

17.1 INTRODUCTION

*Overview*

17.1.1 This chapter sets out the methodology, background information and assessment of impacts to air quality arising from the AMEP. The AMEP is composed of several elements with the potential to impact on air quality, and as such the approach adopted allows consideration of impacts from the development as a whole, and also cumulative impacts.

17.1.2 The construction and operation of the AMEP has the potential to result in impacts on air quality. These impacts may be to sensitive human receptors or sensitive ecological receptors and arise from a number of sources. The key issues of interest are:

- construction phase:
  - road traffic;
  - shipping; and
  - construction dust.
  
- operational phase
  - road traffic;
  - shipping; and
  - emissions from paint spraying of products.

17.1.3 In addition, for the operational phase of the AMEP, consideration has been made of train locomotive emissions. These are unlikely to result in significant emissions in isolation, but in order to capture emissions from all site activities these have been included in the assessment. There is also the potential for emissions of odour in the form of VOCs from the paint spraying activities.

17.1.4 Other potential sources of emissions are considered to be insignificant. Sources of emissions that are considered to be insignificant include use of mobile and non-mobile machinery on site during the construction phase, mobile machinery and welding activities on site during the operational phase.

17.1.5 The elements of the AMEP are not considered in isolation. Consideration is made of impacts in terms of:

- impacts arising from the emissions associated with the AMEP as a whole;
- the existing background conditions, in particular where there may be already existing elevated airborne pollution, such as near to docks, adjacent to major roads and in urban areas, or where there are Air Quality Management Areas (AQMAs); and
- additional emissions that are likely to arise in the future from projects in the vicinity of the AMEP that are within the planning system, but not yet consented, or are consented but not built.

## 17.2 *LEGISLATION, POLICY AND GUIDANCE*

### *Overview*

17.2.1 There are several national policies and legislation that are relevant to the assessment of air quality.

### *UK Air quality standards for the protection of human health*

17.2.2 Within the UK there are statutory Air Quality Standards (AQS) set for the protection of human health relating to a number of airborne pollutants. These standards are legally binding and must be achieved by the relevant target dates. Relevant to this AMEP, the pollutants of interest are:

- particulate matter of aerodynamic diameter  $\leq 10\mu\text{m}$  (PM<sub>10</sub>);
- particulate matter of aerodynamic diameter  $\leq 2.5\mu\text{m}$  (PM<sub>2.5</sub>);
- nitrogen dioxide (NO<sub>2</sub>);
- sulphur dioxide (SO<sub>2</sub>);
- carbon monoxide (CO); and
- benzene.

17.2.3 The AQS for these substances are set out in the Air Quality Standards Regulations 2010. These Regulations themselves were developed from the European Directive and “daughter” Directives: Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe.

### ***UK Air quality standards for the protection of ecology***

17.2.4 The AQSs include those set for the protection of sensitive ecology relating to two airborne pollutants. These standards are legally binding and must be achieved by the relevant target date, and at the relevant locations. The standards relate to:

- oxides of nitrogen (NO<sub>x</sub>); and
- sulphur dioxide (SO<sub>2</sub>).

### ***Environmental Protection Act 1990***

17.2.5 The Environmental Protection Act 1990 is relevant to the AMEP in a number of respects. EPA 1990 states:

*'Subject to subsections (1A) to (6A) below, the following matters constitute "statutory nuisances" for the purposes of this Part, that is to say... any dust, steam, smell or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance'.*

17.2.6 In this respect, EPA 1990 is relevant with regard to the potential for dust nuisance during construction, odour nuisance during operation and emissions to air from all aspects of the operations in terms of impacts to health. In the latter case, this is relevant where there are no air quality standards for the pollutant of interest and instead other guidelines are relevant.

### ***Habitats Directive and Natura 2000 sites, and Wildlife and Countryside Act (1981)***

17.2.7 With regard to the protection of statutory designated sites for nature conservation, these are split into European protected sites (Habitats Directive and the Natura 2000 Network), and nationally protected sites (Countryside and Wildlife Act 1981).

17.2.8 European designated sites for nature conservation including SAC, SPA (and Ramsar in UK law) and all candidate sites are declared and protected under the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (see *Chapter 10*). Nationally designated sites for nature conservation, including SSSI, NNR and LNRs and all candidate sites, are declared and protected under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way (CROW) Act 2000 and the Natural Environment and Rural Communities (NERC) Act 2006 (the W&CA, 1981 as amended).

17.2.9 On this basis, assessment is made of impacts due to emissions both directly to air quality and due to deposition of acid and nutrient compounds to ground at these sites. Following guidance set out by the Environment Agency, European protected sites are assessed within 10 km of the proposed AMEP and other sites within 2 km.

*The Environment Act 1995, Local Air Quality Management and Technical Guidance Note TG(09)*

17.2.10 Under sections 84 and 88 of the Environment Act 1995, local authorities are required to undertake assessments of local air quality. The practical implementation of this Act is the Local Air Quality Management (LAQM) regime, with reference to the LAQM Technical Guidance note TG(09) (DEFRA, 2009b).

17.2.11 The regime sets out methodologies and guidance for local authorities to undertake assessments of local air quality. The staged and on-going approach is designed to determine where air quality standards are not being achieved and the effectiveness of mitigation measures for reducing air pollution. One of the key outcomes for the LAQM process is the declaration of AQMAs which are locations where one or more air quality standards are exceeded, or approached. AQMAs reflect locations where members of the public may be exposed to airborne pollution for relevant periods (ie the averaging period for the air quality standard in question) and may apply to a single property, small areas of properties, up to entire districts or boroughs.

*Ambient Air Quality and Cleaner Air for Europe Directive (2008/50/EC)*

17.2.12 Council Directive 2008/50/EC was adopted on 21 May 2008 and came into force on 11 June 2009. It consolidates and simplifies most of the ambient air quality legislation currently in force and introduces some new requirements.

17.2.13 The objective of ambient air quality legislation is to improve air quality by reducing the impact of air pollution on human health and ecosystems. By setting air quality standards for key pollutants and obliging EU member states to provide air quality plans demonstrating how air quality standards will be achieved and maintained when compliance is breached. Legislation on ambient air quality has contributed to the improvement of air quality throughout the European Union.

17.2.14 To improve air quality further, Directive 2008/50/EC introduced new standards and target dates for reducing concentrations of fine particles

(PM<sub>2.5</sub>) which, together with the coarser fraction of particles known as PM<sub>10</sub> that are already subject to legislation, are among the most damaging pollutants for human health. In recognition of the difficulties that Member States are facing in meeting air quality standards for certain pollutants by their compliance dates, the Directive allows for flexibility in complying with certain deadlines.

*Air Quality (England) Regulations 2000*

- 17.2.15 The Air Quality (England) Regulations establish the air quality objectives for seven pollutants, including sulphur dioxide, nitrogen dioxide, benzene, and carbon monoxide. The standards are set in relation to the effect of the pollutant on human health and are all currently in force in the UK.

*Air Quality Standards Regulations 2010*

- 17.2.16 The Air Quality Standards Regulations 2010 transpose into English legislation the requirements of Directive 2008/50/EC. Other general duties apply such as the maintenance of air quality standards and a duty to assess and monitor air quality.

*Planning Policy Guidance/Statements*

*Planning Policy Statement 23: Planning and Pollution Control*

- 17.2.17 PPS23 states that '(a)ny air quality consideration that relates to land use and its development is capable of being a material planning consideration' (Annex 1G.1). However, it also notes that,

*1'(t)he planning system should focus on whether the development itself is an acceptable use of the land, and the impacts of those uses, rather than the control of processes or emissions themselves. Planning authorities should work on the assumption that the relevant pollution control regime will be properly applied and enforced'.*

*National Policy Statement for Ports (draft)*

- 17.2.18 The draft National Policy Statement for Ports sets out the need for consideration of impacts of ports on air quality. The key considerations are:

- emissions of NO<sub>2</sub>/NO<sub>x</sub> and PM<sub>10</sub> associated with large volumes of HGV traffic;
- emissions of SO<sub>2</sub> associated with shipping in port and using coastal routes; and

- emissions of dust arising from handling of friable materials, including aggregates, cement and coal.

### ***Local Plan Policy***

#### *North Lincolnshire Council Local Plan*

- 17.2.19 **Local Plan Policy DS1 (v)** requires all development to incorporate a high standard of design and specifies that, ‘no pollution of water, air or land should result which poses a danger or creates detrimental environmental conditions’.

### ***Other***

#### *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland*

- 17.2.20 The strategy sets out air quality objectives for improving the air quality in the UK. The objectives do not have direct legal force but their existence and attainment need to be considered.

## **17.3 ASSESSMENT METHODOLOGY AND CRITERIA**

### ***Screening of insignificant emission sources***

- 17.3.1 As noted above there are some minor sources of emissions during construction and operational phases that are considered to have an insignificant impact on air quality and have therefore been scoped out of the study.
- 17.3.2 Due to the small number of vehicles on site during construction, the emissions from mobile and non-mobile construction equipment are not considered to be significant.
- 17.3.3 During operation there will be a number of plant on site, including SPMTs associated with movement of the turbines and components. It is understood that these will be electric and will therefore not have any direct emissions to air.
- 17.3.4 The tower structures will be welded on site as part of the manufacturing process and in the supply chain processes. The primary emissions associated with the welding activities will be small quantities of dust (European Commission, 2005). The emissions of dust from welding activities are considered unlikely to be significant for a number of reasons:

- The emissions will arise from several small sources across the site and therefore impacts will be diffuse.
- The area immediately around AMEP is not subject to baseline concentrations of particulate matter that are close to or above air quality standards. As a consequence the emissions are not considered to be at risk of leading to exceedances of the relevant air quality standards due to their magnitude.
- There are no sensitive human receptors within 100m of any emission source. Emissions from welding will typically be emitted to air through rooftop level vents and therefore concentrations will reduce rapidly with increasing distance from the emission point and are not considered likely to result in significant impacts at sensitive human receptors.
- The sensitive ecological receptors in close proximity to the site are considered insensitive to particulate emissions likely to arise from welding, as these occur only at a low level. The key project related emissions relating to sensitive ecological receptors are instead oxides of nitrogen and acid and nutrient derivatives.

17.3.5 On this basis, welding emissions are considered insignificant and have not been considered further.

17.3.6 Emissions from workshops and maintenance bays are also considered to be insignificant as these will represent only small and localised sources of emissions and are therefore not included.

#### *Overview - AMEP*

17.3.7 There are a range of considerations that determine the appropriate assessment methodology. The critical considerations are:

- key emission sources, as follows:
  - road traffic;
  - shipping; and
  - construction activities.
- assessment of impacts arising from AMEP as a whole;
- assessment of impacts on sensitive ecological receptors of which there are several extensive areas close to the site;
- assessment of impacts on human health, in particular in AQMAs;
- the need to reflect variable background air quality conditions; and

- the need to assess impacts in terms of additional emissions that are likely to arise in the future from projects in the vicinity of the AMEP that are planned but not yet built, for example power stations.

17.3.8 On the basis of these considerations, the primary tool for assessing AMEP related impacts is detailed dispersion modelling. The use of dispersion modelling allows detailed information on the magnitude of impacts to be identified and also allows impacts to be identified due to emissions arising from the various elements of the AMEP and traffic related emissions. The exception to this approach is with regard to construction dust and odour, where assessments are made on a qualitative risk-based basis.

17.3.9 This section also sets out assessment criteria, in terms of air quality standards, air quality guidelines, critical levels and critical loads. In addition, this section sets out the pollutant emissions and a summary of other data required to undertake the detailed modelling of sources. These points are addressed in detail in *Annex 17.1*. The assessment has been undertaken where relevant with consideration of local habitats in the vicinity of the AMEP, as further described in *Chapter 10* and *Chapter 11*, and also with consideration of the assessment of wider health impacts as set out in *Chapter 24*.

### ***Construction Dust***

#### *Sensitive human receptors*

17.3.10 There are no statutory criteria for the assessment of dust nuisance from construction sites. As set out in *Section 17.2.5*, EPA 1990 states that dust emissions should not result in nuisance issues at sensitive receptors. Quantitatively assessing dust emissions (for example using models) is subject to a high degree of uncertainty and therefore is not a preferred approach. A risk-based approach has therefore been developed to identify the potential for significant impacts to arise at sensitive receptors due to construction activities. On this basis, the need for mitigation is identified.

17.3.11 Studies by the Building Research Establishment (2003) suggest that nuisance is unlikely to occur at distances greater than 50 m from a construction site boundary. This is backed up by one particular study (Baughan, 1980) that has shown that at least half the people living within 50 m of the site boundary of a road construction scheme were “seriously bothered” by construction nuisance due to dust, but that beyond 100 m this reduced to less than 20 percent. In addition, ameliorating weather conditions such as rainfall and low wind speed



should also be considered, as dust emissions are negligible during wet and calm periods.

17.3.12 On this basis, a risk evaluation matrix has been devised and is presented in *Table 17.1*. This has been used to determine the potential for significant effects arising from construction dust deposition before the application of mitigation measures.

**Table 17.1** *Evaluation matrix for assessment of potential for dust nuisance issues*

Duration of on-site dust raising activity	Distance from site boundary to sensitive receptors		
	<50 m	50-100 m	100-200 m
> 12 months	Significant	Significant	Potentially significant
6 – 12 months	Significant	Potentially significant	Not significant
< 6 months	Potentially significant	Not significant	Not significant

17.3.13 On the basis of an assessment of the construction activities and programme duration, an assessment will be made of the potential for adverse impacts due to dust emissions associated with construction activities.

17.3.14 Impacts will be assessed primarily at nearby residential receptors, but consideration will also be made of other dust sensitive receptors such as, industrial and commercial property, car storage yards, existing port facilities etc.

*Sensitive ecological receptors*

17.3.15 Emissions of dust from construction activities can also have an impact on sensitive ecological receptors. This primarily arises due to damage to vegetation through the deposition of dust either through obscuration of photosynthetic surfaces or through toxicological effects due to the chemistry of dusts (eg alkaline limestones). The assessment takes into account the potential for adverse impacts at statutory protected national and European sites.

17.3.16 The potential for damage due to dust deposition will depend upon several factors:

- The proximity of sensitive ecological receptors to dust emission sources: dust generated mechanically from the ground preparation activities and arising from the movement of vehicles over exposed

earth is likely to be the most significant source of dust emissions. Emitted dust is likely to travel a maximum of 200 m from source during normal weather conditions, and a maximum of 500 m in particularly extreme weather conditions (Minerals Policy Statement 2, 2005).

- The sensitivity of the species within the sensitive ecological receptors to dust deposition: there is very little information available on the sensitivity of particular species to dust. However, it is understood that damage may be caused by obscuration of photosynthetic surfaces and blockages of stomata. A limited number of sources have been identified and considered when assessing the potential for damage to occur.
- The chemistry of emitted dust with regard to toxicity: given that the dust generated will mainly arise from ground activities, the dust is assumed to have no direct toxic effects and that these effects will be negligible.

17.3.17 On the basis of the points set out above, the potential for adverse impacts to arise at sensitive ecological receptors has been assessed.

### *Road Traffic*

#### *Overview*

17.3.18 Within the traffic assessment, roads in the vicinity of the site where there are likely to be significant increases in traffic have been identified, in this case roads where traffic increases by >5 percent. As a result, the study area extends somewhat beyond the site boundary as traffic is introduced into the wider road network. In addition to identifying roads with significant increases in traffic, on the basis of the findings of the traffic assessment, additional roads with smaller increases close to the site have also been included. This ensures that all impacts at sensitive receptors are identified. The assessment of both construction phase and operational phase traffic has been undertaken. The key emissions associated with road traffic are NO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>.

17.3.19 The assessment methodology reflects the need to take into consideration the emissions to air arising from the additional vehicles generated by the AMEP. The assessment includes consideration of the mix of additional vehicles (ie cars and vans or heavy goods vehicles), and the existing number of vehicles and environment around the roads which are likely to be used by these vehicles.

### *Detailed dispersion modelling*

- 17.3.20 The assessment of impacts associated with road traffic uses detailed dispersion modelling, in this case utilising the ADMS-Roads modelling package, which uses an accurate representation of the required road network and locations of sensitive receptors. The roads of interest were entered in the model as a series of links with defined width, traffic flow, traffic composition and geometry.
- 17.3.21 The model provided predicted results of short term and long term pollution concentrations, and included consideration of hourly variable traffic flows, NO:NO<sub>2</sub> chemistry, and impacts associated with receptor exposure to emissions from more than one road. The model can be validated against monitoring data where suitable such data is available. On this occasion, due to the lack of relevant monitoring data no validation was undertaken. However a qualitative assessment of the predicted results against observed pollution concentrations in the vicinity of road network included in the model was considered. Details on the approach followed, including modelling inputs can be found in *Annex 17.1*.

### *Shipping*

#### *Overview*

- 17.3.22 The AMEP will result in additional near-shore shipping movements in the Humber Estuary. The emissions to air associated with these activities have the potential to impact on air quality at sensitive human and ecological receptors in the vicinity of the Humber Estuary. The key pollutants of interest associated with shipping are PM<sub>10</sub>, NO<sub>2</sub>, NO<sub>x</sub> and SO<sub>2</sub>.

#### *Methodology*

- 17.3.23 The potential impacts of emissions from shipping were assessed using the ADMS 4.2 dispersion model. In terms of emissions relating specifically to AMEP, the model takes into consideration ships accessing the site and further out into the shipping lanes in the Humber Estuary. However, in addition, the modelling also considered existing shipping in the Humber Estuary, primarily in order to validate the results of the model against monitoring. The model is capable of modelling short term and long term impacts, and includes consideration of NO: NO<sub>2</sub> chemistry.
- 17.3.24 Ship movements were modelled as a series of line sources representing shipping routes. The process of deriving emission factors for the

shipping vessels referred to a number of publications (EC, 2010, 2002, 1999; SEPA, 2004). The process of deriving shipping emissions is described in detailed in *Annex 17.1*.

### ***Rail emissions***

#### *Overview*

- 17.3.25 AMEP will result in additional movements of diesel rail locomotives on the site itself and also on routes to and from the development. It is expected that there will be a maximum additional ten trains per week; it is unlikely that this small number of movements will result in an additional significant impact on air quality. Where trains may be stacked awaiting access to the main line there is the potential for impacts to arise in close proximity to the locomotive. However, it is normal practice that locomotives are powered down in the event of a waiting time greater than 15 minutes in order to save fuel. In addition, at the junction onto the main line, there are no receptors within 15 m of the rail line, and therefore impacts, in isolation, are considered negligible. On this basis, no consideration was made of rail emissions outside the site boundary. However, in order to capture impacts of site operations as a whole, the rail sources were included in the modelling of sources arising from the AMEP site itself. The key emissions of interest associated with rail locomotives are SO<sub>2</sub>, NO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub>.
- 17.3.26 The approach was adopted for the operational phase and considered potential impacts at both sensitive human and ecological receptors.

#### *Methodology*

- 17.3.27 The potential impacts of emissions from trains were assessed using the ADMS 4.2 dispersion model. The model is capable of modelling short term and long term impacts, and includes consideration of NO: NO<sub>2</sub> chemistry. The train movements were modelled as line sources representing rail lines. Information on the approach followed including modelling inputs is detailed in *Annex 17.1*.

#### *Main site*

- 17.3.28 The paint spraying of the towers and components on the main site has the potential to result in emissions of VOCs and odour arising from VOCs.
- 17.3.29 In terms of potential impacts to health arising from VOC emissions, the exact composition of the paint used is not known. Instead, the approach has been used whereby overall VOC emissions have been

estimated (as described in detail in *Annex 17.1*) and the assumption made that all emissions occur as benzene. This represents a worst-case approach as benzene has a stringent air quality standard, compared to other VOCs which are likely to be in the paint. This ensures that any impacts are overestimated.

17.3.30 The potential for odour nuisance to occur is primarily associated with VOC emissions from the main site paint spraying activities. The paint used to spray the towers is industrial grade paint, and is likely to have some VOC content. The odour will arise due to human perception of the odour associated with VOCs. However, odour nuisance is subjective and in order to incorporate odour into the assessment, the VOC emissions have been converted to Odour Units and included in the dispersion modelling. The method for undertaking this is set out in *Annex 17.1*.

17.3.31 Emissions of VOCs from the paint spraying process have been estimated. In order to assess the potential for odours to occur, it is necessary to convert between VOC concentration and odour. The assumption has been made that the VOC emissions arise as ethyl alcohol, as this is a common component of paint and has a relatively low odour threshold of 0.28 mg/m<sup>3</sup>). This was used to convert between VOC concentration and total odour.

#### *Climate change and carbon dioxide*

17.3.32 Where possible, the potential impact on climate change, primarily due to additional emissions of carbon dioxide associated with the proposed scheme, has been quantified. The assessment included road traffic, rail traffic and shipping

17.3.33 The quantification of CO<sub>2</sub> emissions associated with road traffic was quantified using equations set out in the design Manual for Roads and Bridges (DMRB). Within the DMRB spreadsheet there is a function that allows calculation of CO<sub>2</sub> emissions, based upon vehicle mix, distances travelled and total numbers of vehicles. CO<sub>2</sub> emissions were calculated for the roads included in the study as this will be the source of the majority of journeys. However, it is recognised that this approach does not take into account impacts arising from traffic elsewhere on the road network.

17.3.34 Shipping emissions were quantified based upon the expected numbers of vessels, number of movements and likely distances travelled. Emission factors were derived for shipping, alongside emissions for airborne pollutants. The assumption was made that the average

shipping journey is 200 km for the purposes of quantifying emissions across the whole journey.

- 17.3.35 Rail emissions were quantified based upon the expected numbers of trains and likely distances travelled. Emission factors were derived for rail, alongside emissions for airborne pollutants. The assumption was made that the average rail journey is 100 km for the purposes of quantifying emissions across the whole journey.

### *Air quality standards, critical levels and critical loads*

#### *Overview*

- 17.3.36 The air quality standards, critical levels and critical loads set out in this section reflect the pollutants that are potentially emitted in significant quantities, and reflect impacts to both human and ecological sensitive receptors.

#### *Air quality standards and guidelines for the protection of human health*

- 17.3.37 The criteria for assessment of impacts at sensitive human receptors at sensitive human receptors during the construction and operational phases are set out in *Table 17.2*. They are derived from EU and UK statutory AQS.

**Table 17.2** *AQS for the protection of human health*

<b>Pollutant</b>	<b>Averaging period and statistic</b>	<b>Assessment criterion (µg /m<sup>3</sup>)</b>	<b>Source</b>
NO <sub>2</sub>	Annual mean	40	AQS
	1 hour mean, not to be exceeded more than 18 times per year	200	AQS
PM <sub>10</sub>	Annual mean	40	AQS
	24 hour mean, not to be exceeded more than 35 times per year	50	AQS
PM <sub>2.5</sub>	Annual mean	25	AQS
SO <sub>2</sub>	24 hour mean, not to be exceeded more than 3 times per year	125	AQS
	1 hour mean, not to be exceeded more than 24 times per year	350	AQS
	15 minute mean, not to be exceeded more than 35 times per year <sup>1</sup>	266	AQS
CO	Maximum 8 hour daily mean	10 000	AQS
Benzene	Annual Mean	5	AQS

AQS: Air Quality Standard – these are currently legally binding in the UK and are derived from European Directives

(Note 1) the 15 minute mean standard for SO<sub>2</sub> is a UK specific air quality standard, and is not included in the European Air Quality Directives

17.3.38 In addition to the air quality standards set out in *Table 17.2*, a criterion of 1 OU/m<sup>3</sup> was utilised for the assessment of odour impacts arising from VOC emissions from the main site. 1 OU/m<sup>3</sup> represents the point at which most receptors will first perceive the odour (ie odour threshold) and therefore using 1 OU/m<sup>3</sup> as an assessment criterion is conservative.

*Critical levels and critical loads for the protection of sensitive ecological receptors*

17.3.39 The critical levels are set out in

17.3.40

17.3.41 *Table 17.3*. These are applicable to the ambient concentrations of pollutants and apply to all sensitive ecological receptors equally, making no consideration of site specific conditions or the species of interest from a conservation perspective.

**Table 17.3** *Critical levels for the protection of sensitive ecological receptors*

Pollutant	Averaging period	Assessment criterion (µg m <sup>-3</sup> )	Date to be achieved
NO <sub>x</sub>	Annual mean	30	31 December 2009
NO <sub>x</sub>	24 hour mean	75 <sup>(1)</sup>	
SO <sub>2</sub>	Annual mean	20	31 December 2005

(1) The NO<sub>x</sub> 24 hour mean is a UK guideline criteria, and is not included in the European Air Quality Directives

17.3.42 The critical loads for the protection of sensitive ecological receptors are set on a site specific basis. This primarily relates to deposition of pollutants to ground and therefore soil chemistry and the sensitivity of the species within each individual sensitive ecological receptor. They are estimated by Centre for Ecology and Hydrology and others and set out on the Air Pollution Information System website (Centre for Ecology and Hydrology, 2010). The site specific critical loads are set out in *Annex 17.1*, along with the sensitive ecological receptors of interest and baseline conditions for these sites.

*Significance criteria*

17.3.43 In order to assess the significance of the predicted impacts, significance criteria are used. The potential impacts associated with the AMEP are assessed in terms of:

- Process Contribution (PC) – this is the impact associated with emissions from the AMEP only; and
- Predicted Environmental Concentration (PEC) – this is the impact associated with emissions from the AMEP added to the existing baseline conditions.

*Significance criteria for assessment of impacts to human health*

17.3.44 Based upon guidance developed by Environmental Protection UK and the UK Institute of Air Quality Management (IAQM), the criteria presented in *Table 17.4* will be used to assess the potential significance of impacts at sensitive human receptors.

**Table 17.4** *Significance criteria for assessing impacts to human health*

Screening Stage				
<i>Increase over baseline/do nothing due to AMEP emissions</i>				
Large	Increase >10 %			
Medium	Increase 5-10 %			
Small	Increase 1-5 %			
Imperceptible	Increase <1 %			
<i>Significance criteria</i>				
<b>Magnitude of change</b>	<b>Imperceptible</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>
<b>PEC above air quality standard or guideline with AMEP</b>	Not significant	Minor Adverse	Moderate Adverse	Major Adverse
<b>PEC just below air quality standard or guideline with AMEP (0% - 10% below air quality standard or guideline)</b>	Not significant	Minor Adverse	Moderate Adverse	Moderate Adverse
<b>PEC below air quality standard or guideline with AMEP (10% - 30% below air quality standard or guideline)</b>	Not significant	Not significant	Minor Adverse	Minor Adverse
<b>PEC well below air quality standard or guideline with AMEP (&gt;30% below air quality standard or guideline)</b>	Not significant	Not significant	Not significant	Not significant

17.3.45 These significance criteria are applied with regard to emissions from the AMEP site, project related traffic and, where appropriate, both. The significance criteria also address the potential for impacts where air quality standards are not currently achieved (ie AQMAs). It should be noted that where an air quality standard is exceeded, this does not necessarily preclude development occurring, but gives a higher sensitivity to these areas. Where there is uncertainty around whether air quality standards are exceeded or otherwise, these are addressed.



### *Significance criteria for assessment of impacts to sensitive ecological receptors*

17.3.46 In relation to impacts on sensitive ecological receptors, there are specific sensitivity criteria that are used in this assessment derived from H1. These relate to the Critical Loads (ie impacts via deposition) and Critical Levels (ie impacts via airborne pollutants directly) set for the protection of sensitive ecological receptors. Impacts of emissions are considered to have not significant impact upon sensitive ecological receptors, if:

- PC < 1 percent of the long term critical load or critical level;
- or, if PC > 1 percent but the PEC < 70 percent of the critical load or critical level.

### *Cumulative impacts – non-development related emissions*

17.3.47 There are a number of proposed schemes in the vicinity of the AMEP which are not yet constructed but which, when operational, may have a significant impact on air quality. These sources of emissions are therefore not reflected in the existing baseline and therefore need to be considered separately.

17.3.48 In this case, the emissions arising from these proposed schemes have been considered on a semi-quantitative basis. The overall impacts arising from other proposed schemes in the vicinity of AMEP are not fully understood in the vicinity of the AMEP site or at locations that are also impacted by the AMEP site. Therefore, instead a risk-based approach has been adopted. This approach is based on the criteria set out in *Table 17.4* and identifies those locations or pollutants where the PC or PEC is close to (ie >70 percent of an AQS or CL) or above the AQS or CL and therefore any additional burden may be critical.

## **17.4 CONSULTATION**

### *Overview*

17.4.1 A number of consultation responses have been received from stakeholders. These have been reviewed and considered in the design of the proposed scope of works. The responses of relevance were addressed, either by inclusion into the scope of works or scoped out on the basis of the justification provided. In some cases responses are truncated to include only those sections relevant to air quality. The summaries of consultation responses and how they were addressed is included in *Annex 2.2*.

## 17.5 *BASELINE*

### *Overview*

17.5.1 This section sets out the following:

- identification and locations of sensitive human receptors;
- baseline air quality at sensitive human receptors;
- Air Quality Management Areas;
- identification and locations of sensitive ecological receptors; and
- baseline conditions at sensitive ecological receptors.

### *Identification and locations of sensitive human receptors*

17.5.2 The air quality standards apply at all non-occupational locations, and therefore impacts are assessed in terms of the maximum impacts at any off site locations. However, assessment has also been undertaken at discrete sensitive human receptors in order to ascertain the magnitude of potential impacts. The receptors have been defined in two sets: sensitive human receptors in the vicinity of the site itself; and sensitive human receptors in the vicinity of roads affected by additional traffic generated by the proposed scheme. In terms of receptors in close proximity to the site itself, these have been selected on the basis of receptors within 1-2 km of the site boundary.

17.5.3 Following guidance set out in TG(09), the potential impacts on sensitive human receptors were considered for receptors within 200 m of roads identified to be subject to significant increases in traffic. The specific sensitive receptor locations have been identified focussing primarily on sensitive receptors in closest proximity to the roadside. Impacts at other receptors will be ascertained by the use of receptor grids around roads of interest. The details of these receptor locations are set out in *Annex 17.1*.

### *Shipping emissions*

17.5.4 Human sensitive receptors were considered within 1-2 km of shipping activities where emissions are potentially significant, primarily these are docksides and the routes to and from dockside. This is based upon guidance set out in TG(09).

## *Dust*

- 17.5.5 Construction activities will typically only impact on sensitive human receptors within 200 m of construction activities, as previously discussed in *Paragraph 17.3.16*. As such, consideration of impacts arising from dust emissions is limited to sensitive receptors within 200 m around the construction site itself.

## *Air Quality Management Areas*

- 17.5.6 As discussed in *Section 17.2*, AQMAs are declared where air quality standards are not achieved or are approached. An initial review has identified four AQMAs that may be potentially impacted by the AMEP:

- Hull (NO<sub>2</sub>);
- Immingham (PM<sub>10</sub>);
- Scunthorpe (PM<sub>10</sub>); and
- Low Stanton (PM<sub>10</sub>).

- 17.5.7 In consultation with North Lincolnshire Council (NLC), it is apparent that the baseline concentrations of NO<sub>2</sub> are close to, or above, the annual mean air quality standard for NO<sub>2</sub>, in close proximity to Humber Road in Killingholme (A160). Whilst NLC have not declared an AQMA this may be a possibility in the future in the immediate vicinity of the roadside, due to the elevated NO<sub>2</sub> concentrations. Therefore, specific consideration of this location is made in the assessment, to ascertain whether the proposed scheme would have any significant impacts, if this location were declared an AQMA.

## *Baseline air quality at sensitive human receptors*

### *Overview*

- 17.5.8 Within the vicinity of the AMEP site there are a number of sources of emissions to air including:

- Scunthorpe steelworks,;
- Immingham Docks;
- Other industry;
- Road sources (A160, A180, M180); and
- Arising from urban areas in Immingham and Scunthorpe.

The emissions arising from these sources will have an influence on the ambient air quality in the vicinity of the AMEP site; and at sensitive receptors potentially impacted by emissions from AMEP and impacted by traffic accessing AMEP.

- 17.5.9 There are a number of sources of baseline air quality data in the vicinity of the site available, and these have been considered in the assessment. Details of the baseline air quality monitoring considered in the assessment are set out in *Annex 17.1*. As the primary impacts are likely to occur relatively close to the AMEP site, the baseline air quality used in the assessment was based upon conditions at the site itself.
- 17.5.10 The baseline air quality was derived from consideration of a number of sources of information, listed here in order of preference:
- monitoring undertaken by North Lincolnshire Council;
  - other nationally available monitoring data; and
  - interpolated mapping data derived from UK wide mapping of pollution emission sources.
- 17.5.11 It is recognised that due to local sources of emissions baseline air quality will not be constant across the study area. Where the baseline conditions are likely to be elevated above those used in the study, and where this is likely to be critical, this has been identified and discussed in the assessment.
- 17.5.12 Within the modelling undertaken for road traffic sources, hourly variable baseline data has been incorporated in the model in order to allow correct calculation of the reaction between nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>). For the other modelled sources, the baseline is not included, and instead the baseline is included once the model has been run. For the assessment of total impacts from the AMEP site, the traffic impacts including the baseline is added to the PC (as defined in *Section 17.3.64*) arising from the other emission sources (ie shipping, rail and the main site).
- 17.5.13 Emissions from road traffic will not affect locations greater than 200 m from the roadside. The elevated pollutant concentrations associated with road traffic will not typically be included in the baseline. Within the assessment, baseline traffic is included in the traffic models in order to take into consideration these elevated concentrations in the vicinity of the roadside.

*Baseline conditions*

- 17.5.14 The derived baseline air quality in the vicinity of the site is set out in *Table 17.5*. These data are based upon continuous monitoring

undertaken at North Killingholme School, in the vicinity of the AMEP site. These data have been used in the impact assessment; the traffic model utilises hourly variable baseline data derived from this location for NO<sub>2</sub>, NO<sub>x</sub>, PM<sub>10</sub> and SO<sub>2</sub>. Consideration is made of additional monitoring undertaken by NLC where relevant, the details of which are set out in *Annex 17.1*.

**Table 17.5** *Summary of baseline air quality in the vicinity of the site*

Pollutant	Averaging Period	Baseline (ug/m3)
NO <sub>2</sub>	Annual	18.0
	99.8%ile 1hr	36.0
NO <sub>x</sub>	Annual	33.4
SO <sub>2</sub>	Annual	8.4
	99.9%ile 15min	16.8
	99.7%ile 1hr	16.8
	99.2%ile 24hr	16.8
PM <sub>10</sub>	Annual	18.5
	90.4%ile 24hr	33.2
PM <sub>2.5</sub>	Annual	10.0
Benzene	Annual	1.6

Derived from continuous monitoring undertaken by North Lincolnshire Council at a site in North Killingholme  
Average benzene concentrations measured by diffusion tube at North and South Killingholme, as presented by NLC in the 2003 Updating and Screening Assessment

17.5.15 Data from the diffusion tube survey undertaken by NLC indicate that there are some locations where concentrations of pollutants, in particular NO<sub>2</sub>, are substantially above the baseline identified at North Killingholme. These primarily occur in close proximity to major roads, but emissions from other sources, such as existing industrial sources, will also elevate the existing concentrations.

17.5.16 In the assessment, the baseline data set out in *Table 17.5* has been utilised in the study, however discussion of the implications of elevated exiting baseline pollutant conditions has also been made where appropriate.

## *Locations and baseline conditions at sensitive ecological receptors*

### *Sensitive ecological receptors*

17.5.17 A review of sensitive ecological receptors has been undertaken using the Multi Agency Geographical Information for the Countryside toolkit (MAGIC). The assessment is required to consider impacts upon sites with the following statutory designations:

- Sites of Special Scientific Interest (SSSIs);
- Special Areas of Conservation (SACs);
- Special Protection Areas (SPAs); and
- Ramsar sites.

17.5.18 Within the impact assessment methodology, all European protected habitat sites within 10 km of the AMEP site are considered (ie SPAs, SACs, RAMSAR sites), and all nationally protected sites within 2 km (ie SSSIs). In addition, some consideration is given to non-statutory sites (ie NNRs). This review identified one European designated sensitive ecological receptor within 10 km of the AMEP, one SSSI within 2 km of the AMEP, and two LNRs which therefore will be included in the assessment. These are:

- The Humber Estuary SSSI, SAC, SPA and RAMSAR;
- North Killingholme Haven Pits SSSI (within the Humber SPA/SAC/RAMSAR);
- South Killingholme NNR; and
- Burkinshaws Covert Woods NNR.

17.5.19 The baseline conditions and critical loads and levels for these sensitive ecological receptors are set out in *Table 17.11*. The Humber Estuary is an extensive habitat, and therefore baseline conditions have been quantified over the area of the estuary within 10 km of the AMEP site.

## **17.6**      ***IMPACTS***

### ***Construction Phase - dust***

17.6.1 The construction of the site has the potential to result in significant emissions of dust. Dust emissions will arise from a range of on-site activities during construction including:

17.6.2

- stripping and levelling of ground;
- stockpiling of materials;
- movement of vehicles over exposed ground;

- other groundworks; and
- handling of friable materials.

17.6.3 The impacts associated with dust are only likely to be potentially significant within 200 m of the source, as described in *Paragraph 17.3.16* and set out in *Table 17.1*. On this basis, there are a small number of sensitive receptors potentially affected by on-site activities, as set out in *Table 17.6*.

**Table 17.6** *Dust sensitive receptors within 200 m of the site boundary*

Site	Direction	Distance site boundary to closest point of receptor (m)
<i>Ecological</i>		
North Killingholme Haven SSSI	North	<50
Humber Estuary SAC/SPA/SSSI	North/Northeast/East	<50
Burkinshaws Covert Woods LNR	West	<50
South Haven LNR	Southeast/east	50-100
<i>Human</i>		
Property on Killingholme Marshes	All	<50
Killingholme Lighthouse 1	East	100-200
Killingholme Lighthouse 2	East	<50
Marsh Farm	Southeast	50-100
Property on Marsh Lane	Southeast	<50
Property adjacent to Rosper Road 1	East	<50
Property adjacent to Rosper Road 2	East	<50
Property adjacent to A1173	South	100-200
Fire station on Rosper Road	West	50-100

17.6.4 In addition to consideration of the risk factors set out in *Table 17.1*, there are a number of factors that need to be considered:

17.6.5 Wind speeds of greater than approximately 5.3 m/s are required to disturb surface dust from open surfaces and stockpiles sufficiently for it to become airborne (USEPA, 1995). Lower wind speeds are unlikely to lead to dust being entrained in the air.

- 17.6.6 Dust may be generated from the action of vehicles over open ground and from the actions of stripping, ground clearing and excavation into dry ground. At a typical wind speed of 4.4 m/s particles larger than 100 µm will settle out within 9 m, for particles of 30-100 µm, which comprise the majority of dust particles, these will settle out within 100 m (USEPA, 1995).
- 17.6.7 When rainfall levels are greater than approximately 0.2mm/hour, dust emission is effectively attenuated and is unlikely to be entrained in the air (Minerals Policy Statement 2, 2005).
- 17.6.8 In order to impact upon sensitive receptors, the wind will need to be blowing from the site towards the sensitive receptors.
- 17.6.9 *Table 17.7* sets out consideration of the risk matrix detailed in *Table 17.1*, and the points noted above to provide an indication of the potential for dust issues to arise at the sensitive human receptors within 200 m of the site boundary. The risk of significant dust nuisance has been determined on the basis of the proximity of the receptor to dust raising activities, and also the likely duration of dust raising activities in areas which may impact upon the receptor. The analysis of wind direction is based upon meteorological data for 2009. *Table 17.7* sets out the risk of dust nuisance occurring with no mitigation measures for the control of dust.



**Table 17.7 Potential for significant dust nuisance issues at sensitive human receptors**

Site	Direction	Distance site boundary to closest point of receptor	Percentage of year potentially affected by dust	Duration of activates	Potential for significant nuisance issues
Property on Killingholme Marshes	All	<50	45%	>12 months	<b>Likely to be significant</b>
Killingholme North Low Lighthouse 1	East	100-200	4.1%	>12 months	Unlikely to be significant
Killingholme North Low Lighthouse 2	East	<50	4.1%	>12 months	<b>Likely to be significant</b>
Marsh Farm	Southeast	50-100	3.8%	>12 months	Potentially significant
Property on Marsh Lane	Southeast	<50	3.8%	>12 months	<b>Likely to be significant</b>
Property adjacent to Rosper Road 1	East	<50	4.1%	>12 months	<b>Likely to be significant</b>
Property adjacent to Rosper Road 2	East	<50	4.1%	>12 months	<b>Likely to be significant</b>
Property adjacent to A1173	South	100-200	9.4%	>12 months	Unlikely to be significant
Fire station on Rosper Road	West	50-100	5.2%	>12 months	Potentially significant

17.6.10

With regard to sensitive ecological receptors an additional consideration is made of the type of habitat. On this basis, it is therefore considered necessary to implement mitigation measures to minimise dust emissions. The potential for significant impacts are set out in *Table 17.8*.

**Table 17.8 Potential for significant dust issues at sensitive ecological receptors**

Site	Direction	Distance site boundary to closest point of receptor	Percentage of year potentially affected by dust	Duration of activities	Site type	Potential for significant impacts
North Killingholme Haven SSSI	North	<50	5.4%	>12 months	Wetland	Potentially significant
Humber Estuary SAC/ SPA/ SSSI	North/ Northeast/ East	<50	13.3%	>12 months	Tidal mudflats	Not significant
Burkinshaws Culvert Woods	West	<50	5.2%	>12 months	Woodland	<b>Likely to be significant</b>
South Haven	Southeast/ East	50-100	7.9%	>12 months	Wetland	Potentially significant

17.6.11 With regard to sensitive ecological receptors, the Humber Estuary is considered insensitive to dust deposition within 200 m of on-site dust sources as the tidal washing of the habitat site will remove any dust deposited. With regard to North Killingholme Haven and South Killingholme Haven, these locations are potentially sensitive to dust deposition due to the flora within the site. With regard to Burkinshaws Covert, this location is likely to be adversely affected by deposition of dust. On this basis, it is therefore considered necessary to implement mitigation measures to minimise dust emissions.

***Construction Phase - traffic***

17.6.12 As discussed in *paragraph 17.3.22* an impact assessment has been undertaken for roads where there are potentially significant increases in traffic are occurring due to the increases in traffic as a result of the operation of the facility. The roads where potentially significant impacts may occur have been identified from the traffic assessment and have been carried forward into modelling using ADMS-Roads along with other roads in the immediate vicinity of the plant where impacts may occur.

17.6.13 The results of the assessment of impacts arising from road sources is set out in *Table 17.9*; this illustrates the maximum impacts arising at any sensitive human receptor identified alongside the roads of interest.

Detailed results for each of the 79 receptors identified are set out in *Annex 17.1*.

**Table 17.9** *Summary of impacts arising from road sources at sensitive human receptors*

Pollutant	AQS	Criterion µg/m <sup>3</sup>	Indicative baseline	PEC DN	PEC DS	Difference %	Magnitude	PEC DS/AQS	Significance
	µg/m <sup>3</sup>		µg/m <sup>3</sup>	µg/m <sup>3</sup>	µg/m <sup>3</sup>			µg/m <sup>3</sup>	
NO <sub>2</sub>	Annual Mean	40	18.0	23.5	23.6	0.44%	Imperceptible	59%	Not significant
NO <sub>2</sub>	1 hour mean	200	36.0	105	105	0.044%	Imperceptible	52%	Not significant
PM <sub>10</sub>	Annual Mean	40	18.5	19.4	19.5	0.27%	Imperceptible	49%	Not significant
PM <sub>10</sub>	24 hour mean	50	33.2	33.7	33.8	0.30%	Imperceptible	68%	Not significant
PM <sub>2.5</sub>	Annual Mean	25	10.0	10.6	10.6	0.34%	Imperceptible	42%	Not significant

- 17.6.14 The results of the assessment of impacts arising from road sources indicate that there will be no significant impacts associated with the increase in road traffic at sensitive human receptors.
- 17.6.15 The results presented in *Table 17.10*, utilise baseline air quality data derived from the continuous monitoring location in North Killingholme. This location is considered to be representative of the general baseline air quality in the vicinity of the AMEP site away from any specific sources of emissions and is therefore appropriate for the majority of study area, including the majority of road sources studied. However, the results of the model, in particular for the 'Do Nothing' scenario are somewhat below the highest roadside NO<sub>2</sub> concentrations identified in the area, particularly in the vicinity of the A160 Humber Road (see *Annex 17.1*).
- 17.6.16 As previously discussed, the baseline used in the traffic model is obtained from a location in North Killingholme. The maximum predicted annual mean NO<sub>2</sub> concentration in the 'Do Nothing' of 23.6 µg/m<sup>3</sup>, is somewhat lower than the monitored concentrations at Humber Road Chip Shop (27 µg/m<sup>3</sup>, ratified) and Humber Road LP 695 (33 µg/m<sup>3</sup>, ratified). On this basis, either the model is underestimating impacts, or the baseline in the vicinity of these monitoring locations is greater than that which occurs at North Killingholme School. Given the proximity of South Killingholme to emission sources at the nearby oil refineries, it is foreseeable that the baseline concentrations at the Humber Road monitoring sites are different from that at the North Killingholme School.
- 17.6.17 There is also some concern raised by NLC that the modelling is underpredicting impacts at roadside sites. This is based upon nitrogen dioxide diffusion tube monitoring which identified concentrations in close proximity to the kerbside of the A160, of a maximum of 66µg/m<sup>3</sup>. However, upon further consultation with NLC, it has been identified that the monitored nitrogen dioxide concentrations are likely to be substantially overestimated due to inaccuracies in the diffusion tube methodology; in this case a correction of between 0.7 to 0.75 is likely to need to be applied to correct the results (email from Ross Thompson (NLC) to Chris Hazell-Marshall (ERM) on the 26<sup>th</sup> July 2011). On this basis, the monitored NO<sub>2</sub> concentrations are likely to be 46-49µg/m<sup>3</sup>, which is closer to the maximum modelled concentration of 31µg/m<sup>3</sup>. Allowing for variability in the baseline conditions around North Killingholme, this provides confidence that the traffic modelling is consistently predicting the impacts of traffic related emissions on air quality.

17.6.18 Whilst the issue of identifying any variations in the baseline is a consideration, it is not critical in this case, as the predicted impact of the traffic associated with the proposed development is 'insignificant' and therefore, even if the existing NO<sub>2</sub> concentrations were to be in excess of the air quality standard, the impacts from the proposed construction phase scheme traffic would remain 'insignificant'.

### *Operational Phase*

17.6.19 The sources of emissions arising during the operational phase are:

- combustion gases arising from road vehicles accessing the site;
- combustion gases arising from shipping accessing the site;
- emissions of combustion gases arising from trains accessing the main site; and
- volatile organic compounds arising from the painting of components on the main site.

17.6.20 These emissions have the potential to affect human health due to elevated concentrations of airborne pollutants. These emissions also have the potential to affect sensitive ecological receptors, in terms of potential impacts on soil chemistry which result in impacts to the health of sensitive plants due to deposition of acids and nutrient nitrogen.

17.6.21 A summary of the potential impacts arising from road sources and non-road sources are set out here. Furthermore, impacts comprising both road and non-road sources are also set out. The potential impacts are set out for both sensitive human receptors and sensitive ecological receptors. Detailed results are set out in *Annex 17.1*.

### *Operational Phase- impacts arising from non-road sources*

17.6.22 The results of the assessment of impacts arising from non-road sources for sensitive human receptors (as set out in *Annex 17.1*) is set out in *Table 17.10*; this illustrates the maximum impacts arising anywhere off-site as a result of emissions from the main site, on-site rail and shipping emissions during the operation of the site.

**Table 17.10** Summary of impacts arising from non-road sources at sensitive human receptors

Pollutant	Averaging Period	Baseline (ug/m3)	AQS (ug/m3)	PC (ug/m3)	PC/AQS %	PEC (ug/m3)	PEC/AQS %	Magnitude	Significance
NO <sub>2</sub>	Annual	18.0	40	0.0172	0.0430%	18.0	45%	Imperceptible	Not Significant
	1 hour mean 99.8%ile	36.0	200	0.0686	0.0343%	36.1	18%	Imperceptible	Not Significant
SO <sub>2</sub>	Annual	8.4	50	0.00775	0.0155%	8.40	17%	Imperceptible	Not Significant
	15 minute mean 99.9%ile	16.8	266	0.112	0.0419%	16.9	6.4%	Imperceptible	Not Significant
	1 hour mean 99.7%ile	16.8	350	0.0635	0.0182%	16.8	4.8%	Imperceptible	Not Significant
	24 hour mean 99.2%ile	16.8	125	0.0352	0.0281%	16.8	13%	Imperceptible	Not Significant
PM <sub>10</sub>	Annual	18.5	40	0.00105	0.00264%	18.5	46%	Imperceptible	Not Significant
	24 hour mean 90.4%ile	33.2	50	0.00373	0.00746%	33.2	66%	Imperceptible	Not Significant
PM <sub>2.5</sub>	Annual	10.0	25	0.00105	0.00422%	10.0	40%	Imperceptible	Not Significant
Benzene	Annual	1.6	5	0.529	10.6%	2.16	43%	Large	Not Significant

- 17.6.23 The results of the assessment of impacts arising from on-site activities suggest that no air quality standards are exceeded due to the operation of AMEP, and that there are no significant impacts.
- 17.6.24 The assessment illustrates that in terms of emissions of volatile organic compounds from the main site, even using the highly conservative assumption that all emissions occur as benzene, the air quality standard is not predicted to be exceeded and there are no significant impacts.
- 17.6.25 The results of the assessment of impacts arising from non-road sources for sensitive ecological receptors is set out in *Table 17.11*; this illustrates the maximum impacts arising anywhere off-site as a result of emissions from the main site, on-site rail and shipping emissions, during the operation of the site.



Table 17.11 Summary of impacts arising from non-road sources at sensitive ecological receptors

	Baseline	CL	PC	PC/CL%	PEC	PEC/CL%	Significance
	ug/m3	ug/m3	ug/m3	%	ug/m3	%	
<b>NO<sub>x</sub> annual mean</b>							
Maximum at compensation site	19.4	30	0.000396	0.00132%	19.4	64.7%	Not Significant
Maximum at Swallow Wold SSSI	13.6	30	0.00101	0.00336%	13.6	45.3%	Not Significant
Maximum at North Killingholme Pits SSSI	25.7	30	0.0329	0.110%	25.7	85.8%	Not Significant
Maximum at Humber Estuary SAC/SPA/RAMSAR/SSSI	37.7	30	0.100	0.333%	37.8	126%	Not Significant
<b>SO<sub>2</sub> annual mean</b>							
Maximum at compensation site	1.4	20	0.000665	0.000333%	1.40	7.00%	Not Significant
Maximum at Swallow Wold SSSI	1.4	20	0.000374	0.00187%	1.40	7.00%	Not Significant
Maximum at North Killingholme Pits SSSI	1.4	20	0.0110	0.0552%	1.41	7.06%	Not Significant
Maximum at Humber Estuary SAC/SPA/RAMSAR/SSSI	1.4	20	0.0376	0.188%	1.44	7.19%	Not Significant
<b>NO<sub>x</sub> 24 hour mean</b>							
Maximum at compensation site	19.4	75	0.0439	0.0586%	19.4	25.9%	Not Significant
Maximum at Swallow Wold SSSI	13.6	75	0.0234	0.0312%	13.6	18.2%	Not Significant
Maximum at North Killingholme Pits SSSI	25.7	75	0.144	0.193%	25.8	34.5%	Not Significant
Maximum at Humber Estuary SAC/SPA/RAMSAR/SSSI	37.7	75	0.425	0.567%	38.1	50.8%	Not Significant
<b>Total Acid Deposition annual mean</b>							
Maximum at compensation site	1.87	4.0	0.000119	0.000299%	1.87	46.8%	Not Significant
Maximum at Swallow Wold SSSI	1.97	4.71	0.0000546	0.00116%	1.97	41.8%	Not Significant
Maximum at North Killingholme Pits SSSI	1.67	4.0	0.00164	0.0411%	1.67	41.8%	Not Significant
Maximum at Humber Estuary SAC/SPA/RAMSAR/SSSI	1.91	4.81	0.0110	0.228%	1.92	39.9%	Not Significant
<b>NN Deposition annual mean</b>							
Maximum at compensation site	21.8	8.0	0.0000571	0.000713%	21.8	273%	Not Significant
Maximum at Swallow Wold SSSI	22.7	5.0	0.000145	0.00290%	22.7	454%	Not Significant
Maximum at North Killingholme Pits SSSI	18.8	10	0.00473	0.0473%	18.8	188%	Not Significant
Maximum at Humber Estuary SAC/SPA/RAMSAR/SSSI	22.3	8.0	0.0144	0.180%	22.3	279%	Not Significant



17.6.26 The results of the assessment of impacts arising from on-site activities suggest that there are no significant impacts associated with emissions from AMEP on sensitive habitats.

*Operational Phase- impacts arising from road sources*

17.6.27 The results of the assessment of impacts arising from road sources is set out in *Table 17.12*; this illustrates the maximum impacts arising at any human receptor adjacent to roads included in the study used to access AMEP. Detailed results of the assessment of road traffic sources are set out in *Annex 17.1*.

Table 17.12 Summary of impacts arising from road sources at sensitive human receptors

Pollutant	AQS ug/m3	Criterion ug/m3	Indicative		PEC DN ug/m3	PEC DS ug/m3	Difference %	Significance	PEC DS/AQS %	Significance
			baseline ug/m3							
NO <sub>2</sub>	Annual Mean	40	18.0	23.5	24.1	2.3%	Small	60%	Not significant	
NO <sub>2</sub>	1 hour mean 99.8%ile	200	36.0	105	108	3.1%	Small	54%	Not significant	
PM <sub>10</sub>	Annual Mean	40	18.5	19.4	19.9	2.4%	Small	50%	Not significant	
PM <sub>10</sub>	24 hour mean 90.4 <sup>th</sup> %ile	50	33.2	33.7	34.3	1.8%	Small	69%	Not significant	
PM <sub>2.5</sub>	Annual Mean	25	10.0	10.6	10.9	3.0%	Small	44%	Not significant	

17.6.28 The results of the assessment of impacts arising from road sources indicate that there will be no significant impacts associated with the increase in road traffic at sensitive human receptors.

17.6.29 As discussed in *Paragraph 17.6.16 to Paragraph 17.6.20*, there is the potential that the baseline data from North Killingholme School utilised in the study is underestimating the baseline in the vicinity of certain areas of the A160, Humber Road. In the case that the existing NO<sub>2</sub> concentration is above the annual mean air quality standard, the predicted impacts of the additional traffic generated by the AMEP scheme will be, at worse, 'minor adverse'. If the existing concentrations of NO<sub>2</sub> are below the air quality standard, then impacts will remain 'insignificant'. In either case, the additional contribution to air pollution associated with the additional traffic arising from the proposed AMEP development is a small proportion of the existing impacts associated with the existing local emission sources and road traffic.

***Operational Phase- overall impacts associated with the AMEP site operations***

17.6.30 Overall impacts have been assessed with regard to all emissions arising due to all aspects of the operations of the proposed AMEP. The overall impacts have been assessed by summing together:

- the estimated existing baseline air pollution concentrations;
- the contribution from road sources (this includes existing baseline traffic and future AMEP development traffic);
- the contribution from AMEP shipping emissions; and
- the contribution from the main site emissions.

17.6.31 As previously described in the baseline section, emissions from road traffic will not affect an area of greater than 200 m from the roadside. Therefore consideration of total traffic, rather than only the increment in airborne pollution associated with AMEP traffic emissions is appropriate as the estimated baseline will not include the large majority of traffic related emissions.

17.6.32 The overall impacts associated with the proposed AMEP have been described in *Figure 17.1 to Figure 17.6*. The data used in identifying the overall impacts are based upon 2009 meteorological year, as this was the year which produced the highest, and therefore worst case, impacts for the site associated emission sources (ie shipping, rail and main site).

Figure 17.1 Overall NO<sub>2</sub> annual mean, µg/m<sup>3</sup>; air quality standard 40µg/m<sup>3</sup>

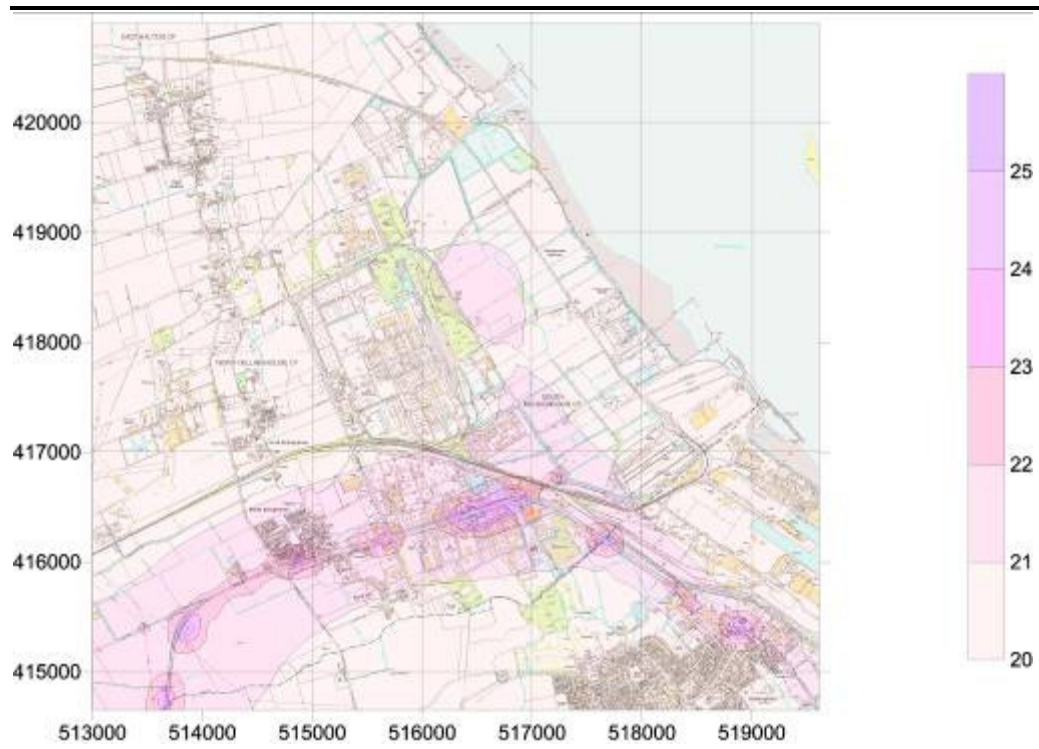


Figure 17.2 Overall NO<sub>2</sub> 99.7<sup>th</sup> percentile of 1 hour means, µg/m<sup>3</sup>; air quality standard 200µg/m<sup>3</sup>

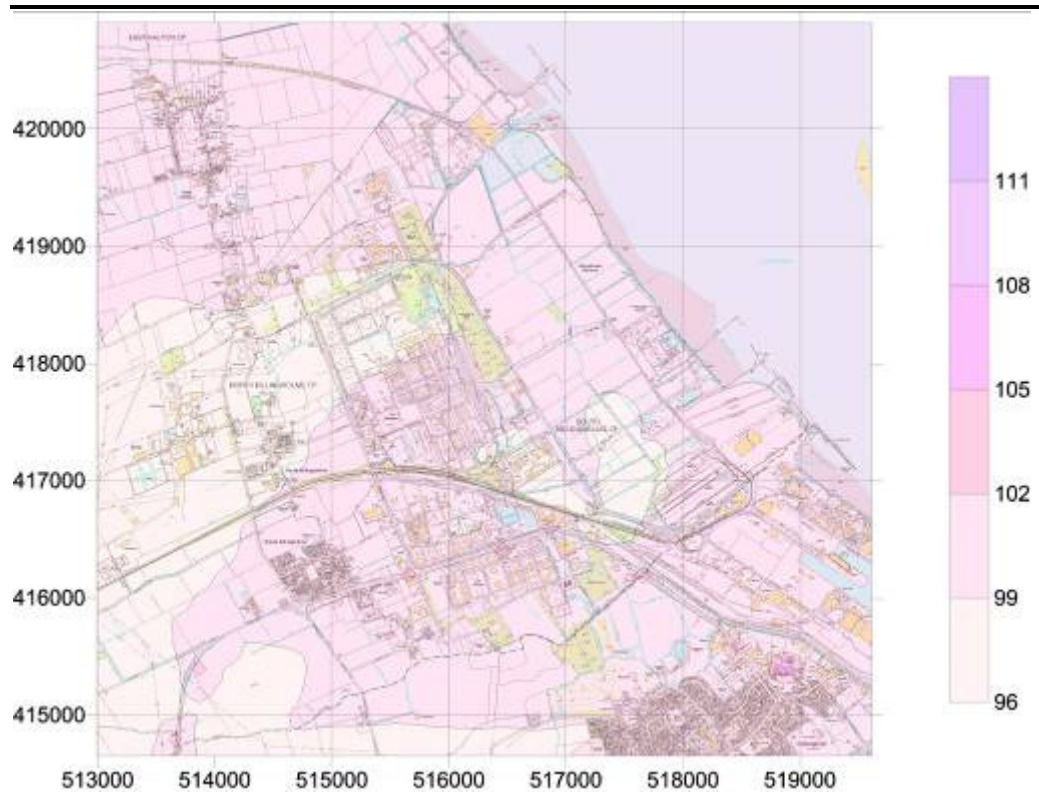


Figure 17.3 Overall NO<sub>x</sub> annual mean, µg/m<sup>3</sup>; air quality standard (for the protection of vegetation) 30µg/m<sup>3</sup>

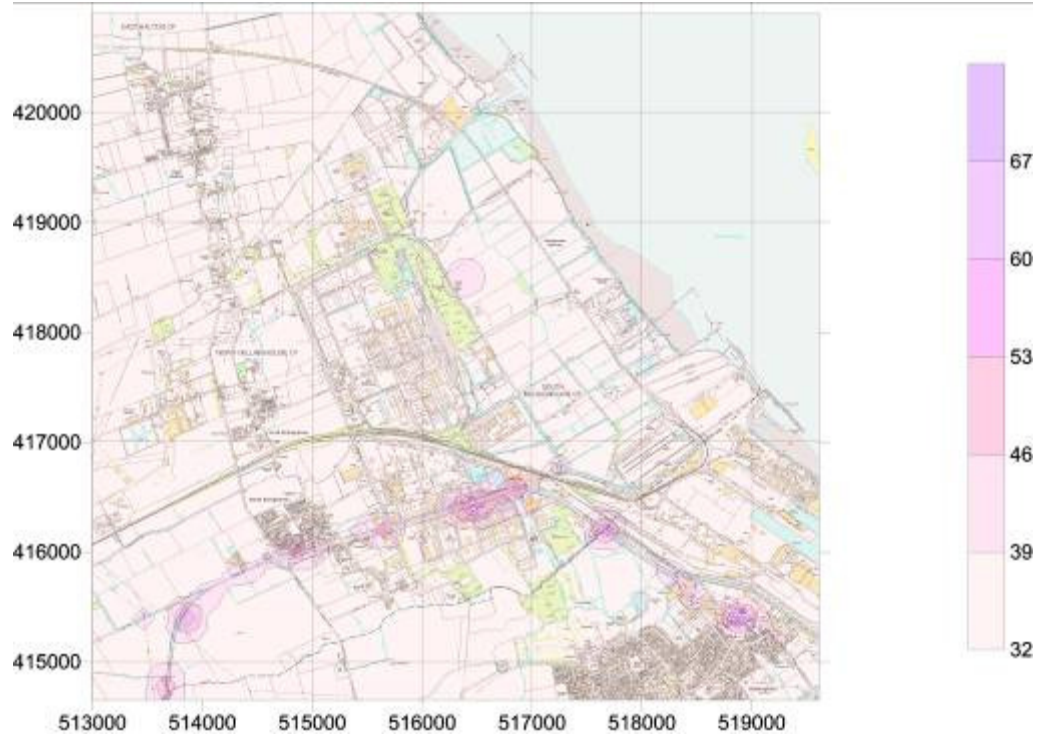


Figure 17.4 Overall PM<sub>10</sub> annual mean, µg/m<sup>3</sup>; air quality standard 40µg/m<sup>3</sup>

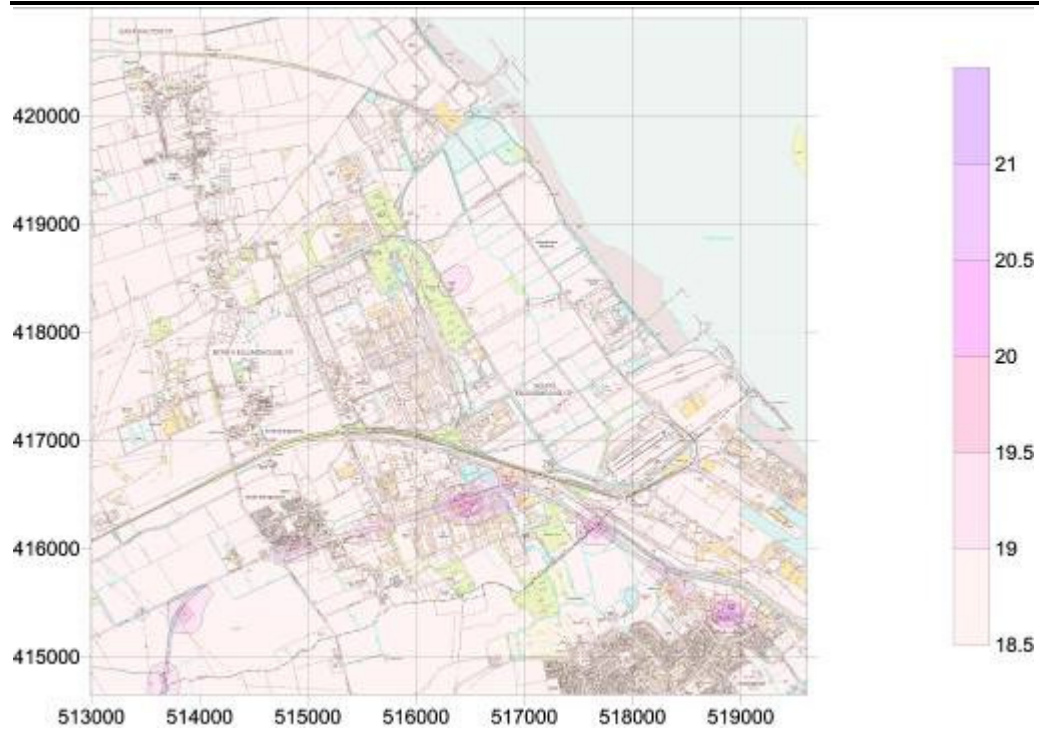


Figure 17.5 Overall PM<sub>10</sub> 90.4<sup>th</sup> percentile of 24 hour means, µg/m<sup>3</sup>; air quality standard 50µg/m<sup>3</sup>

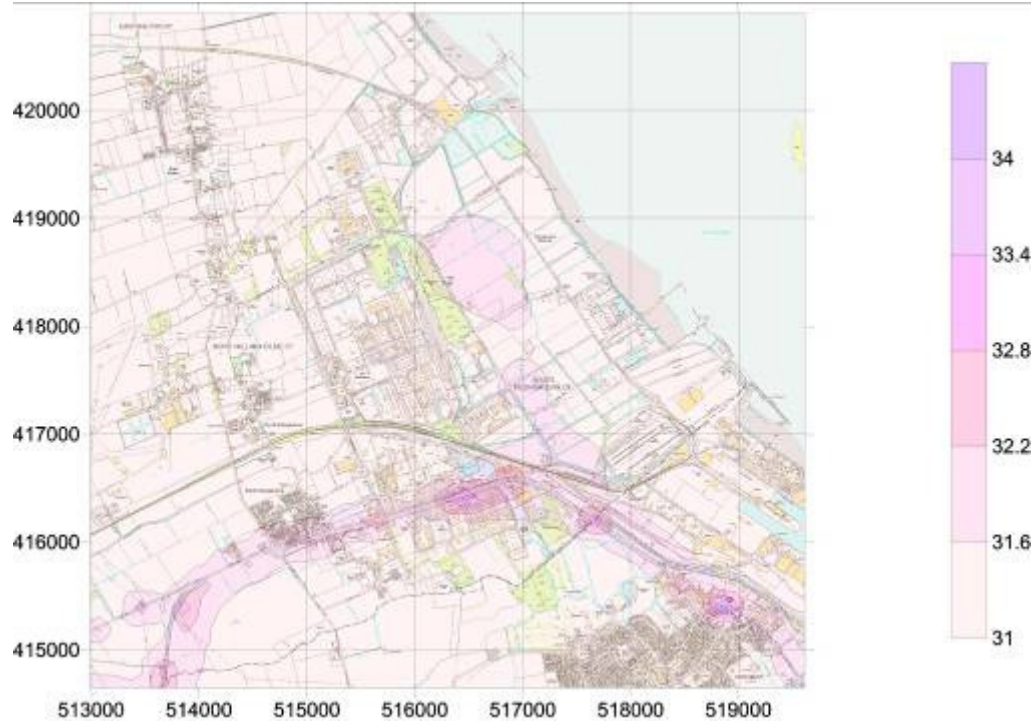
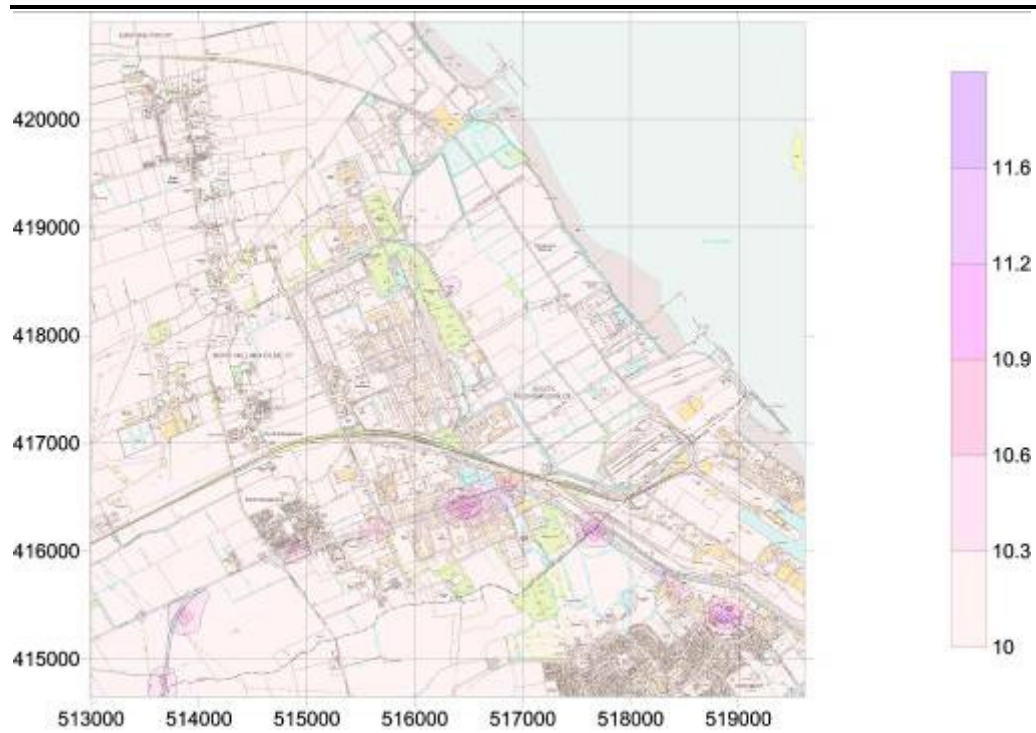


Figure 17.6 Overall PM<sub>2.5</sub> annual mean, µg/m<sup>3</sup>; air quality standard 25µg/m<sup>3</sup>



17.6.33 The assessment of the overall impacts demonstrates that at no location are the air quality standards for the protection of human health



exceeded due to impacts arising from both the AMEP site and road traffic sources.

- 17.6.34 In terms of impacts on habitats the emissions arising from the additional road traffic and emissions from the AMEP site are not predicted to result in a significant impact on the Humber Estuary. However, the air quality standard of 30 µg/m<sup>3</sup> for the protection of vegetation is already exceeded at the Humber Estuary due to the elevated baseline.

#### *Operational Phase- impacts on air quality management areas*

- 17.6.35 As set out in *Paragraph 17.5.6*, there are four Air Quality Management Areas which have the potential to be adversely impacted as a result of AMEP activities, and potentially locations in North Killingholme where elevated concentrations of NO<sub>2</sub> have been monitoring at locations immediately adjacent to the A160. The assessment demonstrates, as illustrated in *Figure 17.1* to *Figure 17.6*, that the impacts arising due to AMEP operations are minimal and are constrained to an area in close proximity to the AMEP development site. With regard to road traffic associated with the proposed scheme, there is the potential for impacts to arise at North Killingholme; there are no predicted significant impacts in the vicinity of the other AQMAs considered in the study. In the vicinity of North Killingholme, if an AQMA were to be declared, the predicted impacts at this location associated with AMEP traffic would be 'minor adverse'. In the event that no AQMA is declared, the impacts would remain 'not significant'.

#### *Operational Phase- emissions of carbon dioxide*

- 17.6.36 The total emissions of CO<sub>2</sub> associated with the proposed scheme are set out in *Table 17.13*, along with total emissions of VOCs.

**Table 17.13** *Total CO<sub>2</sub> and VOC emissions*

Pollutant	Emissions tonnes/year
CO <sub>2</sub>	36 462
VOCs	21

#### *Operational Phase- Odour*

- 17.6.37 The potential for odour nuisance to occur has been calculated on the basis of VOC emissions arising from the main site spray painting activities. The conversion factor for ethyl alcohol has been utilised to convert VOC concentration to Odour Units, and this has then been

compared to the assessment criteria of 1 OU/m<sup>3</sup>, as indicative of potential odour nuisance. *Table 17.14* sets out the results of the odour impact assessment.

**Table 17.14** *Summary of odour assessment*

Period	AQS (ug/m <sup>3</sup> )	PC VOC (µg/m <sup>3</sup> )	PC odour (OU/m <sup>3</sup> )	PC/AQS	%
Annual mean	1	1.51	0.0054	0.54%	
1 hour mean	1	20.0	0.071	7.1%	

17.6.38 The results of the assessment demonstrate that emissions of VOCs are highly unlikely to be detectable at off-site locations and therefore nuisance issues are highly unlikely to occur.

## 17.7 *MITIGATION MEASURES*

### *Construction Phase- dust*

17.7.1 The impact assessment identified that there is a potentially significant risk of dust nuisance at five sensitive human receptors, and three sensitive ecological receptors. The potential impacts were associated with all of the key development areas, and therefore mitigation for the control of dust will need to be implemented across the site.

17.7.2 A detailed dust management plan will be developed prior to the commencement of construction activities. The dust management plan will set out in detail the mitigation and control measures that will be utilised and how these will be implemented across the site. In addition to adhering to general best practice, the following mitigation measures would be implemented as and when appropriate or necessary; the dust management plan will include and build upon these mitigation measures (The Mayor of London, 2006; Good Quarry Guide, 2010):

- where possible dust generation activities will be undertaken away from the site boundary, particularly those locations adjacent to sensitive receptors;
- stockpiles of debris and overburden will be kept watered or sheeted as required, and for long term stockpiles the use of surface bonding materials or vegetating will be implemented if practicable;
- disturbance of stockpiles will be minimised;

- open surfaces and working areas will be watered as required to minimise dust, and surfaces will be converted to permanent hardstanding as soon as possible, or sealed or vegetated is practicable;
- wind breaks and barriers will be erected where possible to minimise wind blow across open areas of the site;
- drop heights will be minimised where possible;
- vehicles will be washed to remove any dusty materials or mud on a regular basis;
- vehicles will be washed to remove any dusty materials from the body and wheels immediately before leaving the construction site;
- the construction access routes will be kept clear of dusty materials with the use of streetcleaners or sprayed with water to maintain the entire road surface wet;
- the speed of vehicles will be limited on unpaved surfaces; and
- containers and trucks will be sheeted to prevent escape of dust during transfer to or from site.

17.7.3 It is also recommended that control measures are also put in place in the site management plan in order to appropriately handle any complaints nuisance received. Passive dust monitoring will be undertaken around the site boundary and an action plan included in the site management plan to effectively manage dust emissions in the event of excessive dust levels being identified from the monitoring.

17.7.4 Therefore, with the assumption that effective mitigation measures will be put in place, it is not expected that there will be significant effects associated with dust.

#### *Construction Phase- traffic*

17.7.5 On the basis of the insignificant impacts identified associated with construction traffic, no mitigation is required.

#### *Operational Phase- non traffic emissions*

17.7.6 The results of the impact assessment identified that there are predicted to be no significant impacts associated with the operation of the AMEP

site, in relation to both sensitive human and ecological receptors. On this basis, no mitigation measures are required. However, in line with best practice commitment is made to operate shipping into and out of the proposed facility such that impacts on air quality are minimised. In particular, consideration should be made to operating vessels using low sulphur fuels, and powering down vessels where possible when at the dockside.

- 17.7.7 With regard to the Supply Chain Park, the facilities and operations will be conditional to the Environmental Permit, and may require the development of specific method statements for the design and operation of any such facilities. These would be agreed in consultation with the Environment Agency and stakeholders at the point of detailed design.

#### *Operational Phase- traffic*

- 17.7.8 On the basis that impacts are not significant associated with operational traffic, no mitigation is required. In the event that an Air Quality Management Area is declared in North Killingholme, impacts associated with operational traffic will become significant. On this basis, it may be appropriate to investigate measures for the implementation of vehicle reduction schemes, such as car sharing, staff buses, and implementation of measures to minimise congestion, such as planning journeys in off peak times.

### **17.8 RESIDUAL IMPACTS**

#### *Construction Phase*

- 17.8.1 The correct implementation of dust mitigation measures is predicted to render residual impacts not significant, in terms of impacts arising in association with dust emissions from the construction works.
- 17.8.2 The assessment of impacts arising from construction traffic indicates that impacts will be insignificant.

#### *Operational Phase*

- 17.8.3 There are no significant residual impacts identified associated with the operation of the AMEP site. With regard to operational traffic, no significant impacts are identified in the context of the existing environment. However, it may be the case that in the future an Air Quality Management Area is declared in North Killingholme. In this

case, the impacts associated with operational traffic will be, at worst, of minor adverse significance.

- 17.8.4 The assessment of odour indicates that emissions of odour will not result in significant off-site impacts.

## 17.9 *CUMULATIVE IMPACTS*

- 17.9.1 Cumulative impacts are considered in terms of whether there is a significant risk of an air quality standard or critical load or critical level being exceeded as a result of AMEP related emissions acting in combination with other committed developments. The assessment of cumulative impacts recognises that the critical load for nutrient nitrogen and the critical level for oxides of nitrogen are already exceeded in the Humber Estuary. Also, the assessment recognises that the concentrations of nitrogen dioxide in the vicinity of North Killingholme, may be close to or above the air quality standard.

- 17.9.2 With regard to road traffic, the traffic data utilised in the assessment takes into account future committed development, and therefore the impacts associated with future committed development in combination with AMEP related traffic emissions is addressed quantitatively in the study. This is important in the context of quantifying air quality in the vicinity of busy roads around North Killingholme where elevated concentrations have been monitored in some locations. In this case, the assessment concluded that, on the basis of the baseline concentrations adopted in this study, there are no significant effects likely to arise as a result of cumulative impacts. However, if the elevated concentrations of nitrogen dioxide identified at North Killingholme result in the declaration of an AQMA at that location, then there is the potential for 'minor adverse' significant effects due to cumulative impacts relating to cumulative traffic related emissions.

- 17.9.3 With regard to emissions arising from the AMEP site itself, and at receptors in close proximity to the AMEP site, it is considered highly unlikely that any air quality standard for the protection of human health will be exceeded as a result of cumulative effects. This conclusion is drawn from the fact that the AMEP site emissions added to the baseline air quality derived from North Killingholme suggest that the PEC will not be greater than 66 percent of any air quality standard. The 34 percent 'headroom' is considered sufficient to allow future committed developments to occur, without leading to any air quality standards being exceeded.

17.9.4 With regard to impacts on sensitive habitats, the impact assessment identified that the impacts on air quality associated with the AMEP scheme are not significant in all cases. The Critical Load for Nutrient Nitrogen and the Critical Level for NO<sub>x</sub> are exceeded as a result of the elevated baseline. However, the contribution from AMEP is not significant in isolation, and represents a maximum of 0.67 percent of any Critical Load or Critical Level. This represents a very small proportion of the existing baseline. On this basis, it is considered that AMEP emissions will have a negligible effect on air quality in the area irrespective of other committed developments.