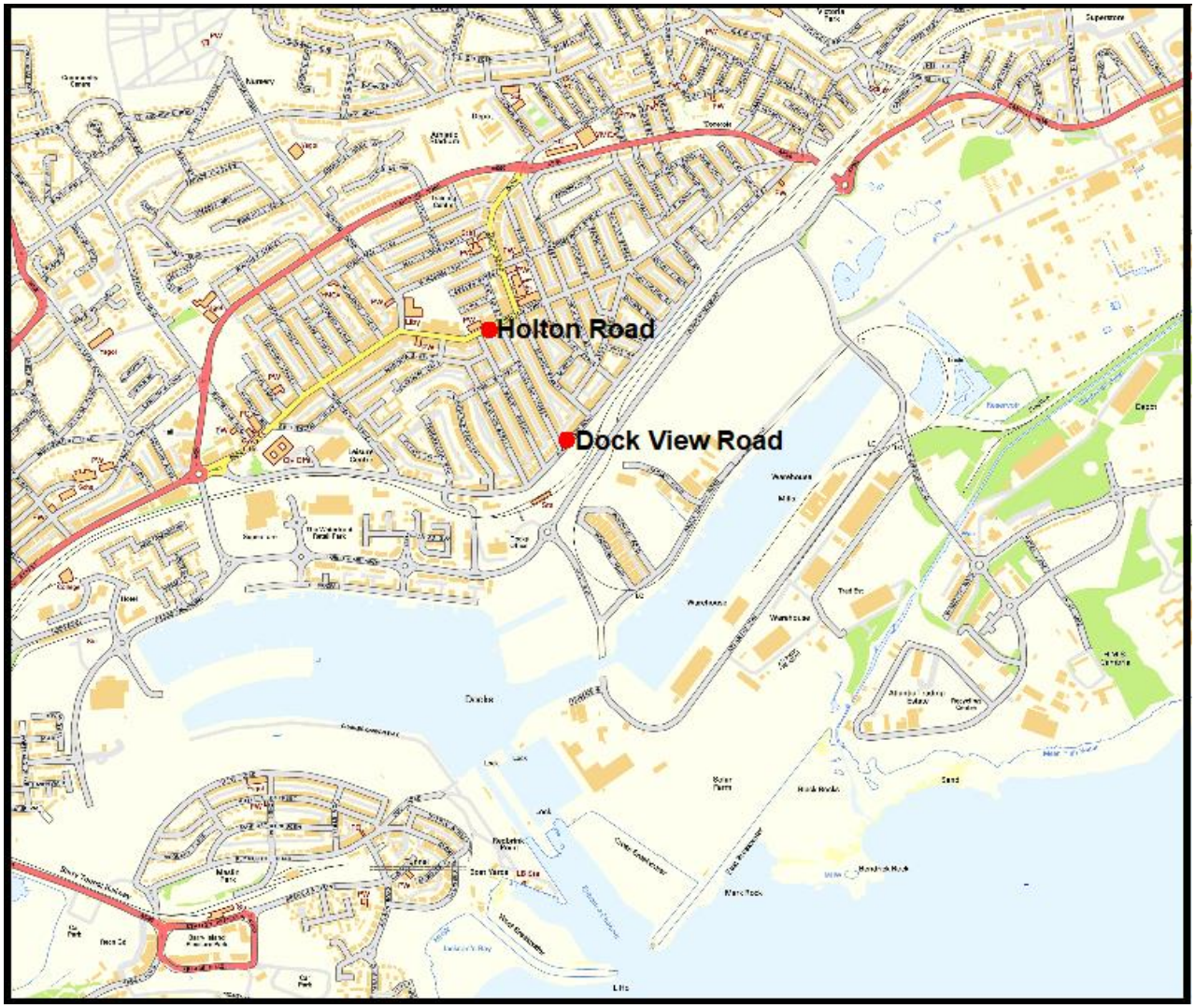
9.4.3 The VoGC operate three automatic monitoring stations that monitor concentrations of nitrogen dioxide (NO_2). The closest two monitoring stations are located along Dock View Road (approximately 250m to the northwest of the Site) and at Holton Road (approximately 615m to the northwest of the Site). Both these monitors are AQMesh analysers and are sited at roadside locations. Ratified monitoring data from these two monitoring stations are presented in Table 9.13 below. The location of the nearby continuous monitoring stations are illustrated in Figure 9.1.

Table 9.13: NO_2 Concentrations measured at VoGC Automatic Monitors

Monitoring Site	Statistic	Year				
		2016	2017	2018	2019	2020
Dock View Road	Annual Mean	-	-	-	23.2	19
	No. of exceedance of hourly mean limit of 200µg/m^3	-	-	-	0	0
Holton Road	Annual Mean	-	-	-	23.7	20.2
	No. of exceedance of hourly mean limit of 200µg/m^3	-	-	-	0	0

Source: Vale of Glamorgan Council. Air Quality Progress Report 2021

Figure 9.1: Location of Continuous Monitoring Stations



9.4.4 At the time of writing the 2020 monitoring data were the latest available. The results of the automatic monitoring show that the NO_2 concentrations have comfortably met the relevant objective level at roadside locations in the vicinity of the Site in both 2019 and 2020.

9.4.5 VoGC also operates an extensive network of passive NO_2 diffusion tubes. Ratified monitoring data measured at the closest diffusion tubes to the Site are presented in Table 9.14 below. The location of the nearby diffusion tubes are illustrated in Figure 9.2.

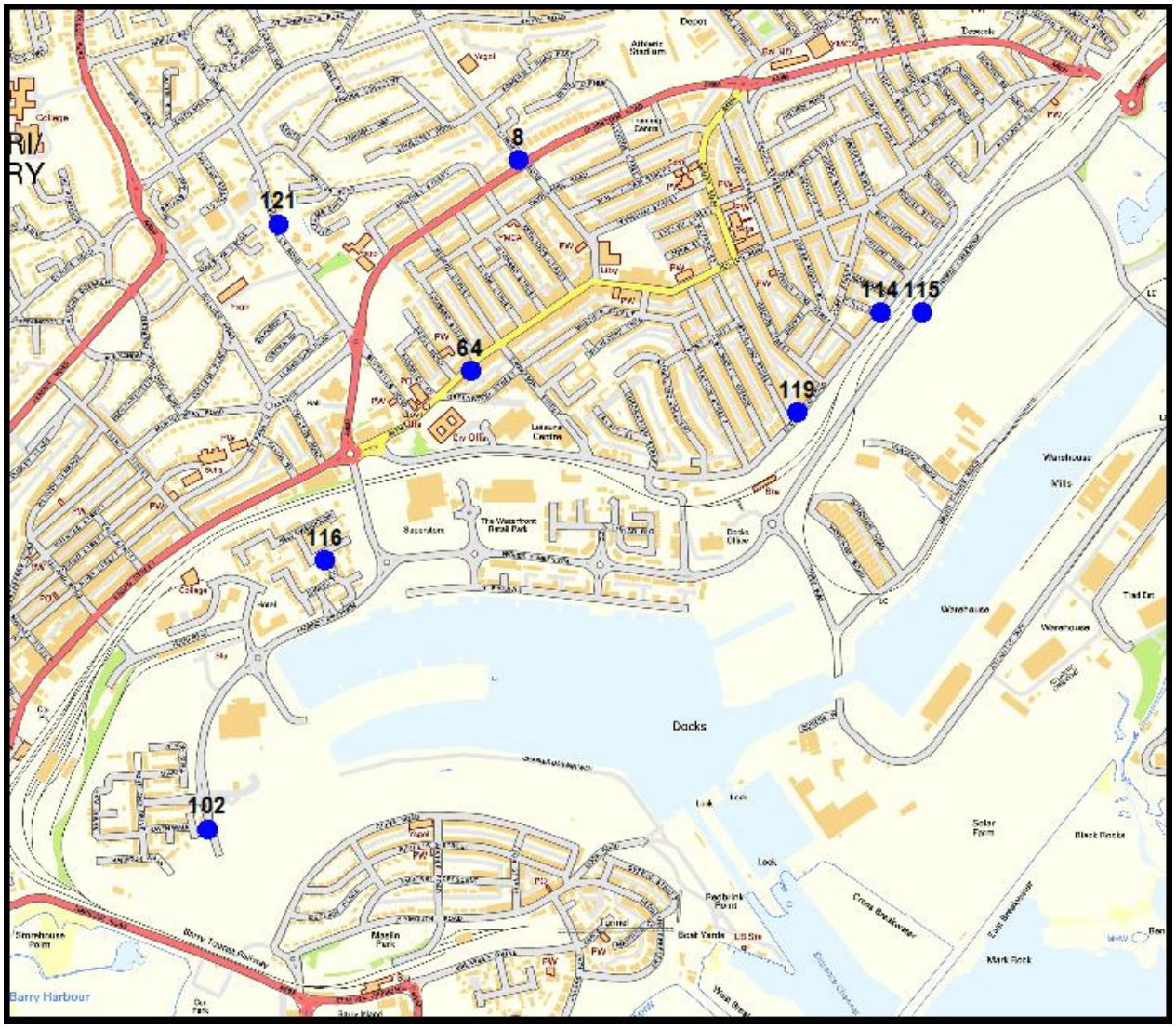
Table 9.14: NO_2 Concentrations measured at VoGC Diffusion Tube Monitoring Sites

ID	Site Name	Type	OS Grid Reference	Year				
				2016	2017	2018	2019	2020
114	107 Dock View Road	Roadside	312585, 168171	-	-	13.5	13.4	11.5
115	20 Barry Road, Cadoxton	Kerbside	312677, 168171	-	-	26.2	25.9	21.9

ID	Site Name	Type	OS Grid Reference	Year				
				2016	2017	2018	2019	2020
119	Dock View Road	Kerbside	315445, 170577	-	-	-	18.9	15.4
8	Tynewydd Road	Kerbside	311797, 168503	23.5	31.9	28.1	27.5	22.9
64	Holton Road	Roadside	311690, 168042	20.4	17.5	16.6	17.8	12.8
121	Buttrills Road	Kerbside	311270, 168363	-	-	-	-	22.4
116	Ffordd y Mileniwm	Roadside	311371, 167628	-	-	-	17.5	15.3
102	Powell Dyffryn Way	Roadside	311115, 167041	-	17.4	17.9	17.0	14.6
66	17 Churchill Terrace	Roadside	313342, 168823	27.7	30.4	26.7	26.3	23.8
117	1 Riverside Place, Barry	Kerbside	313612, 166807	-	-	-	26.7	21.9
41	Despenser Road	Urban Background	315278, 168451	14.5	11.5	10.9	10.6	8.4

Source: Vale of Glamorgan Council. Air Quality Progress Report 2021

Figure 9.2: Location of Diffusion Tubes



9.4.6 The monitoring data shows NO_2 concentrations are below the relevant annual mean AQS objective level of 40µg/m^3 in the vicinity of the Site.

9.4.7 The data show large decreases in concentrations between the year 2019 and 2020. It is considered likely that this decrease is at least in part due to the travel restrictions in place during the COVID-19 pandemic. The concentrations measured during 2020 are therefore unlikely to be representative of the concentrations during normal traffic flow. The 2019 measured concentrations are therefore considered more likely to provide a realistic estimate of the likely current concentrations than the 2020 data.

9.4.8 Diffusion tubes are unable to record short-term concentrations of NO_2. However, as detailed previously, where annual mean concentrations are less than 60µg/m^3 it is unlikely there will be any exceedances of the 1-hour objective. Based on the annual mean concentrations recorded during the past five years it is expected that the 1-hour mean objective is being met in the vicinity of the Site.

9.4.9 Further information regarding background concentrations in the vicinity of the Site have been obtained from the Defra background pollutant maps. The 2018 Defra background maps provide estimated concentrations for the years 2018 to 2030. For the purposes of

this assessment 2019 background concentrations have been obtained. The mapped background NO_2 concentration for the vicinity of the Site is 10.4µg/m^3.

9.4.10 In 2019 concentrations measured at roadside monitoring site along Dock View Road (Diffusion Tube 114) was 13.4µg/m^3. This diffusion tube is positioned approximately 3m from the edge of the road. At the kerbside monitor along Dock View Road (Diffusion Tube 119), the measured concentration in 2019 was 18.9µg/m^3. This diffusion tube is positioned approximately 1m from the roadside and is co-located with the AQ Mesh automatic monitor.

9.4.11 Residential properties along Dock View Road are currently the closest residential properties to the Site. Road traffic although not modelled in this assessment, may slightly increase the concentrations above the background concentration along this road. The residential properties are set back along the road by approximately 3m taking account of front gardens and the roadside pavement. The monitored concentration at the roadside Diffusion Tube 114 is considered to be the most appropriate measurement of the likely existing annual mean NO_2 concentrations at these properties. The measured roadside concentration at Diffusion Tube 114 of 13.4µg/m^3 has been used as the existing baseline concentration.

Particulate Matter (PM_{10})

9.4.12 Ratified PM_{10} monitoring data measured at the two nearby automatic monitors is presented in Table 9.15.

Table 9.15: PM_{10} Concentrations measured at the Automatic Monitors

Monitoring Site	Statistic	Year				
		2016	2017	2018	2019	2020
Dock View Road	Annual Mean	-	-	-	11.2	7.3
	No. of exceedance of 24 hourly mean limit of 50µg/m^3	-	-	-	9	0
Holton Road	Annual Mean	-	-	-	8.99	8.7
	No. of exceedance of 24 hourly mean limit of 50µg/m^3	-	-	-	0	0

Source: Vale of Glamorgan Council. Air Quality Progress Report 2021

9.4.13 The results of the automatic monitoring show that the PM_{10} concentrations have comfortably met the relevant annual mean objective level of 40µg/m^3 at roadside locations in the vicinity of the Site.

9.4.14 Further information regarding background concentrations in the vicinity of the Site have been obtained from the Defra background pollutant maps. In 2019, the mapped background PM_{10} concentration for the vicinity of the Site is 12.4µg/m^3. As this concentration is slightly higher than the roadside concentration measured along Dock View Road in 2019, the value obtained from the Defra background maps has been used as the existing baseline concentration.

Particulate Matter ($PM_{2.5}$)

9.4.15 VoGC does not monitor $PM_{2.5}$ concentrations in the vicinity of the Site. Information regarding background concentrations has therefore been obtained from the Defra background pollutant maps. In 2019, the mapped background $PM_{2.5}$ concentration for the vicinity of the Site is 8.1µg/m^3, this has been used as the existing baseline concentration.

Carbon Monoxide, Sulphur Dioxide and Total Organic Carbon (as Benzene)

9.4.16 VoGC does not monitor CO, SO_2 or Benzene concentrations. Information regarding background concentrations have therefore been obtained from the Defra background maps. The CO, SO_2 and benzene mapped concentrations are based on 2001 monitoring data. For CO and benzene, factors are available to project concentrations to future years. For SO_2, year adjustment factors are not provided as it is considered that away from specific locations near industrial sources or areas of high domestic coal burning, that SO_2 background concentrations would change very little, i.e. the factor would be close to 1. Therefore the 2001 mapped concentration has been used as the background concentration within the assessment. It should be noted that this is a worst-case value.

9.4.17 A summary of the mapped annual mean background concentrations assumed for the assessment is presented in Table 9.16.

Table 9.16: Mapped Annual Mean Background Concentrations for CO, SO_2 and Benzene (µg/m^3)

Pollutant	Annual Mean
Carbon Monoxide (CO)	104.5
Sulphur Dioxide (SO_2)	3.9
Benzene (C_6H_6)	0.2

Hydrogen Chloride

9.4.18 Ambient monitoring of Hydrogen Chloride (HCl) was previously undertaken as part of the Defra Acid Gases and Aerosols Network (AGNET) at a number of locations around the UK.

9.4.19 The closest monitoring sites to the Site are at Narberth in Pembrokeshire and Rosemaund in Herefordshire. Monitoring of Hydrogen Chloride ceased in January 2016. The latest available data (2013 to 2015) was reviewed, the average annual mean HCl concentration measured at Narberth and Rosemaund during this period was 0.24µg/m^3 and 0.23µg/m^3 respectively. The UK average during this period was 0.26µg/m^3. It is considered that the concentration measured at Narberth (0.24µg/m^3) provides a reasonable estimate of the background concentrations of HCl in the vicinity of the Site.

Hydrogen Fluoride

9.4.20 Monitoring of ambient levels of Hydrogen Fluoride (HF) is not currently carried out in the UK, however the Expert Panel on Air Quality Standards (EPAQS) report on halogen and hydrogen halides in ambient air cites a modelling study which suggests that the typical natural background HF concentration is 0.5µg/m^3, with an elevated background concentration of 3µg/m^3 where there are local anthropogenic emission sources.

9.4.21 The natural background HF concentration of 0.5µg/m^3 is assumed to be applicable at sensitive human health and habitat receptors in the vicinity of the Site.

Trace Metals

9.4.22 Defra undertakes monitoring of trace elements at a number of locations in the UK as part of the UK Urban and Rural Heavy Metals Monitoring Networks. Monitoring of Mercury is undertaken within the Automatic Rural Mercury Network.

9.4.23 To provide an indication of the range of trace metal concentrations that occur in the UK the average concentrations measured at rural and urban background sites between 2018 and 2020 are summarised in Table 9.17.

Table 9.17: Average UK Trace Metal Rural and Urban Background Concentrations (ng/m^3)

Pollutant	Rural	Urban	EAL
Antimony (Sb)	Not measured	Not measured	5000
Arsenic (As)	0.48	0.77	6
Cadmium (Cd)	0.08	0.27	5
Chromium (Cr)	0.85	5.78	NA
Trivalent Chromium (Cr(III))	0.68 (a)	4.62 (a)	5000
Hexavalent Chromium (Cr(VI))	0.17 (b)	1.16 (b)	0.25
Cobalt (Co)	0.04	0.26	1000
Copper (Cu)	1.89	11.0	10000
Lead (Pb)	2.89	9.90	250
Manganese (Mn)	2.15	8.91	150
Mercury (Hg)	1.43 (c)	-	250
Nickel (Ni)	0.42	4.29	20
Thallium (Ti)	Not measured	Not measured	1000
Vanadium (V)	0.60	1.06	5000

(a) 80% of total chromium

(b) 20% of total chromium

(c) Gaseous mercury

9.4.24 With the exception of Cr(VI), all the measured concentrations are well below their respective EALs. Guidance issued by the Environment Agency for the assessment of Group 3 metals states that for screening purposes it should be assumed that Cr(VI) comprises 20% of the total background chromium. On this basis the urban average Cr(VI) concentration substantially exceeds the EAL.

9.4.25 For the purposes of the assessment, the UK average urban background concentrations are assumed to be reasonably representative of the baseline trace metal concentrations in the vicinity of the Site.

Dioxins and Furans

9.4.26 Monitoring of Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) is currently carried out by Defra at six locations in the UK (Hazelrigg, High Muffles, London, Manchester, Auchencorth Moss and Weybourne) as part of the Toxic Organic Micropollutants (TOMPs) Network.

9.4.27 To provide an indication of the range of PCDD/F concentrations that occur in the UK, a summary of the annual mean concentrations measured between 2014 and 2016, which are the latest data available from Defra website is presented in Table 9.18.

Table 9.18: UK PCDD/Fs Concentration (fg TEQ/m^3)

Monitoring Site	Type	2014	2015	2016
London	Urban Background	2.9	4.4	18.7
Manchester	Urban Background	17.0	6.0	8.7
Auchencorth Moss	Rural Background	0.01	-	0.2
High Muffles	Rural Background	1.4	1.1	4.4
Hazelrigg	Rural Background	2.6	5.3	3.1
Weybourne	Rural Background	1.6	1.4	20.4

9.4.28 The average concentration measured at the two urban monitoring sites from 2014 to 2016 is 9.6 fg/m^3 and is assumed to be reasonably representative of the background dioxin and furan concentrations at the Site and nearby sensitive receptors.

Polycyclic Aromatic Hydrocarbons (as benzo[a]pyrene)

9.4.29 Monitoring of benzo(a)pyrene (B[a]P) is currently carried out by Defra at a number of locations in the UK as part of the PAH monitoring and analysis network.

9.4.30 The average urban and rural background concentrations measured in the UK between 2015 and 2019 were 0.26 ng/m^3 and 0.082 ng/m^3 respectively. The average urban background concentration is assumed to provide a reasonable estimate of the background concentration in the vicinity of the Site.

Polychlorinated Biphenyls

9.4.31 Monitoring of PCBs is currently carried out by Defra at six locations in the UK as part of the TOMPs Network. The average PCB concentration measured at the urban background monitoring sites from 2016 to 2018 is 0.096 ng/m^3. This is assumed to provide a reasonable estimate of the background concentration in the vicinity of the Site.

Ammonia

9.4.32 Ambient monitoring of ammonia (NH_3) concentrations is carried out as part of the National Ammonia Monitoring Network (NAMN). The nearest ammonia monitoring sites to the Site are Narberth and Rosemaund. The average ammonia concentration measured at these two sites between 2016 and 2020 is 2.52 $\mu g/m^3$. This is assumed to provide a reasonable estimate of the background concentration in the vicinity of the Site.

Summary of Receptors and Sensitivity

Human Health

9.4.33 LAQM.TG(16) describes in detail typical locations where consideration should be given to pollutants defined in the Air Quality Regulations. Generally, the guidance suggests that all locations 'where members of the public are regularly present' should be considered. At such locations, members of the public will be exposed to pollution over the time that they are present, and the most suitable averaging period of the pollutant needs to be used for assessment purposes.

9.4.34 For instance, on a footpath, where exposure will be transient (for the duration of passage along that path) comparison with short-term standard (i.e. 15-minute mean or 1-hour mean) may be relevant. In a school, or adjacent to a private dwelling, however; where exposure may be for longer periods, comparison with long-term (such as 24-hour mean or annual mean) standards may be most appropriate. In general terms, concentrations associated with long-term standards are lower than short-term standards owing to the chronic health effects associated with exposure to low level pollution for longer periods of time.

9.4.35 The locations of the discrete existing sensitive receptors selected for the assessment are presented in Table 9.19 and Figures 9.3. Committed / Proposed sensitive receptors are also included in Table 9.19 and presented in Figure 9.4.

Table 9.19: Summary of Sensitive Human Receptors

ID	Receptor	Type	Easting	Northing
R1	Vistamar House	Residential	312199	167543
R2	Estrella House	Residential	312205	167579
R3	Orellana House	Residential	312115	167585
R4	37 to 48 Heol Clithrydd	Residential	312105	167617
R5	14 Clos Tyniad Glo	Residential	312105	167684
R6	Docks Office	Industrial	312243	167664
R7	3a Waverley Court	Residential	312038	167839
R8	3b Fryatt Street	Residential	311967	167945
R9	Phillipa Freeth Court	Residential	312162	167836
R10	Barry Dock Station	Station	312359	167806
R11	36 Station Street	Residential	312241	167962
R12	54 Dock View Road	Residential	312368	167918
R13	38 George Street	Residential	312324	168166

R14	Holton Primary School	School	312308	168315
R15	89 Dock View Road	Residential	312528	168111
R16	10 Jewel Street	Residential	312523	168315
R17	Children's Playground on Basset Street	Playground	312558	168491
R18	131 Dock View Road	Residential	312724	168359
R19	Wimbourne Buildings	Industrial	313155	167691
R20	Bendrick Road	Residential	313437	167606
R21	Public Recycling Facility	Recycling Facility	313445	167271
R22	Atlantic Crescent	Industrial	312983	167416
R23	Port Office	Industrial	312659	167100
R24	Queens Way	Industrial	312414	167253
R25	Dyfrig Street	Residential	312037	166947
Site and Future Receptors				
R26	North of Office	Within Site	312627	167674
R27	East of Office	Within Site	312638	167671
R28	West of Main Processing Area	Within Site	312589	167677
R29	East of Main Processing Area	Within Site	312601	167696
R30	Wood Processing	Within Site	312577	167731
R31	Wood Processing	Within Site	312553	167748
R32	Land at Barry Waterfront	Committed / Proposed Development	311124	167331
R33	East Quay, Barry Waterfront	Committed / Proposed Development	312476	167480
R34	East Quay, Barry Waterfront	Committed / Proposed Development	312541	167542
R35	East Quay, Barry Waterfront	Committed / Proposed Development	312295	167444
R36	East Quay, Barry Waterfront	Committed / Proposed Development	312413	167469
R37	East Quay, Barry Waterfront	Committed / Proposed Development	312397	167636
R38	Winmill Park, Hayes Road	Committed / Proposed Development	313761	167992
R39	Spider Camp, Hayes Lane	Committed / Proposed Development	313636	167501
R40	Former LME UK Ltd Site, Sully	Committed / Proposed Development	314245	168444

R41	Land to the South of Cog Road, Sully	Committed / Proposed Development	315871	168631
R42	Land at Hayes Wood, Sully	Committed / Proposed Development	313692	167696
R43	Land at Hayes Road, Barry	Committed / Proposed Development	313597	167667
R44	Land at Subway Road, Barry	Committed / Proposed Development	312145	167672
R45	Sea View Labour Club, Dock View Road, Barry	Committed / Proposed Development	312457	168051
R46	The Windsor, 177-170 Holton Road, Barry	Committed / Proposed Development	312170	168206
R47	Castle Hotel, 44 Jewel St, Barry	Committed / Proposed Development	312487	168203
R48	Land at Upper Cosmeston Farm, Penarth	Committed / Proposed Development	317933	169038
R49	Land West of Swanbridge Road, Sully	Committed / Proposed Development	315953	168313
R50	Land to the South and West of the Goodsheds, Barry	Committed / Proposed Development	311121	167596
R51	Former Railway Sidings, Ffordd y Mileniwm, Barry	Committed / Proposed Development	312876	168435
R52	Land at Model Farm, Port Road, Rhoose	Committed / Proposed Development	308672	167180
R53	Leckwith Quay, Leckwith Road, Leckwith	Committed / Proposed Development	316046	174850

Figure 9.3: Existing Sensitive Receptor Locations (Human Health)

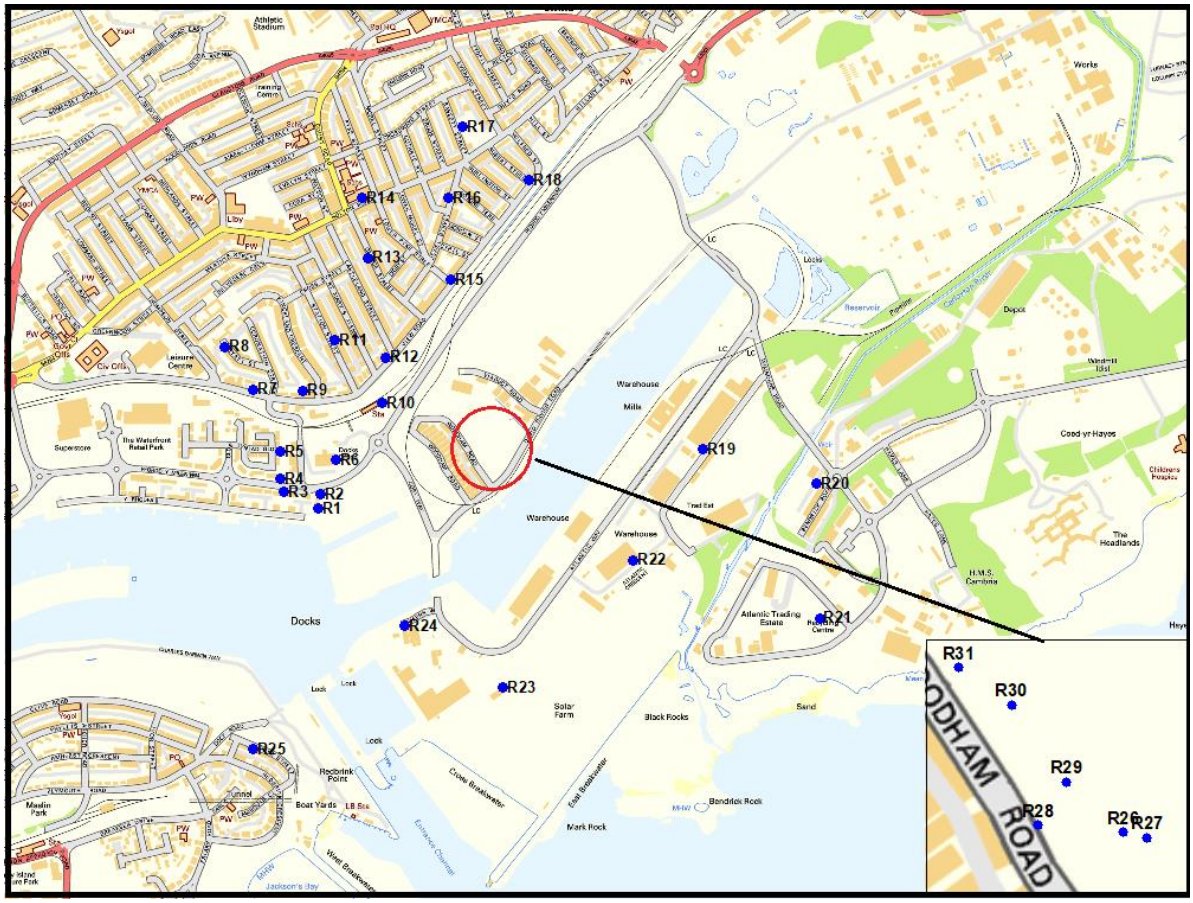
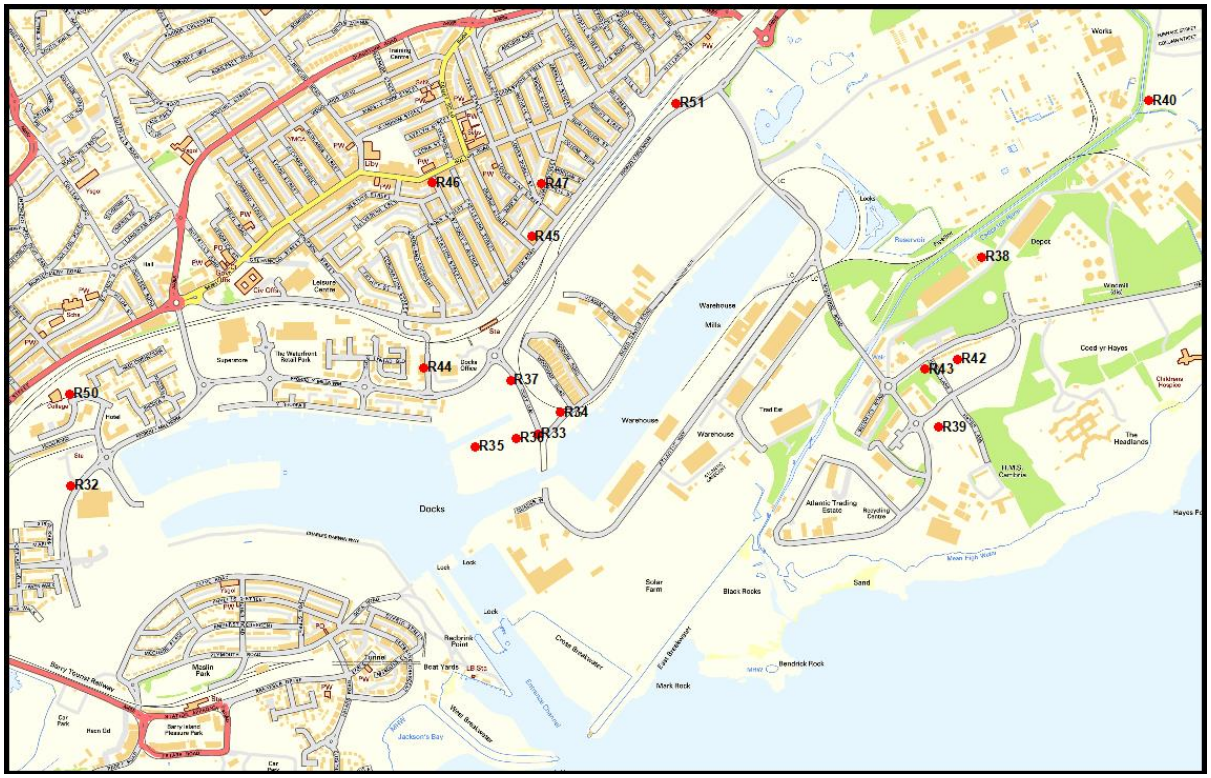


Figure 9.4: Committed / Proposed Sensitive Receptor Locations (Human Health)



Habitat Assessment

9.4.36 The Environment Agency's risk assessment guidance states that the impact of emissions to air on vegetation and ecosystems should be assessed for the following habitat sites within 10 km of the source:

- Special Areas of Conservation (SACs) and candidate SACs (cSACs) designated under the EC Habitats Directive21;
- Special Protection Areas (SPAs) and potential SPAs designated under the EC Birds Directive22; and
- Ramsar Sites designated under the Convention on Wetlands of International Importance23

9.4.37 Within 2 km of the source:

- Sites of Special Scientific Interest (SSSIs) established by the 1981 Wildlife and Countryside Act;
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR);
- Local wildlife sites (LWS), county wildlife sites (CWS) and potential wildlife sites (PWS);
- Sites of Importance for Nature Conservation (SINC) and
- Ancient woodland.

9.4.38 Habitat receptor designations and locations relevant to the assessment are presented in Table 9.20. There are two SSSI's within 2 km of the Site: Hayes Point to Bendrick Rock SSSI and Barry Island SSSI. However, both sites have been designated for geological interest only and have therefore not been included in the assessment.

Table 9.20: Summary of Sensitive Habitats

ID	Receptor	Approximate Location of Nearest Boundary to Site
E1	Cadoxton River SINC	690 m east
E2	Cadoxton Wetlands SINC	780 m northeast
E3	Cadoxton Ponds Wildlife Reserve	780 m northeast
E4	Fields at Merthyr Dyfan SINC	1.9 km northwest
E5	Gladstone Road Pond SINC	1.2 km west-northwest
E6	Nells Point East SINC	1.1 km south-southwest
E7	Friars Point SINC	1.98 km southwest
E8	North of North Road SINC	1.98 km northeast
E9	Ancient Woodland (Hayes Lane)	1.1 km east
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	3.9 km east
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	6.1 km east
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	9.4 km east

E13	Severn Estuary SAC	6.3 km east

9.4.39 A number of receptors have been included within the model within each sensitive ecological habitat. Due to its size, the Severn Estuary SAC has been represented within the model as a grid of spacing 250m. The location of the sensitive habitat sites are illustrated in Figure 9.5, 9.6 and 9.7.

Figure 9.5: Location of Sensitive Ecological Habitat Receptors (SINC and Ancient Woodland sites)

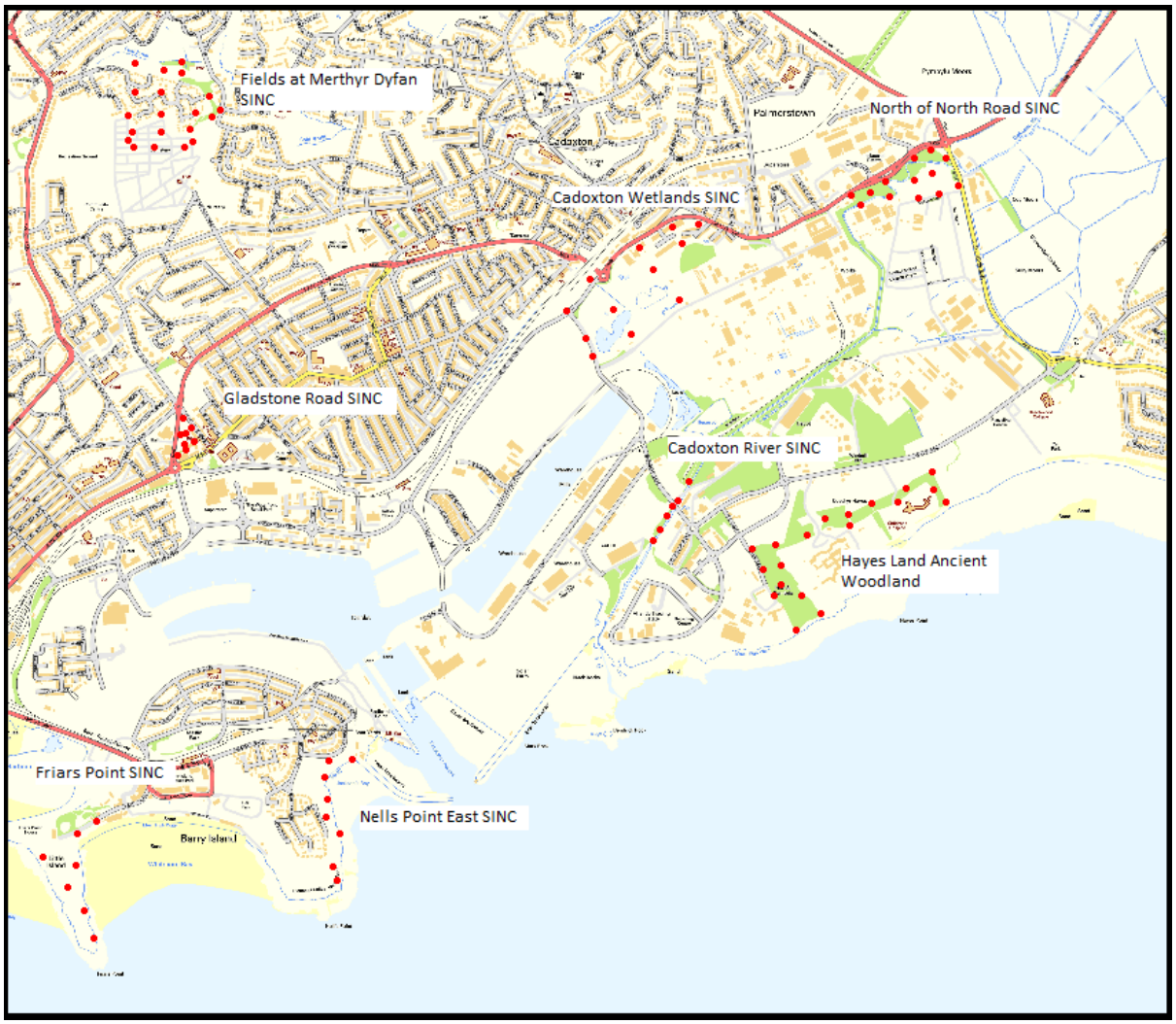


Figure 9.6: Location of Sensitive Ecological Habitat Receptors (SPA and Ramsar sites)

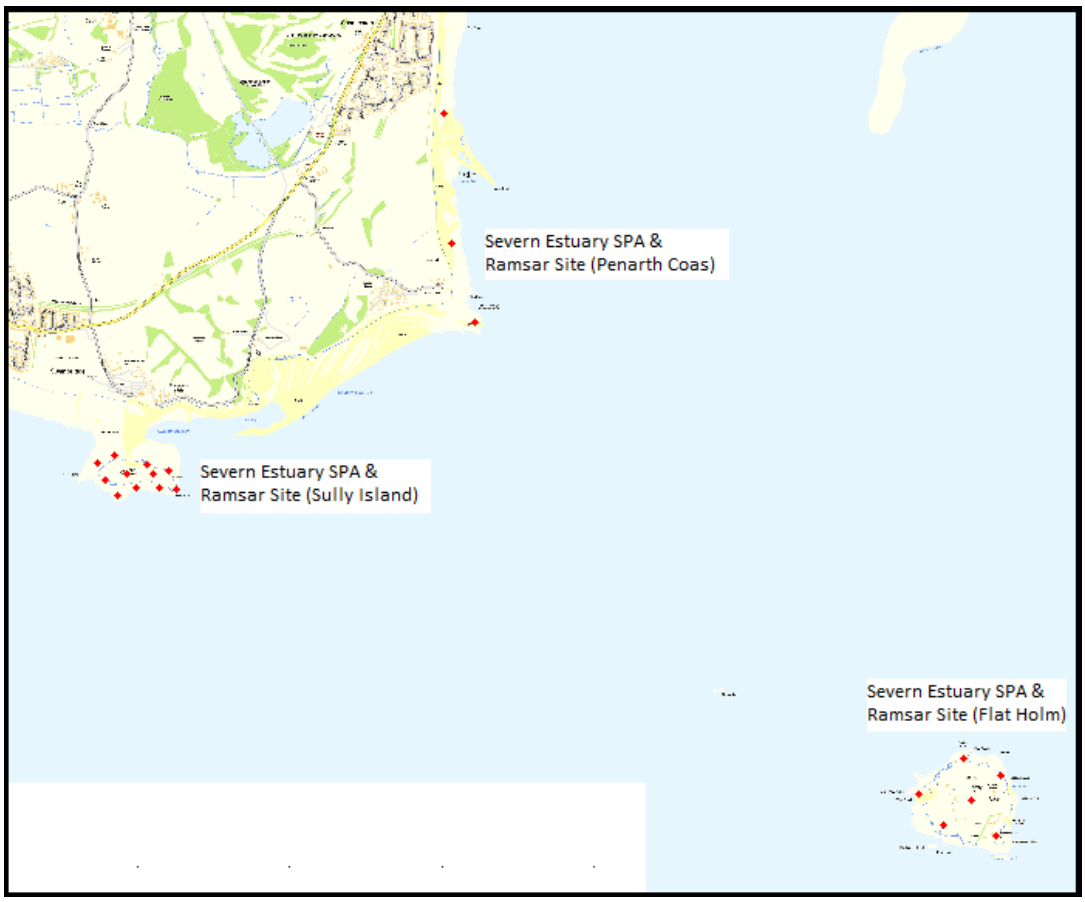
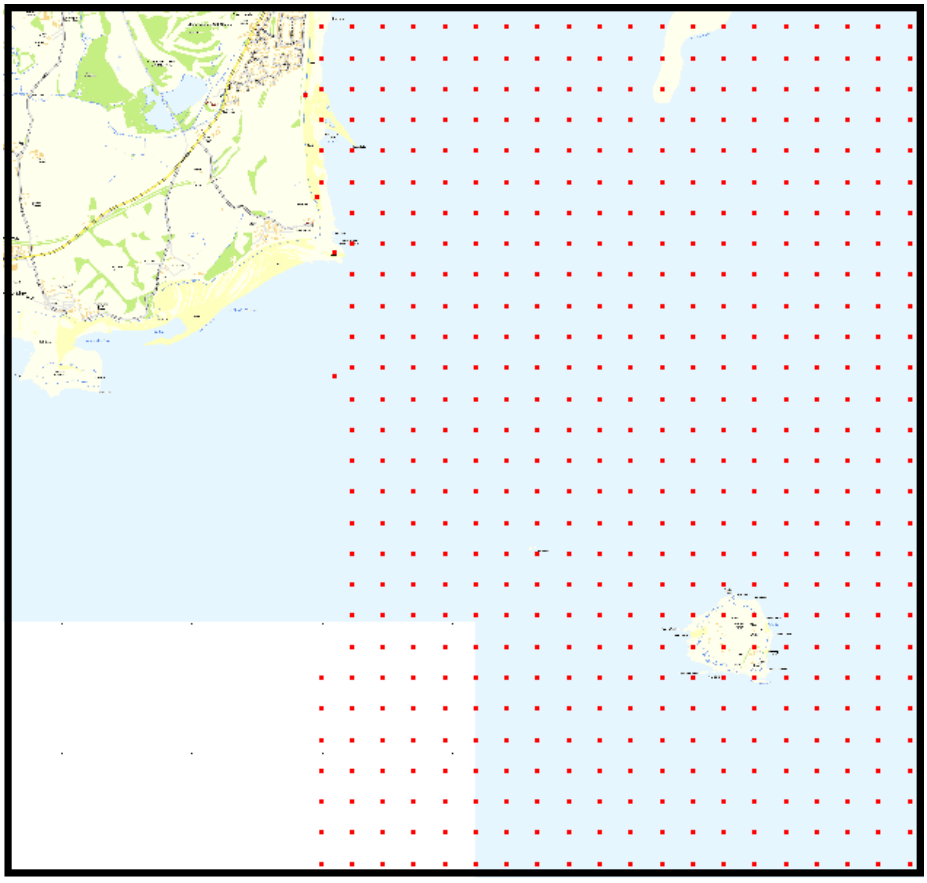


Figure 9.7: Location of Sensitive Ecological Habitat Receptors (SAC) – modelled as a grid



9.5 Scheme Design and Embedded Mitigation

9.5.1 For the purposes of the assessment of construction phase impacts, no embedded mitigation is assumed.

9.5.2 For the purposes of the assessment of operational phase impacts, it is assumed that the best practice management techniques will be followed with regards to the delivery, handing and storage of waste wood fuel.

9.5.3 For the purposes of assessing the emissions from the Facility it is assumed that the flue gas treatment plant comprising Selective Non-Catalytic Reduction (SNCR) and Selective Catalytic Reduction (SCR) will be operational, as such emissions for Ammonia (NH_3) have been included. The emissions of NO_x have been assumed at the IED emission limits to ensure a worst case assessment.

9.5.4 Also included in the assessment is the correct operation of the urea and lime dosing, activated carbon system and bag filter. Additional scenarios have been included in the modelling to account for failure of these systems.

9.5.5 For the purposes of the decommissioning phase impacts, no embedded mitigation is assumed.

9.6 Construction Assessment (Retrospective)

Assessment of Effects

Area Sensitivity

9.6.1 The assessment of dust impacts is dependent on the proximity of the most sensitive receptors to the Site boundary. A summary of the receptor and area sensitivity to health and dust soiling impacts is presented in Table 9.21.

Table 9.21: Summary of Receptors and the Local Area to Dust Impacts

Receptor	Distance from Site Boundary (m)	Approximate Number of Receptors	Sensitivity to Health Impacts (a)		Sensitivity to Dust Soiling Impacts	
			Receptor	Area	Receptor	Area
Residential Properties	< 20 m	0	High	-	High	-
	< 50 m	0	High	-	High	-
	< 100 m	0	High	-	High	-
Places of Work	< 20 m	1 - 10	Medium	Low	Medium	Medium
Overall Sensitivity of the Area			**Low**		**Medium**	

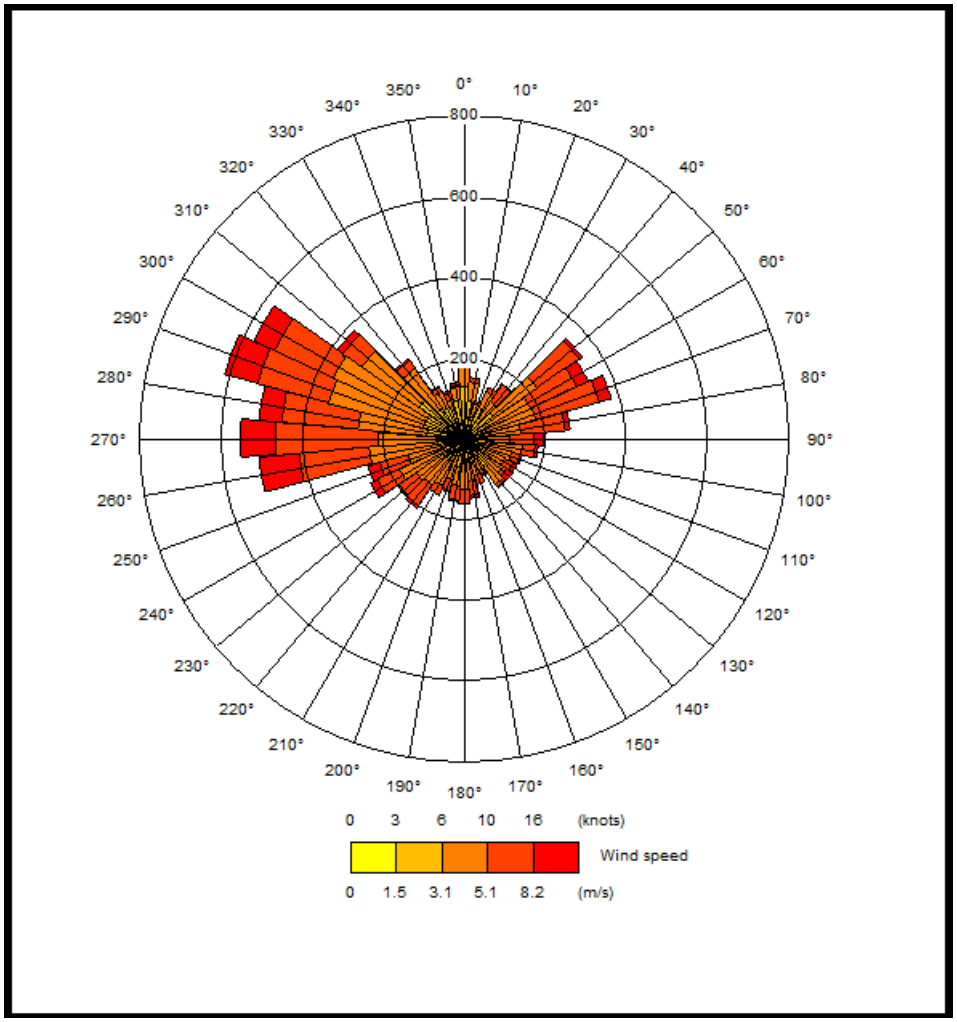
(a) Estimated background PM_{10}

9.6.2 Construction traffic accessed the Site via David Davies Road / Cory Way. The Site is large, therefore receptors within 500m along David Davies Road / Cory Way from the Site access are considered to determine the sensitivity of the area to effects from track-out. There were no sensitive residential receptors along the roads within this distance, however there are a number of commercial/industrial units within 20m of the roadside, therefore the sensitivity of the area to impacts from trackout is considered to be medium for nuisance dust and low for human health impacts from particulates.

9.6.3 The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited will depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust is naturally suppressed by rainfall.

9.6.4 A wind rose from Cardiff Airport is provided in Figure 9.3, which shows that the prevailing wind is from the west-northwest, therefore receptors to the east-southeast of the Site are the most likely to experience dust impacts from the Development. The area to the east-southeast of the Site is a dock and beyond that industrial land.

Figure 9.8: Wind Rose of Cardiff Airport (2021)



Dust Emission Magnitude

9.6.5 Prior to construction of the Development, the Site comprised previously developed (brownfield) land in an industrial location. There were no buildings or structures that required removal prior to the commencement of the construction works.

9.6.6 Earthworks primarily would have involved excavating material, haulage, tipping and stockpiling. This would also have involved levelling of the Site and landscaping. To ensure a worst-case assessment, the magnitude of the dust emission for the earthworks phase is considered to have been large.

9.6.7 Dust emissions during construction works depend on the scale of the works, method of construction, construction materials and duration of build. The Development had a total volume of below 100,000m^3 and the main construction materials had a low to moderate potential for dust release. Based on the overall size of the Development the dust emission magnitude is considered to have been medium.

9.6.8 Factors influencing the degree of trackout and associated magnitude of effect include vehicle size, vehicle speed, vehicle numbers, geology and duration. Construction traffic accessed the Site via David Davies Road / Cory Way. Construction traffic during the majority of the construction phase was approximately 30 2-way HGV trips per day. However, during the muck shifting phase, there were up to 100 2-way HGV trips per day. Based on the likely movements per day, dust emission magnitude due to trackout is considered to have been medium during the majority of the construction phase and large during the muck shifting phase. To ensure a worst-case assessment the dust emission magnitude is assumed to have been large.

Dust Risk Effects

9.6.9 A summary of the potential risk of dust impacts, based on the low overall sensitivity of the area to human health and medium overall sensitivity to dust soiling impacts, is presented in Table 9.22.

Table 9.22: Risk of Dust Impacts Prior to Mitigation

Source	Impact Magnitude	Human Health Risk	Dust Soiling Risk
Earthworks	Large	Low Risk	Medium Risk
Construction	Medium	Low Risk	Medium Risk
Trackout	Large	Low Risk	Medium Risk

Mitigation Measures, Monitoring & Residual Effects

9.6.10 The control of dust emissions from construction site activities relies upon management provision and mitigation techniques to reduce emissions of dust and limit dispersion. Where dust emission controls have been used effectively, large-scale operations have been successfully undertaken without adverse impacts to nearby properties.

9.6.11 A medium risk of dust soiling impacts and a low risk of human health (PM_{10}) effects is predicted at nearby receptors during the construction of the Development. Appropriate

mitigation measures for the Site have been identified following the IAQM guidance and based on the risk effects presented in Table 9.22. It is reasonable to assume that the 'highly recommended' measures set out within the IAQM guidance would have been adhered to during the construction of the Development.

'Highly Recommended' Measures

- develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the log book;
- carry out regular site inspections, record inspection results, and make an inspection log available to the local authority when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- agree dust deposition, dust flux or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site.
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- fully enclose site or specific operations where there is a high potential for dust production and the activities are being undertaken for an extensive period;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If being re-used on site, cover as detailed below;
- cover, seed or fence stockpiles to prevent wind whipping;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- produce a construction logistic plan to manage the sustainable delivery of goods and materials;
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;

- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
- avoid bonfires and burning of waste materials;
- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site;
- avoid dry sweeping of large areas;
- ensure vehicles entering and leaving the site are covered to prevent the escape of materials during transport;
- inspect on-site haul routes for integrity and instigate necessary repairs to the surfaces as soon as reasonably practicable;
- record all inspections of haul routes and any subsequent action in a site log book;
- install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned;
- implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);
- ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit; and
- access gates to be located at least 10 m from receptors where possible.

9.6.12 In addition to the 'recommended' measures, the IAQM guidance also sets out 'desirable' measures which should also have been considered:

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspections results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided in necessary.
- Impose and signpost a maximum-speed limit of 15mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking and car-sharing).

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Only remove the cover in small areas during work and not all at once.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplied of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

9.6.13 A Project Environmental Plan (PEP) was approved by VoGC for the Site in May 2016 to identify and manage the environmental risks associated with the Site during the construction phase. With regards to the control of dust, the PEP includes the following measures that were put in place at the Site:

- Ensure all construction traffic follows specifically designed routes:
- Implement speed limits for all vehicular movements;
- Cover all vehicles carrying loose materials;
- Dampen down haul routes, as necessary, to reduce dust emissions.
- Conduct all cutting and grinding operations in a manner to reduce the risk of dust migration e.g. wet cutting techniques;
- Adopt dust suppression techniques (e.g. water suppression) to reduce dust emissions from all crushing and screening activities;
- Locate stockpiles away from any sensitive receptors, where feasible;
- Seed / seal soil stockpiles to reduce the risk of dust migration;
- Regularly monitor both on and off site to ensure minimal dust impacts upon local neighbours and wildlife

9.6.14 A Construction Phase Plan (CPP) was approved by VoGC for the Site in January 2016 to provide the information required to manage the construction works and control site risks. With regards to the control of dust, the CPP states that a tractor bowser was employed during dry periods to minimise dust nuisance.

9.6.15 Following implementation of the above measures the residual effect of emissions of dust and particulate matter during the construction of the Development would have been **negligible**.

9.7 Operational Assessment

Assessment of Effects

Normal Operations / Emissions

Effects at Human Health Receptors

9.7.1 Predicted process concentrations (PC) for the five years of meteorological data are presented as the maximum arising off-site and at each of the discrete receptors identified in Table 9.19. Predicted concentrations have also been predicted at the location of the committed developments identified in Chapter 3: EIA Methodology. For ease of reading, the results at each of the committed developments are provided in Appendix 9.7 and only the highest concentration at a committed development is provided in the tables below.

9.7.2 The maximum PC is added to the established baseline concentration in the vicinity of the Site to determine the maximum predicted environmental concentrations (PEC). The predicted concentrations are compared to the relevant air quality standards and the significance of impact is determined using the EPUK & IAQM significance criteria as described above.

9.7.3 For comparison against short term air quality standards short term background concentrations have been determined which are twice the long term background concentrations. The exception to this is 24 hour PM_{10} concentrations for which the long-term background concentrations are added in accordance with advice provided in LAQM.TG16.

Nitrogen Dioxide

9.7.4 Annual and hourly mean NO_2 concentrations are presented in Table 9.23 below. The hourly mean AQAL, which is the hourly mean AQS objective level of 200µg/m^3 includes an allowable number of exceedances in a year (18). Concentrations are presented as the 99.8th percentile of hourly mean values for direct comparison with the 200µg/m^3 level.

Table 9.23: Predicted annual and hourly mean NO_2 Concentrations (µg/m^3)

		Annual Mean			Hourly Mean		
ID	Receptor	PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.87	2.2	14.3	11.8	5.9	38.6
R2	Estrella House	0.81	2.0	14.2	11.9	6.0	38.7
R3	Orellana House	0.72	1.8	14.1	10.9	5.5	37.7
R4	37 to 48 Heol Clithrydd	0.66	1.6	14.1	10.8	5.4	37.6
R5	14 Clos Tyniad Glo	0.56	1.4	14.0	10.8	5.4	37.6
R6	Docks Office	0.61	1.5	14.0	11.8	5.9	38.6
R7	3a Waverley Court	0.46	1.2	13.9	9.8	4.9	36.6
R8	3b Fryatt Street	0.42	1.1	13.8	8.8	4.4	35.6
R9	Phillipa Freeth Court	0.56	1.4	14.0	10.8	5.4	37.6

R10	Barry Dock Station	0.56	1.4	14.0	13.0	6.5	39.8
R11	36 Station Street	0.50	1.3	13.9	10.9	5.5	37.7
R12	54 Dock View Road	0.49	1.2	13.9	11.7	5.8	38.5
R13	38 George Street	0.29	0.7	13.7	9.2	4.6	36.0
R14	Holton Primary School	0.23	0.6	13.6	7.9	4.0	34.7
R15	89 Dock View Road	0.36	0.9	13.8	11.1	5.6	37.9
R16	10 Jewel Street	0.28	0.7	13.7	9.2	4.6	36.0
R17	Children's Playground on Basset Street	0.23	0.6	13.6	7.8	3.9	34.6
R18	131 Dock View Road	0.28	0.7	13.7	8.8	4.4	35.6
R19	Wimbourne Buildings	1.50	3.7	14.9	11.2	5.6	38.0
R20	Bendrick Road	1.05	2.6	14.5	8.1	4.1	34.9
R21	Public Recycling Facility	0.85	2.1	14.3	7.4	3.7	34.2
R22	Atlantic Crescent	1.24	3.1	14.6	12.1	6.1	38.9
R23	Port Office	0.22	0.5	13.6	8.3	4.1	35.1
R24	Queens Way	0.31	0.8	13.7	10.7	5.4	37.5
R25	Dyfrig Street	0.25	0.6	13.7	7.1	3.6	33.9
Maximum Off Site Concentration (highest concentration predicted within the modelled grid)		1.88	4.7	15.3	25.6	12.8	52.4
Maximum Concentration at a Committed / Proposed Development		0.87	2.2	14.3	20.4	10.2	47.2
Standard		40µg/m^3			200µg/m^3		
Baseline		13.4µg/m^3			16.8µg/m^3		

9.7.5 The results of the assessment demonstrate that the Air Quality Assessment Level (AQAL) for annual mean NO_2 concentrations, which is the AQS objective level of 40µg/m^3 will be met across the whole of the study area. The highest predicted concentration within the study area is a concentration of 15.3µg/m^3 which is 33.6% of the AQAL.

9.7.6 The highest annual mean NO_2 concentration predicted at an existing sensitive receptor where the annual mean AQAL is applicable is 14.5µg/m^3 which 36.1% of the AQAL, this was predicted at receptor R20, Bendrick Road which is located approximately 750m to the east of the Site.

9.7.7 The operation of the Development is predicted to increase the annual mean NO_2 concentrations in the vicinity of the Site. The greatest increase in annual mean NO_2 concentrations within the study area is 1.88µg/m^3 which is 4.7% of the AQAL. It should be noted that the annual mean AQAL is not applicable at this location due to lack of relevant exposure.

9.7.8 The greatest increase in annual mean NO_2 concentrations at a location of a sensitive receptor, where the annual mean AQAL is applicable, is 1.05µg/m^3 which is 2.6% of the AQAL.

9.7.9 In accordance with the impact descriptors provided by the EPUK & IAQM guidance, , which are described in Table 9.12, the impact at each assessed receptor is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.10 Receptors were placed at the location of the proposed and committed developments in the vicinity of the Site. The highest annual mean NO_2 concentration predicted at a committed development is 14.3µg/m^3 (35.7% of the AQAL) at the location of a residential development at East Quay, Barry Waterfront located to the southwest of the Site. The predicted increase in concentration is 0.87µg/m^3 (2.2% of the AQAL), therefore the impact at each of the locations of future sensitive receptors is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.11 The highest predicted annual mean PC's over the five years modelled are presented as a contour plot in Figure 9.9.

Figure 9.9: Annual Mean NO_2 Process Contribution Contour Plot

9.7.12 The results of the assessment demonstrate that the hourly mean NO_2 AQAL, which is the AQS objective level of 200μg/m^3 will be met across the whole of the study area. The highest predicted concentration within the study area is a concentration of 52.4μg/m^3 which is 26.2% of the AQAL.

9.7.13 The operation of the Development is predicted to increase the hourly mean NO_2 concentrations in the vicinity of the Site. The greatest increase in hourly mean NO_2 concentrations within the study area is 25.6μg/m^3 which is 12.8% of the AQAL.

9.7.14 The greatest increase in hourly mean NO_2 concentrations at a location of an existing sensitive receptor, is 13.0μg/m^3 which is 6.5% of the AQAL which is predicted at Receptor D10, Barry Dock Station. In accordance with the EPUK & IAQM guidance, the impact of the Development on hourly mean NO_2 concentrations at the existing sensitive receptors is described as negligible. The overall significance of the impacts is determined to be negligible **negligible.**

9.7.15 The highest hourly mean NO_2 concentration predicted at a proposed / committed development is 47.2μg/m^3 which is 23.6% of the AQAL, this is predicted at the location of a residential development at East Quay, Barry Waterfront. The predicted increase at this location is 20.4μg/m^3 (10.2% of the AQAL) which is marginally above the EPUK & IAQM significance criteria threshold. It should be noted that the concentrations presented are the worst case concentrations predicted over a five year period. The predicted concentrations include a contribution from the back-up generator which is tested for half an hour once a week. It is unlikely that the operation of the back-up generator would coincide with worst case meteorological conditions. The actual concentrations likely to be experienced are likely to be lower than those presented. Due to the above and as the concentrations are well below the AQAL and only marginally above the significance threshold, the overall significance of the impacts on hourly mean NO_2 concentrations is also considered to be **negligible**.

9.7.16 The highest hourly mean NO_2 concentration predicted within the Site itself is 49.2μg/m^3 (24.6% of the AQAL). As this is well below the relevant AQAL, the impact with regards to new exposure is considered to be **negligible**.

9.7.17 The highest predicted hourly mean PC's over the 5 years modelled are presented as a contour plot in Figure 9.10.

Figure 9.10: Hourly Mean NO_2 Process Contribution Contour Plot

Particulate Matter (PM_{10})

9.7.18 Annual and 24-hour mean PM_{10} concentrations are presented in Table 9.24 below. The 24-hour mean AQAL, which is the AQS objective level of 50µg/m^3 includes an allowable number of exceedances in a year (35). Concentrations are presented as the 90.4th percentile of hourly mean values for direct comparison with the 50µg/m^3 level.

Table 9.24: Predicted annual and 24-hour mean PM_{10} Concentrations (µg/m^3)

ID	Receptor	Annual Mean			24-Hour Mean		
		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.06	0.15	12.46	0.24	0.48	12.6
R2	Estrella House	0.06	0.14	12.46	0.21	0.43	12.6
R3	Orellana House	0.05	0.13	12.45	0.18	0.37	12.6
R4	37 to 48 Heol Clithrydd	0.05	0.12	12.45	0.16	0.31	12.6
R5	14 Clos Tyniad Glo	0.04	0.10	12.44	0.13	0.26	12.5

R6	Docks Office	0.04	0.11	12.44	0.15	0.30	12.5
R7	3a Waverley Court	0.03	0.08	12.43	0.12	0.24	12.5
R8	3b Fryatt Street	0.03	0.08	12.43	0.10	0.20	12.5
R9	Phillipa Freeth Court	0.04	0.10	12.44	0.14	0.28	12.5
R10	Barry Dock Station	0.04	0.10	12.44	0.13	0.26	12.5
R11	36 Station Street	0.04	0.09	12.44	0.12	0.23	12.5
R12	54 Dock View Road	0.03	0.09	12.43	0.11	0.22	12.5
R13	38 George Street	0.02	0.05	12.42	0.06	0.13	12.5
R14	Holton Primary School	0.02	0.04	12.42	0.05	0.10	12.4
R15	89 Dock View Road	0.03	0.06	12.43	0.08	0.16	12.5
R16	10 Jewel Street	0.02	0.05	12.42	0.06	0.11	12.5
R17	Children's Playground on Basset Street	0.02	0.04	12.42	0.05	0.10	12.4
R18	131 Dock View Road	0.02	0.05	12.42	0.07	0.14	12.5
R19	Wimbourne Buildings	0.11	0.27	12.51	0.29	0.58	12.7
R20	Bendrick Road	0.08	0.19	12.48	0.17	0.35	12.6
R21	Public Recycling Facility	0.06	0.15	12.46	0.15	0.30	12.6
R22	Atlantic Crescent	0.09	0.22	12.49	0.24	0.47	12.6
R23	Port Office	0.02	0.04	12.42	0.03	0.06	12.4
R24	Queens Way	0.02	0.05	12.42	0.06	0.12	12.5
R25	Dyfrig Street	0.02	0.04	12.42	0.06	0.12	12.5
Maximum Off Site Concentration		0.13	0.34	12.53	0.35	0.69	12.7
Maximum Concentration at a Committed / Proposed Development		0.06	0.16	12.46	0.26	0.52	12.7
Standard		40µg/m^3			50µg/m^3		
Baseline		12.4µg/m^3			12.4µg/m^3		

9.7.19 The results of the assessment demonstrate that the annual mean PM_{10} Air Quality Assessment Level (AQAL), which is the AQS objective level of 40µg/m^3 will be met across the whole of the study area. The highest predicted concentration within the study area is a concentration of 12.53µg/m^3 which is 31.3% of the AQAL.

9.7.20 The highest annual mean PM_{10} concentration predicted at an existing sensitive receptor where the annual mean AQAL is applicable is 12.48µg/m^3 which 31.2% of the AQAL, this was predicted at receptor R20, Bendrick Road which is located approximately 750m to the east of the Site.

9.7.21 The operation of the Development is predicted to increase the annual mean PM_{10} concentrations in the vicinity of the Site. The greatest increase in annual mean PM_{10}

concentrations within the study area is 0.13µg/m^3 which is 0.34% of the AQAL. It should be noted that the annual mean AQAL is not applicable at this location due to lack of relevant exposure.

9.7.22 The greatest increase in annual mean PM_{10} concentrations at a location of a sensitive receptor, where the annual mean AQAL is applicable, is 0.08µg/m^3 which is 0.19% of the AQAL.

9.7.23 In accordance with the impact descriptors provided by the EPUK & IAQM guidance , which are described in Table 9.12, the impact as each assessed receptor is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.24 Receptors were placed at the location of the proposed and committed developments in the vicinity of the Site. The highest concentration predicted at the location of a committed development is 12.46µg/m^3 (31.2% of the AQAL) at the East Quay development at Barry Waterfront. The predicted increase as a result of the Development is 0.06µg/m^3 (0.16% of the AQAL), the impact at each of the committed developments is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.25 The results also demonstrate the 24-hour mean AQAL will be met across the study area. The greatest impact within the study area is 0.35µg/m^3 which is 0.69% of the AQAL which is considered to be **negligible**.

9.7.26 The highest concentration predicted within a committed development is 12.7µg/m^3 (25.3% of the AQAL) at East Quay, Barry Waterfront. The predicted increase in 24-hour PM_{10} concentrations at this location is 0.26µg/m^3 (0.52% of the AQAL). The impact on 24-hour PM_{10} concentrations at the committed developments is therefore also considered to be **negligible**.

Particulate Matter ($PM_{2.5}$)

9.7.27 Annual mean $PM_{2.5}$ concentrations are presented in Table 9.52 below.

Table 9.25: Predicted annual $PM_{2.5}$ Concentrations (µg/m^3)

ID	Receptor	Annual Mean		
		PC	PC as % Standard	PEC
R1	Vistamar House	0.06	0.2	8.16
R2	Estrella House	0.06	0.2	8.16
R3	Orellana House	0.05	0.2	8.15
R4	37 to 48 Heol Clithrydd	0.05	0.2	8.15
R5	14 Clos Tyniad Glo	0.04	0.2	8.14
R6	Docks Office	0.04	0.2	8.14
R7	3a Waverley Court	0.03	0.1	8.13
R8	3b Fryatt Street	0.03	0.1	8.13
R9	Phillipa Freeth Court	0.04	0.2	8.14

R10	Barry Dock Station	0.04	0.2	8.14
R11	36 Station Street	0.04	0.1	8.14
R12	54 Dock View Road	0.03	0.1	8.13
R13	38 George Street	0.02	0.1	8.12
R14	Holton Primary School	0.02	0.1	8.12
R15	89 Dock View Road	0.03	0.1	8.13
R16	10 Jewel Street	0.02	0.1	8.12
R17	Children's Playground on Basset Street	0.02	0.1	8.12
R18	131 Dock View Road	0.02	0.1	8.12
R19	Wimbourne Buildings	0.11	0.4	8.21
R20	Bendrick Road	0.08	0.3	8.18
R21	Public Recycling Facility	0.06	0.2	8.16
R22	Atlantic Crescent	0.09	0.4	8.19
R23	Port Office	0.02	0.1	8.12
R24	Queens Way	0.02	0.1	8.12
R25	Dyfrig Street	0.02	0.1	8.12
Maximum Off Site Concentration		0.13	0.5	8.23
Maximum Concentration at a Committed / Proposed Development		0.06	0.2	8.16
Standard		25µg/m^3		
Baseline		8.1µg/m^3		

9.7.28 The results of the assessment demonstrate that the annual mean $PM_{2.5}$ AQAL, which is the AQS objective level of 25µg/m^3 will be met across the whole of the study area. The highest predicted concentration within the study area is a concentration of 8.23µg/m^3 which is 32.9% of the AQAL.

9.7.29 The highest annual mean $PM_{2.5}$ concentration predicted at an existing sensitive receptor where the annual mean AQAL is applicable is 8.19µg/m^3 which 32.7% of the AQAL, this was predicted at receptor R20, Bendrick Road.

9.7.30 The operation of the Development is predicted to increase the annual mean $PM_{2.5}$ concentrations in the vicinity of the Site. The greatest increase in annual mean $PM_{2.5}$ concentrations within the study area is 0.13µg/m^3 which is 0.5% of the AQAL. It should be noted that the annual mean AQAL is not applicable at this location due to lack of relevant exposure.

9.7.31 The greatest increase in annual mean $PM_{2.5}$ concentrations at a location of a sensitive receptor, where the annual mean AQAL is applicable, is 0.08µg/m^3 which is 0.3% of the AQAL.

9.7.32 In accordance with the impact descriptors provide by the EPUK & IAQM guidance, which are described in Table 9.12, the impact at each assessed receptor is described as negligible. The overall significance is determined to be **negligible**.

9.7.33 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. The highest concentration predicted at the location of a committed development is 8.16μg/m^3 (32.6% of the AQAL) predicted at the East Quay development at Barry Waterfront. The predicted increase in annual mean $PM_{2.5}$ concentrations at this location is 0.06μg/m^3 (0.2% of the AQAL). The impact of the Development on annual mean $PM_{2.5}$ concentrations at each of the committed developments is described as negligible. The overall significance of the impacts is also determined to be **negligible**.

Carbon Monoxide (CO)

9.7.34 Hourly and 8-hour CO concentrations are presented in Table 9.26 below.

Table 9.26: Predicted 8-hour CO and 1-hour mean CO Concentrations (μg/m^3)

ID	Receptor	Maximum 8-Hour Mean			Maximum 1-Hour Mean		
		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	6.8	0.07	215.8	7.8	0.03	216.8
R2	Estrella House	6.6	0.07	215.6	7.8	0.03	216.8
R3	Orellana House	6.2	0.06	215.2	7.5	0.02	216.5
R4	37 to 48 Heol Clithrydd	6.2	0.06	215.2	7.4	0.02	216.4
R5	14 Clos Tyniad Glo	6.3	0.06	215.3	7.4	0.02	216.4
R6	Docks Office	6.6	0.07	215.6	7.7	0.03	216.7
R7	3a Waverley Court	5.4	0.05	214.4	6.5	0.02	215.5
R8	3b Fryatt Street	4.7	0.05	213.7	6.1	0.02	215.1
R9	Phillipa Freeth Court	5.9	0.06	214.9	7.2	0.02	216.2
R10	Barry Dock Station	6.3	0.06	215.3	7.2	0.02	216.2
R11	36 Station Street	5.6	0.06	214.6	7.4	0.02	216.4
R12	54 Dock View Road	6.1	0.06	215.1	7.7	0.03	216.7
R13	38 George Street	4.0	0.04	213.0	6.8	0.02	215.8
R14	Holton Primary School	3.5	0.03	212.5	5.9	0.02	214.9
R15	89 Dock View Road	5.5	0.05	214.5	7.3	0.02	216.3
R16	10 Jewel Street	4.7	0.05	213.7	6.4	0.02	215.4
R17	Children's Playground on Basset Street	3.8	0.04	212.8	5.4	0.02	214.4
R18	131 Dock View Road	4.5	0.04	213.5	6.1	0.02	215.1
R19	Wimbourne Buildings	6.4	0.06	215.4	7.3	0.02	216.3
R20	Bendrick Road	4.9	0.05	213.9	5.5	0.02	214.5

R21	Public Recycling Facility	4.2	0.04	213.2	5.1	0.02	214.1
R22	Atlantic Crescent	6.5	0.07	215.5	7.9	0.03	216.9
R23	Port Office	4.7	0.05	213.7	6.7	0.02	215.7
R24	Queens Way	5.8	0.06	214.8	7.9	0.03	216.9
R25	Dyfrig Street	4.0	0.04	213.0	5.1	0.02	214.1
Maximum Off Site Concentration		7.2	0.07	216.2	24.7	0.08	233.7
Maximum Concentration at a Committed / Proposed Development		6.9	0.07	215.9	7.9	0.03	216.9
Standard		10,000µg/m^3			30,000µg/m^3		
Baseline		209µg/m^3			209µg/m^3		

9.7.35 The results of the assessment demonstrate that the 8-hour and 1-hour mean CO AQALs will be met across the study area. The impacts are extremely low in comparison to the AQALs, in accordance with the EPUK & IAQM guidance, the impact at each assessed receptor is described to be negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.36 Receptors were placed at the locations of the committed and proposed developments in the vicinity of the Site. Again, the impacts are considered to be extremely low in comparison to the AQALs, and are therefore described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.37 Receptors were also placed within the Site itself, where the short term AQALs are applicable. The highest predicted 8-hour mean CO concentration within the Site is 210.7µg/m^3 (2.1% of the AQAL) and the highest predicted hourly mean CO concentration within the Site is 213.5µg/m^3 (0.7% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Sulphur Dioxide (SO_2)

9.7.38 24-hour, 1-hour and 15-min mean SO_2 concentrations are presented in Table 9.27 below. The AQALs include an allowable number of exceedances in a year. Concentrations are presented as the 99.2nd percentile of 24-hourly mean values, the 99.7th percentile of hourly mean and 99.9th percentile of 15-minute means for direct comparison with the relevant standards.

Table 9.27: Predicted 24-hour, hourly and 15-minute mean SO_2 Concentrations (µg/m^3)

ID	Receptor	Max 24-Hour Mean			Max 1-Hour Mean			Max 15-Min Mean		
		PC	PC as % AQAL	PEC	PC	PC as % AQAL	PEC	PC	PC as % AQAL	PEC
R1	Vistamar House	2.6	2.1	10.4	14.5	4.2	22.3	19.9	7.5	27.7

R2	Estrella House	2.7	2.2	10.5	14.6	4.2	22.4	20.1	7.6	27.9
R3	Orellana House	2.4	1.9	10.2	13.5	3.8	21.3	19.0	7.1	26.8
R4	37 to 48 Heol Clithrydd	2.1	1.7	9.9	13.4	3.8	21.2	18.6	7.0	26.4
R5	14 Clos Tyniad Glo	2.1	1.7	9.9	13.1	3.8	20.9	18.4	6.9	26.2
R6	Docks Office	2.0	1.6	9.8	13.7	3.9	21.5	19.6	7.4	27.4
R7	3a Waverley Court	1.5	1.2	9.3	12.0	3.4	19.8	16.6	6.2	24.4
R8	3b Fryatt Street	1.4	1.1	9.2	10.9	3.1	18.7	15.4	5.8	23.2
R9	Phillipa Freeth Court	1.7	1.4	9.5	13.1	3.7	20.9	18.3	6.9	26.1
R10	Barry Dock Station	2.0	1.6	9.8	13.0	3.7	20.8	18.2	6.8	26.0
R11	36 Station Street	1.6	1.3	9.4	13.0	3.7	20.8	18.6	7.0	26.4
R12	54 Dock View Road	1.4	1.1	9.2	13.9	4.0	21.7	19.4	7.3	27.2
R13	38 George Street	0.9	0.7	8.7	11.2	3.2	19.0	17.1	6.4	24.9
R14	Holton Primary School	0.8	0.7	8.6	10.0	2.9	17.8	15.0	5.7	22.8
R15	89 Dock View Road	1.5	1.2	9.3	13.2	3.8	21.0	18.9	7.1	26.7
R16	10 Jewel Street	1.1	0.9	8.9	11.4	3.3	19.2	16.4	6.2	24.2
R17	Children's Playground on Basset Street	0.9	0.7	8.7	9.6	2.7	17.4	13.9	5.2	21.7
R18	131 Dock View Road	1.1	0.9	8.9	10.7	3.1	18.5	15.4	5.8	23.2
R19	Wimbourne Buildings	2.4	2.0	10.2	13.7	3.9	21.5	18.8	7.1	26.6
R20	Bendrick Road	1.7	1.3	9.5	10.4	3.0	18.2	14.4	5.4	22.2

R21	Public Recycling Facility	1.2	0.9	9.0	9.8	2.8	17.6	13.4	5.0	21.2
R22	Atlantic Crescent	2.0	1.6	9.8	14.5	4.1	22.3	19.9	7.5	27.7
R23	Port Office	1.2	0.9	9.0	10.1	2.9	17.9	16.6	6.2	24.4
R24	Queens Way	1.5	1.2	9.3	12.3	3.5	20.1	19.1	7.2	26.9
R25	Dyfrig Street	1.1	0.9	8.9	9.0	2.6	16.8	13.1	4.9	20.9
Maximum Off Site Concentration		2.7	2.2	10.5	15.1	4.3	22.9	26.5	10.0	34.3
Maximum Concentration at a Committed / Proposed Development		2.6	2.1	10.4	14.7	4.2	22.5	20.0	7.5	27.8
Standard		125µg/m^3			350µg/m^3			266µg/m^3		
Baseline		7.8µg/m^3			7.8µg/m^3			7.8µg/m^3		

9.7.39 The results of the assessment demonstrate that the 24-hour, 1-hour and 15-min mean SO_2 AQALs will be met across the study area. The impacts are less than 10% of the AQALs, therefore, in accordance with the EPUK & IAQM significance criteria, the impact at each assessed receptor is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.40 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. The impacts are less than 10% of the AQALs, therefore in accordance with the EPUK & IAQM significance criteria, the impact at each of the committed developments is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.41 Receptors were also placed within the Site itself, where the short term (hourly mean and 15-minute mean) AQALs are applicable. The highest predicted hourly mean SO_2 concentration (as a 99.7th percentile) within the Site is 12.7µg/m^3 (3.6% of the AQAL) and the highest predicted 15-minute mean SO_2 concentration (as a 99.9th percentile) within the Site is 16.3µg/m^3 (6.1% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Total Organic Carbon (as Benzene (C_6H_6))

9.7.42 Annual and hourly mean C_6H_6 concentrations are presented in Table 9.28 below.

Table 9.28: Annual and hourly mean C_6H_6 Concentrations (µg/m^3)

ID	Receptor	Annual Mean	Maximum 24-Hour Mean

		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.06	1.2	0.26	0.64	2.1	1.04
R2	Estrella House	0.06	1.2	0.26	0.57	1.9	0.97
R3	Orellana House	0.05	1.0	0.25	0.53	1.8	0.93
R4	37 to 48 Heol Clithrydd	0.05	0.9	0.25	0.53	1.8	0.93
R5	14 Clos Tyniad Glo	0.04	0.8	0.24	0.46	1.5	0.86
R6	Docks Office	0.04	0.9	0.24	0.55	1.8	0.95
R7	3a Waverley Court	0.03	0.7	0.23	0.43	1.4	0.83
R8	3b Fryatt Street	0.03	0.6	0.23	0.31	1.0	0.71
R9	Phillipa Freeth Court	0.04	0.8	0.24	0.43	1.4	0.83
R10	Barry Dock Station	0.04	0.8	0.24	0.47	1.6	0.87
R11	36 Station Street	0.04	0.7	0.24	0.38	1.3	0.78
R12	54 Dock View Road	0.03	0.7	0.23	0.40	1.3	0.80
R13	38 George Street	0.02	0.4	0.22	0.26	0.9	0.66
R14	Holton Primary School	0.02	0.3	0.22	0.20	0.7	0.60
R15	89 Dock View Road	0.03	0.5	0.23	0.34	1.1	0.74
R16	10 Jewel Street	0.02	0.4	0.22	0.33	1.1	0.73
R17	Children's Playground on Basset Street	0.02	0.3	0.22	0.28	0.9	0.68
R18	131 Dock View Road	0.02	0.4	0.22	0.27	0.9	0.67
R19	Wimbourne Buildings	0.11	2.1	0.31	0.54	1.8	0.94
R20	Bendrick Road	0.08	1.5	0.28	0.36	1.2	0.76
R21	Public Recycling Facility	0.06	1.2	0.26	0.35	1.2	0.75
R22	Atlantic Crescent	0.09	1.8	0.29	0.43	1.4	0.83
R23	Port Office	0.02	0.3	0.22	0.28	0.9	0.68
R24	Queens Way	0.02	0.4	0.22	0.41	1.4	0.81
R25	Dyfrig Street	0.02	0.4	0.22	0.28	0.9	0.68
Maximum Off Site Concentration		0.13	2.7	0.33	0.67	2.2	1.07
Maximum Concentration at a Committed / Proposed Development		0.06	1.2	0.26	0.61	2.0	1.01
Standard		5µg/m^3			30µg/m^3		
Baseline		0.2µg/m^3			0.4µg/m^3		

9.7.43 The results of the assessment demonstrate that the annual mean and 24-hour mean C_6H_6 AQALs will be met across the study area. The impact on annual mean C_6H_6 concentrations

at each of the assessed receptors is described as negligible in accordance with the EPUK & IAQM guidance. The overall significance of the impacts is determined to be negligible. The predicted 24 hour mean C_6H_6 PCs are low in comparison to the background and the AQAL, therefore the impacts are considered to be **negligible**.

9.7.44 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. Again, the impacts on both annual and 24 hour mean concentrations at the committed developments are also considered to be **negligible**.

Hydrogen Chloride (HCl)

9.7.45 Hourly mean HCl concentrations are presented in Table 9.29 below.

Table 9.29: Hourly mean HCl Concentrations (μg/m^3)

ID	Receptor	Maximum 1-Hour Mean		
		PC	PC as % Standard	PEC
R1	Vistamar House	4.71	0.6	5.19
R2	Estrella House	4.71	0.6	5.19
R3	Orellana House	4.48	0.6	4.96
R4	37 to 48 Heol Clithrydd	4.46	0.6	4.94
R5	14 Clos Tyniad Glo	4.44	0.6	4.92
R6	Docks Office	4.64	0.6	5.12
R7	3a Waverley Court	3.91	0.5	4.39
R8	3b Fryatt Street	3.63	0.5	4.11
R9	Phillipa Freeth Court	4.32	0.6	4.80
R10	Barry Dock Station	4.32	0.6	4.80
R11	36 Station Street	4.44	0.6	4.92
R12	54 Dock View Road	4.62	0.6	5.10
R13	38 George Street	4.07	0.5	4.55
R14	Holton Primary School	3.56	0.5	4.04
R15	89 Dock View Road	4.41	0.6	4.89
R16	10 Jewel Street	3.82	0.5	4.30
R17	Children's Playground on Basset Street	3.25	0.4	3.73
R18	131 Dock View Road	3.65	0.5	4.13
R19	Wimbourne Buildings	4.38	0.6	4.86
R20	Bendrick Road	3.30	0.4	3.78
R21	Public Recycling Facility	3.06	0.4	3.54
R22	Atlantic Crescent	4.76	0.6	5.24
R23	Port Office	4.03	0.5	4.51

R24	Queens Way	4.71	0.6	5.19
R25	Dyfrig Street	3.05	0.4	3.53
Maximum Off Site Concentration		14.81	2.0	15.29
Maximum Concentration at a Committed / Proposed Development		4.75	0.6	5.23
Standard		750µg/m^3		
Baseline		0.24µg/m^3		

9.7.46 The results of the assessment demonstrate that the hourly mean HCl AQAL will be met across the study area. The impact at each of the assessed receptors is less than 10% of the relevant AQAL, therefore in accordance with the EPUK & IAQM significance criteria, the impact at each of the assessed receptors is described to be negligible. The overall significance is determined to be **negligible**.

9.7.47 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. Again, the impact at each of the committed developments is described as negligible in accordance with the EPUK & IAQM significance criteria. The overall significance is determined to be **negligible**.

9.7.48 Receptors were also placed within the Site itself, where the short term AQALs are applicable. The highest predicted hourly mean HCl concentration within the Site is 3.19µg/m^3 (4.3% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Hydrogen Fluoride (HF)

9.7.49 Monthly and hourly mean HF concentrations are presented in Table 9.30 below.

Table 9.30: Monthly and hourly mean HF Concentrations (µg/m^3)

ID	Receptor	Monthly Mean			Maximum 1-Hour Mean		
		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.015	0.10	1.10	0.31	0.2	1.31
R2	Estrella House	0.015	0.09	1.09	0.31	0.2	1.31
R3	Orellana House	0.013	0.08	1.08	0.30	0.2	1.30
R4	37 to 48 Heol Clithrydd	0.012	0.08	1.08	0.30	0.2	1.30
R5	14 Clos Tyniad Glo	0.010	0.06	1.06	0.30	0.2	1.30
R6	Docks Office	0.011	0.07	1.07	0.31	0.2	1.31
R7	3a Waverley Court	0.007	0.04	1.04	0.26	0.2	1.26
R8	3b Fryatt Street	0.006	0.04	1.04	0.24	0.2	1.24
R9	Phillipa Freeth Court	0.008	0.05	1.05	0.29	0.2	1.29
R10	Barry Dock Station	0.008	0.05	1.05	0.29	0.2	1.29

R11	36 Station Street	0.006	0.04	1.04	0.30	0.2	1.30
R12	54 Dock View Road	0.006	0.04	1.04	0.31	0.2	1.31
R13	38 George Street	0.005	0.03	1.03	0.27	0.2	1.27
R14	Holton Primary School	0.004	0.03	1.03	0.24	0.1	1.24
R15	89 Dock View Road	0.007	0.05	1.05	0.29	0.2	1.29
R16	10 Jewel Street	0.006	0.04	1.04	0.25	0.2	1.25
R17	Children's Playground on Basset Street	0.005	0.03	1.03	0.22	0.1	1.22
R18	131 Dock View Road	0.006	0.04	1.04	0.24	0.2	1.24
R19	Wimbourne Buildings	0.019	0.12	1.12	0.29	0.2	1.29
R20	Bendrick Road	0.014	0.08	1.08	0.22	0.1	1.22
R21	Public Recycling Facility	0.008	0.05	1.05	0.20	0.1	1.20
R22	Atlantic Crescent	0.013	0.08	1.08	0.32	0.2	1.32
R23	Port Office	0.004	0.02	1.02	0.27	0.2	1.27
R24	Queens Way	0.005	0.03	1.03	0.31	0.2	1.31
R25	Dyfrig Street	0.004	0.03	1.03	0.20	0.1	1.20
Maximum Off Site Concentration		0.023	0.14	1.14	0.99	0.6	1.99
Maximum Concentration at a Committed / Proposed Development		0.015	0.09	1.09	0.32	0.2	1.32
Standard		16µg/m^3			160µg/m^3		
Baseline		1.0µg/m^3			1.0µg/m^3		

9.7.50 The results of the assessment demonstrate that the monthly mean and 1-hour mean HF AQALs will be met across the study area. The predicted PCs are low in comparison to the AQALs and the background concentrations. The impact at each of the assessed receptors is described as negligible in accordance with the EPUK & IAQM criteria. The overall significance of the impact is determined to be **negligible**.

9.7.51 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. Again, the impact at each of the committed developments is described as negligible. The overall significance is determined to be **negligible**.

9.7.52 Receptors were also placed within the Site itself, where the short term (hourly mean) AQALs are applicable. The highest predicted hourly mean HF concentration within the Site is 1.18µg/m^3 (0.7% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Dioxins and Furans

9.7.53 Annual mean Dioxin and Furan concentrations are presented in Table 9.31 below.

Table 9.31: Annual mean Dioxin and Furan Concentrations (fg/m^3)

ID	Receptor	Annual Mean	
		PC	PC as % Existing Background
R1	Vistamar House	0.62	6.4
R2	Estrella House	0.58	6.0
R3	Orellana House	0.51	5.3
R4	37 to 48 Heol Clithrydd	0.47	4.9
R5	14 Clos Tyniad Glo	0.40	4.1
R6	Docks Office	0.44	4.6
R7	3a Waverley Court	0.33	3.4
R8	3b Fryatt Street	0.30	3.1
R9	Phillipa Freeth Court	0.40	4.1
R10	Barry Dock Station	0.40	4.2
R11	36 Station Street	0.36	3.8
R12	54 Dock View Road	0.35	3.6
R13	38 George Street	0.21	2.2
R14	Holton Primary School	0.16	1.7
R15	89 Dock View Road	0.26	2.7
R16	10 Jewel Street	0.20	2.1
R17	Children's Playground on Basset Street	0.16	1.7
R18	131 Dock View Road	0.20	2.1
R19	Wimbourne Buildings	1.07	11.2
R20	Bendrick Road	0.75	7.8
R21	Public Recycling Facility	0.61	6.4
R22	Atlantic Crescent	0.89	9.2
R23	Port Office	0.16	1.6
R24	Queens Way	0.22	2.3
R25	Dyfrig Street	0.18	1.9
Maximum Off Site Concentration		1.35	14.0
Maximum Concentration at a Committed / Proposed Development		0.62	6.5
Baseline		9.6fg/m^3	

9.7.54 There are no assessment criteria for airborne concentrations of dioxins and furans. The predicted maximum contribution from the Development is 1.35fg/m^3 which is 14% of the existing background concentration measured at urban monitoring sites in the UK.

9.7.55 Health effects from dioxins and furans can occur through exposure routes other than purely inhalation (for example ingestion), therefore a human health risk assessment was completed to determine the overall risk of exposure to the substances emitted to air from the Facility. A Human Health Risk Assessment Report is included as Appendix 9.8, this report demonstrates that for the maximally exposed individual considered, the exposure to dioxins, furans and dioxin-like PCBs is **not significant**.

PAH (as Benzo[a]pyrene)

9.7.56 Annual mean B[a]P concentrations are presented in Table 9.32 below. The results are presented in nanograms (ng) per cubic metre (10^{-9} g/m^3)

Table 9.32: Annual mean B[a]P Concentrations (ng/m^3)

ID	Receptor	Annual Mean		
		PC	PC as % Standard	PEC
R1	Vistamar House	0.0006	0.2	0.2606
R2	Estrella House	0.0005	0.2	0.2605
R3	Orellana House	0.0005	0.2	0.2605
R4	37 to 48 Heol Clithrydd	0.0004	0.2	0.2604
R5	14 Clos Tyniad Glo	0.0004	0.1	0.2604
R6	Docks Office	0.0004	0.2	0.2604
R7	3a Waverley Court	0.0003	0.1	0.2603
R8	3b Fryatt Street	0.0003	0.1	0.2603
R9	Phillipa Freeth Court	0.0004	0.1	0.2604
R10	Barry Dock Station	0.0004	0.1	0.2604
R11	36 Station Street	0.0003	0.1	0.2603
R12	54 Dock View Road	0.0003	0.1	0.2603
R13	38 George Street	0.0002	0.1	0.2602
R14	Holton Primary School	0.0002	0.1	0.2602
R15	89 Dock View Road	0.0002	0.1	0.2602
R16	10 Jewel Street	0.0002	0.1	0.2602
R17	Children's Playground on Basset Street	0.0001	0.1	0.2601
R18	131 Dock View Road	0.0002	0.1	0.2602
R19	Wimbourne Buildings	0.0010	0.4	0.2610
R20	Bendrick Road	0.0007	0.3	0.2607
R21	Public Recycling Facility	0.0006	0.2	0.2606
R22	Atlantic Crescent	0.0008	0.3	0.2608
R23	Port Office	0.0001	0.1	0.2601
R24	Queens Way	0.0002	0.1	0.2602

R25	Dyfrig Street	0.0002	0.1	0.2602
Maximum Off Site Concentration		0.0012	0.5	0.2612
Maximum Concentration at a Committed / Proposed Development		0.0006	0.2	0.2606
Standard		0.25ng/m^3		
Baseline		0.26ng/m^3		

9.7.57 The results of the modelling assessment demonstrate that the predicted annual mean B[a]P PCs are well below the lowest AQAL of 0.25ng/m^3 at the selected receptor locations. Due to the high background concentrations, the predicted PECs are in excess of this AQAL. They are however, lower than the EU Target Level.

9.7.58 The predicted PCs are below 0.5% of the AQAL, therefore in accordance with the EPUK & IAQM guidance the impact on annual mean B[a]P concentrations at each assessed receptor is described as negligible. The overall significance of the impacts is determined to be **negligible**.

9.7.59 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. The impacts at the committed developments are also less than 0.5% of the relevant AQAL, therefore the impacts are described as negligible in accordance with the EPUK & IAQM significance criteria. The overall significance of the impacts is determined to be **negligible**.

Polychlorinated Biphenyls (PCBs)

9.7.60 Annual and hourly mean PCB concentrations are presented in Table 9.33 below. The results are presented in nanograms (ng) per cubic metre (10^{-9} g/m^3).

Table 9.33: Annual and hourly mean PCBs Concentrations (ng/m^3)

ID	Receptor	Annual Mean			Maximum 1-Hour Mean		
		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.029	0.01	0.125	0.4	0.01	0.56
R2	Estrella House	0.027	0.01	0.123	0.4	0.01	0.56
R3	Orellana House	0.024	0.01	0.120	0.3	0.01	0.54
R4	37 to 48 Heol Clithrydd	0.022	0.01	0.118	0.3	0.01	0.54
R5	14 Clos Tyniad Glo	0.018	0.01	0.114	0.3	0.01	0.54
R6	Docks Office	0.020	0.01	0.116	0.4	0.01	0.55
R7	3a Waverley Court	0.015	0.01	0.111	0.3	0.01	0.49
R8	3b Fryatt Street	0.014	0.01	0.110	0.3	0.00	0.47
R9	Phillipa Freeth Court	0.018	0.01	0.114	0.3	0.01	0.53
R10	Barry Dock Station	0.019	0.01	0.115	0.3	0.01	0.53

R11	36 Station Street	0.017	0.01	0.113	0.3	0.01	0.54
R12	54 Dock View Road	0.016	0.01	0.112	0.4	0.01	0.55
R13	38 George Street	0.010	0.00	0.106	0.3	0.01	0.51
R14	Holton Primary School	0.008	0.00	0.104	0.3	0.00	0.47
R15	89 Dock View Road	0.012	0.01	0.108	0.3	0.01	0.53
R16	10 Jewel Street	0.009	0.00	0.105	0.3	0.00	0.49
R17	Children's Playground on Basset Street	0.007	0.00	0.103	0.3	0.00	0.44
R18	131 Dock View Road	0.009	0.00	0.105	0.3	0.00	0.47
R19	Wimbourne Buildings	0.050	0.02	0.146	0.3	0.01	0.53
R20	Bendrick Road	0.035	0.02	0.131	0.3	0.00	0.45
R21	Public Recycling Facility	0.028	0.01	0.124	0.2	0.00	0.43
R22	Atlantic Crescent	0.041	0.02	0.137	0.4	0.01	0.56
R23	Port Office	0.007	0.00	0.103	0.3	0.01	0.50
R24	Queens Way	0.010	0.01	0.106	0.4	0.01	0.56
R25	Dyfrig Street	0.008	0.00	0.104	0.2	0.00	0.43
Maximum Off Site Concentration		0.062	0.03	0.158	1.1	0.02	1.34
Maximum Concentration at a Committed / Proposed Development		0.029	0.01	0.125	0.4	0.01	0.56
Standard		200ng/m^3			6000ng/m^3		
Baseline		0.096ng/m^3			1.92ng/m^3		

9.7.61 The results of the assessment demonstrate that the annual mean and 1-hour mean PCB AQALs will be met across the study area. In accordance with the EPUK & IAQM guidance, the impact at each of the assessed receptors is described as negligible. The overall significance of the impacts are determined to be **negligible**.

9.7.62 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. Again, the impacts at each of the committed developments are also described as negligible in accordance with the EPUK & IAQM significance criteria. The overall significance of the impacts are determined to be **negligible**.

9.7.63 Receptors were also placed within the Site itself, where the short term (hourly mean) AQALs are applicable. The highest predicted hourly mean PCB concentration within the Site is 0.4ng/m^3 (0.01% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Ammonia (NH_3)

9.7.64 Annual and hourly mean NH_3 concentrations are presented in Table 9.34 below. The results are presented in nanograms (ng) per cubic metre (10-9 g/m^3).

Table 9.34: Annual and hourly mean NH_3 Concentrations ($\mu g/m^3$)

ID	Receptor	Annual Mean			Maximum 1-Hour Mean		
		PC	PC as % Standard	PEC	PC	PC as % Standard	PEC
R1	Vistamar House	0.12	0.07	2.64	1.57	0.06	6.61
R2	Estrella House	0.12	0.06	2.64	1.57	0.06	6.61
R3	Orellana House	0.10	0.06	2.62	1.49	0.06	6.53
R4	37 to 48 Heol Clithrydd	0.09	0.05	2.61	1.49	0.06	6.53
R5	14 Clos Tyniad Glo	0.08	0.04	2.60	1.48	0.06	6.52
R6	Docks Office	0.09	0.05	2.61	1.55	0.06	6.59
R7	3a Waverley Court	0.07	0.04	2.59	1.30	0.05	6.34
R8	3b Fryatt Street	0.06	0.03	2.58	1.21	0.05	6.25
R9	Phillipa Freeth Court	0.08	0.04	2.60	1.44	0.06	6.48
R10	Barry Dock Station	0.08	0.04	2.60	1.44	0.06	6.48
R11	36 Station Street	0.07	0.04	2.59	1.48	0.06	6.52
R12	54 Dock View Road	0.07	0.04	2.59	1.54	0.06	6.58
R13	38 George Street	0.04	0.02	2.56	1.36	0.05	6.40
R14	Holton Primary School	0.03	0.02	2.55	1.19	0.05	6.23
R15	89 Dock View Road	0.05	0.03	2.57	1.47	0.06	6.51
R16	10 Jewel Street	0.04	0.02	2.56	1.27	0.05	6.31
R17	Children's Playground on Basset Street	0.03	0.02	2.55	1.08	0.04	6.12
R18	131 Dock View Road	0.04	0.02	2.56	1.22	0.05	6.26
R19	Wimbourne Buildings	0.21	0.12	2.73	1.46	0.06	6.50
R20	Bendrick Road	0.15	0.08	2.67	1.10	0.04	6.14
R21	Public Recycling Facility	0.12	0.07	2.64	1.02	0.04	6.06
R22	Atlantic Crescent	0.18	0.10	2.70	1.59	0.06	6.63
R23	Port Office	0.03	0.02	2.55	1.34	0.05	6.38
R24	Queens Way	0.04	0.02	2.56	1.57	0.06	6.61
R25	Dyfrig Street	0.04	0.02	2.56	1.02	0.04	6.06
Maximum Off Site Concentration		0.27	0.15	2.79	4.94	0.20	9.98
Maximum Concentration at a Committed / Proposed Development		0.12	0.07	2.64	1.58	0.06	6.62
Standard		180$\mu g/m^3$			2500$\mu g/m^3$		
Baseline		2.52$\mu g/m^3$			5.04$\mu g/m^3$		

9.7.65 The results of the assessment demonstrate that the annual mean and 1-hour mean NH_3 AQALs will be met across the study area. In accordance with the EPUK & IAQM significance criteria, the impact at each of the assessed receptors is described as negligible. The overall significance of the impacts are determined to be **negligible**.

9.7.66 Receptors were placed at the location of the committed and proposed developments in the vicinity of the Site. Again, the impacts at each of the committed developments is described as negligible in accordance with the EPUK & IAQM significance criteria. The overall significance of the impacts are determined to be negligible.

9.7.67 Receptors were also placed within the Site itself, where the short term (hourly mean) AQALs are applicable. The highest predicted hourly mean NH_3 concentration within the Site is 5.94µg/m^3 (0.24% of the AQAL). The impact with regards to new exposure is therefore also considered to be **negligible**.

Trace Metals

9.7.68 The highest predicted long-term (annual mean) trace metals at a sensitive receptor where the annual mean standard is applicable are presented in Table 9.35 below. The maximum concentrations are predicted at Receptor 20, Bendrick Road.

Table 9.35: Predicted Maximum Annual Mean Trace Metals Concentrations (µg/m^3)

Pollutant	EAL (µg/m^3)	Max PC (µg/m^3)	Background (µg/m^3)	PC (% of EAL)	PEC (as % EAL)	Significance / Further Assessment Required
Group I Metals						
Cadmium (Cd)	0.005	0.00038	0.00027	7.7	13.1	Insignificant
Thalium (Ti)	1	0.00038	Not measured	0.04	-	Insignificant
Group II Metals						
Mercury (Hg)	0.25	0.00038	0.00143	0.15	0.73	Insignificant
Group III Metals						
Antimony (Sb)	5	0.003761	Not measured	0.08	-	Insignificant
Arsenic (As)	0.006	0.003761	0.00077	62.7	75.5	Insignificant
Lead (Pb)	0.25	0.003761	0.0099	1.5	5.5	Insignificant
Chromium III	5	0.003009	0.00462	0.06	0.15	Insignificant
Chromium VI	0.00025	0.000752	0.00116	300.9	764.9	Further Assessment
Cobalt (Co)	1	0.003761	0.00026	0.38	0.40	Insignificant
Copper (Cu)	10	0.003761	0.011	0.04	0.1	Insignificant
Manganese (Mn)	0.15	0.003761	0.00891	2.5	8.4	Insignificant

Nickel (Ni)	0.02	0.003761	0.00429	18.8	40.3	Insignificant
Vanadium (V)	5	0.003761	0.00106	0.08	0.10	Insignificant

9.7.69 The highest predicted short-term PC trace metals are presented in Table 9.36 below. As the short-term standards are applicable at more locations that the annual mean standards, the highest predicted off-site concentration within the modelled grid is presented.

Table 9.36: Predicted Maximum Short Term Mean Trace Metals Concentrations (μg/m^3)

Pollutant	EAL (μg/m^3)	Max PC (μg/m^3)	Background (μg/m^3)	PC (% of EAL)	PEC (as % EAL)	Significance / Further Assessment Required
Group I Metals						
Thalium (Ti)	30	0.012586	Not measured	0.04	-	Insignificant
Group II Metals						
Mercury (Hg)	7.5	0.012586	0.00286	0.17	0.21	Insignificant
Group III Metals						
Antimony (Sb)	150	0.123574	Not measured	0.82	-	Insignificant
Chromium III	150	0.098859	0.00924	0.07	0.07	Insignificant
Cobalt (Co)	30	0.123574	0.00052	0.41	0.41	Insignificant
Copper (Cu)	200	0.123574	0.022	0.06	0.07	Insignificant
Manganese (Mn)	1500	0.123574	0.01782	0.008	0.009	Insignificant
Vanadium (V)	1	0.017351	0.00212	1.7	1.9	Insignificant

Short term standards are 1-hour averaging periods with the exception of Vanadium which is a 24-hour averaging period.

9.7.70 As demonstrated in the tables above, the Group I and II metals all meet the relevant AQALs and on the basis of the criteria outlined in the EA Guidance, emissions of these pollutants are considered to be **insignificant**.

9.7.71 For the Group III metals, on the basis of the Step 1 screening advice provided by the EA, further assessment is required only for long-term chromium VI. Emissions of all the remaining Group III metals are considered to be **insignificant**.

9.7.72 The EA guidance note for assessment of Group III metals provides measured concentrations of emissions of metals from Waste Incinerators. In accordance with the Step 2 of the guidance note, predictions of chromium VI have been made using the maximum measured concentration over a range of Waste Incinerators. The results are presented in Table 9.37 below.

Table 9.37: Predicted Maximum Long Term Mean Trace Metals Concentrations (using maximum measured values from the EA Guidance) (µg/m^3)

Pollutant	EAL (µg/m^3)	Max PC (µg/m^3)	Background (µg/m^3)	PC (% of EAL)	PEC (as % EAL)	Significance / Further Assessment Required
Chromium VI	0.00025	0.000001	0.00116	0.4	464.4	Insignificant

9.7.73 The results of the modelling using the maximum measured emissions over a range of Waste Incinerators show that the impact of chromium VI emissions are insignificant. The Facility is newer and likely to be significantly less polluting that the Waste Incinerator plants sampled to obtain the emission levels provided in the guidance note, therefore the impact of chromium VI emissions arising from the Facility is considered to be **insignificant**.

Effects on Ecological Habitats

Airborne Concentrations of NO_x, SO_2, NH_3 and HF

9.7.74 Predicted maximum ground-level concentrations of NO_x, SO_2, HF and NH_3 at the sensitive habitat sites illustrated in Figures 9.5, 9.6 and 9.7 are presented in Tables 9.38 to 9.41 below.

Table 9.38: Predicted Annual and daily mean NO_x concentrations (µg/m^3)

		PC	PC as % CL	PEC	PEC as % CL	CL
Annual Mean NOx						
E1	Cadoxton River SINC	1.80	6.0	15.4	51.2	30
E2	Cadoxton Wetland SINC	0.52	1.7	19.7	65.7	
E3	Cadoxton Ponds Wildlife Reserve	0.52	1.7	19.7	65.7	
E4	Fields at Merthyr Dyfan SINC	0.12	0.4	13.1	43.8	
E5	Gladstone Road Pond SINC	0.33	1.1	15.0	49.9	
E6	Nells Point East SINC	0.22	0.7	17.0	56.7	
E7	Friars Point SINC	0.22	0.7	11.1	37.2	
E8	North of North Road SINC	0.20	0.7	19.4	64.7	
E9	Hayes Lane Ancient Woodland	1.01	3.4	14.6	48.5	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.16	0.5	9.3	31.0	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.06	0.2	7.8	25.9	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.04	0.1	7.1	23.8	

E13	Severn Estuary SAC	0.07	0.2	9.1	30.2	
Daily Mean NOx						
E1	Cadoxton River SINC	8.18	10.9	35.3	47.0	75
E2	Cadoxton Wetland SINC	5.59	7.5	44.0	58.7	
E3	Cadoxton Ponds Wildlife Reserve	5.59	7.5	44.0	58.7	
E4	Fields at Merthyr Dyfan SINC	2.17	2.9	28.2	37.6	
E5	Gladstone Road Pond SINC	4.22	5.6	33.5	44.6	
E6	Nells Point East SINC	3.65	4.9	37.2	49.6	
E7	Friars Point SINC	2.39	3.2	24.2	32.3	
E8	North of North Road SINC	1.82	2.4	40.2	53.6	
E9	Hayes Lane Ancient Woodland	4.66	6.2	31.8	42.3	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.75	1.0	19.1	25.4	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.52	0.7	16.0	21.3	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.26	0.3	14.4	19.3	
E13	Severn Estuary SAC	1.67	2.2	19.6	26.2	

9.7.75 The EA provides a national screening criteria for determining the significance of an impact of emissions of pollutants on sensitive ecological sites. For long-term or annual mean impacts the guidance provides a screening criteria in two stages. Firstly, the process contribution (PC) is compared against 1% of the relevant Critical Level. If the PC is less than 1% of the Critical Level the impact can be considered to be insignificant. If it is higher than 1% of the Critical Level, then the overall predicted environmental concentration (PEC) is calculated by adding the background concentration. If the PEC is less than 70% of the Critical Level, the impact can be considered to be insignificant. If the PEC is higher than 70% of Critical Level, further consideration of the sensitivity of the specific habitat to the pollutant is required.

9.7.76 The annual mean NO_x process contributions (PCs) are below 1% at all but the closest sites. At the Cadoxton River SINC, the Cadoxton Wetland SINC, Cadoxton Pond Wildlife Reserve, Gladstone Road Pond SiNC and the Hayes Lane Ancient Woodland the PCs are greater than 1%, therefore the local background NO_x concentrations (as obtained from the APIS website) have been added to determine the overall predicted environmental concentrations (PECs). The PECs are all below 70% of the Critical Level, therefore in accordance with the EA's criteria, the impacts on annual mean NO_x concentrations at all of the sensitive ecological habitats are considered to be **insignificant**.

9.7.77 The EA also provides a screening criteria for short-term impacts. The process contribution is compared against 10% of the Critical Level. The daily mean NO_x PCs are below 10% of

the relevant Critical Level at all of the sensitive ecological habitats with the exception of the Cadoxton River SINC where the maximum predicted PC is 10.9% of the Critical Level. Therefore, the impact cannot be considered to be **insignificant** in accordance with the EA screening criteria. Further consideration has therefore been given to the sensitivity of this habitat to airborne NO_x concentrations.

9.7.78 Advice was sought from a suitably qualified ecologist at SLR. The species at the habitat sites were identified and are **not considered to be at risk of any significant effects** due to the predicted levels of airborne NOx concentrations.

9.7.79 The predicted concentrations are the worst case concentrations predicted over a five year period and the modelling includes worst case assumptions with regards to the emissions i.e. pollutants have been modelled using the IED emission limit concentrations. The concentrations likely to be experienced at the sensitive habitats are therefore likely to be lower than the concentrations presented in the table above. As the overall PEC is significantly lower than the Critical Level at the Cadoxton River SINC (i.e. 47% of the Critical Level), it is considered unlikely that the Critical Level will be breached.

Table 9.39: Predicted Annual mean SO_2 concentrations ($\mu g/m^3$)

		PC	PC as % CL	PEC	PEC as % CL	CL
Annual SO_2						
E1	Cadoxton River SINC	0.45	2.3	2.2	10.9	20µg/m³ (10µg/m³ where lichens or bryophytes are present)
E2	Cadoxton Wetland SINC	0.13	0.6	1.9	9.3	
E3	Cadoxton Ponds Wildlife Reserve	0.13	0.6	1.9	9.3	
E4	Fields at Merthyr Dyfan SINC	0.03	0.2	1.8	8.8	
E5	Gladstone Road Pond SINC	0.08	0.4	1.8	9.1	
E6	Nells Point East SINC	0.05	0.3	1.8	8.9	
E7	Friars Point SINC	0.05	0.3	1.8	8.9	
E8	North of North Road SINC	0.05	0.2	1.8	8.9	
E9	Hayes Lane Ancient Woodland	0.25	2.5	2.0	19.8	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.04	0.2	1.2	5.9	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.02	0.1	1.0	5.1	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.01	0.1	0.8	4.1	
E13	Severn Estuary SAC	0.02	0.1	0.9	4.6	

Critical Level of 10µg/m³ assumed for E9 Hayes Lane Ancient Woodland as lichens and byrophtes may potentially be present. Critical Level of 20µg/m³ assumed for all other habitats.

9.7.80 The annual mean SO_2 process contributions (PCs) are below 1% at all but the Cadoxton River SINC and Hayes Wood Ancient Woodland. The local background SO_2 concentrations (as obtained from the APIS website) have been added to determine the overall predicted environmental concentrations (PECs). The maximum PECs predicted within these habitat sites are below 70% of the relevant Critical Levels, therefore in accordance with the EA's criteria, the impacts on annual mean SO_2 concentrations at all of the sensitive ecological habitats are considered to be **insignificant**.

Table 9.40: Predicted Annual mean NH_3 concentrations ($\mu g/m^3$)

		PC	PC as % CL	PEC	PEC as % CL	CL
Annual Mean NH_3						
E1	Cadoxton River SINC	0.18	6.0	1.4	45.0	3µg/m³ (1µg/m³ where lichens or bryophytes are present)
E2	Cadoxton Wetland SINC	0.05	1.7	1.2	40.7	
E3	Cadoxton Ponds Wildlife Reserve	0.05	1.7	1.2	40.7	
E4	Fields at Merthyr Dyfan SINC	0.01	0.4	1.2	39.4	
E5	Gladstone Road Pond SINC	0.03	1.1	1.2	40.1	
E6	Nells Point East SINC	0.02	0.7	1.2	39.7	
E7	Friars Point SINC	0.02	0.7	1.2	39.7	
E8	North of North Road SINC	0.02	0.7	1.2	39.7	
E9	Hayes Lane Ancient Woodland	0.10	10.1	1.3	42.4	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.02	0.5	0.9	29.2	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.01	0.2	0.9	28.9	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.00	0.1	1.5	51.5	
E13	Severn Estuary SAC	0.01	0.2	1.5	48.9	

9.7.81 The annual mean NH_3 process contributions (PCs) are below 1% at all but the Cadoxton River SINC, the Cadoxton Weltand SINC, Cadoxton Ponds Wildlife Reserve, Gladstone Road Pond SINC and Hayes Wood Ancient Woodland. The local background NH_3 concentrations (as obtained from the APIS website) have been added to determine the overall predicted environmental concentrations (PECs). The maximum PECs predicted within these habitat sites are below 70% of the Critical Level, therefore in accordance with the EA's criteria, the impacts on annual mean NH_3 concentrations at all of the sensitive ecological habitats are considered to be **insignificant**.

Table 9.41: Predicted Weekly and Daily Mean HF concentrations (µg/m^3)

		PC	PC as % CL	CL
Weekly Mean HF				
E1	Cadoxton River SINC	0.041	8.2	0.5
E2	Cadoxton Wetland SINC	0.028	5.6	
E3	Cadoxton Ponds Wildlife Reserve	0.028	5.6	
E4	Fields at Merthyr Dyfan SINC	0.011	2.2	
E5	Gladstone Road Pond SINC	0.021	4.2	
E6	Nells Point East SINC	0.018	3.7	
E7	Friars Point SINC	0.012	2.4	
E8	North of North Road SINC	0.009	1.8	
E9	Hayes Lane Ancient Woodland	0.023	4.7	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.004	0.8	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.003	0.5	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.001	0.3	
E13	Severn Estuary SAC	0.008	1.7	
Daily Mean HF				
E1	Cadoxton River SINC	0.041	0.82	5
E2	Cadoxton Wetland SINC	0.028	0.56	
E3	Cadoxton Ponds Wildlife Reserve	0.028	0.56	
E4	Fields at Merthyr Dyfan SINC	0.011	0.22	
E5	Gladstone Road Pond SINC	0.021	0.42	
E6	Nells Point East SINC	0.018	0.37	
E7	Friars Point SINC	0.012	0.24	
E8	North of North Road SINC	0.009	0.18	
E9	Hayes Lane Ancient Woodland	0.023	0.47	
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.004	0.08	
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.003	0.05	
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.001	0.03	
E13	Severn Estuary SAC	0.008	0.17	

9.7.82 The daily and weekly mean HF PCs are below 10% of the relevant Critical Level at all of the sensitive ecological habitats. Therefore, the impacts are considered to be **insignificant** in accordance with the EA screening criteria.

Eutrophication

9.7.83 Predicted maximum nutrient nitrogen deposition rates are compared with the relevant Critical Loads (CL_d) in Table 9.42 below.

Table 9.42: Predicted Nitrogen Deposition Rates (kg N/ha/yr)

		PC	Background	PC as % CL_d	PEC	PEC as % CL_d	Critical Load (CL_d)
E1	Cadoxton River SINC	1.20	11.62	8.0	12.82	85.4	15
E2	Cadoxton Wetland SINC	0.35	11.62	2.3	11.97	79.8	15
E3	Cadoxton Ponds Wildlife Reserve	0.35	11.62	2.3	11.97	79.8	15
E4	Fields at Merthyr Dyfan SINC	0.08	11.62	0.4	11.70	58.5	20
E5	Gladstone Road Pond SINC	0.22	11.62	1.5	11.84	78.9	15
E6	Nells Point East SINC	0.15	11.62	0.7	11.77	58.8	20
E7	Friars Point SINC	0.15	11.62	0.7	11.77	58.8	20
E8	North of North Road SINC	0.13	11.62	0.9	11.75	78.3	15
E9	Hayes Lane Ancient Woodland	1.07	19.46	10.7	20.53	205.3	10
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.10	9.8	0.5	9.90	49.5	20
E11	Severn Estuary SPA & Ramsar Site (Penarth Coast)	0.04	9.8	0.2	9.84	49.2	20
E12	Severn Estuary SPA & Ramsar Site (Flat Holm)	0.03	0	0.1	0.03	0.1	20
E13	Severn Estuary SAC	0.05	10.1	0.2	10.15	50.7	20

9.7.84 The maximum PC nutrient nitrogen deposition rates arising from the Development are low in comparison to the Critical Loads and the background concentrations. Therefore, the impacts are considered to be **insignificant**.

Acidification

9.7.85 Predicted maximum acid deposition rates are compared with the relevant Critical Loads (CL_d) in Table 9.43 below.

Table 9.43: Predicted Acid Deposition Rates (kg N/ha/yr)

		PC	PC (as % of CLfunction)	PEC (as % CLfunction
E4	Fields at Merthyr Dyfan SINC	0.014	0.2	4.8
E7	Friars Point SINC	0.024	0.4	4.8
E9	Hayes Lane Ancient Woodland	0.219	7.0	58.4
E10	Severn Estuary SPA & Ramsar Site (Sully Island)	0.017	0.5	21.1

9.7.86 The maximum PC acid deposition rates arising from the Development are low in comparison to the critical load functions and the background concentrations. Therefore, the impacts are considered to be **insignificant**.

Abnormal Operations / Emissions

Failure of Urea Injection and Lime Dosing Operation

9.7.87 In the event of failure of the Urea Injection or Lime Dosing systems, emissions of SO_2 and HCl would likely occur, however this would only occur for a short period of time following which the plant would shut down. It is considered this is an unlikely event due to the plant control systems.

9.7.88 The plant control system continuously monitor the urea and lime injection systems and the valves stored within the bulk storage containers. The control systems will not allow the plant to continue operating without there being adequate supplies of urea or lime reagent available. Once the critical 'low level' reagent alarm is activated, the plant will automatically shut down without any loss of performance. It is therefore considered that emissions would not occur in the event of failure to the Urea Injection System or Lime Dosing Operation.

9.7.89 The reagent injection systems operate across many zones of the combustion plant, all of which have been designed with duty and standby pumps. Similarly, all reagent and abatement systems are fitted with duty and standby systems which have been subject to HAZOP assessment to ensure the plant fails safe in all instances.

Failure of Activated Carbon Dosing

9.7.90 The failure of the Activated Carbon Dosing will lead to an increase in the emissions of heavy metals. As plant failure would only be for a short period, comparison has only been made against hourly mean standards. The predicted maximum short-term Group III trace metals impacts at the sensitive receptors for emissions at 5mg/Nm^3 are presented in Table 9.44 below.

Table 9.44: Predicted Maximum Short Term Mean Trace Metals Concentrations (µg/m^3)

Pollutant	EAL (µg/m^3)	Max PC (µg/m^3)	Background (µg/m^3)	PC (% of EAL)	PEC (as % EAL)	Significance / Further Assessment Required
Antimony (Sb)	150	1.26	Not measured	8.39	-	**Insignificant**
Chromium III	150	1.01	0.00924	0.67	0.68	**Insignificant**
Cobalt (Co)	30	1.26	0.00052	4.20	4.20	**Insignificant**
Copper (Cu)	200	1.26	0.022	0.63	0.64	**Insignificant**
Manganese (Mn)	1500	1.26	0.01782	0.08	0.09	**Insignificant**

Failure of Bag Filter

9.7.91 Failure of the Bag Filter would lead to increased emissions of particulates. Predicted 90.4th percentile of PM_{10} concentrations are presented in Table 9.45 below.

Table 9.45: Predicted 24-hour mean PM_{10} Concentrations (µg/m^3)

ID	Receptor	24-Hour Mean		
		PC	PC as % Standard	PEC
R1	Vistamar House	3.57	7.1	16.0
R2	Estrella House	3.18	6.4	15.6
R3	Orellana House	2.73	5.5	15.1
R4	37 to 48 Heol Clithrydd	2.33	4.7	14.7
R5	14 Clos Tyniad Glo	1.91	3.8	14.3
R6	Docks Office	2.21	4.4	14.6
R7	3a Waverley Court	1.75	3.5	14.2
R8	3b Fryatt Street	1.49	3.0	13.9
R9	Phillipa Freeth Court	2.06	4.1	14.5
R10	Barry Dock Station	1.90	3.8	14.3
R11	36 Station Street	1.73	3.5	14.1
R12	54 Dock View Road	1.65	3.3	14.0
R13	38 George Street	0.95	1.9	13.3
R14	Holton Primary School	0.72	1.4	13.1
R15	89 Dock View Road	1.17	2.3	13.6
R16	10 Jewel Street	0.84	1.7	13.2
R17	Children's Playground on Basset Street	0.74	1.5	13.1

R18	131 Dock View Road	1.00	2.0	13.4
R19	Wimbourne Buildings	4.32	8.6	16.7
R20	Bendrick Road	2.57	5.1	15.0
R21	Public Recycling Facility	2.25	4.5	14.6
R22	Atlantic Crescent	3.50	7.0	15.9
R23	Port Office	0.47	0.9	12.9
R24	Queens Way	0.91	1.8	13.3
R25	Dyfrig Street	0.93	1.9	13.3
Maximum Off Site Concentration		5.14	10.3	17.5
Maximum Concentration at a Committed / Proposed Development		3.85	7.7	16.3
Standard		50µg/m^3		
Baseline		12.4µg/m^3		

9.7.92 The predicted 90.4th percentile of 24-hour mean PCs are all less than 10% of the relevant standard, therefore the impact of the Development in the event of failure of the Bag Filter is described as negligible. The overall significance of the impact is determined to be **negligible**.

Mitigation, Monitoring and Residual Effects

9.7.93 The results of the assessment demonstrate that the likely impact of the operation of the Development on local air quality would be **negligible**. Therefore, **no mitigation measures are required**.

9.7.94 Monitoring of pollutant concentrations within the exhaust from the stack will be undertaken on a regular basis in accordance with the requirements of the Permit. Continuous monitoring of particulate matter, TOCs, HCl, CO, SO_2, NO_2, NO, NH_3 and N_2O will be undertaken. Quarterly sampling of HF, Heavy Metals, Dioxins and Furans, PCBs and PAHs will be undertaken in the first year of operation and then bi-annually in the subsequent years.

9.7.95 Pursuant to the requirements of Condition 31 of the 2015 Permission, ambient monitoring will be undertaken at a number of key sensitive receptors in the vicinity of the Site and a further Air Quality Assessment submitted providing the results of the monitoring.

9.8 Decommissioning Assessment

Assessment of Effects

9.8.1 In the event of the definitive cessation of activities at the Facility, decommissioning of the Development has the potential to give rise to emissions of dust and particulate matter arising from dismantling and demolition activities and emissions arising from road traffic vehicles associated with the decommissioning works.

9.8.2 The Site is located in a predominantly industrial setting, it is considered unlikely that additional residential properties would likely be developed closer to the Site than the current existing and committed developments, the closest of which is located at Barry Waterfront (East Quay). As discussed within the construction phase assessment the sensitivity of the area to impacts of dust and particulate matter arising from the Site is considered to be medium for dust effects and low for human health effects from particulate matter. It is considered that sensitivity of the area would remain the same in future years.

9.8.3 The Facility is predominantly modular in design, therefore the decommissioning works will more likely comprise dismantling the plant and buildings and removing the materials from Site rather than demolition activities. It is assumed that the hardstanding would be left in-situ to facilitate the Site's future re-use rather than being broken up. The dust emission magnitude arising from the dismantling works is therefore considered to be small.

9.8.4 Traffic associated with the decommissioning stage would access the Site via the existing entrance via David Davies Road. Vehicles accessing the Site would be routed to the North of Dina Powys using the A4050 therefore avoiding residential areas within Barry Waterfront as far as practicable. To ensure a worst case assessment, the dust emission magnitude during track out is considered to be medium.

9.8.5 The potential risk of dust impacts, based on the low overall sensitivity of the area to human health and medium overall sensitivity to dust soiling impacts, is presented in Table 9.46.

Table 9.46: Risk of Dust Impacts Prior to Mitigation

Source	Impact Magnitude	Human Health Risk	Dust Soiling Risk
Demolition	Small	Negligible Risk	Low Risk
Trackout	Medium	Low Risk	Low Risk

Mitigation, Monitoring and Residual Effects

9.8.6 A low risk of dust soiling impacts and a low risk of human health (PM_{10}) effects is predicted at nearby receptors during the decommissioning of the Development. In the event of the definitive cessation of operational activities at the Facility, an application would be submitted to NRW to surrender the Permit. Permit condition 1.1.1a requires the operator to have a written management system in place which identifies and minimises risks of pollution including those arising from closure which would include dust.

9.8.7 Appropriate mitigation measures for the Site have been identified following the IAQM guidance and based on the risk effects presented in Table 9.46. The 'highly recommended' measures set out within the IAQM guidance should be adhered to during the decommissioning of the Development.

'Highly Recommended' Measures

- display the name and contact details of the person accountable for air quality and dust issues on the site boundary (i.e. the environment manager/engineer or site manager);
- display the head or regional office contact information on the site boundary;
- record all dust and air quality complaints, identify cause, take appropriate measures to reduce emissions in a timely manner and record the measures taken;

- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off-site and the action taken to resolve the situation in the log book;
- carry out regular site inspections, record inspection results, and make an inspection log available to the local authority when asked;
- increase frequency of site inspection by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged periods of dry or windy conditions;
- plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles;
- avoid site runoff of water or mud;
- ensure all vehicles switch off engines when stationary - no idling vehicles;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
- only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes and conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;
- avoid bonfires and burning of waste materials;
- ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;
- avoid explosive blasting, using appropriate manual or mechanical alternatives;
- bag and remove any biological debris or damp down such material before demolition;

9.8.8 In addition to the 'recommended' measures, the IAQM guidance also sets out 'desirable' measures which should also be considered:

- Undertake daily on-site and off-site inspections, where receptors (including roads) are nearby, to monitor dust, record inspections results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100m of site boundary, with cleaning to be provided in necessary.
- Fully enclose site or specific operations where there is high potential for dust production and the site is actives for an extensive period.

- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible.
- Impose and signpost a maximum-speed limit of 15mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Record all inspections of haul routes and any subsequent action in a site log book.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).

9.8.9 Following implementation of the above measures the residual effect of emissions of dust and particulate matter during the decommissioning of the Development would be negligible at all receptors.

9.9 Cumulative Effects

9.9.1 Cumulative effects can potentially be experienced during both the construction and operational phases. During the construction phase, cumulative effects of dust and particulate matter generated from on-site activities may be experienced in locations in close proximity to two or more development sites and the timing of the construction phases overlap. There may also be an effect due to the increased construction traffic on the local roads if construction vehicles are to use the same routes to access the sites. During the operational phase, cumulative effects may be experienced due to the additional road vehicles generated by one or more schemes if the traffic is likely to affect the same local roads.

Construction Phase Effects (Retrospective)

9.9.2 As the construction of the Site is complete, a cumulative assessment against the currently committed / proposed developments has not been undertaken.

9.9.3 Following the implementation of the mitigation measures as outlined above, there should have been no significant effects arising from the construction phase. Any other developments that may have been under construction during the same time period would have been subject to similar measures, therefore there should have been **no significant cumulative effects arising** from the construction of Site in combination with any other construction works in the vicinity of the Site.

Operational Phase Effects

9.9.4 A number of nearby committed development have been considered cumulatively within this assessment (detailed in Appendix 3.6). Review of the committed / proposed developments indicated that the emissions to air arising from these developments will be related to emissions from road vehicles generated by each development. None include any emissions to air from a stack.

9.9.5 The Development does not result in the generation of significant road traffic, therefore there will be no cumulative effects resulting from the cumulative effects of additional road vehicles using the same roads.

9.9.6 Road traffic associated with the nearby committed developments may increase the roadside concentrations of NO_2 and PM_{10} along some roads in the vicinity of the Site, such as the Ffordd-Y-Mileniwm, which may also experience additional concentrations of NO_2 and particulate matter as a result of emissions from the Facility. However, the predicted NO_2 and particulate matter concentrations are well below the relevant standards. An increase such as would be anticipated from the additional road traffic associated with the committed / proposed development would likely only increase the baseline concentrations along these roads by a small amount. The significance of the impacts at the sensitive receptors would remain **negligible**.

9.9.7 No significant cumulative effects have been identified during any future decommissioning stage.

Table 9.47: Summary of Residual Effects

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact	Mitigation and Monitoring	Residual Effect
Construction (Retrospective)						
Dust and Particulate Matter generated during the construction phase	Surrounding area (sensitivity to dust = medium; Sensitivity to particulate matter = low)	Local	Temporary	NA	The adoption of best practice measures outlined in the IAQM guidance	Negligible
Operational						
Effects on Local Air Quality from emissions from plant	Surrounding area (Human and ecological receptors)	Local	Permanent	Negligible / Insignificant	None Required	Negligible / Insignificant
Decommissioning						
Dust and Particulate Matter generated during the decommissioning phase	Surrounding area (sensitivity to dust = medium; Sensitivity to particulate matter = low)	Local	Temporary	NA	The adoption of best practice measures outlined in the IAQM guidance	Negligible
Cumulative Effects						
Construction	Surrounding area (sensitivity to dust = medium; Sensitivity to particulate matter = low)	local	temporary	NA	The adoption of best practice measures outlined in the IAQM guidance	Negligible

Effect	Receptor (Sensitivity)	Geographic Scale	Temporal Scale	Magnitude of Impact	Mitigation and Monitoring	Residual Effect
Operation	Surrounding area (Human and ecological receptors)	local	temporary	Negligible / Insignificant	None Required	Negligible / Insignificant

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