APPENDIX I
RCBC: 2020 AIR QUALITY ASR

2020 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

June 2020

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This report is submitted with the approval of the joint Director of Public Health for Redcar and Cleveland and Middlesbrough Councils, Mr Mark Adams.

Executive Summary: Air Quality in Our Area

Air Quality in Redcar and Cleveland

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The formal assessment of air quality within Redcar and Cleveland has been undertaken since 2000, providing us with a long history of data and trends of the pollutants monitored. The submission of formal air quality returns to the UK Government have been completed independently and in conjunction with the Environment Agency and other authorities within the Tees Valley, enabling a region wide view of air quality and endorsing a positive joint working history.

Conclusions from Redcar and Cleveland's annual reports to Government have consistently shown good air quality as measured at monitoring stations and in locations where members of the public are regularly exposed to air pollution. Our results continue to be well below the UK Government objective levels and overall show a downwards trend, particularly for nitrogen dioxide (NO_2) and sulphur dioxide (SO_2). During the 2019 reporting period a slight increase in particulate matter (PM_{10}) levels has been measured, however there has been no observed exceedance of the PM_{10} 24-hour mean objective. Given the continued compliance with the objective levels Redcar and Cleveland have had no requirement to declare an Air Quality Management Area (AQMA), however we will continue to improve air quality for the public by improving our monitoring network and publishing our first South Tees Clean Air Strategy, jointly with Middlesbrough Council with whom we share the Director of Public Health.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Redcar and Cleveland has an extensive coastline within its boundary which has the potential to be a source of high levels of natural particulates. During times of strong north-easterly weather, this may have health implications for vulnerable members of the public. Further information regarding current air quality and public health notifications can be found using the link below.

https://www.airqualityengland.co.uk/local-authority/?la_id=279

Members of the public are able to access a free app for users of iPhone, iPad and Android software, developed by Ricardo-AEA Ltd, providing air pollution health advice for where it is needed.

Actions to Improve Air Quality

Redcar and Cleveland continues to prioritise improving air quality within the Borough via a number of legislative means, such as permitting of industrial activities, reviewing and conditioning planning applications that have the potential to impact air quality and developing a robust monitoring regime.

Redcar and Cleveland continues to participate in joint working across the Tees Valley to improve air quality across the region. The Tees Valley Strategic Transport Plan, issued January 2020, outlines the priorities until 2030 that will positively contribute to air quality improvements. https://teesvalley-ca.gov.uk/transport/strategic-transport-plans/

The South Tees Clean Air Strategy continues to be developed, identifying actions and priorities for the two involved local authority boroughs (Redcar and Cleveland and Middlesbrough), to ensure a stronger consistent approach for improving the public's air quality. This strategy is due for publication during 2020.

Our joint Director of Public Health (DPH) has chosen air quality as the theme for the 2019 DPH Report, reaffirming our commitment to raise the profile and improve air quality for all. A link to the 2019 report can be found below.

https://www.redcar-cleveland.gov.uk/resident/adult-children-health/health-care-services/Pages/health-care-services.aspx

Conclusions and Priorities

Redcar and Cleveland continues to monitor and demonstrate compliance with the Government's National Objectives for a range of air quality pollutants. https://uk-air.defra.gov.uk/air-pollution/uk-eu-limits

Continued compliance is achieved using a long-standing monitoring regime; a static continuous air quality station, a passive diffusion tube network, effective inspection of industrial processes and consultation on large planning developments.

Redcar and Cleveland have no requirement to declare an AQMA and it is anticipated that this situation will not change in the near future.

An annual review of the diffusion tube network is completed after analysis of existing results and in light of new exposure areas being identified so that a comprehensive assessment of the Borough can be developed.

Although Redcar and Cleveland does not at present actively monitor $PM_{2.5}$, a conversion factor enables PM_{10} values to be used to establish a likely emission. Redcar and Cleveland has guaranteed that $PM_{2.5}$ monitoring will be undertaken from 2020 through the acquisition of a continuous monitor.

The first South Tees Clean Air Strategy, due for publication in 2020, highlights Redcar and Cleveland's commitment to a strong pro-active approach to improving air quality.

Redcar and Cleveland Borough Council declared a 'Climate Emergency' in March 2019 with a pledge to become carbon neutral by 2030, compounding our vision to make substantial improvements for our residents.

The Council is also preparing an Environmental Strategy, led by colleagues in Economic Growth Directorate, due for publication in 2020 outlining measures to reduce our carbon footprint and become more energy and resource efficient.

Local Engagement and How to get Involved

Redcar and Cleveland continues to be part of the "Let's Go Tees Valley" organisation whose ambitions are to improve and change the way the public travels around the region, making small changes to journeys to make a big difference. A Commuter Challenge was launched during September 2019 to change the way in which you

travel to work, encouraging car shares or alternative means of transport with the added health benefits. Further information is available from:

https://www.letsgoteesvalley.co.uk/in-your-area/redcar-and-cleveland/

Let's Go Tees Valley were also responsible for developing a 'Free Guided Ride' scheme on a Friday from June 2019 to increase resident's riding confidence, improve health and increase the uptake of cycle routes within the Borough.

The Environmental Protection Team participated in National Clean Air Day 2019 by hosting a publicity campaign within the authority's main publically accessible building, asking residents to make a pledge on our pledge tree and find out what materials can be burnt on a multi-fuel stove.

The Team will be again participating in National Clean Air Day 2020 on 8th October, further information on how you can get involved can be found at:

https://www.cleanairday.org.uk/

The Energy Saving Trust provides advice on fuel saving, driving techniques and deliberations to consider when purchasing a new car. The combination of factors

which allows an individual to reduce their air pollution contribution. Additional information can be found at:

https://energysavingtrust.org.uk/transport

Redcar and Cleveland host the 'Festival of Thrift' event in September each year, the 2019 events theme was Clean Air. The Environmental Protection Team were able to acquire a stall promoting the work on improving air quality, a survey on transport modes to the festival, mapping public perceptions of areas of good and bad air quality and engaging with people through craft.

The Environmental Protection Team continue to provide advice to a range of internal department, external agencies and public enquiries regarding air quality in accordance with relevant legislation.

Residents within Redcar and Cleveland are responding positively to local and national publicity regarding air quality, especially with regard to the use of wood burning stoves. The Environmental Protection Team began a publicity campaign during 2019 to raise awareness of the legislation and smoke control areas within the Borough to stove suppliers and installers. This campaign was received positively by those businesses approached and further publicity for residents is planned for 2020.

Additional information and leaflets regarding the work undertaken by the Environmental Protection Team can be found using the link below:

https://www.redcar-cleveland.gov.uk/resident/environmental-protection/Pages/environmental-protection.aspx

“The South Tees Local Delivery Pilot January 2019, in conjunction with Sport England Delivery Pilot - You’ve Got This”. Their vision is for more people to be more active, more often; working with local partners to support individual and organisational change.

Since the formal announcement of the 12 pilot areas in December 2017, work has been progressing at a local level in collaboration with Sport England, to agree and implement the initial development phase of the pilot. They have spent a great deal of time talking to communities to really understand the reasons residents are inactive which sadly includes fear of crime and road safety, all in turn which harm the air quality agenda because people believe they have to drive everywhere to stay safe. Addressing stubborn inequalities in our communities is key to improving quality of life and achieving environmental aspirations for South Tees. Further information is available at: https://sportengland-production-files.s3.eu-west-2.amazonaws.com/s3fs-public/south-tees-sep-18.pdf?c0OwClZmokcDQUdWI2UilmO3jB8uxyxe

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1 Local Air Quality Management

This report provides an overview of air quality in Redcar and Cleveland Council during 2019. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Redcar and Cleveland Borough Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Redcar and Cleveland Borough Council currently does not have any AQMAs. The first voluntary South Tees Clean Air Strategy continues to be developed by Redcar and Cleveland and Middlesbrough Councils and publication is planned during 2020. For reference, a map of Redcar and Cleveland's monitoring locations is available in Appendix D. The Council is also preparing an Environment Strategy for publication in 2020 which will address climate emergency.

2.2 Progress and Impact of Measures to address Air Quality in Redcar and Cleveland

Defra's appraisal of last year's ASR concluded that the report was well structured, detailed and provided the information specified in the guidance.

- *The report is well-written and comprehensive. It includes all required information and has been completed to a high standard.*
- *The report continues to confirm that Redcar and Cleveland has no exceedances of air quality objectives, with no AQMA's or the requirement for an action plan.*

Redcar and Cleveland has taken forward a number of direct measures during the current reporting year of 2019 in pursuit of improving local air quality.

Redcar and Cleveland has no formal air quality action plans as the declaration of an AQMA has not been required. The Authority remains committed to monitoring and improving air quality within the Borough.

Redcar and Cleveland, as a member of the Tees Valley Combined Authority, participates in joint working to address air quality across the region. The Strategic Transport Plan was produced in January 2020 outlining the priorities until 2030.

Redcar and Cleveland identified in the 2019 ASR a number of initiatives that would be implemented, progress against each one is outlined below:

- **Publicity campaign to raise awareness and understanding of the correct installation and use of wood and multi-fuel stoves and fireplaces within the Borough.** Stove suppliers were visited by officers within the Team to provide leaflets, maps of SCA's and advice to ensure compliance with the legislation. Further publicity will be undertaken during the next reporting year to increase awareness with the public.
- **Publication of the first South Tees Clean Air Quality Strategy**. In preparing for the Strategy, the two authorities involved (Redcar and Cleveland and Middlesbrough) held a stakeholder event on 1st March 2019, attended by representatives of businesses, local authorities, transport businesses, voluntary sector organisations, Environment Agency and educational establishments. The event focused on sharing information, what is already being done to

improve air quality, what more can be done and how the new Strategy can be a tool to help us achieve further improvements in our air quality.

- **Redcar and Cleveland and Middlesbrough Council supported the Tees Valley Nature Partnership Conference** held on 28th June 2019 by providing a workshop focused on the importance of further reducing levels of air pollution, promotion of the first South Tees Clean Air Strategy, the value of the community approach to achieving ambitions, the artistic interpretation of air pollution and the role of artists in raising the status and awareness of air quality issues across the world.
- **The annual South Tees Health Protection Conference held** on 20th November 2019 attended by a wide range of professionals included table discussions with the same focus, on Air Quality which had been employed at the stakeholder event held earlier in the year.
- **The publication of the first South Tees Clean Air Strategy** has encountered a delay, however, it is envisaged that this will be finalised during 2020.
- **Support and participate in National Clean Air Day 2019**. A public awareness event was held on 20th June 2019 incorporating a pledge tree, model wood burning stove, bold posters and posts on the Authority's Facebook and Twitter pages.
- **Attendance and participation in the Festival of Thrift**, September 2019. The Environmental Protection Team attended the festival and were approached by a large number of the public to discuss clean air. During the event officers introduced the concept of the first voluntary South Tees Clean Air Strategy, asked people to complete a survey on transport modes used to reach the event, to identify areas of 'good' and 'bad' air quality within the Borough and also make a pledge for a pledge tree.
- **Campaign to target industrial areas regarding the legal routes for disposal of commercial waste**. Following receipt of a justified complaint of burning, all businesses on the same industrial estate were provided with advice and education. Campaign is to continue during 2020.

- **Procurement of 10 fully electric small panel vans to replace 10 diesel Ford Connect vans**. The Authority was successful in procuring 10 Nissan e-NV200 zero emission vans for use within the Technical and Highways Teams during June 2019. The electric panel vans have been really successful in implementation, Redcar and Cleveland are hoping to acquire further vehicles during the next reporting period.
- **Procurement and use of 8 x 7.5ton Euro VI vehicles for the Highways Team**. These vehicles have been successfully procured and are in use for the Authority's fleet.
- **Street lighting LED replacement programme**. This initiative was a long term replacement scheme that has been undertaken during the 2019 reporting year and will continue into the next.
- **Request to our electricity supplier that all future supplies are from renewable resources**. Redcar and Cleveland have been successful in this request from our energy supplier.
- **Declaration of a climate emergency**. Redcar and Cleveland Borough Council declared a Climate Emergency on 28th March 2019 to become carbon neutral by 2030. This declaration confirms our commitment to improve air quality and the climate. Climate emergency will be included in the Environment Strategy, due for publication in 2020.
- **Sign up to the UK100 clean energy pledge**. Redcar and Cleveland signed up this pledge to have 100% clean energy by 2050.

Priorities and initiatives for the forthcoming year (2020) are:

- Publication of the first South Tees Clean Air Quality Strategy, a voluntary and joint Air Quality Strategy with neighbouring authority Middlesbrough Council.
- Support and participate in the 2020 National Clean Air Day campaign 8th October 2020, the UK's largest air pollution campaign.
- Campaign to target industrial areas within the Borough regarding the legal routes for disposal of commercial waste.

- Publication of the Redcar and Cleveland Environment Strategy which will identify priorities to achieve the 2030 Climate Emergency Declaration.
- Support and contribute to the implementation of the actions identified in the Joint Director of Public Health's 2019 Annual Report, which focused on air quality.
- Procurement of 8 small panel electric zero emission vans to complement the existing fully electric fleet within the Authority.
- Procurement of 5 x 26ton Euro VI vehicles into the fleet.
- Completion of the LED street lighting replacement scheme for all areas within the Authority.
- Publicity campaign relating to the change in fuel stock availability for domestic heating.
- Feasibility study to assess the potential for large Council buildings to be fitted with solar PV and battery storage systems.
- Replacement of lighting at two primary schools with energy efficient LED lighting.
- Investigate the potential to utilise an E-bike loan scheme within the Borough encouraging the use of alternative modes of transport.

The Covid-19 worldwide pandemic placed the UK into extreme measures for social distancing and lockdown conditions from March 2020. It is anticipated that these actions may have an effect on the ability to complete all priorities and incentives detailed above.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

2.3.1 Redcar and Cleveland $PM_{2.5}$ Measures

Redcar and Cleveland is taking the following measures to address $PM_{2.5}$:

- Use the Environmental Permitting Regulations to ensure that businesses are implementing best practice for emission control.
- Procure more efficient Euro VI fleet vehicles.
- Use the planning consultation process to identify sources of $PM_{2.5}$, ensure appropriate modelling of emissions is undertaken and work with the construction industry to ensure robust dust suppression techniques are employed.
- Attendance at the industry, regulator and community supported Industrial Briefing Group on the Wilton International Complex, to share information on emission control and technological improvements.
- Co-operative working with the South Tees Development Corporation (STDC) during the redevelopment of the former Redcar Steelworks site to ensure clean technologies are supported and air quality is not harmed during the implementation of the “South Tees Regeneration Master Plan”, a 25 year vision for the area.

2.3.2 $PM_{2.5}$ Tees Valley Overview

$PM_{2.5}$ particulates have been identified as the cause of a more significant health risk than PM_{10} due to the smaller particle size and ability to penetrate further into the respiratory system. UK Public Health Outcomes Framework includes an indicator relating to fine particulate pollution. The 2018 factors across the Tees valley for the indicator “Fraction of mortality attributed to particulate air pollution” are shown below:

	England	North East	Darlington	Hartlepool	Middlesbrough	Redcar & Cleveland	Stockton-on-Tees
Fraction	5.2	3.8	3.9	4.0	4.4	4.0	4.1

The values are estimates of the percentage of mortality to long term exposure to particulate air pollution. In comparison to the 2017 data Redcar and Cleveland has remained at the same fraction, however all other authorities within the Tees Valley, North East and England have increased.

Tees Valley region has three $PM_{2.5}$ monitors as part of the AURN network, Breckon Hill within Middlesbrough, Eaglescliffe and A1035 Nelson Terrace located within Stockton-on-Tees. The annual means measured at these locations range from 8 to 10.3µg/m^3, this data has been obtained from neighbouring authority colleagues and the Defra AURN website, https://uk-air.defra.gov.uk/data/exceedence

2.3.3 Redcar and Cleveland $PM_{2.5}$

Redcar and Cleveland Borough Council is one of the five unitary authorities forming the Tees Valley area. Redcar & Cleveland covers 24,490 hectares and is geographically the largest borough in the Tees Valley. The map below shows the relative location with extensive coastline between South Gare and Cowbar, including 12km of 'Heritage Coast' from Saltburn eastwards. A large proportion of our borough is rural land use and 23 square miles of the southern area is within the North York Moors National Park.

Historically Redcar and Cleveland has been associated with a heavy industrial identity from chemical and steelmaking, unfortunately over the last 20 years this has declined with the closure of some plants. Opportunely, investment in the Borough is now on an increase and industrial developments are beginning to blossom. The new industrial developments come with an added benefit of improved technology and research so that air quality remains a priority and will prevent a decline to historical levels.

In acknowledgement of the Government's Clean Air Strategy 2019 which highlighted PM2.5 as a major pollutant of concern to health, although Redcar and Cleveland had monitored PM_{10} for a number of years and are therefore able to calculate an estimate of $PM_{2.5}$ from this data, we felt this was an opportune time to pro-actively respond to

current local air quality matters and adjust to the pollutants of major concern at present. The Council has therefore committed to procure a dedicated $PM_{2.5}$ continuous monitor for use at the static monitoring station from 2020.

The Government's Clean Air Strategy, 2019 also highlighted the pollution potential from domestic heating sources linked to the recent increase in installation of wood burning stoves into properties. Redcar and Cleveland acknowledged this situation and during 2019 began a campaign to increase awareness and understanding of multi-fuel stove use. Initially the focus of this campaign was to stove suppliers and installers, during the next reporting year this campaign will have a greater public emphasis.

Redcar and Cleveland declared 51 smoke control areas (SCA) during the 1970's and 1980's which remain in place today. The Environmental Protection Team has noted a seasonal rise in smoke complaints over the last 2 years in relation to wood burning and multi-fuel stoves use within the Borough. Education and advice is provided as an initial response to ensure the public are aware of the legal requirements and it is hoped that the additional publicity campaign will further enhance this. A map identifying the 51 SCA's has been provided in Appendix D.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Redcar and Cleveland undertook automatic (continuous) monitoring at one site during 2019. Table A.1 in Appendix A shows the details of the site referenced as 'Dormanstown'. National monitoring results are available at https://www.airqualityengland.co.uk/local-authority/?la_id=279

A map showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

Dormanstown continuous suburban monitoring location is within school grounds in an area of relevant public exposure, it remains a key site within the Tees Valley region. The monitoring site is affected by light traffic, it is within 4km of the Borough's main industrial complexes and is within the prevailing wind direction for 75% of the year. The two industrial and chemical complexes are subject to large amounts of re-development, confirming the need to maintain and support the continuous monitoring site's use, operational since January 2012.

The site monitors oxides of nitrogen (NO_x), particulate matter (PM_{10}), ozone (O_3) and sulphur dioxide (SO_2). During the reporting year the NO_x monitor experienced age-related failures, meaning that for a small proportion of time the monitor was turned off, this has been detailed in the 'valid data capture' in the tables below. As a result of this Redcar and Cleveland procured a new NO_x monitor which was installed at the beginning of 2020. The SO_2 monitor also suffered similar failings and a loan analyser was provided by our supplier. A review of the SO_2 levels over the last few years was undertaken. This review showed a consistent decline in levels therefore a decision was made not to replace the SO_2 analyser at the end of the 2019 reporting period. The on loan SO_2 analyser was removed from Dormanstown during January 2020 so that we had a full reporting year for this report. The reduced 'valid data capture' for this pollutant is again identified in the tables below.

3.1.2 Non-Automatic Monitoring Sites

Redcar and Cleveland undertook non-automatic (passive) monitoring of NO_2 at 18 sites during 2019 including three co-location studies at the continuous monitoring site in Dormanstown. Table A.2 in Appendix A shows the details of the sites.

It was detailed during the 2018 report that a review of the co-location diffusion tubes would be undertaken to address the variation in results at the site. This review was completed and the findings confirmed that the co-location tubes are deployed in accordance with TG 16 guidance. During the 2019 reporting period the results from the co-location site showed minor variation for most of the year, however September results showed a greater measurement range. Redcar and Cleveland have contributed to the National Bias Adjustment survey for a number of years. Unfortunately, this year due to the varied results from September 2019 and low continuous monitoring levels our results could not be utilised in the study. As a result of this, discussions have taken place with our continuous monitoring site's data analysts. They were able to review our continuous monitoring data and confirm that it is robust in nature, therefore it is likely that the variation in values is linked to the diffusion tube methodology. The results will continue to be monitored.

A travel blank diffusion tube was also deployed as part of the non-automatic study, used as a quality checking mechanism for the transportation of the diffusion tubes. The travel blank confirmed that the transportation of the diffusion tubes placed a negligible effect on the final reported results, non-bias adjusted results are shown below. There was no value for January due to an error made by the supplier.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
R00	-	0.71	0.47	0.24	0.13	0.57	0.2	0.12	0.18	0.29	0.06	0.24	0.29

The diffusion tubes deployed in the study are 50% trimethylamine (TEA) in acetone and the results have been bias adjusted using the national bias factor. Further information relating to this has been outlined in Appendix C.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes,

including bias adjustments and any other adjustments applied (e.g. “annualisation” and/or distance correction), are included in Appendix C.

The diffusion tube network has been in operation since 2014 across various areas of the Borough, targeting areas of high traffic flow, industrial activity and public exposure. Each year the diffusion tube network is reviewed to ensure that the most appropriate locations are monitored and to allow monitoring in previously unmonitored areas. Redcar and Cleveland continue to monitor at areas close to schools to ascertain if the ‘school run’ has an observed effect on public exposure in our Borough. Results to date have not shown an increased value at these locations.

Diffusion tube R27 (West Lane) was employed due to the 2010 Defra modelling that identified the A66 main thoroughfare as being non-compliant with the EU limit for nitrogen dioxide. Monitoring has shown actual levels to be below the EU limit. The annual mean for 2019 when subject to bias adjustment and distance correction was 21.2µg/m3, below the 2018 figure of 23.6µg/m^3. Redcar and Cleveland are committed to continued monitoring at this location to ensure compliance with objective levels.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias[4], “annualisation” (where the data capture falls below 75%), and distance correction[5]. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, for two sites (R27 and R41). Additional details on this bias adjustment and distance correction can be found in Appendix C.

[4] https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html
[5] Fall-off with distance correction criteria is provided in paragraph 7.77, LAQM.TG(16)

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

During 2019 there have been no exceedances of the annual mean or 1-hour mean objective level at any monitoring site.

Figure A.1 depicts the trend graphs for the Dormanstown monitoring site incorporating historical data from the previous site at Corporation Road, this identifies that since 1998 levels have continued in a downwards trend.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

There have been no exceedances of the annual mean PM_{10} concentration at the monitoring site, a level of 14µg/m^3 recorded during 2019, a slight increase from the previous year of 12µg/m^3. There has been one exceedance of the PM_{10} daily mean objective level during the reporting year.

Figure A.2 identifies trends in PM_{10} emissions since 1998 from the current Dormanstown site and previous Corporation Road location, depicting the slight increase for 2019 values.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Redcar and Cleveland did not directly measure $PM_{2.5}$ during 2019, however an estimation using PM_{10} data can be completed using the nationally derived correction factor of 0.7. Results in 2019 have increased slightly from the previous year, 9.8µg/m^3 for 2019 compared to 8.4µg/m^3 in 2018 and in 2017. This increase may be attributable to the redevelopment of the industrial and chemical complexes within 4km of the monitoring site and the rise in popularity of domestic wood burning stoves.

$PM_{2.5}$ monitoring is currently completed by two authorities within the Tees Valley, Middlesbrough and Stockton-on-Tees, forming part of the national AURN network as they are located within areas of high urban traffic flow. These sites ranged between 8 to 10.3µg/m^3 during 2019. $PM_{2.5}$ monitoring will be undertaken by Redcar and Cleveland in 2020.

3.2.4 Sulphur Dioxide (SO_2)

Table A.8 in Appendix A compares the ratified continuous monitored SO_2 concentrations for 2019 with the air quality objectives for SO_2.

Results for 2019 show no exceedances of the three air quality objectives and the annual mean at the site is again 1µg/m^3, however, due to the age of the SO_2 analyser, there has been a reduction in data capture, 76.77%, due to shutdown of the unit. Given the historical trend data of the pollutant Redcar and Cleveland has decided to cease SO_2 monitoring from 2020 with a shift to $PM_{2.5}$ monitoring instead. Figure A.3 depicts the historical data incorporting data from the former Corporation Road site and existing Dormanstown site from 1998.

3.2.5 Ozone (O_3)

Ozone is a complex secondary pollutant formed in the atmosphere by the chemical reaction between volatile organic compounds (VOC's), oxides of nitrogen (NO_x) and sunlight. The sources of these pollutants are wide ranging, with ozone levels naturally recording higher levels at coastal areas and being very spatially and seasonally dependant. Due to this, although O_3 is not a regulated pollutant required for LAQM reporting purposes, we have chosen to monitor long-term at the Dormanstown static continuous monitoring station. During 2019 over a period of 12 days, Redcar and Cleveland monitored 92 exceedances of the National Air Quality Objective, 100µg/m^3 not to be exceeded more than 10 times a year when measured as an 8-hour mean.

Appendix A: Monitoring Results

Table A.1 - Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Redcar Dormanstown	Dormanstown (2012 - Present)	Suburban	458379	523486	NO2, PM10, SO2, O3	N	NO2 - Chemiluminescence, PM10 – BAM from 2013, SO2 - UV fluorescence, O3 – UV Absorption	1	150	2.5
Redcar Corporation Road	Corporation Road (1997 - 2011)	Suburban	459900	524600	NO2, PM10, SO2, O3	N	NO2 - Chemiluminescence, PM10 – TEOM (vcm correction), SO2 - UV fluorescence, O3 – UV Absorption	1	20	2.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
R17	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R18	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R19	Dormanstown	Suburban	458379	523486	NO_2	NO	-	150	YES	2.5
R26	South Bank, Trunk Road	Roadside	453142	520836	NO_2	NO	42	11	NO	2.5
R27	West Lane, Grangetown	Roadside	454712	520678	NO_2	NO	42	1	NO	2
R36	Rectory Lane	Roadside	461211	515667	NO_2	NO	6	4	NO	2
R37	Lingdale Pharmacy	Roadside	467369	516404	NO_2	NO	3	1.8	NO	2.5
R38	Skelton High Street	Roadside	465640	518819	NO_2	NO	0	6.6	NO	2
R39	Arlington Street	Roadside	472403	518211	NO_2	NO	0	2.3	NO	2.5
R40	Keilder Close	Roadside	459909	522873	NO_2	NO	0.8	3.2	NO	2.5
R41	Mersey Road	Roadside	459695	524553	NO_2	NO	17	3.7	NO	2.5
R42	Primrose Court	Roadside	453834	519869	NO_2	NO	0	9.6	NO	2
R43	Normanby Road	Roadside	453964	519621	NO_2	NO	0	11.6	NO	2
R44	Normanby Road	Roadside	454648	518546	NO_2	NO	0	7.9	NO	2
R45	The Crescent	Roadside	453922	515096	NO_2	NO	11.2	3.7	NO	2.5
R46	Haven Site	Suburban	452644	520921	NO_2	NO	0	85.4	NO	2.5
R47	Whitehouse Café	Roadside	454621	518344	NO_2	NO	0	3.9	NO	2.5

R48	Kirkleatham Lane	Roadside	459257	524555	NO_2	NO	0	13.4	NO	2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 Annual Mean Concentration (µg/m³) (3) (4)				
							2015	2016	2017	2018	2019
Redcar Dormanstown	458379	523486	Suburban	Automatic	100	93.58	12.7	11	12	10	9
R01	461530	516410	Roadside	Diffusion Tube	-	-	15	-	-	-	-
R02	461531	516412	Roadside	Diffusion Tube	-	-	12.2	9.9	-	-	-
R03	472062	518152	Roadside	Diffusion Tube	-	-	12.9	11.2	-	-	-
R04	470786	519142	Suburban	Diffusion Tube	-	-	7.8	-	-	-	-
R05	466502	521298	Roadside	Diffusion Tube	-	-	14.2	11.7	-	-	-
R06	466256	521206	Roadside	Diffusion Tube	-	-	11	8.9	-	-	-
R07	463155	522293	Roadside	Diffusion Tube	-	-	14.5	11.6	-	-	-
R08	462339	521391	Roadside	Diffusion Tube	-	-	12.3	-	-	-	-
R09	460291	522268	Roadside	Diffusion Tube	-	-	29.8	24.1	-	-	-
R10	459289	524187	Roadside	Diffusion Tube	-	-	23	-	-	-	-
R11	459310	524177	Roadside	Diffusion Tube	-	-	17.2	14.2	-	-	-
R12	459355	522825	Roadside	Diffusion Tube	-	-	18.4	-	-	-	-
R13	458890	524510	Roadside	Diffusion Tube	-	-	21.4	15.2	-	-	-

R14	459144	525203	Industrial	Diffusion Tube	-	-	13	10.5	-	-	-
R15	459198	525251	Suburban	Diffusion Tube	-	-	15.4	-	-	-	-
R16	459945	525076	Suburban	Diffusion Tube	-	-	15.9	11.6	-	-	-
R17	458379	523486	Suburban	Diffusion Tube	100	100	12.7	13.5	13.9	17.9	17.4
R18	458379	523486	Suburban	Diffusion Tube	100	100	12.5	12.9	14.2	17.3	16.5
R19	458379	523486	Suburban	Diffusion Tube	100	100	12.2	13.2	14.8	17.5	15.2
R20	457440	519862	Suburban	Diffusion Tube	-	-	10.5	-	-	-	-
R21	455678	518799	Suburban	Diffusion Tube	-	-	14	-	-	-	-
R22	454540	518684	Suburban	Diffusion Tube	-	-	13.2	10.8	-	-	-
R23	453541	520651	Roadside	Diffusion Tube	-	-	17.6	16.2	-	-	-
R24	454986	520309	Suburban	Diffusion Tube	-	-	12.9	10.2	-	-	-
R25	453123	517395	Roadside	Diffusion Tube	-	-	12.7	-	-	-	-
R26	453142	520836	Roadside	Diffusion Tube	100	91.7	21.9	20.5	19.8	24.7	19.5
R27	454712	520678	Roadside	Diffusion Tube	100	100	30	26.4	25.5	29.8	24.8
R28	469251	519643	Roadside	Diffusion Tube	-	-	8	-	-	-	-
R29	453695	516766	Roadside	Diffusion Tube	-	-	-	11.5	-	-	-
R30	465523	518376	Background	Diffusion Tube	-	-	-	6.3	6.2	-	-
R31	471967	518208	Roadside	Diffusion Tube	-	-	-	-	12.9	-	-

R32	463609	522253	Roadside	Diffusion Tube	-	-	-	-	10.2	-	-
R33	460818	524938	Roadside	Diffusion Tube	-	-	-	-	16.6	18.6	-
R34	456476	519137	Roadside	Diffusion Tube	-	-	-	-	12.9	-	-
R35	454237	515505	Suburban	Diffusion Tube	-	-	-	-	12.0	-	-
R36	461211	515667	Roadside	Diffusion Tube	100	100	-	-	-	17.8	15.6
R37	467369	516404	Roadside	Diffusion Tube	100	100	-	-	-	10.9	9.7
R38	465640	518819	Roadside	Diffusion Tube	100	100	-	-	-	15.6	13.5
R39	472403	518211	Roadside	Diffusion Tube	100	91.7	-	-	-	20.0	15.5
R40	459909	522873	Roadside	Diffusion Tube	100	83.3	-	-	-	16.5	11.8
R41	459695	524553	Roadside	Diffusion Tube	100	100	-	-	-	20.2	19.4
R42	453834	519869	Roadside	Diffusion Tube	100	100	-	-	-	16.6	13.9
R43	453964	519621	Roadside	Diffusion Tube	100	100	-	-	-	16.1	15.2
R44	454648	518546	Roadside	Diffusion Tube	100	91.7	-	-	-	15.7	12.9
R45	453922	515096	Roadside	Diffusion Tube	100	100	-	-	-	15.2	13.5
R46	452644	520921	Suburban	Diffusion Tube	100	100	-	-	-	-	16.1
R47	454621	518344	Roadside	Diffusion Tube	100	100	-	-	-	-	20.3
R48	459257	524555	Roadside	Diffusion Tube	100	100	-	-	-	-	17.7

☒ **Diffusion tube data has been bias corrected**

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

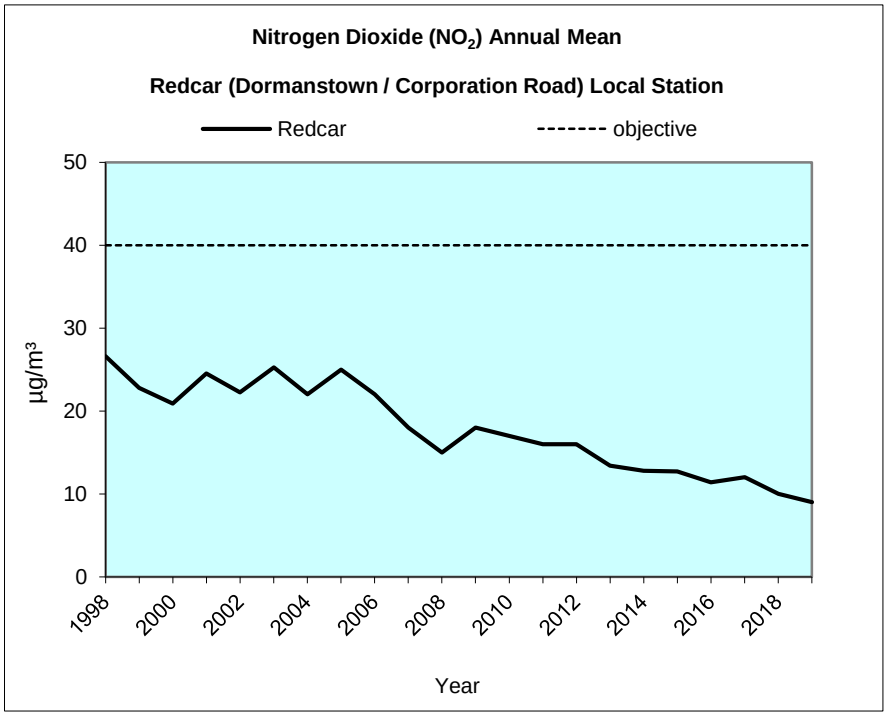
(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

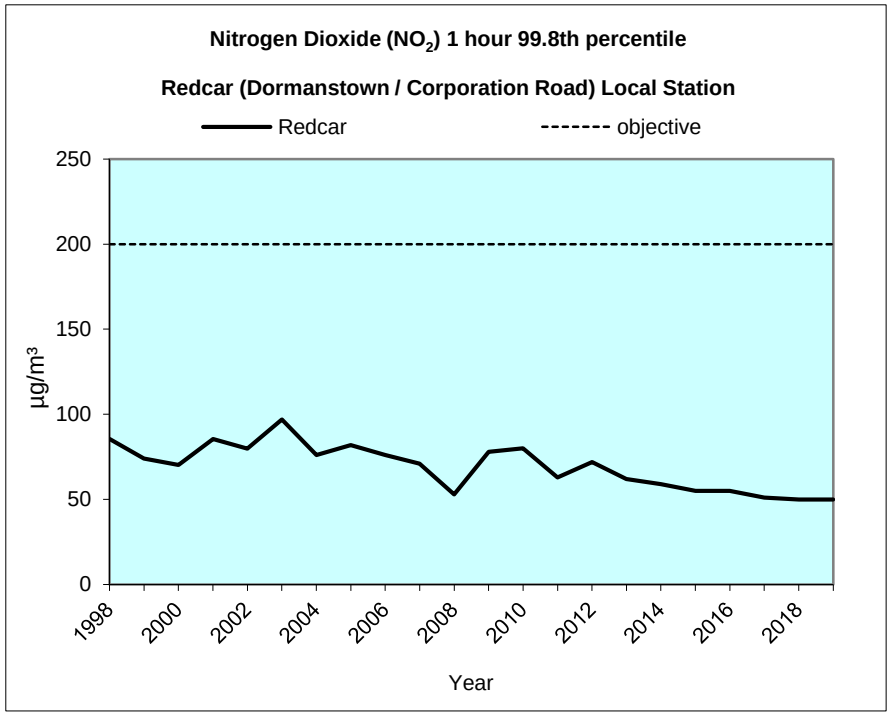
Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)(1). Column 'Valid Data Capture(2)' represents the data capture during the 12 month period.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
							2015	2016	2017	2018	2019
Redcar Dormanstown	458379	523486	Suburban	Automatic	100	93.58	0	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)(1). Column 'Valid Data Capture(2)' represents the data capture during the 12 month period.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
Redcar Dormanstown	458379	523486	Suburban	100	97.5	15.7	12.7	12	12	14

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

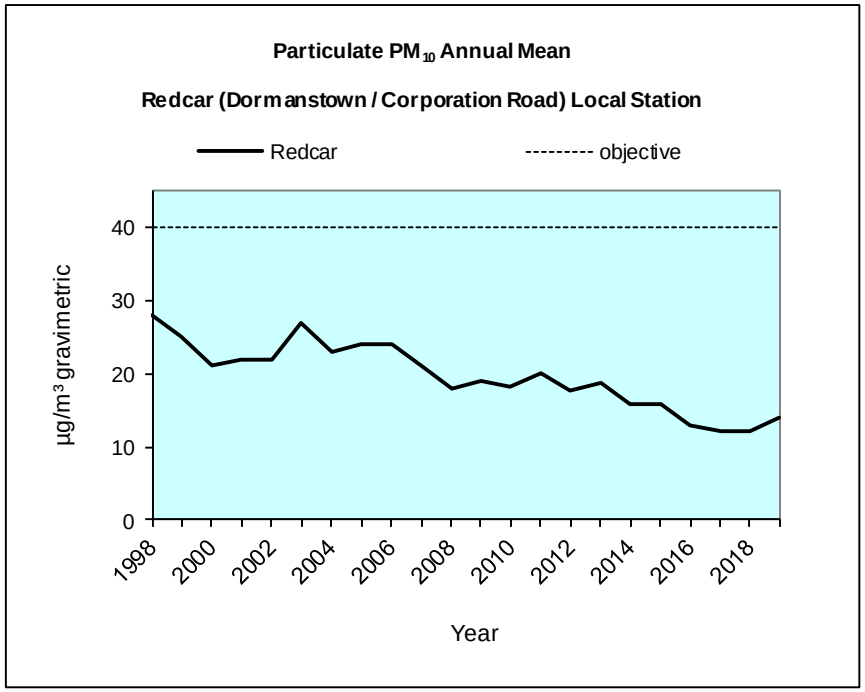
(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

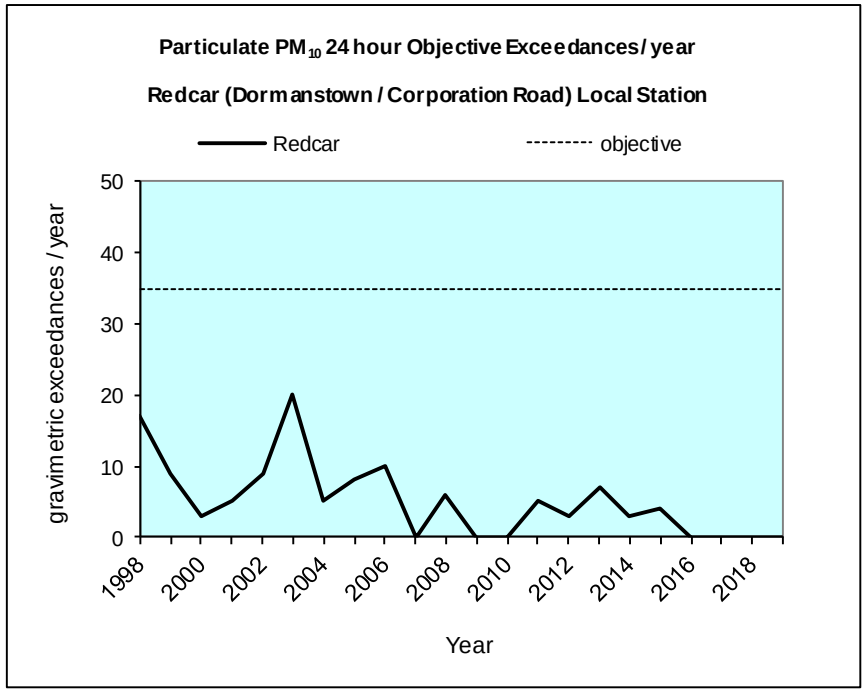
Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)(1). Column 'Valid Data Capture(2)' represents the data capture during the 12 month period.

Figure A.3 – Trends in Annual Mean PM_{10} Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
						2015	2016	2017	2018	2019
Redcar Dormanstown	458379	523486	Suburban	100	97.5	4	0	1	0	0

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)(1). Column 'Valid Data Capture(2)' represents the data capture during the 12 month period.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2019 (%) (2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3) (3)				
						2015	2016	2017	2018	2019
Redcar Dormanstown	458379	523486	Suburban	100	97.5	11	8.9	8.4	8.4	9.8
Middlesbrough Breckon Hill	450506	519620	Urban Background	100	96	10.5	10.2	7	8.9	10.3
Middlesbrough Macmillan College	447800	519300	Urban Background	100	91	11.9	11	6.7	7	8.7
Stockton Eaglescliffe	441623	513674	Roadside	100	94	10.7	9.2	8	10	8
Stockton A1305 Nelson Terrace	444331	519170	Roadside	100	95	-	9.5	8	9	8

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Monitoring was carried out for a full calendar year at all sites, this is represented in Column 'Valid Data Capture for Monitoring Period (%)(1). Column 'Valid Data Capture(2)' represents the data capture during the 12 month period.

The "Middlesbrough Macmillan College" site does not monitor $PM_{2.5}$ therefore these values have been calculated using PM_{10} actual values.

Table A.8 – SO_2 Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for monitoring Period (%) [1]	Valid Data Capture 2019 (%) [2]	Number of Exceedances 2019 (percentile in bracket) [3]		
						15-minute Objective (266 µg/m^3)	1-hour Objective (350 µg/m^3)	24-hour Objective (125 µg/m^3)
Redcar Dormanstown	458379	523486	Suburban	100	76.77	0(4)	0(3)	0(2)
Middlesbrough Breckon Hill	450506	519620	Urban Background	100	94	0	0	0

Notes:

Exceedances of the SO_2 objectives are shown in **bold** (15-min mean = 35 allowed a year, 1-hour mean = 24 allowed a year, 24-hour mean = 3 allowed a year)

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

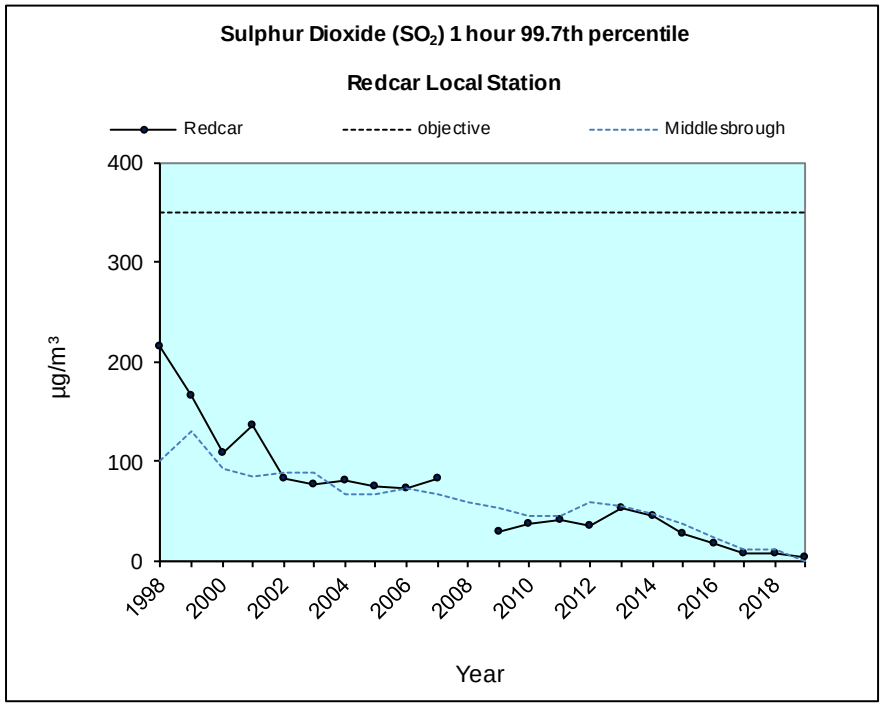
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

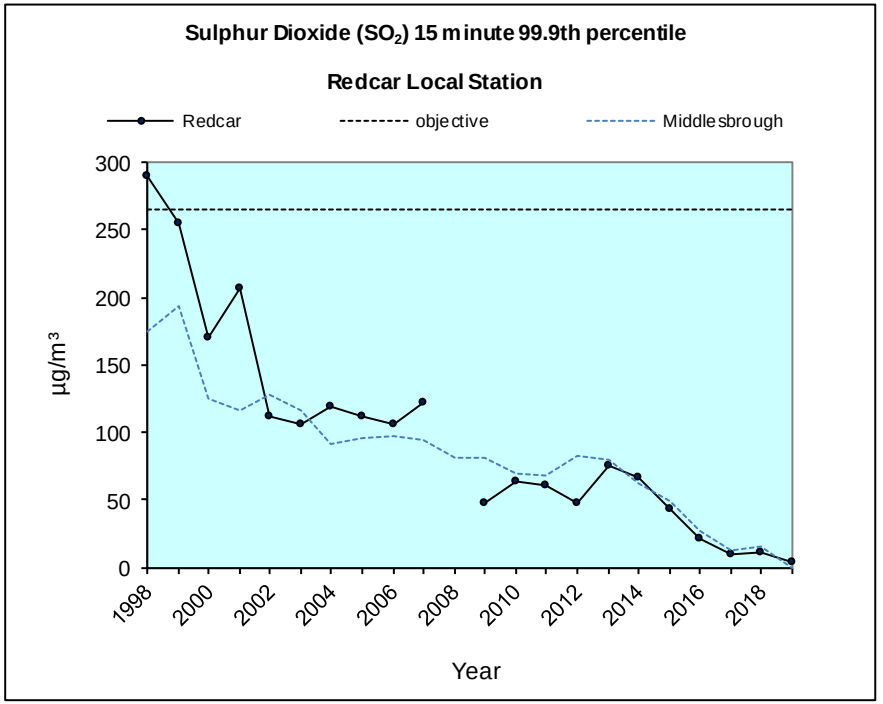
(3) If the period of valid data is less than 85%, the relevant percentiles are provided in brackets.

Figure A.6 – Trends in SO_2 Concentrations

REDCAR (Dormanstown & Corporation Road) Local Station

(suburban industrial site classification)





Station relocated to Dormanstown from Corporation Road January 2012

Middlesbrough Breckon Hill AURN station trend line added for comparison

Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO_2 Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO_2 Mean Concentrations ($\mu g/m^3$)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (0.87) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
R17	458379	523486	32.7	30.1	22.4	11.1	10.7	11.4	12.9	19.6	20.5	19.5	20.9	27.8	20.0	17.4	-
R18	458379	523486	26.7	35.8	24.5	10.4	7.6	10.8	12.5	16.7	12.6	21.8	16.8	32.1	19.0	16.5	-
R19	458379	523486	34.34	35.44	20.52	9.67	9.36	11.23	13.93	19.09	15.74	17.72	16:59	22.5	17.5	15.2	-
R26	453142	520836	38.45	28.75	22.61	25.96	12.94	22.42	19.08	17.41	24.15	26.28	30.99		22.4	19.5	-
R27	454712	520678	40.44	29.34	24.65	35.57	15.36	31.92	27.4	22.4	28.41	29.38	34.6	22.79	28.5	24.8	21.2
R36	461211	515667	27.65	19.59	15.11	18.48	9.82	13.79	15.36	13.56	16.16	21.14	25.02	19.52	17.9	15.6	-
R37	467369	516404	18.06	16.16	9.7	10.45	6.4	8.25	8.5	8.36	10.55	11.95	14.2	11.08	11.1	9.7	-
R38	465640	518819	22.71	18.17	11.83	17.15	8.36	12.51	13	12.92	15.29	17.26	20.39	17.05	15.6	13.5	-
R39	472403	518211	28.68		23.1	17.71	10.24	16.03	16.78	14.97	19.58	21.76	25.94	19.4	17.8	15.5	-
R40	459909	522873	26.77	22.76	20.53	10.57	9.16	10.29	10.44	13.27		18.08	21.08		13.6	11.8	-
R41	459695	524553	35.71	33.84	26.26	13.6	7.77	14.93	15.83	17.18	21.09	24.24	26.25	30.81	22.3	19.4	19.0
R42	453834	519869	21.01	20.44	13.38	16.49	9.46	14.16	13.17	9.96	15.41	20.2	21.77	16.56	16.0	13.9	-
R43	453964	519621	26.32	20.25	13.41	21.94	13.03	19.79	13.48	9.82	12.43	18.4	24.27	15.87	17.4	15.2	-
R44	454648	518546	27.84	23.86	14.06	13.48	8.12	12.14	12.02	11.23	16.23	16.46	22.84		14.9	12.9	-
R45	453922	515096	24.45	18.5	14.73	12.13	7.45	12.48	11.97	11.72	15.82	18.08	21.02	17.71	15.5	13.5	-
R46	452644	520921	28.73	25.11	16.65	21.22	8.05	14.22	15.5	13.22	16.85	20.18	22.93	19.53	18.5	16.1	-
R47	454621	518344	34.23	27.51	23.45	20.2	10.37	20.09	19.82	17.9	21.38	29.21	31.15	24.97	23.4	20.3	-
R48	459257	524555	31.5	23.04	21.25	19.09	12.65	18.9	18.54	17.55	20.72	22.39	21.05	18.03	20.4	17.7	-

☐ **Local bias adjustment factor used**

☒ **National bias adjustment factor used**

☐ **Annualisation has been conducted where data capture is <75%**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

AC.1 Diffusion Tube Bias Adjustment Factors

Diffusion tubes are supplied and analysed by Gradko International Ltd, using a 50% TEA in acetone. The nationally derived bias adjustment factor has been used for reporting purposes, a figure of 0.87. The Gradko International Ltd bias figure uses results from the national database of 5 co-location studies. Redcar and Cleveland Borough Council usually contribute to the national database, however due to an anomaly with the diffusion tube measurement range for September 2019 our co-location study cannot be used this time. The local bias adjustment factor (0.52) for 2019 has been calculated using triplicate co-location tubes at the Dormanstown static monitoring site. The local bias adjustment figure has not been used this year as there was one month of poor data capture and another month of poor precision, therefore Redcar and Cleveland has used the more conservative national bias factor.

AC.2 PM Monitoring Adjustment

The Dormanstown monitor is BAM gravimetric equivalence for particulate matter. The Ricardo-AEA monitoring tool has been used to adjust the figures using a value of 0.833 to produce a direct gravimetric equivalence.

AC.3 Short-term to Long-term Data Adjustment

Redcar Dormanstown continuous monitoring site had a data capture range of 76.77% to 97.5% during 2019 meaning that no data adjustment is required as no value was below 75%. During 2019 the SO_2 analyser experienced a large amount of downtime due to age related failings in the equipment. A loan analyser was provided by our contractor as replacement parts for the unit could not be sourced. A review of the SO_2 data was undertaken and as it has shown a decline over several years and

no exceedances have been observed from the site, Redcar and Cleveland decided to cease monitoring of SO_2 from 2020 and instead invest in a $PM_{2.5}$ analyser.

During 2019 no diffusion tube had a data capture of less than 75% therefore no site had to be annualised.

AC.4 QA/QC of Automatic Monitoring

The Redcar and Cleveland static continuous local monitoring station (NO_x, PM_{10}, SO_2, O_3) is operated under a comprehensive service contract with the supplier. Operators of the site have received supplier training. All data since 2012 has been collected and rescaled by Ricardo-AEA.

Redcar and Cleveland are committed to achieving accuracy, precision, data capture, traceability and long term consistency to ensure that data is representative of ambient air quality. Redcar and Cleveland has documented quality assurance and control programme, which includes an established schedule of regular site calibrations, validation of data and documentation of all procedures. Details are as follows:

Calibration	Daily ‘automatic’ calibration with frequent (usually fortnightly) manual checks. Calibration gas obtained from approved gas standard suppliers.
Equipment	Comprehensive service agreement with the supplier.
Data Capture	Site operators are experienced and trained personnel. Monitoring data capture is inspected on a daily basis where possible by Ricardo-ARA to ensure that faults are detected and corrected quickly.
Ratification	Data verification is carried out on an ongoing basis, to check for unusual measurements. Data ratification reviews all calibrated data, information from analyser services and repairs and any other information available for the particular site or analyser over the whole

ratification period. In addition, the results from the independent QA/QC audits are incorporated to take account of any problems detected during the QA/QC audits such as:

- Long-term drift in an ozone instrument calibration.
- Faulty NO_x converters.
- Drifts in calibration cylinder concentrations.
- Instrument leaks or flow faults.
- Faulty instrument configuration.

Incorporation of the QA/QC audits ensures that ratified data are traceable to UK national and international gas calibration standards.

Redcar Dormanstown data can be found on Ricardo Energy & Environment using the web address below:

https://www.airqualityengland.co.uk/local-authority/?la_id=279

AC.5 QA/QC of Diffusion Tube Monitoring

Redcar and Cleveland operate the nitrogen dioxide diffusion tube study via an approved laboratory (Gradko International Ltd) with formal accreditation to BS standards and participation in the AIR-PT programme. Particular attention is given to correct installation of the tubes at site and a reliable exposure duration.

Gradko International Ltd have demonstrated 100% performance in three of the four AIR-PT schemes during 2019, results from scheme can be found using the address below,

https://laqm.defra.gov.uk/assets/laqmno2performancedatauptonovember2019v1.pdf

During 2019 the co-location study measured a large range of results for September (12.6 / 15.74 / 20.5) which gave a poor precision value. A review of the co-location tubes position was undertaken during 2019 and in accordance with the guidance in TG16. From this review the tubes are located in accordance with the guidance and there is no obvious reason for the variation in results for this particular month. The

results continue to be reviewed on receipt to ensure that this situation does not occur each month.

Table C.1 – Triplicate NO_2 Diffusion Tube Bias Calculation 2019

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements										Automatic Method		Data Quality Check	
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	09/01/2019	06/02/2019	32.7	26.7	34.3	31	4.0	13	10.0	8.51	30.65	Good	or Data Capture
2	06/02/2019	06/03/2019	30.1	35.8	35.6	34	3.2	10	8.0	16.45	92.41	Good	Good
3	06/03/2019	03/04/2019	22.4	24.5	20.5	22	2.0	9	5.0	10.14	99.85	Good	Good
4	03/04/2019	01/05/2019	11.1	10.4	9.7	10	0.7	7	1.8	7.37	98.96	Good	Good
5	01/05/2019	05/06/2019	10.7	7.6	9.4	9	1.6	17	3.9	6	99.88	Good	Good
6	05/06/2019	03/07/2019	11.4	10.8	11.2	11	0.3	3	0.7	5	99.85	Good	Good
7	03/07/2019	07/08/2019	12.9	12.5	13.9	13	0.7	6	1.8	6	99.52	Good	Good
8	07/08/2019	04/09/2019	19.6	16.7	19.1	18	1.6	9	3.9	8	100	Good	Good
9	04/09/2019	02/10/2019	20.5	12.6	15.7	16	4.0	25	9.9	9	99.55	Poor Precision	Good
10	02/10/2019	06/11/2019	19.5	21.8	17.7	20	2.0	10	5.0	10	97.02	Good	Good
11	06/11/2019	04/12/2019	20.9	16.8	16.6	18	2.4	13	6.0	12.76	99.85	Good	Good
12	04/12/2019	08/01/2020	27.8	32.1	22.5	27	4.8	18	11.9	12.22	99.76	Good	Good
13													
										Overall survey -->		Good precision	Good Overall DC

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

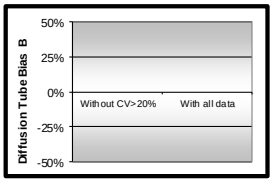
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Redcar Dormanstown

Precision: 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%	
Bias calculated using 10 periods of data	
Bias factor A	0.52 (0.45 - 0.6)
Bias B	94% (68% - 120%)
Diffusion Tubes Mean:	18 µgm^{-3}
Mean CV (Precision):	10 caution
Automatic Mean:	9 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	10 (8 - 11) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA	
Bias calculated using 11 periods of data	
Bias factor A	0.52 (0.46 - 0.59)
Bias B	92% (68% - 116%)
Diffusion Tubes Mean:	18 µgm^{-3}
Mean CV (Precision):	11 caution
Automatic Mean:	9 µgm^{-3}
Data Capture for periods used:	99%
Adjusted Tubes Mean:	9 (8 - 11) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Calculations were undertaken using the AEA Energy and Environment tool and data supplied by Ricardo Energy and Environment to obtain a local bias factor. As the data quality check showed one 'Poor Precision' and one 'Poor Data Capture' during the reporting year it was decided that the national bias adjustment figure would be reported for 2019. The national bias adjustment figure also provides a more conservative adjustment of the NO_2 figures, as show in Table C3.

Table C.2 – National NO_2 Diffusion Tube Bias Calculation 2019

National Diffusion Tube Bias Adjustment Factor Spreadsheet		Spreadsheet Version Number: 03/20
Follow the steps below **in the correct order** to show the results of **relevant** co-location studies Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.		This spreadsheet will be updated at the end of June 2020 LAQM Helpdesk Website
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.	Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.	

Step 1:	Step 2:	Step 3:	Step 4:
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[2] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	50% TEA in acetone	2019	R	City of London	12	74	71	4.1%	G	**0.96**
Gradko	50% TEA in acetone	2019	UB	City of London	12	37	33	14.3%	G	**0.88**
Gradko	50% TEA in acetone	2019	KS	Marylebone Road Intercomparison	12	83	65	26.3%	G	**0.79**
Gradko	50% TEA in acetone	2019	R	London Borough of Richmond upon Thames	12	46	35	30.4%	G	**0.77**
Gradko	50% TEA in acetone	2019	R	London Borough of Richmond upon Thames	12	29	27	7.1%	G	**0.93**
Gradko	50% TEA in acetone	2019	B	London Borough of Richmond upon Thames	11	21	21	1.0%	G	**0.99**
Gradko	50% TEA in acetone	2019	UB	Falkirk Council	9	18	15	18.1%	G	**0.85**
Gradko	50% TEA in acetone	2019	R	LB Newham	12	35	30	16.2%	G	**0.86**
Gradko	50% TEA in acetone	2019		**Overall Factor[3] (8 studies)**				**Use**		**0.87**

Table C.3 – Comparison of National and Local Bias Adjustment

Site ID	NO_2 Raw Data	Local Bias Adjustment (0.52)	National Bias Adjustment (0.87)
R17	20.0	10.4	17.4
R18	19.0	9.9	16.5
R19	17.5	9.1	15.2
R26	22.4	11.6	19.5
R27	28.5	14.8	24.8
R36	17.9	9.3	15.6
R37	11.1	5.8	9.7
R38	15.6	8.1	13.6
R39	17.8	9.3	15.5
R40	13.6	7.1	11.8
R41	22.3	11.6	19.4
R42	16.0	8.3	13.9
R43	17.4	9.0	15.1
R44	14.9	7.7	13.0
R45	15.5	8.1	13.5
R46	18.5	9.6	16.1
R47	23.4	12.2	20.4
R48	20.4	10.6	17.7

An example of the calculation used to derive the above results is shown below:

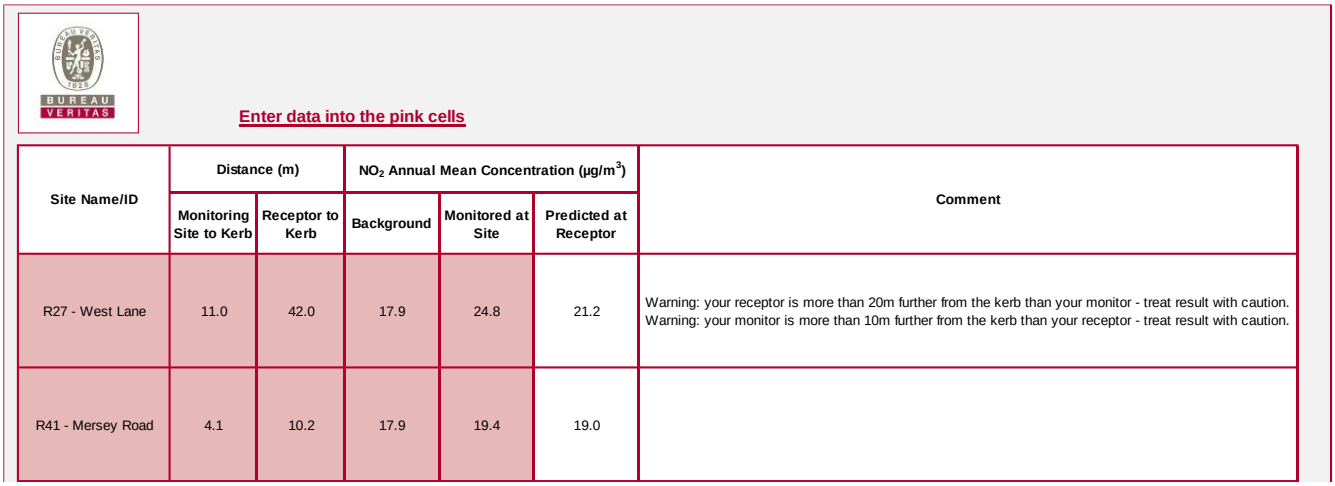
Bias Adjusted Figure = Raw Data x bias adjustment figure

= 20.0 x 0.52

= **10.4**

Table C.4 – Distance Correction Calculation

Distance correction calculations were undertaken for sites R27 and R41 due to their proximity from sensitive receptors. The Bureau Veritas NO_2 fall off calculator methodology was used to make these adjustments, as shown in the image below.



Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
R27 - West Lane	11.0	42.0	17.9	24.8	21.2	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution. Warning: your monitor is more than 10m further from the kerb than your receptor - treat result with caution.
R41 - Mersey Road	4.1	10.2	17.9	19.4	19.0	

AC.6 – Estimating $PM_{2.5}$ Concentrations from PM_{10} Monitoring

Redcar and Cleveland have not monitored $PM_{2.5}$ during the reporting period, therefore PM_{10} measurements are used to estimate $PM_{2.5}$ concentrations. These estimates have been calculated using the National Factor Figure, an example of the calculation is shown below.

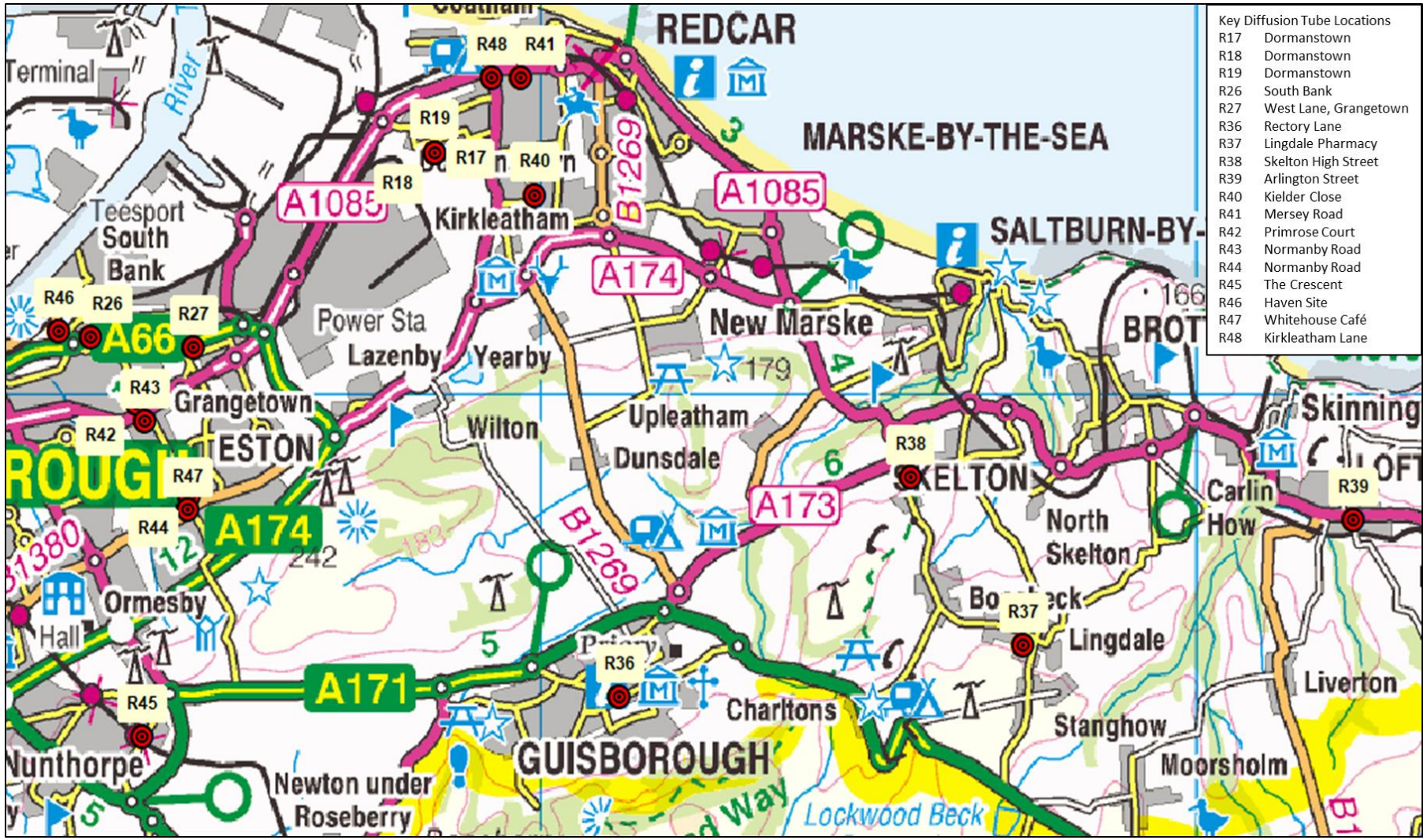
$PM_{2.5}$ Estimation = Annual Mean PM_{10} concentration x National correction factor

= 14 x 0.7

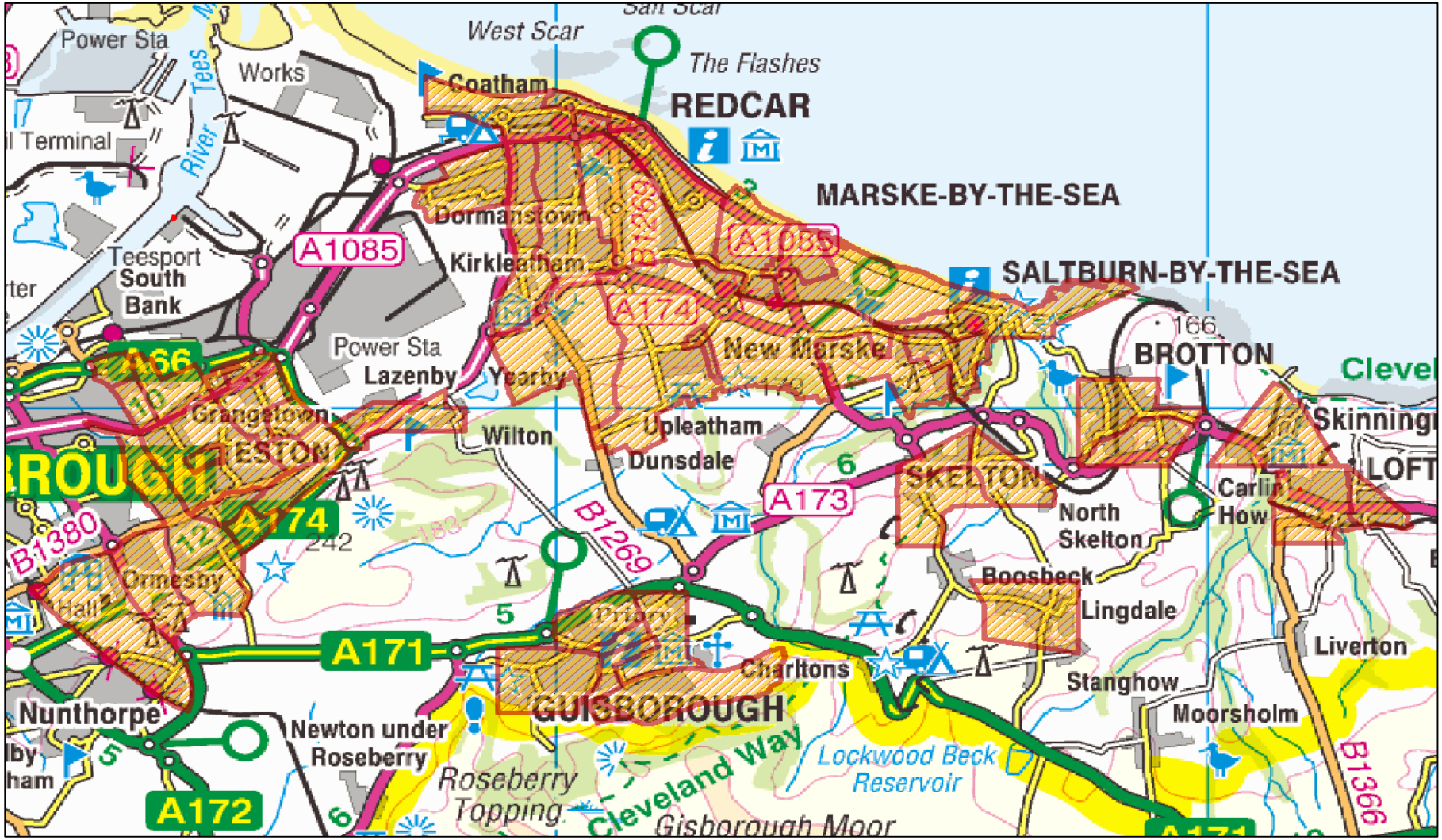
= **9.8**

Appendix D: Map of Monitoring Locations

Appendix D.1: Diffusion Tube Monitoring Network 2019



Appendix D.2: Smoke Control Areas within Redcar and Cleveland



Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[6]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[6] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
SCA	Smoke Control Area
TEA	Triethylamine

APPENDIX II
BSG ECOLOGY: P20-1004
sHRA & AIR QUALITY IMPACTS ON SSSI REPORT

ECL Ref: ECL.007.04.01/ADM
February 2022
Version: Issue 1a

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Grangetown Energy Recovery Facility

Report to Inform a Habitats Regulations Assessment

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Client	FCC Environment
Project	Grangetown Energy Recovery Facility
Report title	Report to Inform a Habitats Regulations Assessment
Draft version/final	FINAL
File reference	P20-1004 Grangetown Prairie shadow HRA.docx

	Name	**Position**	**Date**
Originated	Steven Betts	Associate Director	23 August 2021
Reviewed	Roger Buisson	Associate Director	26 August 2021
Reviewed	James Gillespie	Director	31 August 2021
Updated	Steven Betts	Associate Director	25 January 2022
Approved for issue to client	Steven Betts	Associate Director	25 January 2022
Issued to client	Steven Betts	Associate Director	25 January 2022

Contents

1 Introduction

Overview

1.1 Outline planning consent has been granted for the construction of an Energy Recovery Facility (ERF) and associated development at a site known as Grangetown Prairie (planning reference R/2019/0767/OOM).

1.2 The planning process included consultation with Natural England that confirmed that a Habitats Regulations Assessment was required because of the site's proximity to, and potential to impact on, the following European designated sites: Teesmouth and Cleveland Coast SPA and Ramsar. An HRA Screening Report (see Section 5 for further explanation of the 'screening' process) was subsequently prepared (JBA Consulting, 2019) and submitted alongside the planning application. The Screening Report concluded that '*no likely significant effects were identified from the proposed works*' and that '*the HRA process for the project will not be required to proceed to an Appropriate Assessment*'.

1.3 In correspondence dated 20 January 2020 (reference 304948, Andrew Whitehead, Team Leader - Sustainable Development, Marine & Wildlife Licensing Northumbria Area Team) Natural England objected to the proposed development and advised Redcar and Cleveland Borough Council that they considered that it was '*not possible to conclude that the proposal is unlikely to result in significant effects on the European sites in question*'. Consequently the need to carry out an 'appropriate assessment' was considered to be triggered. In particular, Natural England requested that an air quality assessment was completed that considered the operation of the ERF and the effects of emissions on designated site habitats and species, i.e., the qualifying features of the European designated sites.

1.4 In subsequent correspondence to Redcar and Cleveland Borough Council dated 26 March 2020 (reference 312932, Andrew Whitehead, Team Leader - Sustainable Development, Marine & Wildlife Licensing Northumbria Area Team) Natural England withdrew their objection to the proposed development, advising that they no longer believed that the proposal was likely to have a significant effect on the European sites in question. This conclusion was reached following the submission of further information in the form of an 'appropriate assessment' (JBA Consulting, 2020).

1.5 Following the withdrawal of Natural England's objection, outline planning consent was granted. Condition 3 of the decision notice states:

1.6 '*Upon the approval of the Reserved Matters, and prior to the implementation of the approved scheme, the development shall be the subject of an updated Habitats Regulations Assessment and additional supplementary air quality assessment. The HRA and additional air quality assessment shall confirm, based on the approved detail of the development and its processes, the conclusions of the Environmental Impact Assessment and Air Quality Assessment that the development will not give rise to significant adverse impacts on designated sites. Where significant impacts not previously identified are assessed to arise from the approved detailed scheme, the additional information shall set out those mitigation measures to be employed to minimise or eliminate such impacts*.'

1.7 This document presents the results of a further HRA (a shadow HRA[1]), which will provide information that will help Redcar and Cleveland Council to discharge its duties as the 'competent authority' as defined under Regulation 63(1) of the Conservation of Habitats and Species Regulations 2017[2] (as amended - hereafter referred to as the 'Habitats Regulations').

1.8 It should be noted that it has not been possible to visit the site during the preparation of this assessment due to ongoing remediation work. This is not considered to be a limitation as previous surveys have established site conditions prior to this work commencing. The loss of habitats and disturbance associated with these works is likely to have reduced the value of the site to qualifying features (birds) associated with the Teesmouth and Cleveland Coast SPA and Ramsar site.

[1] Under the Conservation of Habitats and Species Regulations 2017 the 'competent authority' is responsible for completing a Habitats Regulations Assessment (HRA). If an HRA is carried out by a third party with the objective of it being adopted by the competent authority, this is often referred to as a shadow HRA.

[2] Following the UK's exit from the European Union, the 2017 Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

Site description

1.9 The site (the 'Site') is located on land to the east of John Boyle Road and to the west of Tees Dock Road, Grangetown, Redcar and Cleveland. The central Ordnance Survey Grid Reference (OSGR) for the site is NZ543213. The location of the Site is shown on Figure 1 in Section 12.

1.10 BSG Ecology understands from FCC Environment that Site remediation works have been carried out by South Tees Development Corporation (STDC). This has resulted in the removal of all vegetation within the Site.

Project Description

1.11 FCC Environment is one of three bidders in a confidential bidding process looking to secure a long-term contract to build and operate an Energy from Waste facility with the Joint Authorities. The Tees Valley Authorities (TVA), Durham County Council and Newcastle City Council (the Councils) have joined together to create an opportunity for a contractor to design, build, finance and operate (DBFO) a new Energy Recovery Facility (ERF) to be located in the Tees Valley on a mandated site owned by the South Tees Development Corporation (STDC).

1.12 The mandated site is on a large industrial brownfield site within the Redcar and Cleveland Borough Council administrative area: this is the site of the former British Steel works in Grangetown, an area known as Grangetown Prairie. The site is approximately 25 acres in total.

1.13 Outline planning consent has been granted by Redcar and Cleveland Borough Council (planning reference R/2019/0767/OOM) for an ERF facility that could treat 450,000 tonnes per annum of waste and export up to 49.9 MWH of electricity. The developed site will also include landscaping, internal access roads and car parking areas.

Report Structure

1.14 This report documents the HRA for the proposed Energy Recovery Facility. It identifies, analyses and quantifies (where possible) potential negative impacts on the relevant European sites. The report is structured as follows:

- Chapter One: sets out the purpose of the report and provides an overview of the project.
- Chapter Two: describes the Habitats Regulations Assessment process.
- Chapter Three: sets out the scope of the assessment and how this has been derived.
- Chapter Four: identifies the European sites that may potentially be impacted by the project, together with ecological information about each site.
- Chapter Five: sets out the screening for any Likely Significant Effects.
- Chapter Six: describes the Appropriate Assessment, which includes mitigation measures where appropriate.
- Chapter Seven: presents the conclusions of the assessment.

Consultation

1.15 FCC Environment has engaged with Natural England through the Discretionary Advice Service (DAS), which involved a meeting on 24 November 2021 between Nick Lightfoot and Lewis Pemberton (Natural England), David Molland (FCC), Tim Heard, Sarah Burley and Sara Maile (ECL), Steven Betts (BSG Ecology) and Sam Thistlethwaite (Identity Consult Planning).

1.16 Natural England provided the following advice in relation to the draft shadow HRA that had been sent to them in advance of the meeting:

- Modelling locations TCC10, 11, 12 and 13 are considered to be the most sensitive ecological receptors due to the habitats that are present, i.e., mudflats (at Seal Sands), saltmarsh and sand dunes.
- The mudflats at Seal Sands provide an important feeding area for SPA and Ramsar qualifying birds and eutrophication is currently resulting in the formation of algal mats that make feeding difficult for some species.
- Saltmarsh may be used by some SPA and Ramsar qualifying birds for feeding and so needs to be considered in the HRA.
- Sand dune is not important for SPA and Ramsar qualifying birds but is important as a qualifying feature of the Teesmouth and Cleveland Coast SSSI (this habitat does not need to be considered within the HRA).
- Table 8 of the draft HRA refers to the release of waterborne non-synthetic compounds as being unlikely. Further explanation is required as to why this is unlikely.
- The HRA needs to consider deposition to the River Tees and estuary and nutrient enrichment of the water.

Contributors

1.17 The report has been prepared by Steven Betts, who has worked in the ecological sector for more than 27 years. During this time he has contributed to a wide range of projects, both as author and technical reviewer. This has included the preparation of and contributions to numerous HRAs for projects that have included an energy recovery facility, housing developments, powerline projects, solar schemes and wind farms.

1.18 The report has been reviewed by Dr Roger Buisson. Roger is a highly experienced professional ecologist with over 30 years' experience. He has managed or contributed to numerous projects that have included a requirement for HRA.

1.19 Further details of the experience and qualifications of the above can be found at http://www.bsg-ecology.com/people/.

2 Habitats Regulations Assessment

Legislation and policy

2.1 This section describes the legislation and policy as it applies now that the UK has left the European Union.

2.2 Guidance from Defra has been provided on the application of the relevant legislation in the post-Brexit period in their policy paper published on 01 January 2021 available at https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017.

2.3 The Conservation of Habitats and Species Regulations 2017 (as amended) provide for the protection of particular habitats, plants and animals through the creation of, and specific decision-making procedures applied to, the 'national site network' (Regulation 3 'Interpretation'). This 'national site network' includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) that were designated or classified both in that period when the UK was a member of the EU and designated since the UK has left the EU.

2.4 It is UK Government policy (in England this is identified in paragraph 181 of the National Planning Policy Framework, 2021) that all competent authorities should treat candidate SACs (cSACs) and potential SPAs (pSPAs) as being within the provisions of the Conservation of Habitats and Species Regulations 2017 (as amended).

2.5 In this report the term 'European Sites' is used to refer collectively to SACs, cSACs, SPAs and pSPAs. Although they are referred to as the 'national site network' in those recently amended parts of the Habitats Regulations, the decision-making procedures concerning HRA, as set out in Regulation 63, continue to refer to them as 'European Sites' (as does much of the available guidance) and for that reason in this report they are referred to collectively as European Sites.

Habitats Regulations Assessment process

2.6 The requirements of the Habitats Regulations with regard to the implications of plans or projects are set out within Regulation 63 of the Habitats Regulations. The step-based approach implicit within this regulation is referred to as a 'Habitats Regulations Assessment', which is the term that has been used throughout this report.

2.7 It is a requirement of any public body (referred to as a competent authority within the Habitats Regulations) to undertake a Habitats Regulations Assessment (HRA) when they are proposing to carry out a project, implement a plan or authorise another party to carry out a plan or project. Competent authorities are required to record the process undertaken, ensuring that there will be no adverse effects on the integrity of any European Site, as a result of a plan or project whether alone or in combination with other plans or projects. In this case the competent authority is Redcar and Cleveland Borough Council.

Assessment stages

2.8 The assessment of a plan or project goes through a number of stages, with guidance having been published to aid competent authorities fulfil their responsibilities (e.g., Defra, 2021). Those stages are summarised in Table 1 below.

***Table 1**: Stages in the Habitats Regulations Assessment process*

Stage	Description	Legislative Context
Purpose	Determines if the purpose of the plan or project is directly connected with, or necessary, to the management of a European Site. If it is, then no further assessment is necessary	Regulation 63(1)(b)
Scoping	The identification of any European Site that might be within scope of a HRA, i.e., those European Sites should be taken forward to the screening stage based on a wide consideration of spatial and ecological factors. Such European Sites may be located within the plan or project area but may also include sites located in neighbouring authority areas.	
Screening	Assessment of whether a plan or project, either alone or in combination with other plans or projects, is likely to have a significant effect on any European Sites' qualifying features (habitats and species) and the achievement of the European Site's conservation objectives. This is also known as the 'test of likely significant effect' (ToLSE).	Regulation 63(1)(a)
Appropriate Assessment	Consideration of the impacts of the proposals to determine whether or not it is possible to conclude with certainty that the project will not result in any adverse effect on the integrity of any European Site, either alone or in combination with other plans or projects and with reference to the European Site's conservation objectives. This is also known as the test of 'adverse effect on integrity' (AEoI). At this stage consent may be granted for the plan or project if it is possible to conclude with certainty that the proposal will not result in any adverse effect on the integrity of any European Site, either alone or in combination with other plans or projects.	Regulation 63(5)
If it cannot be concluded with certainty that the proposal will not result in any adverse effect on the integrity of any European Site then proceed to:		
Assessment of alternative solutions	Assess whether there is an alternative solution to the plan or project, i.e., one that avoids adverse effects on European Sites. If no such alternative solution exists, the process continues to an assessment of whether there are 'imperative reasons of overriding public interest' (IROPI) for the plan or project to proceed.	Regulation 64(1)
Assessment of IROPI	Assess whether a plan or project can be justified as being needed for 'imperative reasons of overriding public interest' (IROPI).	Regulation 64(1)
Compensatory measures	Identify and secure any necessary compensatory measures to ensure that the overall coherence of the 'national site network' is protected.	Regulation 68

Applying Case law to the HRA process

2.9 The Court of Justice of the European Union (CJEU) and UK Court judgments have identified that in the HRA process the assessment may not have lacunae (gaps or omissions) and must contain complete, precise and definitive findings capable of removing all reasonable scientific doubt as to the effects of the proposed works on the European Site concerned. Court judgments have identified that in the HRA process all aspects of the plan or project which can, by themselves or in combination with other plans or projects, affect the conservation objectives of European Sites concerned must be identified in the light of the best scientific knowledge available in the field.

2.10 A CJEU judgment in 2018 (People Over Wind and Sweetman, 12 April 2018, C-323/17) has provided clarification as to when avoidance or reduction (i.e., mitigation) measures can be considered within the HRA process. The headline for the case is:

> "*In the light of all the foregoing considerations, the answer to the question referred is that Article 6(3) of the Habitats Directive must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*".

2.11 This case means that a competent authority cannot rely on avoidance or reduction measures that allow a conclusion of 'no likely significant effect' to be reached: instead, it is necessary to accept that there is a 'likely significant effect' in the absence of these measures, and move to the next stage, i.e., appropriate assessment, at which point such mitigation measures can be considered. This judgment is accounted for in this report.

2.12 A further CJEU judgment (Holohan & Ors. v An Bord Pleanála, 7 November 2018, C-461/17) provides further clarification about the HRA process, requiring that all habitats and species associated with a European Site (irrespective of whether or not they are qualifying features) must be considered in the assessment if impacts on those non-qualifying habitats or species are liable to affect the conservation objectives of the European Site through, for instance, effects on ecological processes or food chains. This judgment is also accounted for in this report.

2.13 It is noted that relevant case law still applies following the UK's departure from the EU, and that the 2017 Regulations amendments in The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, will apply.

Functionally linked land

2.14 A development has the potential to impact a European site either directly, for example as a result of land-take, or indirectly, for example as a result of changes in air quality. When assessing impacts it is important to note that impacts need to be considered on 'functionally linked land'. Functionally linked land can be defined as follows (Chapman & Tyldesley, 2016):

2.15 '*the term 'functional linkage' refers to the role or 'function' that land or sea beyond the boundary of a European site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such land is therefore 'linked' to the European site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status*.'

2.16 In this report consideration has been given to whether or not the proposed development will impact land that is functionally linked to a European site.

3 Scope of the Assessment

Overview

3.1 There are no standard criteria for determining the spatial scope of an HRA and so the decision to include or exclude European sites from an assessment needs to be supported by application of the source-pathway-receptor conceptual model, which highlights whether there is any potential pathway that connects the development to any European sites. In this case the spatial scope of the assessment is informed by identifying the impacts that could potentially arise as a result of the development, assessing the spatial and temporal scope of those impacts and understanding the effects on sensitive receptors that might arise.

Potential impact mechanisms

3.2 Potential impacts that may arise from the construction phase of the proposed development have been identified as follows:

- Degradation of habitats as a result of excavation work, material storage and mobile plant tracking; such impacts will be limited in their extent to the Site with no construction activity proposed outside the Site boundary.
- Degradation of habitats arising from pollution, in particular airborne (e.g., dust) and water-borne (e.g., silt) pollutants; such impacts will be limited in their extent to the Site and the adjacent area.

3.3 Impacts that may arise during the operational phase of the proposed development will be limited to changes in air quality arising from the operation of the energy recovery facility. No further degradation of habitat arising from excavation work, material storage and mobile plant tracking etc is likely during this phase of the development.

3.4 The decommissioning phase of the proposed development is expected to result in similar impacts to those described for the construction phase of the development. Air quality impacts will be limited to dust generated during the decommissioning works, with other aerial discharges having ceased prior to this phase of the development. Habitat degradation will be limited to the landscaped habitats that have developed within the Site during its operational life.

Scope of the assessment

3.5 The Zone of Influence (ZoI) for the proposed development is the area over which ecological features may be affected by biophysical changes as a result of the proposed work and associated activities. This may extend beyond the Site boundary. The ZoI has been used to determine the extent of the desk study, baseline ecological surveys and biological / non-biological (air quality) assessments.

3.6 During the construction stage of the proposed development the ZoI is considered to be the Site and a buffer area around it within which impacts may occur depending upon the sensitivity of the ecological receptors being considered. In this assessment the following ZoIs have been adopted:

- Degradation of habitats (habitat loss and disturbance) – This will be limited to the Site and immediate environs, i.e., a precautionary ZoI of 100 m. Consideration needs to be given to direct impacts on European sites and to impacts on land that is functionally linked to a European site (see Section 2.14 et seq.).
- Degradation of habitats (airborne pollution) - Air quality impacts due to dust production may potentially impact on sensitive ecological features. Current guidance (Holman *et al*, 2014) advises that construction-related dust impacts only need to be considered for important ecological features within 50 m of the proposed development boundary. Guidance on mineral developments (IAQM, 2016) advises that a significant effect from dust is unlikely beyond 400 m of the proposed development boundary (this higher figure has been adopted on a precautionary basis for the purposes of the HRA).

- Degradation of habitats (waterborne pollution) – Water-borne pollutants, such as silt, fuel and oils, have the potential to impact on habitats downstream of the pollution source. Whilst this type of pollution can potentially be wide-ranging, its effects will be limited to the receiving watercourse. A watercourse runs alongside the western boundary of the Site and this flows into culverts to the north and south. It is likely that this drains into the Tees Estuary to the north of the Site. At this point any pollutant is likely to be subject to some dilution, mixing and dispersal, although this may be reduced within the confines of an estuarine environment. Approximately 7 km downstream the River Tees discharges to the open sea, at which point dilution, mixing and dispersal are likely to be significant. For this reason 7 km has been set as the ZoI.

3.7 During the operation phase a ZoI of 10 km has been adopted. As the proposed development will generate less than 50 MW, the ZoI for the project is taken to be 10 km from the proposed works location to follow DEFRA air emission guidance (DEFRA, 2016).

3.8 In summary, the following potential types of adverse effect, with their associated ZoI, have been considered in this assessment:

- Degradation of habitats (habitat loss and disturbance) (ZoI is 100 m from the Site);
- Degradation of habitats (airborne pollution - dust) (ZoI is 400 m from the Site);
- Degradation of habitats (waterborne pollution) (ZoI is 7 km from the Site);
- Degradation of habitats (airborne pollution – gaseous and particulate pollutants) (ZoI is 10 km from the Site.

3.9 Taking into account these impact mechanisms and the ZoIs that have been adopted for the assessment, the HRA has considered impacts on the following European sites:

- Teesmouth and Cleveland Coast SPA;
- Teesmouth and Cleveland Coast Ramsar;
- North York Moors SAC; and
- North York Moors SPA.

3.10 No other European sites have been identified where the impacts and effects of the proposed development need to be considered.

4 Information on the Relevant European Sites

4.1 Set out below is information relating to the Teesmouth and Cleveland Coast SPA (Table 2), Teesmouth and Cleveland Coast Ramsar (Table 3), North York Moors SAC (Table 4) and North York Moors SPA (Table 5) and the reference sources of information used. The following information is provided for each site:

- Site name and code
- Year classified/designated/listed
- Area
- Qualifying interest features
- Conservation objectives
- Distance between nearest component of European Site and the quarry
- Sources of information

***Table 2**: Teesmouth and Cleveland Coast SPA*

Site name: Teesmouth and Cleveland Coast SPA
Site code: UK9006061
Year designated: Designated on 1 April 2005
Area: 12210.62 ha
Component SSSIs: Durham Coast SSSI, Teesmouth and Cleveland Coast SSSI.
Qualifying interest features: The site qualifies under Article 4 of the Birds Directive (2009/147/EC) as it regularly supports more than 1% of the Great Britain populations of the following species listed in Annex I of the EC Birds Directive: • Avocet (*Recurvirostra avosetta*), Breeding • Sandwich tern (*Thalasseus sandvicensis*), Non-breeding • Little tern (*Sternula albifrons*), Breeding • Common tern (*Sterna hirundo*), Breeding • Ruff (*Calidris pugnax*), Non-breeding The site also regularly supports more than 1% of the biogeographic population of two regularly occurring migratory species not listed in Annex I of the EC Birds Directive: • Redshank (*Tringa totanus*), Non-breeding • Knot (*Calidris canutus*), Non-breeding The site qualifies under Article 4 of the Birds Directive (2009/147/EC) as it is used regularly by over 20,000 waterfowl (waterfowl as defined by the Ramsar Convention) or 20,000 seabirds in any season: • Waterbird assemblage, Non-breeding – average number of individuals 26,014
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features, • The structure and function of the habitats of the qualifying features, • The supporting processes on which the habitats of the qualifying features rely, • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.
Distance: The development site is 1.4 km from the nearest part of the SPA.

Site name: Teesmouth and Cleveland Coast SPA
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/4903947418730496 JNCC Natura 2000 Data Form - http://publications.naturalengland.org.uk/file/3209673 (2012) Conservation Objectives - http://publications.naturalengland.org.uk/file/4849489020190720 Regulation 33 Conservation Advice - http://publications.naturalengland.org.uk/file/3208616 (2012) Site Improvement Plan – http://publications.naturalengland.org.uk/publication/5803888850501632

***Table 3**: Teesmouth and Cleveland Coast Ramsar*

Site name: Teesmouth and Cleveland Coast Ramsar
Site code: UK0019859
Year designated: Designated on 15 August 1995
Area: 1247.31 ha
Component SSSIs: Durham Coast SSSI, Teesmouth and Cleveland Coast SSSI.
Qualifying interest features: The site qualifies under Ramsar criterion 5 because it supports: • An assemblage of international importance – 9,528 waterfowl (5 year peak mean 1998/99-2002/2003). The site qualifies under Ramsar criterion 6 because it supports the following species/populations, which occur at levels of international importance: • Redshank (*Tringa totanus*), Non-breeding • Knot (*Calidris canutus*), Non-breeding
Conservation objectives: There are no specific conservation objectives for the Ramsar site; however, as the site is of importance for species that are also qualifying features of the SPA, it has been assumed that the SPA conservation objectives are also relevant for the Ramsar site. Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species. • The structure and function (including typical species) of qualifying natural habitats. • The structure and function of the habitats of qualifying species. • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely. • The populations of qualifying species, and, • The distribution of qualifying species within the site.
Distance: The development site is 1.7 km from the nearest part of the Ramsar site.

Site name: Teesmouth and Cleveland Coast Ramsar
Sources of information: Site citation - https://jncc.gov.uk/jncc-assets/RIS/UK11068.pdf JNCC Natura 2000 Data Form – n/a Conservation Objectives – n/a Conservation Objectives Supplementary Advice – n/a Site Improvement Plan – n/a Proposed targets for SAC Conservation Objectives – n/a

***Table 4**: North York Moors SAC*

Site name: North York Moors SAC
Site code: UK0030228
Year designated: Designated on 1 April 2005
Area: 44053.29 ha
Component SSSI: North York Moors SSSI.
Qualifying interest features: Qualifying habitats: The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I: • 4010 Northern Atlantic wet heaths with *Erica tetralix*. • 4030 European dry heaths Qualifying habitats: Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 7130 Blanket bogs (* if active bog) * Priority feature
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of the qualifying natural habitats, • The structure and function (including typical species) of the qualifying natural habitats, and, • The supporting processes on which the qualifying natural habitats rely.
Distance: The development site is 9.4 km from the nearest part of the SAC.
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/5868610203418624 JNCC Natura 2000 Data Form - https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030228.pdf Conservation Objectives - http://publications.naturalengland.org.uk/file/5052053512781824 Conservation Objectives Supplementary Advice - http://publications.naturalengland.org.uk/file/5324037278662656 Site Improvement Plan – http://publications.naturalengland.org.uk/publication/6110322049941504

***Table 5**: North York Moors SPA*

Site name: North York Moors SPA
Site code: UK0019859
Year designated: 12 May 2000
Area: 44,087.68 ha
Component SSSIs: North York Moors SSSI.
Qualifying interest features: Qualifying species: The site qualifies under article 4.1 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the Great Britain population of the following two species listed in Annex I in any season: • Merlin *Falco columbarius* • Golden Plover *Pluvialis apricaria* Non-qualifying species of interest: In addition, the site supports a rich upland breeding bird assemblage which includes Short-eared owl *Asio flammeus*, peregrine *Falco peregrinus* and hen harrier *Circus cyaneus* (all Annex I species), together with redshank *Tringa totanus*, red grouse *Lagopus lagopus scoticus* and a nationally important population of curlew *Numenius arquata*.
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features, • The structure and function of the habitats of the qualifying features, • The supporting processes on which the habitats of the qualifying features rely, • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.
Distance: The development site is 9.4 km from the nearest part of the SPA.
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/4889831448510464 JNCC Natura 2000 Data Form - https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9020325.pdf Conservation Objectives - http://publications.naturalengland.org.uk/file/4525396477607936 Conservation Objectives Supplementary Advice - http://publications.naturalengland.org.uk/file/6752904849653760 Site Improvement Plan – http://publications.naturalengland.org.uk/publication/6110322049941504

Teesmouth and Cleveland Coast SPA / Ramsar: site condition

4.2 Natural England has not published the results of a comprehensive condition assessment for the Teesmouth and Cleveland Coast SPA and Ramsar site and it is not known if such an assessment has been carried out.

4.3 Natural England publishes condition assessments for SSSIs, the Teesmouth and Cleveland Coast SSSI being the component SSSI for the Teesmouth and Cleveland Coast SPA / Ramsar that is located closest to the proposed development site. Whilst this information can be helpful in terms of establishing the baseline conditions of a European site, in this case the condition assessment is incomplete for the Teesmouth and Cleveland Coast SSSI. The summary data available for the SSSI indicates that 0.77% is in 'favourable' condition, 9.98% is in 'unfavourable declining' condition and 89.25% is 'not recorded'. Two management units are reported to be in 'unfavourable declining' condition due to declining numbers of certain species: unit 8 (Seal Sands) and unit 26 (Bran Sands).

Teesmouth and Cleveland Coast SPA / Ramsar: site vulnerabilities

4.4 Known threats and pressures on the SPA (as listed on the JNCC Natura 2000 Data Form) are 'Outdoor sports and leisure activities, recreational activities' (G01), 'Pollution to surface waters (limnic & terrestrial, marine & brackish)' (H01), 'Human induced changes in hydraulic conditions' (J02), 'Industrial or commercial areas' (E02) and 'Fishing and harvesting aquatic resources' (F02). The Site Improvement Plan (Natural England, 2014a) lists the following threats and pressures: physical modification; public access/disturbance; land-take; water pollution; fisheries (commercial and recreational); undergrazing; inappropriate water levels; predation; coastal squeeze; change to site conditions; air pollution (specifically the effects of nitrogen deposition on little tern).

North York Moors SAC / SPA: site condition

4.5 Natural England has not published the results of a comprehensive condition assessment for the SAC but it has published a summary of the 'Monitored features on unit' for the SAC[3], and this provides a summary assessment for each qualifying feature in each management unit within the component SSSI.

4.6 The content of the 'Monitored features on unit' table can be summarised as follows:

- H4010 Northern Atlantic wet heaths with *Erica tetralix* is in 'favourable' condition in management units 19, 39, 98, 99 and 166. The habitat is reported to be in 'unfavourable recovering' condition in all other management units where it occurs, with the exception of management unit 186 where it is in 'unfavourable' condition.
- H4030 European dry heaths is in 'favourable' condition in management units 5, 15, 17, 23, 27, 39, 68, 98, 99, 166 and 187. The habitat is reported to be in 'unfavourable recovering' condition in all other management units where it occurs, with the exception of management units 4, 32, 96 and 186 where it is in 'unfavourable' condition, and management unit 72 where it is in 'unfavourable declining' condition.
- H7130 Blanket bog is reported to be in 'unfavourable recovering' condition in all management units where it occurs, with the exception of management unit 186 where it is in 'unfavourable' condition.

4.7 No condition assessment has been published for the North York Moors SPA (i.e., for the habitats that support the qualifying features – birds). As the SPA shares the same boundary as the SAC, the monitoring data summarised above is considered to apply.

North York Moors SAC / SPA: site vulnerabilities

4.8 Known threats and pressures on the SAC (as listed on the JNCC Natura 2000 Data Form) are 'Changes in abiotic conditions' (M01), 'Air pollution, air-borne pollutants' (H04), 'Invasive non-native species' (I01), 'Interspecific floral relations' (K04) and 'Fire and fire suppression' (J01).

[3] 'Monitored features on unit' is published as a summary table that can be accessed at https://designatedsites.naturalengland.org.uk/SiteSACFeaturesMatrix.aspx?SiteCode=UK0030228&SiteName=North%20York%20Moors%20SAC. No information is provided about the data that has informed this assessment and when it was collected.

4.9 Known threats and pressures on the SPA are 'Invasive non-native species' (I01), 'Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)' (F03), 'Changes in abiotic conditions' (M01), 'Fire and fire suppression' (J01) and 'Air pollution, air-borne pollutants' (H04).

4.10 The Site Improvement Plan (Natural England, 2014b) lists the following threats and pressures for the SAC and SPA: climate change; air pollution (atmospheric nitrogen deposition); disease; invasive species; rotational burning; mineral and waste planning; game management; changes in species distribution; agriculture; energy production; wildfire/arson.

Qualifying Features Present in Vicinity of Proposed Works

4.11 Summary information on the European site qualifying features that have been recorded in the vicinity of the site is presented in a previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020). No ecological survey of the site and the surrounding area has been completed in 2021 due to ongoing remediation work, which has meant that the site could not be accessed. For this reason the original summary information presented in JBA Consulting (2020) is reproduced below.

4.12 '*An ecological assessment of the site was undertaken by Hartlepool Borough Council (HBC) in August 2019 and a further assessment was undertaken by HBC and JBA Consulting in November 2019, in which no qualifying species were identified using or flying over the proposed works site (HBC, 2019), however this data is limited due to only two visits being undertaken throughout the year.*

4.13 *A further desk-based assessment was undertaken after the site visit gathering data from the Environmental Records Information Centre North East, Durham Bird Club and Teesmouth Bird Club. The results of the assessment identified no qualifying species within 2 km of the proposed works site most likely due to large areas surrounding the site being inaccessible to the public (including the site itself).*

4.14 *No habitats were recorded on site during the site visit that would be suitable or provide support for foraging or breeding species related to the European designated sites. The area is highly industrial with no suitable habitats or land functionally linked to the European designated sites apparent in the vicinity of the proposed works site*.'

4.15 '*Industrial buildings are dominant in the landscape with areas of brownfield present in the gaps where developments have become derelict or been demolished in the past. Mudflats and intertidal substrate foreshores are present within the designated sites around 1.6 km and 1.5 km away respectively from the proposed works site*.'

Habitat sensitivity

4.16 Habitats are sensitive to deposition of pollutants carried in the air, which may result in eutrophication and acidification. Deposition occurs both in the form of dry deposition and wet deposition and the exposure to pollutants through deposition is described with reference to Critical Loads and Critical Levels. Critical loads are defined as (Holman *et al*., 2019):

4.17 "*Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr)*."

4.18 Critical levels are defined as (Holman *et al*., 2019):

4.19 "*The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge*."

4.20 The critical loads used to assess the impact of compounds deposited to land which result in eutrophication and acidification are expressed in terms of kilograms of the relevant pollutant deposited per hectare per year (for example for nitrogen the unit is kg N/ha/yr) and kilo-equivalents H+ ions deposited per hectare per year (keq/ha/yr).

4.21 The unit of 'equivalent' (eq) is used, rather than a unit of mass, for the purposes of assessing acidification from multiple pollutants. The unit eq. (1 keq ≡ 1,000 eq) refers to molar equivalent of potential acidity resulting from, for example, sulphur, oxidised and reduced N, as well as base cations.

4.22 Critical loads are set by the United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution. Natural England site-specific critical loads for SPA, SAC and SSSI sites in England are established from The Working Group on Effects of the UNECE Convention on Long Range Transboundary Air Pollution. The information is available via the Air Pollution Information Service (APIS, http://www.apis.ac.uk/) which contains information on applicable critical loads for various habitats and species.

4.23 The critical loads used in this assessment are presented in Table 6 and Table 7. These include a range for each site. The lower end of the range has been used for a conservative assessment.

4.24 Natural England has advised (letter received from Nick Lightfoot dated 13 January 2022, reference: DAS A002818 / 371306) that the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), it is more appropriate to adopt a Critical Load range of 10-15 kgN/ha/yr (instead of 8-10 kgN/ha/yr for acid type dunes).

***Table 6**: Nitrogen Nutrient Critical Loads (source: Air Pollution Information Service (APIS)) *denotes priority habitats*

Site	**Habitat / Ecosystem**	**N Critical Load (CL) range (kg N/ha/yr)**
Teesmouth and Cleveland Coast SPA / Ramsar	Shifting coastal dunes*	10-20
	Coastal stable dune grasslands - acid type*	8-10
	Coastal stable dune grasslands - calcareous type*	10-15
	Pioneer, low-mid mid-upper saltmarshes	20-30
North York Moors SPA / SAC	Raised and blanket bogs	5-10
	Northern wet heath: *Erica tetralix* dominated	10-20
	Dry Heaths	10-20

4.25 Information presented on the APIS website indicates that dune habitats are an important habitat as they have the potential to support qualifying features of the Teesmouth and Cleveland Coast SPA / Ramsar. Dunes may potentially be used by breeding tern species (see Tables 2 and 3); however, these habitats are not likely to be of importance for other SPA / Ramsar qualifying features.

4.26 The information on the Natural England designated sites website[4] provides information on the key breeding grounds of terns. This states that little terns have had breeding sites at Crimdon Denemouth (15 km north of the Site) and more recently at Seaton Carew (7 km north of the Site); common terns have breeding grounds on the coast, beside inland freshwater-bodies (RSPB Saltholme, 4 km north-west of the Site; No. 4 Brinefield south of Greatham Creek, 4.5 km north-west of the Site; and on rafts at Cowpen Marsh, 6 km north-west of the Site, and Portrack Marsh, 7.5 km west of the Site). There are no breeding sites in the immediate vicinity of the Tees Estuary.

4.27 Whilst a Critical Load range of 8-10 kg N/ha/yr has been used for 'Coastal stable dune grasslands - acid type', this is a precautionary approach as there is no evidence that this habitat is used by breeding terns in a location where air quality impacts are predicted.

***Table 7**: Acid Deposition Critical Loads for qualifying features (habitats) or habitats that support qualifying features (birds)*

Site	Habitat	Acidity CLminN-CLmaxN (keq /ha/yr)	Acidity CLmaxS (keq /ha/yr)
Teesmouth and Cleveland Coast Ramsar/SPA/SSSI	Acid grassland	MinCLminN: 0.223 | MaxCLminN: 0.438 MinCLMaxN: 1.998 | MaxCLMaxN: 4.508	MinCLMaxS: 1.56 | MaxCLMaxS: 4.07
	Calcareous grassland	MinCLminN: 0.856 |MaxCLminN: 1.071 MinCLMaxN: 4.856 | MaxCLMaxN: 5.071	CLmaxS: 4
North York Moors SPA/SAC	Bogs	MinCLminN: 0.321 | MaxCLminN: 0.321 MinCLMaxN: 0.504 | MaxCLMaxN: 0.705	MinCLMaxS: 0.183 | MaxCLMaxS: 0.384
	Dwarf shrub heath	MinCLminN: 0.499 | MaxCLminN: 1.25 MinCLMaxN: 0.792 | MaxCLMaxN: 4.962	MinCLMaxS: 0.15 |MaxCLMaxS: 4.07

APIS advises that where the total acid nitrogen deposition is greater than the Nmin, the sum of acid nitrogen, sulphur and hydrochloric (and other contributors like hydrofluoric) acid deposition should be compared against the Nmax value

4 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9006061&SiteName=teesmouth&SiteNameDisplay=Teesmouth%20and%20Cleveland%20Coast%20SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=7&HasCA=1#SiteInfo

5 Identification of any Likely Significant Effects

The 'Screening' process

5.1 The term 'screening' is routinely adopted to describe the initial stages of the Habitats Regulations Assessment. The purpose of screening is to:

- Identify all aspects of the project that are not likely to have a significant effect on a European site, either alone or in combination with other plans or projects. These can then be screened out from further assessment.
- Identify those aspects of the project where it is likely to have a significant effect on a European site, either alone or in combination with other plans or projects. These aspects will require 'appropriate assessment' and mitigation measures may need to be introduced.

Likely significant effects

5.2 Current guidance defines a 'likely' effect as one that cannot be ruled out on the basis of objective information. In the Waddenzee case the European Court of Justice provides further clarity on this point, advising that a project should be subject to appropriate assessment '*if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site, either individually or in combination with other plans and projects*'[5]. Therefore, 'likely' should be interpreted as a significant effect that, objectively, cannot be ruled out.

5.3 An effect may be significant if it undermines the conservation objectives for the European site. The assessment of whether a potential effect is significant for the site's interest features must consider, amongst other things, the characteristics and specific environmental conditions of the site concerned. The Advocate General's Opinion for the Sweetman case C-127/02[6] provides further clarification, stating that consideration of the likelihood of a significant effect is simply a case of determining whether the plan or project is capable of having a significant effect.

5.4 As previously noted the judgment CJEU judgment C-323/17 (People Over Wind) means that it is not possible to rely on mitigation measures that allow a conclusion of 'no likely significant effect' to be reached. This judgment has been taken into account in this assessment.

Testing for likely significant effects of the project alone

5.5 The following section of this report presents a screening of likely significant effects. This fulfils the requirement of Regulation 63 of the Habitats Regulations that a proposed project is assessed to determine whether or not it is likely to have a significant effect on the qualifying features (species and habitats) of any European Site, either alone or in combination with other plans or projects.

5.6 As part of the screening process, it is noted that the project is not directly connected with or necessary to the management of any European Site.

5.7 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) included an assessment of likely significant effects for various potential impacts that could arise as a result of the proposed development. The results of this assessment are summarised in Table 8 and the results of the previous assessment have been updated to consider the results of this assessment.

[5] See paragraph 45 of European Court of Justice case C-127/02 dated 7th September 2004, 'the Waddenzee ruling'.
[6] Sweetman v. An Bord Pleanála, Case C-258/11, CJEU judgment 11 April 2013.

***Table 8**: Assessment of likely significant effects (JBA Consulting, 2020)*

Impact	**Rational**
Teesmouth and Cleveland Coast SPA / Ramsar	
Noise/vibration disturbance	Due to the distance of the SPA from the proposed works area (1.6 km and 1.4 km respectively) it is not anticipated that the qualifying features of the SPA will be impacted. No Likely Significant Effect
Visual disturbance	Due to the distance of the SPA from the proposed works area and the roads in the area already being subjected to large volumes of traffic, it is not anticipated that the qualifying features of the SPA will be impacted. No Likely Significant Effect
Introduction of synthetic compounds – Normal operating conditions (Emissions)	The assessment (JBA Consulting, 2020) concluded that the Process Contribution (PC) was 3.3% of the Air Quality Assessment Level (AQAL) and therefore could not be screened out as insignificant. However, baseline annual mean NOx concentrations at the Teesmouth and Cleveland Coast exceeded the critical level regardless of the emissions from the proposed development. The conclusion of this assessment has been applied to the screening of likely significant effects for the proposed development. **Likely Significant Effect**
Introduction of synthetic compounds – Abnormal or emergency operating conditions (Emissions)	Potential releases of synthetic compounds into both the atmosphere and the water environment during abnormal or emergency operating conditions may cause an adverse impact on breeding and foraging bird species. However, baseline annual mean NOx concentrations at the Teesmouth and Cleveland Coast exceed the critical level regardless of the emissions associated with the proposed development. The PC was found to be 3.3% of the AQAL and therefore could not be screened out as insignificant. The conclusion of this assessment has been applied to the screening of likely significant effects for the proposed development. **Likely Significant Effect**
Introduction of non-synthetic compounds – Normal operating conditions	The proposed development site has been subject to remediation, which has now been completed. When this is taken into account alongside statutory facility design requirements, it is highly unlikely that non-synthetic compounds will be released into the water environment during the construction and operation of the facility. No Likely Significant Effect

Impact	Rational
Introduction of non-synthetic compounds – Abnormal or emergency operating conditions	The proposed development site has been subject to extensive remediation, which has now been completed. When this is taken into account alongside statutory facility design requirements, it is highly unlikely that non-synthetic compounds will be released into the water environment during the construction and operation of the facility, including abnormal or emergency operating conditions. It is expected that the facility design shall include backup measures in case of an emergency thereby ensuring that normal operation conditions are achieved. Therefore, potential releases of non-synthetic compounds into both the atmosphere and the water environment are unlikely, and it therefore follows that such releases are unlikely to cause an adverse impact on breeding and foraging bird species. No Likely Significant Effect
Changes in nutrient loading from waste discharge	Nutrient loading from waste discharge in the watercourse is not anticipated. The proposed facility will not require any such discharges to be made. No Likely Significant Effect
Changes in organic loading from waste discharge	Organic loading from waste discharge in the watercourse is not anticipated. The proposed facility will not require any such discharges to be made. No Likely Significant Effect
Introduction of Invasive Non native Species (INNS)	It is not anticipated that the project will cause the direct spread of INNS to the SPA as site remediation is taking place resulting in the clearance of all vegetation. No INNS have been reported as being present within the site during previous survey (INCA, 2019). No Likely Significant Effect
Air pollution – Construction Activities / Traffic	Elevations in vehicle movements during construction or decommissioning are expected to be temporary. During the operation of the facility, exact levels of traffic movements are unknown; however, no significant effects are considered likely taking into account the already high levels of traffic within the area. Traffic related air pollution it is not expected to cause an adverse impact on breeding and foraging bird species within the sensitive sites. No Likely Significant Effect

Impact	Rational
North York Moors SAC / SPA	
Introduction of synthetic compounds	Due to the distance from the proposed works area[7], any accidental releases of synthetic compounds into the atmosphere are unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely. No Likely Significant Effect
Introduction of non-synthetic compounds	Due to the distance from the proposed works area, any accidental releases of non-synthetic compounds into the atmosphere are unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely. No Likely Significant Effect
Introduction of Invasive Non native Species	It is not anticipated that the project will cause the direct spread of INNS to the SAC / SPA due to the separation distance and the fact that site remediation has resulted in vegetation clearance within the site. No INNS have been reported as being present within the site during previous survey (INCA, 2019). No Likely Significant Effect
Air pollution	Natural England data on impact zones estimates that impacts on the SAC will not occur beyond 5 km. Thus, due to the distance from the proposed works area, air pollution is unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely No Likely Significant Effect

Potential In-combination Effects: local planning

5.8 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) included a review of planning applications that could be viewed via the Redcar and Cleveland Borough Council planning portal (https://planning.redcar-cleveland.gov.uk/) and the Hartlepool Borough Council planning portal (http://eforms.hartlepool.gov.uk/portal/servlets/ApplicationSearchServlet). This review of planning applications has been updated as part of this assessment.

5.9 A total of eight projects have been identified that could potentially act in-combination with the proposed ERF facility. An assessment of these applications is summarised in Table 9.

[7] The site is 1.4 km from the nearest part of the SPA and 1.7 km from the nearest part of the Ramsar site.

***Table 9**: Projects considered as part of the assessment of in-combination effects*

Development type / planning reference	**Assessment**
Power Station Development (R/2018/0098/FF) Approx. 550 m south-east of the Grangetown ERF site.	Examination of aerial imagery (Google Earth Pro) shows that the facility has been constructed. The only in-combination effects anticipated from this project is air pollution (including the introduction of synthetic and non-synthetic compounds into the atmosphere) during the operational stage.
Power Station Development (R/2008/0671/EA) Approx. 1.5 km north of the Grangetown ERF site.	Examination of aerial imagery (Google Earth Pro) shows that the facility has been constructed. The only in-combination effects anticipated from this project is air pollution (including the introduction of synthetic and non-synthetic compounds into the atmosphere) during the operational stage.
Demolition of South Bank Works Temporary Storage Facility (R/2019/0427/FFM) Includes the Grangetown ERF site.	An ecology report (INCA, 2019) concluded that no significant effects were likely on European sites and their qualifying features. Measures are proposed to mitigation pollution related impacts on the Tees Estuary and associated habitats. No in-combination effects are likely.
Train Maintenance and Fuelling Facility (R/2019/0245/SC) Approx. 1.6 km to the north-east of the Grangetown ERF site.	The proposed Maintenance and Fuelling Facility is 2.4 km from the estuary and is separated from the estuary by existing development. Current land use and operational activities lead to the conclusion that the site and adjacent land are unlikely to be functionally linked to a European site. No in-combination effects are likely.
Northern Gateway Container Terminal (R/2006/0433/OO) Approx. 2.0 km to the north-east of the Grangetown ERF site.	The ecological assessments that supported the planning application concluded that no intertidal mudflats would be lost as a result of the development. No significant effects were identified for SPA / Ramsar bird species feeding in the estuary or using the site itself for feeding or roosting. No in-combination effects are likely for disturbance related impacts. In-combination effects on air quality may arise as a result of increased ship movements.
Peak Resources Refinery (R/2017/0876/FFM) Approx. 1.4 km to the east of the Grangetown ERF site	The ES for the development concluded that construction activities on the site are not considered to present a risk of disturbance to species at the SPA / Ramsar. Standard mitigation for the control/avoidance of pollution events would be implemented to prevent potential adverse effects and the site is over 3 km from the SPA / Ramsar. The proposed development was considered to have no significant effects on Teesmouth and Cleveland Coast SPA / Ramsar. No in-combination effects are likely.
Residential Development (R/2014/0372/OOM) Approx. 460 m to the south-west of the Grangetown ERF site	Natural England advised that the proposal is unlikely to have a significant effect on any European site and can therefore be screened out from any requirement for further assessment. They advised that due to the location of the proposed site in relation to the nearest designated sites, together with its setting surrounded by existing residential and industrial development, the proposed site is not likely to have significant value as functional land for SPA interest features. No in-combination effects are likely.

Potential In-combination effects: major infrastructure projects

5.10 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) considered in-combination effects arising from four major infrastructure projects (since JBA Consulting, 2020, was prepared, no new projects have been brought forward in the NSIP decision making process[8]). These are summarised as follows:

Tees Combined Cycle Power Plant (CCPP)

5.11 A gas fired combined cycle gas turbine (or CCGT) power station will be located at the site of the former Teesside Power Station on Greystone Road, Grangetown at OSGR NZ 56642 20384 approximately 2.5 km south-east of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/north-east/tees-ccpp/).

5.12 The HRA for this project concluded that there were no likely significant effects on the Teesmouth and Cleveland Coast SPA / Ramsar or the North York Moors SAC / SPA from the proposed development. A Development Consent Order was granted on 05 April 2019 for this project. No in-combination effects are likely.

York Potash Harbour Facilities Order

5.13 This development includes the installation of wharf/jetty facilities, associated dredging operations, and construction of a storage building and connecting conveyor. The development will be located at Bran Sand, Teesport at OSGR NZ 55035 24937 approximately 3.6 km north of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/north-east/york-potash-harbour-facilities-order/).

5.14 An 'Appropriate Assessment' has been undertaken because of likely significant effects arising from the proposed development. The applicant's HRA Report concluded that the Harbour Facility application alone, and in-combination with other plans and projects, would not adversely affect the integrity of the Teesmouth and Cleveland Coast SPA and Ramsar sites. Natural England agreed with this conclusion. A Development Consent Order for the York Potash Harbour Facilities Order was granted on 20 July 2016. No in-combination effects are likely.

Teesside Cluster Carbon Capture and Usage project

5.15 A 'full chain' carbon capture, utilisation and storage (CCUS) project, comprising a combined cycle gas turbine electricity generating station, is to be located in the vicinity of the Sahaviriya Steel Industries (SSI) Steel Works Site, Redcar at OSGR NZ 56971 25200 approximately 4.6 km north-east of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/northeast/teesside-cluster-carbon-capture-and-usage-project/).

5.16 An HRA has not been completed for this project, but an assessment of impacts on European designated sites is recommended in the Scoping Opinion. As a result it is not possible to predict any likely significant effects on the European designated sites.

Conclusion of screening assessment

5.17 Taking into account the identified impact mechanisms and applying the precautionary principle, it has been assumed that changes in air quality resulting from the proposed development are likely to have a significant effect on some of the qualifying features of the Teesmouth and Cleveland Coast SPA and Ramsar. It therefore follows that the requirement for an 'appropriate assessment' under Regulation 63(5) of the Habitats Regulations is triggered.

5.18 No other likely significant effects have been identified for the development when considered alone and in-combination with other plans and projects and with reference to Teesmouth and Cleveland Coast SPA and Ramsar.

[8] The PINS NSIP website (https://infrastructure.planninginspectorate.gov.uk/projects/) has been reviewed as part of this assessment and no new projects have been identified in the vicinity of the proposed ERF.

5.19 No likely significant effects have been identified for the development when considered alone and in-combination with other plans and projects and with reference to the North York Moors SAC and SPA. These sites have therefore been screened out of the appropriate assessment.

6 Appropriate Assessment

Scope of the Appropriate Assessment

6.1 The appropriate assessment has been informed by the results of an air quality assessment completed by Environmental Compliance Limited (ECL, 2021). The European sites that have been screened into the appropriate assessment are Teesmouth and Cleveland Coast SPA and Ramsar site.

6.2 The Conservation Objectives for the two European Sites are described in Section 4 (Tables 2 and 3). The assessment has taken into account the Holohan v An Bord Pleanala ECJ case (C-462/17), which requires that an assessment considers habitats and species, within or outside of a European site boundary, if they are necessary for the conservation of the qualifying features (habitat types and species) of a European site.

Summary of the air quality modelling approach

6.3 An air quality assessment has been carried out by ECL using the latest version of the ADMS modelling package to determine the impact of emissions to air on local European sites, from the proposed ERF's two emission points (referred to as A1, NZ 54379 21412, and A2, NZ 54381 21408). The results presented in the tables below are for a modelled stack height of 90 m for both the A1 and the A2 emission points.

6.4 The assessment was undertaken on the basis of a worst-case scenario, which involves the following assumptions:

- The release concentrations of the pollutants will be at the permitted emission limit values ("ELVs") on a 24 hour basis, 365 days of the year. In practice, when the plant is operating, the release concentrations will be below the ELVs, and, for most pollutants, considerably so. Taking shutdowns for planned maintenance into account, the plant will not operate for 365 days.
- The highest predicted pollutant ground level concentrations ("GLCs") for the six years of meteorological data (five years, 2016 – 2020 inclusive, from the Loftus recording station and one year, 2020, of site-specific numerical weather prediction ("NWP") data) for each averaging period (annual mean, hourly, etc.) have been used.

6.5 The maximum predicted annual mean GLCs of oxides of nitrogen (NOx), sulphur dioxide (SO_2), hydrogen fluoride (HF) and ammonia (NH3) were compared with the Critical Levels for the Protection of Ecosystems or Vegetation detailed in the Environment Agency's online guidance[9].

6.6 Using ADMS, the rates of deposition for acids (nitrogen and sulphur, as kilo-equivalents) and nutrient nitrogen were predicted for all relevant habitat sites. These rates were then compared to the critical loads for the type and location of each habitat (in the interest of being conservative, the habitat with the lowest lower critical load has been selected).

6.7 Modelling points (specific locations shown on Figure 2) were selected to include key sensitive ecological receptors (see Table 10 and associated table notes). Modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats.

Air quality modelling data

Overview

6.8 The air quality modelling undertaken by ECL considered a number of different ecological receptors, which are listed in Table 10.

6.9 The Critical Loads for deposition that have been used in the assessment are presented in Tables 6 and 7 for each of the ecological receptors (designated sites) that have been considered.

[9] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

***Table 10**: Ecological Receptors Considered for the Assessment (see Figure 2)*

ECL Receptor Ref.	Name [(a)]	Designation [(a)]	Easting (X) [(a)]	Northing (Y) [(a)]	Distance from Source [(b)] (m)	Heading (degrees)
NYM1	North York Moors	SAC, SPA	458895	512978	9565	152
TCC1	Teesmouth and Cleveland Coast [(c)]	SPA, SSSI	453277	522462	1524	314
TCC2			454760	523212	1842	12
TCC3			454282	523483	2075	357
TCC4			452203	521269	2181	266
TCC5		SPA, Ramsar	453002	522482	1745	308
TCC6			452430	521870	2003	283
TCC7			451970	521355	2410	269
TCC8			454304	524213	2804	358
TCC9			455670	524302	3167	24
TCC10			450882	522960	3825	294
TCC11			453572	525627	4294	349
TCC12			451681	525099	4570	324
TCC13			456614	525978	5085	26
TCC14[(d)]		SSSI	453880	526160	4776	354

Notes to Table 10

(a) The European sites included were identified using the Multi-Agency Geographic Information System for the Countryside ("MAGIC") portal and via the EA's pre-application advice Nature and Heritage Conservation Screening Report (reference EPR/ZP3309LW/A001).

(b) Distances are measured as the crow flies from the approximate nearest point of the boundary of the ecological receptor / coastal priority habitat location to the 'Source'. The 'Source' is the approximate halfway location between the two emission points associated with the incinerator – location coordinates: 454379 (X), 521410 (Y).

(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation and coastal priority habitat, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.

(d) For details of TCC14 see Section 6.48 'Revised Modelling'.

Airborne NO_X, SO_2 and NH_3 concentrations

6.10 A summary of site-specific baseline concentrations of NO_X, SO_2 and NH_3, as provided by APIS, is presented in Table 11. In Table 12 background nutrient nitrogen and acid deposition concentrations are provided, as provided by APIS. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 10, i.e., the closest grid square to the point of the site used in the assessment.

6.11 Comparison of the baseline data presented in Tables 11 and 12 with the Critical Load ranges presented in Tables 6 and 7 reveals that there is already exceedance of the Critical Load for most pollutants when considered in the absence of the proposed development.

***Table 11**: Baseline Concentrations of NO_X, SO_2 and NH_3*

ECL Receptor Reference	Name and Designation(s)	Background Concentration [a]			
		NO_X (µg/m^3)		SO_2 (µg/m^3)	NH_3 (µg/m^3)
		Annual Mean	24 Hour Mean [b]	Annual Mean	Annual Mean
NYM1	North York Moors – SAC, SPA	8.67	10.23	0.91	1.95
TCC1	Teesmouth and Cleveland Coast – SPA, SSSI [c]	25.65	30.27	3.05	1.6
TCC2		35.78	42.22		
TCC3					
TCC4		28.89	34.09		
TCC5	Teesmouth and Cleveland Coast – SPA and Ramsar [c]	25.65	30.27	3.05	1.6
TCC6		28.89	34.09		
TCC7		27.59	32.56		
TCC8		49.1	57.94		
TCC9		27.93	32.96	3.89	1.42
TCC10		21.62	25.51	3.05	1.6
TCC11		41.45	48.91	2.38	1.71
TCC12		19.51	23.02	2.38	1.71
TCC13		21.52	25.39	0 [d]	0.89
TCC14[e]	SSSI	24.14	28.49	2.38	1.71

Notes to Table 11

(a) Background concentrations for the relevant ecological habitats have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).

(b) The 24-hour mean baseline concentration is twice the annual mean multiplied by a factor of 0.59, in accordance with the H1 guidance.

(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation and coastal priority habitat, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.

(d) With APIS reporting a concentration of 0 µg/m, it is suspected this value is erroneous. In the interest of being conservative the SO2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m will be used for calculating the SO2 PECs for TCC13.

(e) For details of TCC14 see Section 6.48 'Revised Modelling'.

***Table 12**: Background Nutrient Nitrogen and Acid Deposition*

ECL Receptor Reference	Name and Designation(s)	Nutrient Nitrogen Background (kgN/ha/yr) [a]	Acid Deposition Background - (keq/ha/yr) [b]		
			Total	Nitrogen	Sulphur
NYM1	North York Moors – SAC, SPA	14.98	1.46	1.36	0.18
TCC1	Teesmouth and Cleveland Coast – SPA, SSSI [b]	8.96	1.19	1.03	0.2
TCC2		8.96	1.19	1.03	0.2
TCC3		8.96	1.19	1.03	0.2
TCC4		8.96	1.19	1.03	0.2
TCC5	Teesmouth and Cleveland Coast – SPA and Ramsar [b	8.96	1.19	1.03	0.2
TCC6		8.96	1.19	1.03	0.2
TCC7		8.96	1.19	1.03	0.2
TCC8		8.96	1.19	1.03	0.2
TCC9		8.4	1.2	1.01	0.23
TCC10		8.96	1.19	1.03	0.2
TCC11		10.78	1.31	1.07	0.28
TCC12		10.78	1.31	1.07	0.28

ECL Receptor Reference	Name and Designation(s)	Nutrient Nitrogen Background (kgN/ha/yr) [a]	Acid Deposition Background - (keq/ha/yr) [b]		
			Total	Nitrogen	Sulphur
TCC13		9.1	0.95	0.75	0.25
TCC14[d]	SSSI	10.78	1.31	1.07	0.28

Notes to Table 12
(a) Background concentrations for nutrient nitrogen deposition have been taken from the APIS website (specifically the *APIS GIS map tool*) for the relevant grid square. The concentrations provided are the grid averages, with 2018 selected as the midyear for all sites with the exception of TCC13 (with 2016 being the latest available midyear).
(b) Background concentrations for acid deposition have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).
(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.
(d) For details of TCC14 see Section 6.48 'Revised Modelling'.

Deposition parameters - sensitive habitats

6.12 Deposition of nitrogen and acids at European sites was also included in the assessment. The pollutant deposition rates (as detailed in AQTAG06) for grassland were utilised for all European sites considered.

6.13 For acidification impacts, the deposition of oxides of nitrogen, ammonia, sulphur dioxide and hydrogen chloride are considered. For nutrient nitrogen, the deposition of the oxides of nitrogen and ammonia are included.

Table 13: Pollutant Emission Rates – Daily ELVs

Pollutant	ELV [a][b] (mg/Nm^3)	A1 & A2 (g/s)
NOx as NO_2	120	5.06
SO_2	30	1.27
HCl	6	0.253
HF	1	0.0422
NH_3	10	0.422

Notes to Table 13
(a) Concentrations are at reference conditions i.e., 273K, 1 atmosphere, 11% oxygen, dry.
(b) Unless stated otherwise, the BAT-AEL[10]s have been used (new plant, high end).

Assessment of significance of impact guidelines – ecological receptors, Critical Levels and/or Loads

6.14 EA Operational Instruction 67_12[11] states that a detailed assessment is required where modelling predicts that the long-term Process Contribution (PC) is greater than 1% for European sites, and the Predicted Environmental Concentration (PEC) is greater than 70% for European sites.

6.15 For short-term emissions, modelling is required at European sites where the PC is greater than 10% of the critical level.

6.16 Following detailed assessment, if the PEC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no adverse effect for European Sites.

6.17 Information presented on the APIS website for the Teesmouth and Cleveland Coast SPA indicates that Sandwich tern and little tern are the only species that are sensitive to nutrient nitrogen effects on the broad habitat that they rely on. Effects on northern shoveler are considered to be site-specific but they are typically found in greatest numbers in several locations around the North Tees Marshes.

[10] Best Available Technique – Associated Emission Level
[11] EA Operational Instruction 67_12 Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation, V2, 27.3.15.

6.18 The broad habitat for shoveler is listed as supralittoral sediment and the relevant nitrogen critical load class is considered for coastal stable dune grasslands. The potential effects on northern shoveler relate to food chain effects with nutrient inputs affecting the freshwater habitats that support the invertebrate/zooplankton that shoveler feed on. Modelling point TCC10 covers freshwater habitats and so the results of modelling at this point have been used to determine whether or not effects on shoveler need to be considered.

6.19 Examination of the coastal priority habitat mapping available on the MAGIC website indicates that dune grassland only occurs along the coast and not at any of the air quality modelling point (it is c.1.8 km north of TCC9). Table 26 shows that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near any of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs.

6.20 Information presented on the APIS website for the SPA indicates that Sandwich tern and little tern are the only species sensitive to NOx effects on the broad habitat (effects on northern shoveler are considered to be site-specific and have not been considered here for the reasons set out previously). The broad habitat is listed as supralittoral sediment. As noted above, examination of the coastal priority habitat mapping available on the MAGIC website indicates that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near any of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs (see Table 26).

6.21 APIS does not provide data for the Ramsar site but as this site is designated for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. The 'noteworthy' plant species associated with the Ramsar site are not likely to be associated with intertidal mudflats (and consequently are not likely to occur at any of the air quality modelling locations in the estuary) – they are species that are typically associated with sand dune or saltmarsh or coastal grazing marsh habitats (modelling points have been selected to include locations where these habitats occur).

6.22 Table 14 shows that for NOx exceedance of the long-term PC is predicted at modelling points TCC2 (1.59%), TCC3 (1.003%) and TCC9 (1.28%). The data show that the background levels already exceed the long-term Critical Level in the absence of development. Table 16 similarly shows exceedance of the long-term PC for NH3 at modelling points TCC2 (1.33%) and TCC9 (1.07%). Table 26 shows that no coastal priority habitats are likely to be affected by NOx, with intertidal mudflats being the only coastal priority habitat near any modelling points. It is therefore concluded that the process contribution is very small in a situation where background levels are already elevated and sensitive habitats are not present at (or near) those modelling points where exceedance is predicted.

6.23 Table 17 shows predicted exceedances for hydrogen fluoride, with exceedance of the 1% threshold possible at all modelling points except TCC11. The predicted exceedance ranges from 1.07% to 3.74%; however, even though hydrogen fluoride exceedance of the 1% threshold is predicted at all but one modelling location, the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. Reports in the public domain for similar assessments have used the 10% significance criterion for both the weekly and daily hydrogen fluoride PCs (Tim Heard, ECL, pers. comm.). As the guidance is somewhat vague and does not explicitly state whether the weekly CL should be treated as long-term or not, to adopt a conservative approach ECL has assessed the weekly PCs against the stricter 1% screening criterion.

6.24 As noted above, no coastal priority habitats are likely to be affected by hydrogen fluoride, with intertidal mudflats being the only coastal priority habitat near any modelling points.

6.25 Table 18 shows predicted exceedance for nitrogen deposition at modelling points TCC1, TCC2, TCC3, TCC5, TCC6, TCC8, TCC9 and TCC13. Predicted exceedance of the lower CL ranges from 1.23% to 2.62%. Predicted exceedance of the upper CL ranges from 1.03% to 2.10%. The data show that the background levels already exceed the lower CL, i.e., there is exceedance in the absence of development.

Table 15 below shows that there is no predicted exceedance for SO2 at any modelling points. Similarly, Table 19 below shows that there is no predicted exceedance for acid deposition at any modelling points.

***Table 14**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m^3)	Long Term Critical Level (CL) (µg/m^3)	Long Term PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Short Term PC (µg/m^3)	Short Term Critical Level (CL) (µg/m^3)	Short Term PC as a % of the CL (µg/m^3)
NYM1	North York Moors - SAC / SPA	0.0404	30	0.13%	n/a	n/a	n/a	0.530	75	0.71%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.229		0.76%	n/a	n/a	n/a	4.66		6.21%
TCC2		**0.477**		**1.59%**	35.78	36.26	**121%**	4.04		5.39%
TCC3		**0.301**		**1.003%**		36.08	**120%**	3.60		4.80%
TCC4		0.133		0.44%	n/a	n/a	n/a	2.75		3.67%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.217		0.72%	n/a	n/a	n/a	4.63		6.17%
TCC6		0.228		0.76%	n/a	n/a	n/a	3.36		4.48%
TCC7		0.123		0.41%	n/a	n/a	n/a	2.43		3.24%
TCC8		0.213		0.71%	n/a	n/a	n/a	2.50		3.34%
TCC9		0.383		**1.28%**	27.93	28.31	94%	2.12		2.83%
TCC10		0.119		0.40%	n/a	n/a	n/a	1.64		2.19%
TCC11		0.105		0.35%	n/a	n/a	n/a	1.33		1.77%
TCC12		0.0722		0.24%	n/a	n/a	n/a	1.26		1.68%
TCC13		0.246		0.82%	n/a	n/a	n/a	1.46		1.95%

6.26 A summary of maximum predicted GLCs of oxides of nitrogen at the identified European sites is presented in Table 14. In accordance with the H1 guidance, the significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.27 It can be seen from the data in Table 14 that the daily mean oxides of nitrogen PCs are all less 10% of the respective critical level and therefore, are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered. For the annual mean oxides of nitrogen PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3 and TCC9. Consequently, PECs will need to be calculated for these receptors.

6.28 Making use of the relevant background NO_X concentration, the PECs for TCC2, TCC3 and TCC9 are 36.26 µg/m^3, 36.08 µg/m^3 and 28.31 µg/m^3, respectively. The PECs as a percentage of the annual critical level would therefore be 121% (TCC2), 120% (TCC3) and 94% (TCC9). Whilst it can be assumed for TCC9 that there will be no adverse effect (i.e., the PEC is less than 100% of the critical level), the PECs for both TCC2 and TCC3 are potentially significant.

***Table 15**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Long Term PC ($\mu g/m^3$)	Long Term Critical Level (CL) ($\mu g/m^3$)	Long Term PC as a % of the CL ($\mu g/m^3$)
NYM1	North York Moors - SAC / SPA	0.0101	20	0.05%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0574		0.29%
TCC2		0.120		0.60%
TCC3		0.0755		0.38%
TCC4		0.0333		0.17%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0545		0.27%
TCC6		0.0573		0.29%
TCC7		0.0307		0.15%
TCC8		0.0536		0.27%
TCC9		0.0962		0.48%
TCC10		0.0262		0.13%
TCC11		0.0226		0.11%
TCC12		0.0153		0.08%
TCC13		0.0518		0.26%

6.29 A summary of maximum predicted GLCs of sulphur dioxide at the identified European sites are presented in Table 15. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. In Table 15, any significant impacts are highlighted in bold.

6.30 It can be seen from the data in Table 15 that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

***Table 16**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	NH_3 (annual mean) - When Lichens and Bryophytes are not present					
		Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
NYM1	North York Moors - SAC / SPA	0.00337	3	0.11%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0191		0.64%	n/a	n/a	n/a
TCC2		**0.0398**		**1.33%**	1.60	1.64	55%
TCC3		0.0251		0.84%	n/a	n/a	n/a
TCC4		0.0111		0.37%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0181		0.60%	n/a	n/a	n/a
TCC6		0.0190		0.63%	n/a	n/a	n/a
TCC7		0.0102		0.34%	n/a	n/a	n/a
TCC8		0.0178		0.59%	n/a	n/a	n/a
TCC9		**0.0320**		**1.07%**	1.42	1.45	48%
TCC10		0.00812		0.27%	n/a	n/a	n/a
TCC11		0.00701		0.23%	n/a	n/a	n/a
TCC12		0.00471		0.16%	n/a	n/a	n/a
TCC13		0.0159		0.53%	n/a	n/a	n/a

6.31 A summary of maximum predicted GLCs of ammonia at the identified European sites are presented in Table in 16. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.32 It can be seen from the data in Table 16 that the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the European sites assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2 and TCC9. Consequently, PECs will need to be calculated for these receptors.

6.33 The relevant background NH_3 concentrations for TCC2 and TCC9 are 1.64 µg/m³ and 1.45 µg/m³, respectively. The PECs as a percentage of the annual critical level would therefore be 55% (TCC2) and 48% (TCC9). It can therefore be assumed that there will be no adverse effect on the European sites assessed (i.e., the PECs are less than 100% of the critical level).

***Table 17**: Comparison of Maximum Predicted HF PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Weekly PC (µg/m^3)	Weekly Critical Level (CL) (µg/m^3)	Weekly PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Daily PC (µg/m^3)	Daily Critical Level (CL) (µg/m^3)	Daily PC as a % of the CL (µg/m^3)
NYM1	North York Moors - SAC / SPA	0.00238	0.5	0.48%	n/a	n/a	n/a	0.00442	5	0.09%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	**0.0146**		**2.92%**	0.003*	0.02	4%	0.0389		0.78%
TCC2		**0.0187**		**3.74%**		0.02	4%	0.0337		0.67%
TCC3		**0.0120**		**2.40%**		0.02	3%	0.0300		0.60%
TCC4		**0.0118**		**2.37%**		0.01	3%	0.0229		0.46%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	**0.0149**		**2.98%**		0.02	4%	0.0386		0.77%
TCC6		**0.0145**		**2.90%**		0.02	4%	0.0280		0.56%
TCC7		**0.0104**		**2.07%**		0.01	3%	0.0203		0.41%
TCC8		**0.00864**		**1.73%**		0.01	2%	0.0209		0.42%
TCC9		**0.00808**		**1.62%**		0.01	2%	0.0177		0.35%
TCC10		**0.00651**		**1.30%**		0.01	2%	0.0140		0.28%
TCC11		0.00452		0.90%	n/a	n/a	n/a	0.0115		0.23%
TCC12		**0.00514**		**1.03%**	0.003*	0.01	2%	0.0106		0.21%
TCC13		**0.00533**		**1.07%**		0.01	2%	0.0126		0.25%

Notes to Table 17

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m^3 with an elevated background of 0.003µg/m^3 where there are local anthropogenic emission sources [(12)].

6.34 A summary of maximum predicted GLCs of hydrogen fluoride at the identified European sites are presented in Table 17. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.35 It can be seen from the data in Table 17 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

(12) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

6.36 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC1-TCC10 (inclusive) and TCC12 and TCC13 - and are therefore potentially significant. NYM1 and TCC11 are less than 1% of the critical level therefore no further assessment is required.

6.37 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources (13). In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

6.38 The maximum weekly HF PC occurs at TCC2 and therefore the worst-case PEC would be 0.0217 µg/m^3 (or 4.34% of the weekly critical level). It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level). Consequently, the same can be concluded for all other locations considered.

(13) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

***Table 18**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at European Sites*

ECL Receptor Ref.	Description	Habitat Type	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critical Load
NYM1	North York Moors - SAC	Blanket Bogs - Raised and blanket bogs	0.0159	5	10	0.32%	0.16%	n/a	n/a	n/a	n/a
	North York Moors - SPA	European Golden Plover - Reproducing - Montane habitats	0.0159	5	10	0.32%	0.16%	n/a	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA	Sandwich Tern - Concentration - Supralittoral sediment - Coastal stable dune grasslands (acid type)	**0.110**	8	10	**1.37%**	**1.10%**	8.96	9.07	**113%**	91%
TCC2			**0.210**			**2.62%**	**2.10%**		9.17	**115%**	92%
TCC3			**0.143**			**1.79%**	**1.43%**		9.10	**114%**	91%
TCC4			0.0652			0.82%	0.65%	n/a	n/a	n/a	n/a
TCC1 - TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal	N/A								
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	Sandwich Tern / Little Tern - Supralittoral sediment (acidic type)	**0.103**	8	10	**1.29%**	**1.03%**	8.96	9.06	**113%**	91%
TCC6			**0.110**			**1.38%**	**1.10%**		9.07	**113%**	91%
TCC7			0.0598			0.75%	0.60%	n/a	n/a	n/a	n/a
TCC8			**0.0980**			**1.23%**	0.98%	8.96	9.06	**113%**	
TCC9			**0.174**			**2.18%**	**1.74%**	8.4	8.57	**107%**	86%
TCC10			0.0542			0.68%	0.54%	n/a	n/a	n/a	n/a
TCC11			0.0470			0.59%	0.47%	n/a	n/a	n/a	n/a
TCC12			0.0318			0.40%	0.32%	n/a	n/a	n/a	n/a
TCC13			**0.107**			**1.34%**	**1.07%**	9.1	9.21	**115%**	92%

6.39 A summary of maximum predicted nutrient nitrogen deposition rates at the identified European Sites and SSSIs are presented in Table 18. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.40 In Table 18, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.41 It can be seen from the data in Table 18 that there are predicted exceedances for nitrogen deposition at a number of modelling points, although this is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load at modelling points TCC1, TCC2, TCC3, TCC5, TCC6, TCC9 and TCC 13. There is only exceedance of the upper Critical Load at modelling points TCC2 and TCC9. Using the more conservative Critical Load range there are no PECs greater than 100%.

6.42 It should be noted that, as APIS does not provide data for Ramsar sites, as the Ramsar site is noted for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. Consequently, the SPA habitat interest and feature with the lowest lower critical load assigned to it has also been selected for the Ramsar site considered.

6.43 It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

***Table 19**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CLMaxN (keq/ha/yr)	CLMaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
NYM1	North York Moors – SAC (Blanket Bogs – Raised and blanket bogs)	0.00113	1.36	0.00119	0.18	0.321	0.504	0.183	1.36	0.181	0.46%	n/a	n/a
	North York Moors – SPA (European Golden Plover – Reproducing – Montane habitats)	0.00113	1.36	0.00119	0.18	0.178	0.471	0.150	1.36	0.181	0.49%	n/a	n/a
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.00781	1.03	0.00833	0.20	0.223	1.998	1.56	1.04	0.208	0.81%	n/a	n/a
TCC2		0.0162	1.03	0.0173	0.20	0.223	1.998	1.56	1.05	0.217	**1.68%**	1.26	63%
TCC3		0.0102	1.03	0.0109	0.20	0.223	1.998	1.56	1.04	0.211	**1.05%**	1.25	63%
TCC4		0.00464	1.03	0.00495	0.20	0.223	1.998	1.56	1.03	0.205	0.48%	n/a	n/a

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal											
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.00734	1.03	0.00783	0.20	0.223	1.998	1.56	1.04	0.208	0.76%	n/a	n/a
TCC6		0.00786	1.03	0.00838	0.20	0.223	1.998	1.56	1.04	0.208	0.81%	n/a	n/a
TCC7		0.00426	1.03	0.00453	0.20	0.223	1.998	1.56	1.03	0.205	0.44%	n/a	n/a
TCC8		0.00698	1.03	0.00742	0.20	0.223	1.998	1.56	1.04	0.207	0.72%	n/a	n/a
TCC9		0.0124	1.01	0.0132	0.23	0.223	1.998	1.56	1.02	0.243	**1.28%**	1.27	63%
TCC 10		0.00386	1.03	0.00411	0.20	0.223	1.998	1.56	1.03	0.204	0.40%	n/a	n/a
TCC 11		0.00335	1.07	0.00354	0.28	0.223	1.998	1.56	1.07	0.284	0.34%	n/a	n/a
TCC 12		0.00226	1.07	0.00239	0.28	0.223	1.998	1.56	1.07	0.282	0.23%	n/a	n/a
TCC 13		0.00763	0.75	0.00808	0.25	0.223	1.998	1.56	0.758	0.258	0.79%	n/a	n/a

Notes to Table 19

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

6.44 A summary of maximum predicted acid deposition rates at the identified European Sites and SSSIs are presented in Table 19, with the deposition velocities for grassland utilised for all European sites assessed.

6.45 In Table 19, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.46 It can be seen from the data in Table 19 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC2, TCC3 and TCC9.

6.47 Following the calculation of the PECs, for the modelled points with potentially significant PCs on acid deposition rates, it can be seen from the data in Table 19 that the PECs are all less than 100% of the critical load (i.e., for TCC2, TCC3 and TCC9). It can therefore be assumed that there will be no adverse effects on these sites.

Revised Modelling

6.48 In January 2022 ECL repeated the modelling work for the proposed ERF using different input parameters (ECL, 2022). This was in response to a decision by FCC Environment to design, build and operate the ERF based on these new parameters. Specifically the revised modelling was based on an Emissions Limit Value (ELV) for NOx of 100 mg/Nm^3 (reduced from an ELV for NOx of 120 mg/Nm^3 – see Table 13).

6.49 In addition, a new modelling point – TCC14 – was added (OSGR NZ 53880 26160). This modelling point is located within the SSSI immediately to the north of modelling point TCC11: it covers a location where saltmarsh and sand dune is present.

6.50 The revised modelling shows a slight reduction in the PCs for the scenarios where the NH_3 is at the BAT-AEL. For the scenarios where the NH_3 emission rate (at the HZI confirmed normal operating scenario concentration of 3.5 mg/Nm^3) a slight increase is observed due to the lowering of the NO_X from 120 mg/Nm^3 to 100mg/Nm^3. Overall the results are fairly similar to the previous results discussed earlier in this report. For the modelled point TCC14 it displays similar PCs to that of the nearby TCC11: the PCs are slightly greater at TCC11 with the ERF modelled in isolation and are greater at TCC14 for the cumulative scenario.

6.51 The revised modelling data (Table 24 in ECL, 2022) show that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

6.52 The revised modelling data (Table 25 in ECL, 2022) show that the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the modelling points assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2 and TCC9. Consequently, PECs will need to be calculated for these receptors. The relevant background NH_3 concentrations (see Table 6 in ECL, 2022) for TCC2 and TCC9 are 1.64 µg/m^3 and 1.45 µg/m^3, respectively. The PECs as a percentage of the annual critical level would therefore be 55% (TCC2) and 48% (TCC9). It can therefore be assumed that there will be no adverse effect on the ecological sites assessed (i.e., the PECs are less than 100% of the critical level).

6.53 The revised modelling data show negligible change for hydrogen fluoride compared to the data presented in Table 17. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

6.54 The revised modelling data (Table 27 in ECL, 2022) show that there are predicted exceedances for Nitrogen deposition at modelling points TCC1, TCC2, TCC3, TCC5, TCC6, TCC9 and TCC13, with the remaining sites screening out as insignificant. At these modelling locations the lower Critical Load is exceeded for Coastal stable dune grasslands (calcareous type) (i.e., a Critical Load range of 10-15 kgN/ha/yr). However, the upper Critical Load is only exceeded at TCC2 and TCC9, both locations only supporting mudflat habitats. The PECs have been calculated for the modelling points where exceedance is identified and all are less than 100% of the critical level. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

6.55 The revised modelling data (Table 28 in ECL, 2022) show that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC2, TCC3 and TCC9. Following the calculation of the PECs for the modelled points with potentially significant PCs on acid deposition rates, all PECs are less than 100% of the critical load (i.e., for TCC2, TCC3 and TCC9). It can therefore be assumed that there will be no adverse effects on these sites.

In-combination assessment

6.56 ECL has carried out a cumulative assessment, the methods and detailed results being presented in a separate report (ECL, 2022).

6.57 In addition to the effect of the proposed ERF, there are several other developments in the surrounding area which may have an effect on ecological receptors when considered in combination. Existing emissions within the area are considered to already be accounted for in background air quality data.

6.58 The developments that ECL were aware of (at time of writing), but which have been excluded from the assessment are as follows:

- Potential new Energy from Waste ("EfW") site opening in 2026 at the former SSI steelworks site, which is situated approximately 1.6 km east-north-east from the proposed FCC Installation. This information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Dockside Road (1) and Dockside Road (2) Teeside Renewable Energy Centre, operated by PD Ports, is expected to be operational within the next few years. Situated approximately 1.7 km to the west of the proposed development, this information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Wilton 11 EfW, operated by Suez / Sembcorp is situated approximately 2.1 km east from the proposed development. Despite being operational since around 2018, no data are publicly available in relation to the input data required to model the site. An information request has been sent by ECL to the EA; however, at time of writing no suitable data were available.
- Haverton Hill household waste recycling centre and North East Energy Recovery Centre, both operated by Suez, are located approximately 6.5 km to the west from the proposed development. It is considered by ECL, given their distance from the proposed development, that it will not be necessary to include them in the cumulative assessment.
- Tees Eco Energy, which is currently proposed (planning and permitting granted). This site is situated approximately 6.7 km to the west from the proposed development. It is considered, given the distance of Tees Eco Energy from the proposed development, that it will not be necessary to be include it in the cumulative assessment.

6.59 The development that has been included in the cumulative assessment is the Redcar Energy Centre ("REC"). The REC will be situated at land formerly occupied by Redcar Bulk Terminal (approximately 4.8 km to the north of the proposed development) and is due to be commissioned circa 2024 to 2025. Consequently, the emissions arising from the two stacks associated with its two process lines have been incorporated into the cumulative impact assessment undertaken as part of this study. This has been carried out making use of the emissions data disclosed in the air quality chapter submitted as part of the planning application documentation for REC[14].

[14] Planning Application Reference Number: R/2020/0411/FFM. Available online via: https://planning.redcar-cleveland.gov.uk/Planning/Display?applicationNumber=R%2F2020%2F0411%2FFFM

***Table 20**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m^3)	Long Term Critical Level (CL) (µg/m^3)	Long Term PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Short Term PC (µg/m^3)	ShortTerm Critical Level (CL) (µg/m^3)	Short Term PC as a % of the CL (µg/m^3)
NYM1	North York Moors - SAC / SPA	0.0654	30	0.22%	n/a	n/a	n/a	0.696	75	0.93%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.295		0.98%	n/a	n/a	n/a	4.68		6.24%
TCC2		**0.662**		**2.21%**	35.780	36.44	**121%**	4.06		5.42%
TCC3		**0.433**		**1.44%**		36.21	**121%**	3.60		4.81%
TCC4		0.183		0.61%	n/a	n/a	n/a	2.75		3.66%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.276		0.92%	n/a	n/a	n/a	4.64		6.18%
TCC6		0.279		0.93%	n/a	n/a	n/a	3.37		4.49%
TCC7		0.172		0.57%	n/a	n/a	n/a	2.43		3.24%
TCC8		**0.396**		**1.32%**	49.10	49.50	**165%**	3.35		4.47%
TCC9		**0.674**		**2.25%**	27.930	28.60	95%	6.05		8.07%
TCC10		0.159		0.53%	n/a	n/a	n/a	1.69		2.26%
TCC11		0.253		0.84%	n/a	n/a	n/a	4.29		5.72%
TCC12		0.145		0.48%	n/a	n/a	n/a	2.01		2.68%
TCC13		**0.861**		**2.87%**	21.52	22.38	75%	5.18		6.91%

6.60 A summary of maximum predicted GLCs of oxides of nitrogen at the identified European sites is presented in Table 20. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.61 It can be seen from the data in Table 20 that the daily mean oxides of nitrogen PCs are all less than 10% of the respective critical level and therefore, are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

6.62 For the annual mean oxides of nitrogen PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3, TCC8, TCC9 and TCC13. Consequently, the PECs have been calculated for these receptors.

6.63 Using the background NO_X concentrations the PEC assessment for TCC2, TCC3, TCC8, TCC9 and TCC13 is shown in Table 20.

6.64 It can be seen from the results in Table 20, that whilst it can be assumed for TCC9 and TCC13 that there will be no adverse effect (i.e., the PECs are less than 100% of the critical level), the PECs for TCC2, TCC3 and TCC8 are potentially significant.

6.65 The data show that the ambient background levels at TCC2, TCC3 and TCC8 already exceed the long-term critical level in the absence of the development (i.e., a concentration that is 119% of the critical level at TCC2 and TCC3 and a concentration that is 164% of the critical at TCC8).

6.66 The results of revised modelling carried out by ECL in 2022 (Table 43 in ECL, 2022) show that no adverse effect can be assumed for TCC9, TCC13 and TCC14 (i.e., the PECs are less than 100% of the critical level); however, the PECs for TCC2, TCC3 and TCC8 are potentially significant (as the PECs are 121%, 121% and 165% respectively). The data show that the ambient background levels at TCC2, TCC3 and TCC8 already exceed the long-term critical level in the absence of the development (i.e., a concentration that is 119% of the critical level at TCC2 and TCC3 and a concentration that is 164% of the critical at TCC8).

***Table 21**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
NYM1	North York Moors - SAC / SPA	0.0164	20	0.08%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0739		0.37%	n/a	n/a	n/a
TCC2		0.166		0.83%	n/a	n/a	n/a
TCC3		0.109		0.54%	n/a	n/a	n/a
TCC4		0.0460		0.23%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0691		0.35%	n/a	n/a	n/a
TCC6		0.0699		0.35%	n/a	n/a	n/a
TCC7		0.0430		0.22%	n/a	n/a	n/a
TCC8		0.0991		0.50%	n/a	n/a	n/a
TCC9		0.169		0.84%	n/a	n/a	n/a
TCC10		0.0399		0.20%	n/a	n/a	n/a
TCC11		0.0634		0.32%	n/a	n/a	n/a
TCC12		0.0362		0.18%	n/a	n/a	n/a
TCC13		**0.215**		**1.08%**	2.38	2.60	13%

6.67 A summary of maximum predicted GLCs of sulphur dioxide at the identified European sites are presented in Table 21. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.68 It can be seen from the data in Table 21 that, with the exception of TCC13, the annual mean sulphur dioxide PCs are all less than 1% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

6.69 For the annual mean sulphur dioxide PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. It should be noted that the latest background SO_2 concentration at TCC13, as reported by APIS, is 0 µg/m³. However, it is suspected this value is erroneous and in the interest of being conservative the SO_2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m³ has been used for calculating the SO_2 PEC for TCC13.

6.70 Consequently, with a PEC of 2.60 µg/m³ (or 13% of the critical level) at TCC13, it can be assumed there will be no adverse effect (i.e., the PEC is less than 100% of the critical level). The revised modelling data from 2022 show a similar result (ECL, 2022).

***Table 22**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	NH_3 (annual mean) - When Lichens and Bryophytes are NOT present					
		Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
NYM1	North York Moors - SAC / SPA	0.00545	3	0.18%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0246		0.82%	n/a	n/a	n/a
TCC2		**0.0552**		**1.84%**	1.60	1.66	55%
TCC3		**0.0361**		**1.20%**	1.60	1.64	55%
TCC4		0.0153		0.51%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0230		0.77%	n/a	n/a	n/a
TCC6		0.0232		0.77%	n/a	n/a	n/a
TCC7		0.0143		0.48%	n/a	n/a	n/a
TCC8		**0.0330**		**1.10%**	1.60	1.63	54%
TCC9		**0.0561**		**1.87%**	1.42	1.48	49%
TCC10		0.0133		0.44%	n/a	n/a	n/a
TCC11		0.0211		0.70%	n/a	n/a	n/a
TCC12		0.0121		0.40%	n/a	n/a	n/a
TCC13		**0.0717**		**2.39%**	0.89	0.962	32%

6.71 A summary of maximum predicted GLCs of ammonia at the identified European sites are presented in Table 22. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.72 It can be seen from the data in Table 22 that the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the European sites assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3, TCC8, TCC9 and TCC13. Consequently, PECs will need to be calculated for these receptors.

6.73 Using the relevant background NH_3 concentrations, the PEC assessment for TCC2, TCC3, TCC8, TCC9 and TCC13 is shown in Table 22. As displayed by the results in Table 22 it can be assumed that there will be no adverse effect on the European sites assessed (i.e., the PECs are all less than 100% of the critical level).

6.74 The revised modelling data from 2022 show a similar result (ECL, 2022 – Tables 45 and 46). For all modelling points it can be assumed that there will be no adverse effect on the ecological sites assessed (i.e., the PECs are all less than 100% of the critical level).

***Table 23**: Comparison of Maximum Predicted HF PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Weekly PC (µg/m^3)	Weekly Critical Level (CL) (µg/m^3)	Weekly PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Daily PC (µg/m^3)
NYM1	North York Moors - SAC / SPA	0.00383	0.5	0.77%	n/a	n/a	n/a	0.00579
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	**0.0146**		**2.92%**	0.003 *	0.0176	3.52%	0.0390
TCC2		**0.0186**		**3.73%**		0.0216	4.33%	0.0339
TCC3		**0.0121**		**2.42%**		0.0151	3.02%	0.0301
TCC4		**0.0120**		**2.41%**		0.0150	3.01%	0.0229
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	**0.0150**		**3.00%**		0.0180	3.60%	0.0387
TCC6		**0.0148**		**2.95%**		0.0178	3.55%	0.0281
TCC7		**0.0107**		**2.13%**		0.0137	2.73%	0.0203
TCC8		**0.0133**		**2.66%**		0.0163	3.26%	0.0277
TCC9		**0.0177**		**3.55%**		0.0207	4.15%	0.0500
TCC10		**0.00656**		**1.31%**		0.00956	1.91%	0.0141
TCC11		**0.0135**		**2.70%**		0.0165	3.30%	0.0355
TCC12		**0.00769**		**1.54%**		0.0107	2.14%	0.0166
TCC13		**0.0177**		**3.55%**		0.0207	4.15%	0.0428

Notes to Table 23

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m^3 with an elevated background of 0.003µg/m^3 where there are local anthropogenic emission sources [(15)].

6.75 A summary of maximum predicted GLCs of hydrogen fluoride at the identified European sites are presented in Table 23. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.76 It can be seen from the data in Table 23 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

(15) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

6.77 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC1- TCC13, inclusive, and are therefore potentially significant. For NYM1 the long-term significance criteria has not been exceeded (being less than 1% of the critical level).

6.78 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources (16). In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

6.79 The maximum weekly HF PC occurs at TCC2 and therefore the worst-case PEC would be 0.0216 µg/m^3 (or 4.33% of the weekly critical level). It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

6.80 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

(16) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

***Table 24**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at European Sites – In-combination*

ECL Receptor Ref.	Description	Habitat Type	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critical Load
NYM1	North York Moors - SAC	Blanket Bogs - Raised and blanket bogs	0.0254	5	10	0.51%	0.25%	n/a	n/a	n/a	n/a
	North York Moors - SPA	European Golden Plover - Reproducing - Montane habitats	0.0254	5	10	0.51%	0.25%	n/a	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA	Sandwich Tern - Concentration - Supralittoral sediment - Coastal stable dune grasslands (acid type)	**0.139**	8	10	**1.73%**	**1.39%**	8.96	9.10	**114%**	91%
TCC2			**0.287**			**3.59%**	**2.87%**		9.25	**116%**	92%
TCC3			**0.201**			**2.51%**	**2.01%**		9.16	**115%**	92%
TCC4			**0.0857**			**1.07%**	0.86%		9.05	**113%**	90%
TCC1 - TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal	N/A								
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	Sandwich Tern / Little Tern - Supralittoral sediment (acidic type)	**0.129**	8	10	**1.61%**	**1.29%**	8.96	9.09	**114%**	91%
TCC6			**0.132**			**1.65%**	**1.32%**		9.09	**114%**	91%
TCC7			**0.0797**			**1.00%**	0.80%		9.04	**113%**	90%
TCC8			**0.183**			**2.29%**	**1.83%**		9.14	**114%**	91%
TCC9			**0.314**			**3.93%**	**3.14%**	8.4	8.71	**109%**	87%
TCC10			0.0688			0.86%	0.69%	n/a	n/a	n/a	n/a
TCC11			**0.118**			**1.48%**	**1.18%**	10.78	10.90	**136%**	**109%**
TCC12			0.0630			0.79%	0.63%	n/a	n/a	n/a	n/a
TCC13			**0.421**			**5.26%**	**4.21%**	9.1	9.52	**119%**	95%

6.81 A summary of maximum predicted nutrient nitrogen deposition rates at the identified European Sites and SSSIs are presented in Table 24. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.82 In Table 24, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.83 It can be seen from the data in Table 24 that there are predicted exceedances for nitrogen deposition at a number of modelling points, although this is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is exceedance of the lower Critical Load at all modelling points except TCC4, TCC7, TCC10 and TCC 12. There is only exceedance of the upper Critical Load at modelling points TCC2, TCC3, TCC8, TCC9 and TCC13. Using the more conservative Critical Load range there are no PECs greater than 100% except at TCC11 (109%).

6.84 It should be noted that, as APIS does not provide data for Ramsar sites, as the Ramsar site is noted for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. Consequently, the SPA habitat interest and feature with the lowest lower critical load assigned to it has also been selected for the Ramsar site considered.

6.85 It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

6.86 The revised modelling completed in 2022 shows similar results (Table 48 in ECL, 2022). There are predicted exceedances for lower critical load for Nitrogen deposition at modelling points TCC1-TCC3 (inclusive), TCC5, TCC6, TCC8, TCC9, TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant (a Critical Load range of 10-15 kgN/ha/yr has been considered). There are only predicted exceedances for the upper critical load for Nitrogen deposition at modelling points TCC2, TCC3, TCC8, TCC9, TCC13 and TCC14.

6.87 The PEC as a percentage of the lower Critical Load is only exceeded at TCC11 and TCC14 (109%). No PECs as a percentage of the upper Critical Load are exceeded. At these modelling points the baseline already exceeds the lower Critical Load.

***Table 25**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites – Cumulative*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
NYM1	North York Moors – SAC (Blanket Bogs – Raised and blanket bogs)	0.00181	1.36	0.00190	0.18	0.321	0.504	0.183	1.36	0.182	0.74%	n/a	n/a
	North York Moors – SPA (European Golden Plover – Reproducing – Montane habitats)	0.00181	1.36	0.00190	0.18	0.178	0.47	0.150	1.36	0.182	0.79%	n/a	n/a
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.00988	1.03	0.0105	0.20	0.223	1.998	1.56	1.04	0.211	1.02%	1.25	63%
TCC2		0.0222	1.03	0.0237	0.20	0.223	1.998	1.56	1.05	0.224	2.30%	1.28	64%
TCC3		0.0143	1.03	0.0152	0.20	0.223	1.998	1.56	1.04	0.215	1.48%	1.26	63%
TCC4		0.00610	1.03	0.00648	0.20	0.223	1.998	1.56	1.04	0.206	0.63%	n/a	n/a

***Table 25** (cont.): Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites – Cumulative*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal											
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.00917	1.03	0.00977	0.20	0.223	1.998	1.56	1.04	0.210	0.95%	n/a	n/a
TCC6		0.00939	1.03	0.0100	0.20	0.223	1.998	1.56	1.04	0.210	0.97%	n/a	n/a
TCC7		0.00567	1.03	0.00602	0.20	0.223	1.998	1.56	1.04	0.206	0.59%	n/a	n/a
TCC8		0.0130	1.03	0.0139	0.20	0.223	1.998	1.56	1.04	0.214	**1.35%**	1.26	63%
TCC9		0.0224	1.01	0.0238	0.23	0.223	1.998	1.56	1.03	0.254	**2.31%**	1.29	64%
TCC 10		0.00490	1.03	0.00520	0.20	0.223	1.998	1.56	1.03	0.205	0.51%	n/a	n/a
TCC 11		0.00842	1.07	0.00894	0.28	0.223	1.998	1.56	1.08	0.289	0.87%	n/a	n/a
TCC 12		0.00448	1.07	0.00475	0.28	0.223	1.998	1.56	1.07	0.285	0.46%	n/a	n/a
TCC 13		0.0299	0.75	0.0318	0.25	0.223	1.998	1.56	0.78	0.282	**3.09%**	1.06	53%

Notes to Table 25

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

6.88 A summary of maximum predicted acid deposition rates at the identified European Sites and SSSIs are presented in Table 25, with the deposition velocities for grassland utilised for all European sites assessed.

6.89 In Table 25, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.90 It can be seen from the data in Table 25 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC1 - TCC3 (inclusive), TCC8, TCC9 and TCC13.

6.91 Following the calculation of the PECs, for the modelled points with potentially significant PCs on acid deposition rates, it can be seen from the data in Table 25 that the PECs are all less than 100% of the critical load It can therefore be assumed that there will be no adverse effects on these sites.

6.92 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

Discretionary Advice Service Consultation with Natural England

6.93 A meeting was held with Natural England on 24 November 2021 during which ECL advised that NH_3 was the main contributor to nitrogen deposition arising from the proposed development. ECL noted that the modelling approach that had been adopted, where emission rates for NOx and NH_3 had been calculated from Best Available Technique – Associated Emission Levels (BAT-AELs), was likely to have over-estimated actual NH_3 emissions. It was therefore agreed that further modelling would be carried out using actual emissions data from a similar operational facility at the Resource and Energy Recovery Centre at Millerhill, Edinburgh. Further details of the modelling approach are provided in a separate report (ECL, 2022).

6.94 The revised modelling has considered the habitats with the lowest lower and upper critical loads, i.e., a precautionary approach has been adopted. The results of the revised modelling using data from the Millerhill facility show that the revised NH_3 emission rates at all modelling points are less than 1% of the critical load (Table 26). In accordance with published guidance[17], the impacts can therefore be considered insignificant.

***Table 26**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC1 – TCC13 (Installation Only)*

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	8	10	0.0524	0.655%	0.524%	n/a	n/a
TCC2				0.0964	1.21%	0.964%	8.96	9.06 (113% of lower critical load)
TCC3				0.0637	0.796%	0.637%	n/a	n/a
TCC4				0.0285	0.356%	0.285%	n/a	n/a

[17] Environment Agency online guidance advises that if the short-term PC is less than 10% of the short-term environmental standard and the long-term PC is less than 1% of the long-term environmental standard it can be screened out as insignificant. See https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pcs.

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal						
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	8	10	0.0482	0.603%	0.482%	n/a	n/a
TCC6				0.0469	0.586%	0.469%	n/a	n/a
TCC7				0.0260	0.325%	0.260%	n/a	n/a
TCC8				0.0437	0.546%	0.437%	n/a	n/a
TCC9				0.0786	0.983%	0.786%	n/a	n/a
TCC10	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	8	10	0.0239	0.298%	0.239%	n/a	n/a
TCC11				0.0216	0.270%	0.216%	n/a	n/a
TCC12				0.0164	0.205%	0.164%	n/a	n/a
TCC13				0.0492	0.615%	0.492%	n/a	n/a
TCC14				0.0204	0.254%	0.204%	n/a	n/a

Notes to Table 26

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

6.95 It can be seen from the data in Table 26 that the maximum nutrient nitrogen deposition rates due to the ERF's PCs, with the revised NH_3 emission rates, are now less than 1% of the critical load at all the modelled points, except TCC2. For TCC2, a small exceedance of the lower critical load is predicted (i.e., with a PC approximately 0.21% above the significance criteria). It is worth noting that the background level for TCC2 is already elevated and exceeds the lower critical load in the absence of the development.

6.96 ECL has created isopleths based on the revised modelling data (ECL, 2021). Figure 3 (reproduced from ECL, 2021) provides the nutrient nitrogen deposition rates in the area surrounding the modelled points.

6.97 In addition, Figure 4 has been included to allow for comparison to be made between the NH_3 emissions at the revised concentration and the NH_3 emissions at the BAT-AELs.

6.98 In Figures 3 and 4, the ecological receptors are represented by the pink annotated pins and the Installation as the red annotated circle. The results displayed are for the worst-case met year for the maximum GLC.

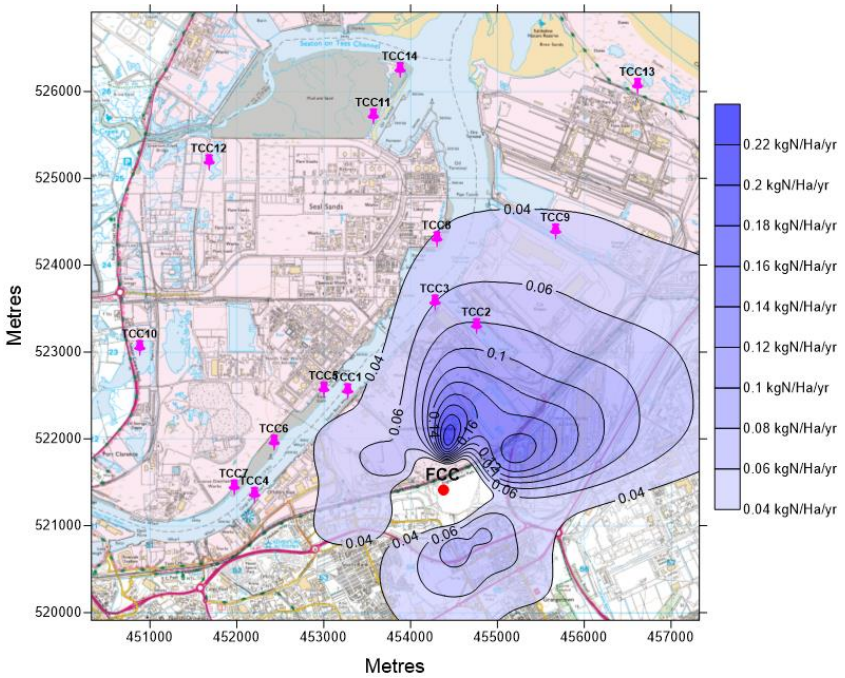


***Figure 3**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (Revised NH_3 Emission Rate) – Met Year 2020 (Source: ECL, 2021)*

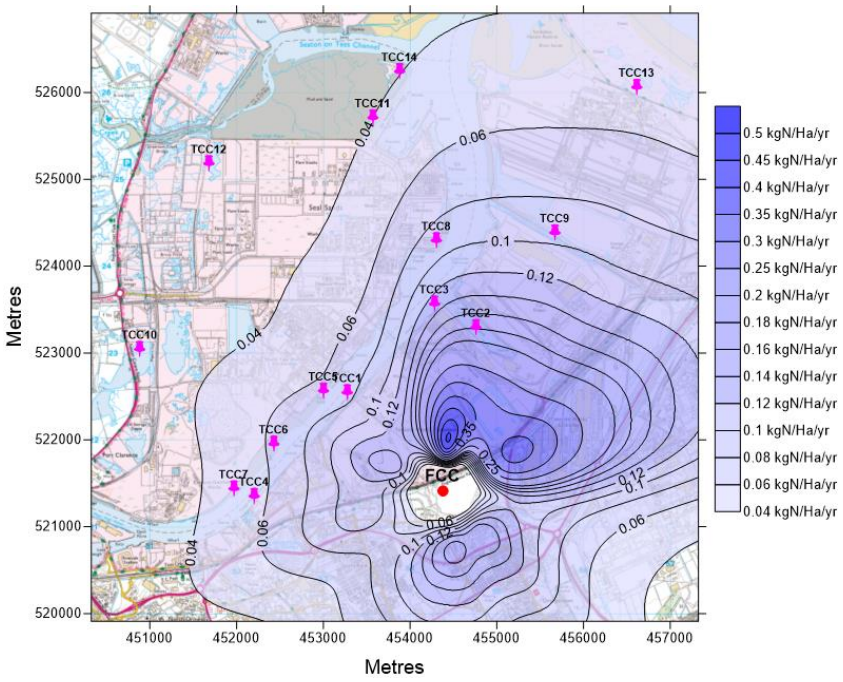


***Figure 4**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (NO_X & NH_3 at BAT-AELs) – Met Year 2020 (Source: ECL, 2021)*

6.99 Modelling of the proposed facility in combination with the Redcar Energy Centre (REC) shows that there are exceedances predicted for nitrogen deposition at modelling points TCC2, 3, 8, 9, 11 and 13 (Table 27). It should be noted that emission rates for NOx and NH_3 had been calculated from BAT-AELs for REC, and are also likely to have over-estimated actual NH_3 emissions.

***Table 27**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC1 – TCC13 (Installation + REC)*

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC as % of Lower Critical Load	PEC as a% of Upper Critical Load
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	8	10	0.0810	**1.01%**	0.810%	n/a	9.04	**113%**	90%
TCC2				0.176	**2.20%**	**1.76%**	8.96	9.14	**114%**	91%
TCC3				0.138	**1.72%**	**1.38%**		9.10	**114%**	91%
TCC4				0.0522	0.653%	0.522%	n/a	n/a	n/a	n/a
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal								
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	8	10	0.0741	0.927%	0.741%	n/a	n/a	n/a	n/a
TCC6				0.0679	0.849%	0.679%	n/a	n/a	n/a	n/a
TCC7				0.0478	0.597%	0.478%	n/a	n/a	n/a	n/a
TCC8				0.137	**1.71%**	**1.37%**	8.96	9.10	**114%**	91%
TCC9				0.223	**2.78%**	**2.23%**	8.4	8.62	**108%**	86%
TCC10	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	8	10	0.0397	0.496%	0.397%	n/a	n/a	n/a	n/a
TCC11				0.0919	**1.15%**	0.919%	10.78	10.87	**136%**	**109%**

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC as % of Lower Critical Load	PEC as a% of Upper Critical Load
TCC12				0.0475	0.593%	0.475%	n/a	n/a	n/a	n/a
TCC13				0.382	**4.77%**	**3.82%**	9.1	9.48	**119%**	95%
TCC14	SSSI	8	10	0.125	**1.56%**	**1.25%**	10.78	10.91	**136%**	**109%**

Notes to Table 27

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

6.100 In Table 27, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.101 The data presented in Table 27 show that there are predicted exceedances for nitrogen deposition at modelling points TCC1 - TCC3 (inclusive), TCC8, TCC9, TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant. Where there are predicted exceedances of the critical load, these range from 1.01% to 4.77% of the lower critical load and 1.25% to 3.82% of the upper critical load. It is important to note that the background levels are already elevated and exceed the lower critical load in the absence of the development (as well as the upper critical load for TCC11).

6.102 It should be noted that the habitat with the lowest lower and upper critical load has been selected and used as the basis for the above assessment. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.103 When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load at modelling points TCC2, TCC3, TCC8, TCC9, TCC13 and TCC14. There is only exceedance of the upper Critical Load at modelling points TCC2, TCC9 and TCC13. Using the more conservative Critical Load range the only PEC that is greater than 100% is at TCC11 and TCC14 (109%).

6.104 The proposed development operating in isolation does not lead to a breach of the relevant nutrient nitrogen critical loads for any of the modelled points assessed. It is only the cumulative impact of both installations operating simultaneously that result in the exceedances shown in Table 27.

6.105 Table 28 demonstrates the predicted nutrient nitrogen deposition rates associated with the three scenarios that have been modelled by ECL, i.e., the Installation in isolation, REC in isolation and the cumulative scenario of the Installation's and REC's emissions.

***Table 28**: Predicted Nutrient Nitrogen Deposition Rates at Sensitive Habitat Sites (TCC1 – TCC13) For Three Scenarios*

ADMS Ref.	Site Details	Nutrient Nitrogen Deposition Rate [(a)] [(b)] (kgN/ha/yr)		
		Installation Only	REC Only	Installation + REC
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.0524	0.0501	0.0810
TCC2		0.0964	0.0799	0.176
TCC3		0.0637	0.0838	0.138
TCC4		0.0285	0.0333	0.0522
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal		
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.0482	0.0465	0.0741
TCC6		0.0469	0.0375	0.0679
TCC7		0.0260	0.0321	0.0478
TCC8		0.0437	0.0986	0.137
TCC9	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.0786	0.144	0.223
TCC10		0.0239	0.0310	0.0397
TCC11		0.0216	0.0714	0.0919
TCC12		0.0164	0.0356	0.0475
TCC13		0.0492	0.356	0.382
TCC14		0.0204	0.105	0.125

Notes to Table 28
(a) Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).
(b) The NO_X and NH_3 emission rates for both the Installation and REC are as discussed in Section 10 of ECL (2022).

6.106 The results presented in Table 28 show that, overall, the predicted nutrient nitrogen deposition rates for the REC are greater than those for the Installation.

6.107 ECL (2022) note that the '*greater predicted deposition rate associated with the REC scenario is largely due to REC's closer proximity to a number of the specified ecological points (TCC9, TCC11 and TCC13, in particular)*'. In addition, they also note that '*the emission rates for REC are based on the BAT-AELs*' and therefore it follows that '*When accounting for normal day to day operation, it is anticipated that the actual emission rates for REC, particularly in regard to NH_3, are likely to be lower, as is the case with the FCC Installation*'.

6.108 ECL has produced isopleths (Figure 5) for nutrient nitrogen deposition rates for the installation in combination with REC. In addition, Figure 6 has been included to allow for comparisons to be made between the cumulative emissions with the Installation's actual NH_3 concentration, compared to the BAT-AELs.

6.109 In Figures 5 and 6, the ecological receptors are represented by the pink annotated pins and the Installation and REC as the red annotated circles. The results displayed are for the worst-case met year for the maximum GLC.

***Figure 5**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation (with revised NH3) + REC – NWP 2020 (Source: ECL, 2021)*

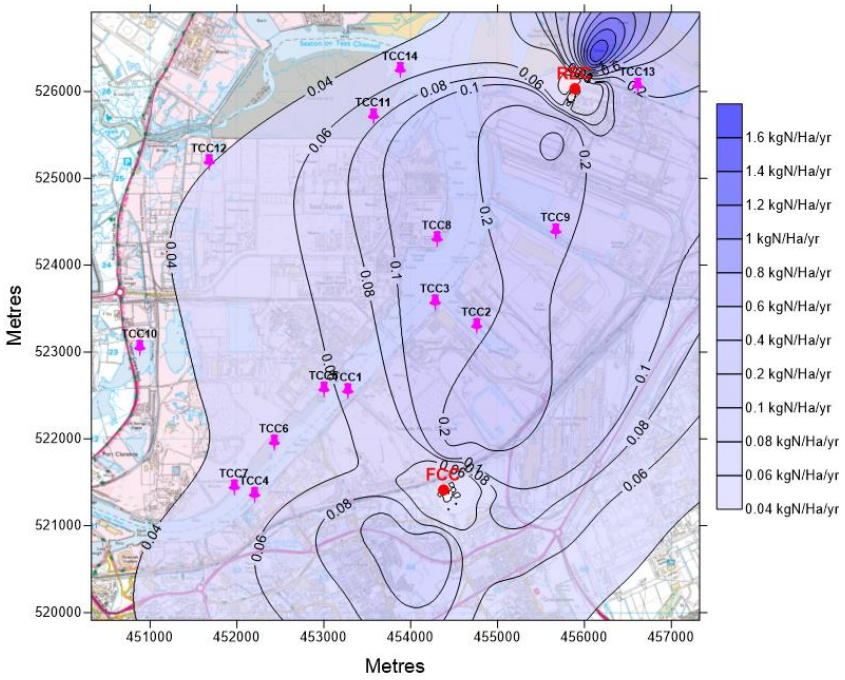
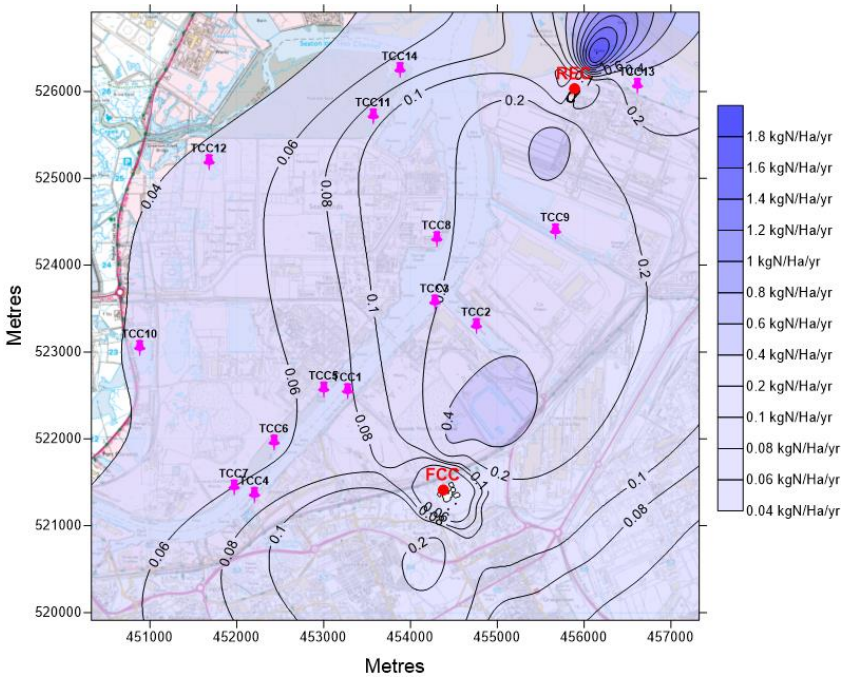


***Figure 6**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation + REC (BAT-AELs) – NWP 2020 (Source: ECL, 2021)*



Habitat sensitivity at modelling point

6.110 Table 29 provides an evaluation of the points where modelling has identified a potential exceedance of a critical load or level. In each case the habitats present are identified and related to the qualifying features (birds) of the SPA and Ramsar site. The locations of all air quality modelling points are shown on Figure 2.

6.111 Mapping presented on the MAGIC website shows the locations of coastal priority habitats in relation to the site. It should be noted that the only coastal priority habitat that occurs within the inner and central estuary is intertidal mudflats – all other coastal priority habitats are located at the coast or the extreme outer part of the estuary.

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Assessment of air quality impacts on Teesmouth and Cleveland Coast SSSI

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Updated			Click here to enter a date.
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Approved for issue to client	Steven Betts	Associate Director	25 January 2022
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Contents

1 Introduction

Overview

1.1 Outline planning consent has been granted for the construction of an Energy Recovery Facility (ERF) and associated development at a site known as Grangetown Prairie (planning reference R/2019/0767/OOM).

1.2 Air quality modelling has been completed by Environmental Compliance Limited (ECL) and this has revealed that air quality changes may affect parts of the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI). This report therefore considers the impact of the proposed ERF on the SSSI.

Site description

1.3 The site (the 'Site') is located on land to the east of John Boyle Road and to the west of Tees Dock Road, Grangetown, Redcar and Cleveland. The central Ordnance Survey Grid Reference (OSGR) for the site is NZ543213. The location of the Site is shown on Figure 1 in Section 12.

1.4 BSG Ecology understands from FCC Environment that Site remediation works have been carried out by South Tees Development Corporation (STDC). This has resulted in the removal of all vegetation within the Site.

Project Description

1.5 FCC Environment is one of three bidders in a confidential bidding process looking to secure a long-term contract to build and operate an Energy from Waste facility with the Joint Authorities. The Tees Valley Authorities (TVA), Durham County Council and Newcastle City Council (the Councils) have joined together to create an opportunity for a contractor to design, build, finance and operate (DBFO) a new Energy Recovery Facility (ERF) to be located in the Tees Valley on a mandated site owned by the South Tees Development Corporation (STDC).

1.6 The mandated site is on a large industrial brownfield site within the Redcar and Cleveland Borough Council administrative area: this is the site of the former British Steel works in Grangetown, an area known as Grangetown Prairie. The site is approximately 25 acres in total.

1.7 Outline planning consent has been granted by Redcar and Cleveland Borough Council (planning reference R/2019/0767/OOM) for an ERF facility that could treat 450,000 tonnes per annum of waste and export up to 49.9 MWH of electricity. The developed site will also include landscaping, internal access roads and car parking areas.

Consultation

1.8 FCC Environment has engaged with Natural England through the Discretionary Advice Service (DAS), which involved a meeting on 24 November 2021 between Nick Lightfoot and Lewis Pemberton (Natural England), David Molland (FCC), Tim Heard, Sarah Burley and Sara Maile (ECL), Steven Betts (BSG Ecology) and Sam Thistlethwaite (Identity Consult Planning).

1.9 Natural England provided the following advice in relation to the potential impacts of the ERF on the Teesmouth and Cleveland Coast SSSI:

- Modelling locations TCC10, 11, 12 and 13 (see Figure 2) are considered to be the most sensitive ecological receptors due to the habitats that are present, i.e., mudflats (at Seal Sands), saltmarsh and sand dunes.
- The mudflats at Seal Sands provide an important feeding area for birds and eutrophication is currently resulting in the formation of algal mats that make feeding difficult for some species.
- Saltmarsh and sand dune are important as qualifying features of the Teesmouth and Cleveland Coast SSSI.

Contributors

1.10 The report has been prepared by Steven Betts, who has worked in the ecological sector for more than 27 years. During this time he has contributed to a wide range of projects, both as author and technical reviewer. This has included the preparation of and contributions to numerous HRAs for projects that have included an energy recovery facility, housing developments, powerline projects, solar schemes and wind farms.

1.11 The report has been reviewed by Roger Buisson, Associate Director at BSG Ecology. Roger has worked for over 30 years assessing the impacts of man's activities on natural habitats and species, including the preparation of, and contributions to, EIAs and HRAs for energy recovery facilities, port and harbour infrastructure, underground cable routes, renewable energy projects (onshore and offshore wind and solar) and housing developments.

1.12 Further details of the experience and qualifications of the above can be found at http://www.bsg-ecology.com/people/.

2 Scope of the Assessment

2.1 The nearest part of the Teesmouth and Cleveland Coast SSSI is approximately 1.4 km to the north-west of the Site. Consequently, no significant impacts on the SSSI are likely to arise during the construction phase of the proposed development due to the separation distance. In particular, degradation of habitats arising from pollution, in particular airborne (e.g., dust) and water-borne (e.g., silt) pollutants, are likely to be limited in their extent to the Site and the adjacent area.

2.2 Impacts that may arise during the operational phase of the proposed development will be limited to changes in air quality arising from the operation of the ERF. No further degradation of habitat arising from excavation work, material storage and mobile plant tracking etc is likely during this phase of the development.

2.3 The decommissioning phase of the proposed development is expected to result in similar impacts to those described for the construction phase of the development, i.e., no significant impacts on the SSSI are likely to arise during this phase of the works.

Zone of Influence

2.4 The Zone of Influence (ZoI) for the proposed development is the area over which ecological features may be affected by biophysical changes as a result of the proposed work and associated activities. This may extend beyond the Site boundary. The ZoI has been used to determine the extent of the desk study, baseline ecological surveys and biological / non-biological (air quality) assessments.

2.5 During the construction stage of the proposed development the ZoI is considered to be the Site and a buffer area around it within which impacts may occur depending upon the sensitivity of the ecological receptors being considered. In this assessment the following ZoIs have been adopted:

- Degradation of habitats (habitat loss and disturbance) – This will be limited to the Site and immediate environs, i.e., a precautionary ZoI of 100 m. As the nearest part of the SSSI is approximately 1.4 km away from the Site, habitat degradation as a result of the proposed development is highly unlikely.
- Degradation of habitats (airborne pollution) - Air quality impacts due to dust production may potentially impact on sensitive ecological features. Current guidance (Holman *et al*, 2014) advises that construction-related dust impacts only need to be considered for important ecological features within 50 m of the proposed development boundary. Guidance on mineral developments (IAQM, 2016) advises that a significant effect from dust is unlikely beyond 400 m of the proposed development boundary (this higher figure has been adopted on a precautionary basis for the purposes of the assessment). As the nearest part of the SSSI is approximately 1.4 km away from the Site, habitat degradation as a result of the proposed development is highly unlikely.
- Degradation of habitats (waterborne pollution) – Waterborne pollutants, such as silt, fuel and oils, have the potential to impact on habitats downstream of the pollution source. Whilst this type of pollution can potentially be wide-ranging, its effects will be limited to the receiving watercourse. A watercourse runs alongside the western boundary of the Site and this flows into culverts to the north and south. It is likely that this drains into the Tees Estuary to the north of the Site. At this point any pollutant is likely to be subject to some dilution, mixing and dispersal, although this may be reduced within the confines of an estuarine environment. Approximately 7 km downstream the River Tees discharges to the open sea, at which point dilution, mixing and dispersal are likely to be significant. As the Site has already been subject to remediation, the release of contaminants during the construction phase is unlikely. As contractors will be required to adhere to best practice guidance for mitigating impacts on watercourses, it is considered that there is a low likelihood of pollutants, including silt, reaching the River Tees, which is approximately 1.4 km to the north-west of the Site. A ZoI of 1 km has therefore been adopted for the assessment.

2.6 During the operation phase a ZoI of 10 km has been adopted for the consideration of airborne pollutants emitted by the ERF. As the proposed development will generate less than 50 MW, the ZoI for the project is taken to be 10 km from the proposed works location to follow DEFRA air emission guidance (DEFRA, 2016).

2.7 In summary, the following potential types of adverse effect, with their associated ZoI, have been considered in this assessment:

- Degradation of habitats (habitat loss and disturbance) (ZoI is 100 m from the Site);
- Degradation of habitats (airborne pollution - dust) (ZoI is 400 m from the Site);
- Degradation of habitats (waterborne pollution) (ZoI is 1 km from the Site);
- Degradation of habitats (airborne pollution – gaseous and particulate pollutants) (ZoI is 10 km from the Site.

2.8 Taking into account the evaluation of these impact mechanisms and the associated ZoIs, this assessment only considers air quality impacts on the Teesmouth and Cleveland Coast SSSI during the operational phase of the ERF. Impacts on European sites are considered in a separate report (BSG Ecology, 2022).

3 Information on the Teesmouth and Cleveland Coast SSSI

Qualifying features

3.1 The Teesmouth and Cleveland Coast SSSI is of special interest for the following nationally important features that occur within and are supported by the wider mosaic of coastal and freshwater habitats:

Geology:

- Jurassic geology;
- Quaternary geology;

Habitats:

- sand dunes;
- saltmarshes;

Species:

- breeding harbour seals *Phoca vitulina*;
- breeding avocet *Recurvirostra avosetta*, little tern *Sternula albifrons* and common tern *Sterna hirundo*;
- a diverse assemblage of breeding birds of sand dunes, saltmarsh and lowland open waters and their margins;
- non-breeding shelduck *Tadorna tadorna*, shoveler *Spatula clypeata*, gadwall *Mareca strepera*, ringed plover *Charadrius hiaticula*, knot *Calidris canutus*, ruff *Calidris pugnax*, sanderling *Calidris alba*, purple sandpiper *Calidris maritima*, redshank *Tringa totanus* and Sandwich tern *Thalasseus sandvicensis*;
- an assemblage of more than 20,000 waterbirds during the non-breeding season.

3.2 In Section 2 the scope of the assessment is described as being limited to consideration of air quality impacts during the operational phase of the development. Changes in air quality are not likely to impact on the geological interest of the SSSI and so this has been scoped out of the assessment.

3.3 Similarly, changes in air quality are not likely to result in direct impacts on any of the species that are qualifying features of the SSSI (http://www.apis.ac.uk/, accessed 11 January 2022). For this reason the listed species have been scoped out of the assessment; however, the habitats that support these species have been considered, specifically mudflats, sand dunes and saltmarsh. Should a deterioration in habitat condition be identified by the assessment then consideration would be given to the assessment of potential indirect impacts on species through their dependence on particular habitats and the food sources that those habitats support.

Site condition

3.4 Natural England has published the results of a condition assessment for the Teesmouth and Cleveland Coast SSSI. The summary data available for the SSSI indicates that 0.77% is in 'favourable' condition, 9.98% is in 'unfavourable declining' condition and 89.25% is 'not recorded'. Two management units are reported to be in 'unfavourable declining' condition due to declining numbers of certain species: unit 8 (Seal Sands) and unit 26 (Bran Sands).

3.5 Examination of priority habitat mapping on the MAGIC website (www. magic.defra.gov.uk, accessed 11 January 2022) shows that saltmarsh is present in SSSI management units 8 and 9. A condition assessment is only available for management unit 8, which is reported to be 'unfavourable declining' due to coastal squeeze and pollution.

3.6 Habitat mapping on the MAGIC website (www. magic.defra.gov.uk, accessed 11 January 2022) shows that sand dune is present in SSSI management units 28 and 29. A condition assessment is not available for either management unit.

Habitat sensitivity

3.7 Habitats may be sensitive to deposition of pollutants carried in the air, which may result in eutrophication and acidification. Deposition occurs both in the form of dry deposition and wet deposition and the exposure to pollutants through deposition is described with reference to Critical Loads and Critical Levels. Critical loads are defined as (Holman *et al*., 2019):

3.8 "*Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr)*."

3.9 Critical levels are defined as (Holman *et al*., 2019):

3.10 "*The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge*."

3.11 The critical loads used in this assessment are presented in Tables 1 and 2. These include a range for each site. The lower end of the range has been used for a conservative assessment.

3.12 Natural England has advised (letter received from Nick Lightfoot dated 13 January 2022, reference: DAS A002818 / 371306) that most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), it is more appropriate to adopt a Critical Load range of 10-15 kgN/ha/yr (instead of 8-10 kgN/ha/yr for acid type dunes).

***Table 1**: Nitrogen Nutrient Critical Loads (source: Air Pollution Information Service (APIS)) *denotes priority habitats*

Habitat / Ecosystem	N Critical Load (CL) range (kg N/ha/yr)
Shifting coastal dunes*	10-20
Coastal stable dune grasslands - acid type*	8-10
Coastal stable dune grasslands - calcareous type*	10-15
Pioneer, low-mid mid-upper saltmarshes	20-30

***Table 2**: Acid Deposition Critical Loads for habitats that support qualifying features (birds)*

Habitat	Acidity CLminN-CLmaxN (keq /ha/yr)	Acidity CLmaxS (keq /ha/yr)
Acid grassland	MinCLminN: 0.223 | MaxCLminN: 0.438 MinCLMaxN: 1.998 | MaxCLMaxN: 4.508	MinCLMaxS: 1.56 | MaxCLMaxS: 4.07
Calcareous grassland	MinCLminN: 0.856 |MaxCLminN: 1.071 MinCLMaxN: 4.856 | MaxCLMaxN: 5.071	CLmaxS: 4

APIS advises that where the total acid nitrogen deposition is greater than the Nmin, the sum of acid nitrogen, sulphur and hydrochloric (and other contributors like hydrofluoric) acid deposition should be compared against the Nmax value.

No Critical Load/Level data are available for saltmarsh, APIS advising that 'The likely contribution of acidification to this breakdown is not understood but the risks from acid deposition compared with eutrophication are probably small, based on available evidence.'

No Critical Load/Level data data are available for sand dunes, APIS advising that 'The majority of dune systems in the UK are calcareous, well buffered and low in heavy metals so should be tolerant of acid deposition.'

4 Impact Assessment

Summary of the air quality modelling approach

4.1 An air quality assessment has been carried out by ECL (ECL, 2022) using the latest version of the ADMS modelling package to determine the impact of emissions to air on local European sites and their underpinning SSSIs, from the proposed ERF's two emission points (referred to as A1, NZ 54379 21412, and A2, NZ 54381 21408). The results presented in the tables below are for a modelled stack height of 90 m for both the A1 and the A2 emission points (see Figure 2).

4.2 The assessment was undertaken on the basis of a worst-case scenario, which involves the following assumptions:

- The release concentrations of the pollutants will be at the permitted emission limit values ("ELVs") on a 24 hour basis, 365 days of the year. In practice, when the plant is operating, the release concentrations will be below the ELVs, and, for most pollutants, considerably so. Taking shutdowns for planned maintenance into account, the plant will not operate for 365 days.
- The highest predicted pollutant ground level concentrations ("GLCs") for the six years of meteorological data (five years, 2016 – 2020 inclusive, from the Loftus recording station and one year, 2020, of site-specific numerical weather prediction ("NWP") data) for each averaging period (annual mean, hourly, etc.) have been used.

4.3 The maximum predicted annual mean GLCs of oxides of nitrogen (NOx), sulphur dioxide (SO_2), hydrogen fluoride (HF) and ammonia (NH3) were compared with the Critical Levels for the Protection of Ecosystems or Vegetation detailed in the Environment Agency's online guidance[1].

4.4 Using ADMS, the rates of deposition for acids (nitrogen and sulphur, as kilo-equivalents) and nutrient nitrogen were predicted for all relevant habitat sites. These rates were then compared to the critical loads for the type and location of each habitat (in the interest of being conservative, the habitat with the lowest lower critical load has been selected).

4.5 Modelling points (specific locations shown on Figure 2) were selected to include key sensitive ecological receptors (see Table 3 and associated table notes). Modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats: TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; and TCC13 is sand dune. All of these modelling points are located within the boundary of the SSSI.

Air quality modelling data

Overview

4.6 The air quality modelling undertaken by ECL considered a number of different ecological receptors, which are listed in Table 3. As previously noted, modelling points TCC10 to TCC13 are the focus of this assessment as they relate to priority habitats that form part of the qualifying interest of the Teesmouth and Cleveland Coast SSSI.

4.7 The Critical Loads for deposition that have been used in the assessment are presented in Tables 1 and 2 for the habitat that have been considered.

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

***Table 3**: Ecological Receptors Considered for the Assessment (see Figure 2)*

ECL Receptor	Easting (X) [(a)]	Northing (Y) [(a)]	Distance from Source [(b)] (m)	Heading (degrees)
TCC10	450882	522960	3825	294
TCC11	453572	525627	4294	349
TCC12	451681	525099	4570	324
TCC13	456614	525978	5085	26

Notes to Table 3
(a) The European sites included were identified using the Multi-Agency Geographic Information System for the Countryside ("MAGIC") portal and via the EA's pre-application advice Nature and Heritage Conservation Screening Report (reference EPR/ZP3309LW/A001).
(b) Distances are measured as the crow flies from the approximate nearest point of the boundary of the ecological receptor / coastal priority habitat location to the 'Source'. The 'Source' is the approximate halfway location between the two emission points associated with the incinerator – location coordinates: 454379 (X), 521410 (Y).

Airborne NO_X, SO_2 and NH_3 concentrations

4.8 A summary of site-specific baseline concentrations of NO_X, SO_2 and NH_3, as provided by APIS, is presented in Table 4. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 3, i.e., the closest grid square to the point of the site used in the assessment. Comparison of the baseline data presented in Tables 4 and 5 with the Critical Load ranges presented in Tables 1 and 2 reveals that there is already exceedance of the Critical Load for most pollutants when considered in the absence of the proposed development.

***Table 4**: Baseline Concentrations of NO_X, SO_2 and NH_3*

ECL Receptor Reference	Background Concentration [(a)]			
	NO_X (µg/m^3)		SO_2 (µg/m^3)	NH_3 (µg/m^3)
	Annual Mean	24 Hour Mean [(b)]	Annual Mean	Annual Mean
TCC10	21.62	25.51	3.05	1.6
TCC11	41.45	48.91	2.38	1.71
TCC12	19.51	23.02	2.38	1.71
TCC13	21.52	25.39	0 [(c)]	0.89

Notes to Table 4
(a) Background concentrations for the relevant ecological habitats have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).
(b) The 24-hour mean baseline concentration is twice the annual mean multiplied by a factor of 0.59, in accordance with the H1 guidance.
(c) With APIS reporting a concentration of 0 µg/m, it is suspected this value is erroneous. In the interest of being conservative the SO2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m will be used for calculating the SO2 PECs for TCC13.

Table 5: Background Nutrient Nitrogen and Acid Deposition

ECL Receptor Reference	Nutrient Nitrogen Background (kgN/ha/yr) [(a)]	Acid Deposition Background - (keq/ha/yr) [(b)]		
		Total	Nitrogen	Sulphur
TCC10	8.96	1.19	1.03	0.2
TCC11	10.78	1.31	1.07	0.28
TCC12	10.78	1.31	1.07	0.28
TCC13	9.1	0.95	0.75	0.25

Notes to Table 5
(a) Background concentrations for nutrient nitrogen deposition have been taken from the APIS website (specifically the *APIS GIS map tool*) for the relevant grid square. The concentrations provided are the grid averages, with 2018 selected as the midyear for all sites with the exception of TCC13 (with 2016 being the latest available midyear).
(b) Background concentrations for acid deposition have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).

Deposition parameters - sensitive habitats

4.9 Deposition of nitrogen and acids at European sites was also included in the assessment. The pollutant deposition rates (as detailed in AQTAG06) for grassland were utilised for all European sites considered.

4.10 For acidification impacts, the deposition of oxides of nitrogen, ammonia, sulphur dioxide and hydrogen chloride are considered. For nutrient nitrogen, the deposition of the oxides of nitrogen and ammonia are included.

Table 6: Pollutant Emission Rates – Daily ELVs

Pollutant	**ELV [(a)(b)] (mg/Nm^3)**	**A1 & A2 (g/s)**
NOx as NO_2	120	5.06
SO_2	30	1.27
HCl	6	0.253
HF	1	0.0422
NH_3	10	0.422

Notes to Table 6
(a) Concentrations are at reference conditions i.e., 273K, 1 atmosphere, 11% oxygen, dry.
(b) Unless stated otherwise, the BAT-AEL[2]s have been used (new plant, high end).

Assessment of significance of impact guidelines – ecological receptors, Critical Levels and/or Loads

4.11 EA Operational Instruction 67_12[3] states that a detailed assessment is required where modelling predicts that the long-term Process Contribution (PC) is greater than 1% for European sites, and the Predicted Environmental Concentration (PEC) is greater than 70% for European sites. This guidance has been adopted for the assessment in relation to the SSSI.

4.12 For short-term emissions, modelling is required at European sites where the PC is greater than 10% of the critical level.

4.13 Following detailed assessment, if the PEC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no adverse effect for the receiving site.

4.14 Information presented on the APIS website for the Teesmouth and Cleveland Coast SSSI indicates that sand dunes and saltmarsh, which are habitats that may be used by some of the birds associated with the SSSI, are sensitive to nutrient nitrogen effects.

4.15 For northern shoveler and gadwall APIS reports that there is no comparable habitat with an established critical load estimate available. Furthermore the habitat that supports these species is typically P limited. The potential effects on northern shoveler and gadwall relate to food chain effects with nutrient inputs affecting the freshwater habitats that support the invertebrate/zooplankton that shoveler feed on. Modelling point TCC10 covers freshwater habitats and so the results of modelling at this point have been used to determine whether or not effects on shoveler need to be considered.

4.16 Examination of the coastal priority habitat mapping available on the MAGIC website indicates that dune grassland only occurs along the coast and not at any of the air quality modelling point (it is c.1.8 km north of TCC9). Table 22 shows that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near any of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs.

[2] Best Available Technique – Associated Emission Level

[3] EA Operational Instruction 67_12 Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation, V2, 27.3.15.

4.17 Information presented on the APIS website for the SSSI indicates that Sandwich tern, common tern and little tern are associated with dune habitat; however, there are no known dune nest sites located within the area that might be impacted by the operation of the ERF. Consequently, impacts on tern species are not considered further in this report.

4.18 Information presented on the APIS website for the SSSI indicates that sanderling, knot, ringed plover, avocet, redshank and shelduck are all associated with saltmarsh habitat. Modelling point TCC11 covers this habitat, which is present in SSSI management units 8 and 9. Breeding ruff is associated with hay meadows, which does not appear to be present within the study area (https://magic.defra.gov.uk/, accessed 11 January 2022). Wintering ruff is likely to be associated with saltmarsh habitat.

4.19 Information presented on the APIS website for the SSSI indicates that purple sandpiper is associated with littoral rock habitat, which is not sensitive to nitrogen deposition. Similarly APIS reports that grey seal is associated with inshore sublittoral rock, which is not sensitive to nitrogen deposition.

4.20 Examination of the coastal priority habitat mapping available on the MAGIC website indicates that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near most of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs.

4.21 Table 7 shows that no NOx exceedance of the long-term PC is predicted at modelling points TCC10, TCC11, TCC12 and TCC13. The data show that the background levels already exceed the long-term Critical Level in the absence of development.

4.22 Table 9 similarly shows no exceedance of the long-term PC for NH3 at modelling points TCC10, TCC11, TCC12 and TCC13.

4.23 Table 10 shows predicted exceedances for hydrogen fluoride, with exceedance of the 1% threshold possible at all modelling points except TCC11. The predicted exceedance ranges from 1.07% to 3.74%; however, even though hydrogen fluoride exceedance of the 1% threshold is predicted at all but one modelling location, the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. Reports in the public domain for similar assessments have used the 10% significance criterion for both the weekly and daily hydrogen fluoride PCs (Tim Heard, ECL, pers. comm.). As the guidance is somewhat vague and does not explicitly state whether the weekly CL should be treated as long-term or not, to adopt a conservative approach ECL has assessed the weekly PCs against the stricter 1% screening criterion.

4.24 Table 11 shows predicted exceedance for nitrogen deposition at modelling point TCC13. Predicted exceedance of the lower CL is 1.07%. Predicted exceedance of the upper CL is 1.34%. The data show that the background levels already exceed the lower CL, i.e., there is exceedance in the absence of development.

4.25 Table 8 below shows that there is no predicted exceedance for SO2 at any modelling points. Similarly Table 12 below shows that there is no predicted exceedance for acid deposition at any modelling points.

***Table 7**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	Long Term PC (µg/m^3)	Long Term Critical Level (CL) (µg/m^3)	Long Term PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Short Term PC (µg/m^3)	Short Term Critical Level (CL) (µg/m^3)	Short Term PC as a % of the CL (µg/m^3)
TCC10	0.119	30	0.40%	n/a	n/a	n/a	1.64	75	2.19%
TCC11	0.105		0.35%	n/a	n/a	n/a	1.33		1.77%
TCC12	0.0722		0.24%	n/a	n/a	n/a	1.26		1.68%
TCC13	0.246		0.82%	n/a	n/a	n/a	1.46		1.95%

4.26 A summary of maximum predicted GLCs of oxides of nitrogen at the modelling points is presented in Table 7. In accordance with the H1 guidance, the significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsar sites and SSSIs. Any significant impacts are highlighted in bold.

4.27 It can be seen from the data in Table 7 that the daily mean oxides of nitrogen PCs are all less 10% of the respective critical level and therefore, are not significant at all receptor locations. For the annual mean oxides of nitrogen PCs, the impact is also not significant (i.e., greater than 1% of the long-term critical level).

***Table 8**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	Long Term PC (µg/m^3)	Long Term Critical Level (CL) (µg/m^3)	Long Term PC as a % of the CL (µg/m^3)
TCC10	0.0262	20	0.13%
TCC11	0.0226		0.11%
TCC12	0.0153		0.08%
TCC13	0.0518		0.26%

4.28 A summary of maximum predicted GLCs of sulphur dioxide at the modelling points are presented in Table 8. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsar sites and SSSIs. In Table 8, any significant impacts are highlighted in bold.

4.29 It can be seen from the data in Table 8 that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all modelling points.

***Table 9**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	NH_3 (annual mean) - When Lichens and Bryophytes are not present					
	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
TCC10	0.00812	3	0.27%	n/a	n/a	n/a
TCC11	0.00701		0.23%	n/a	n/a	n/a
TCC12	0.00471		0.16%	n/a	n/a	n/a
TCC13	0.0159		0.53%	n/a	n/a	n/a

4.30 A summary of maximum predicted GLCs of ammonia at the modelling points are presented in Table in 9. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsar sites and SSSIs. Any significant impacts are highlighted in bold.

4.31 It can be seen from the data in Table 9 that the annual mean ammonia PCs are all less than 1% of the critical level at the modelling locations. The impact is not significant (i.e., greater than 1% of the long-term critical level) at any modelling point.

***Table 10**: Comparison of Maximum Predicted HF PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	Weekly PC (µg/m³)	Weekly Critical Level (CL) (µg/m³)	Weekly PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL	Daily PC (µg/m³)	Daily Critical Level (CL) (µg/m³)	Daily PC as a % of the CL (µg/m³)
TCC10	**0.00651**	0.5	**1.30%**	0.003*	0.01	2%	0.0140	5	0.28%
TCC11	0.00452		0.90%	n/a	n/a	n/a	0.0115		0.23%
TCC12	**0.00514**		**1.03%**	0.003*	0.01	2%	0.0106		0.21%
TCC13	**0.00533**		**1.07%**		0.01	2%	0.0126		0.25%

Notes to Table 10

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m³ with an elevated background of 0.003µg/m³ where there are local anthropogenic emission sources [(4)].

(4) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

4.32 A summary of maximum predicted GLCs of hydrogen fluoride at the modelling points are presented in Table 10. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsar sites and SSSIs. Any significant impacts are highlighted in bold.

4.33 It can be seen from the data in Table 10 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all modelling points.

4.34 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC10, TCC12 and TCC13 - and are therefore potentially significant. TCC11 is less than 1% of the critical level therefore no further assessment is required.

4.35 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources (5). In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

4.36 The maximum weekly HF PC are all less than 1% of the weekly critical level. It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

***Table 11**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at receptor locations TCC10-13*

ECL Receptor Ref.	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critical Load
TCC10	0.0542	8	10	0.68%	0.54%	n/a	n/a	n/a	n/a
TCC11	0.0470			0.59%	0.47%	n/a	n/a	n/a	n/a
TCC12	0.0318			0.40%	0.32%	n/a	n/a	n/a	n/a
TCC13	**0.107**			**1.34%**	**1.07%**	9.1	9.21	**115%**	92%

4.37 A summary of maximum predicted nutrient nitrogen deposition rates at the receptor locations related to the SSSI are presented in Table 11. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 3.12, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

(5) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

4.38 In Table 11, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

4.39 It can be seen from the data in Table 11 that there are predicted exceedances for nitrogen deposition at modelling point TCC13, with the remaining sites screening out as insignificant. This is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load (1.07%). Using the more conservative Critical Load range there are no PECs greater than 100%.

4.40 It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

***Table 12**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at receptor locations TCC10-13*

ADMS Ref.	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC 10	0.00386	1.03	0.00411	0.20	0.223	1.998	1.56	1.03	0.204	0.40%	n/a	n/a
TCC 11	0.00335	1.07	0.00354	0.28	0.223	1.998	1.56	1.07	0.284	0.34%	n/a	n/a
TCC 12	0.00226	1.07	0.00239	0.28	0.223	1.998	1.56	1.07	0.282	0.23%	n/a	n/a
TCC 13	0.00763	0.75	0.00808	0.25	0.223	1.998	1.56	0.758	0.258	0.79%	n/a	n/a

Notes to Table 12

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

4.41 A summary of maximum predicted acid deposition rates at the modelling points are presented in Table 12, with the deposition velocities for grassland utilised for all modelling points assessed.

4.42 In Table 12, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

4.43 It can be seen from the data in Table 12 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points.

Revised Modelling

4.44 In January 2022 ECL repeated the modelling work for the proposed ERF using different input parameters (ECL, 2022). This was in response to a decision by FCC Environment to design, build and operate the ERF based on these new parameters. Specifically the revised modelling was based on an Emissions Limit Value (ELV) for NOx of 100 mg/Nm^3 (reduced from an ELV for NOx of 120 mg/Nm^3 – see Table 6).

4.45 In addition, a new modelling point – TCC14 – was added (OSGR NZ 53880 26160). This modelling point is located within the SSSI immediately to the north of modelling point TCC11: it covers a location where saltmarsh and sand dune is present.

4.46 The revised modelling shows a slight reduction in the PCs for the scenarios where the NH_3 is at the BAT-AEL. For the scenarios where the NH_3 emission rate (at the HZI confirmed normal operating scenario concentration of 3.5 mg/Nm^3) a slight increase is observed due to the lowering of the NO_X from 120 mg/Nm^3 to 100mg/Nm^3. Overall, the results are fairly similar to the previous results discussed earlier in this report. For the modelled point TCC14 it displays similar PCs to that of the nearby TCC11: the PCs are slightly greater at TCC11 with the ERF modelled in isolation and are greater at TCC14 for the cumulative scenario.

4.47 The revised modelling data (Table 24 in ECL, 2022) show that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all monitoring points considered.

4.48 The revised modelling data (Table 25 in ECL, 2022) show that the annual mean ammonia PCs are all less than 1% of the critical level at modelling points TCC10-TCC14. The PECs as a percentage of the annual critical level are all less than 100% of the critical level. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

4.49 The revised modelling data show negligible change for hydrogen fluoride compared to the data presented in Table 10. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

4.50 The revised modelling data (Table 27 in ECL, 2022) show that there are predicted exceedances for Nitrogen deposition at modelling points TCC13, with the remaining sites screening out as insignificant. At these modelling locations the lower Critical Load is exceeded for Coastal stable dune grasslands (calcareous type) (i.e., a Critical Load range of 10-15 kgN/ha/yr). However, the upper Critical Load is not exceeded at any monitoring points. The PECs have been calculated for the modelling points where exceedance is identified and all are less than 100% of the critical level. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

4.51 The revised modelling data (Table 28 in ECL, 2022) show that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points. Following the calculation of the PECs for the modelled points with potentially significant PCs on acid deposition rates, all PECs are less than 100% of the critical load. It can therefore be assumed that there will be no adverse effects on these sites.

In-combination assessment

4.52 ECL has carried out a cumulative assessment, the methods and detailed results being presented in a separate report (ECL, 2021).

4.53 In addition to the effect of the proposed ERF, there are several other developments in the surrounding area which may have an effect on ecological receptors when considered in combination. Existing emissions within the area are considered to already be accounted for in background air quality data.

4.54 The developments that ECL were aware of (at the time of writing), but which have been excluded from the assessment for the reasons given are as follows:

- Potential new Energy from Waste ("EfW") site opening in 2026 at the former SSI steelworks site, which is situated approximately 1.6 km east-north-east from the proposed FCC Installation. This information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Dockside Road (1) and Dockside Road (2) Teeside Renewable Energy Centre, operated by PD Ports, is expected to be operational within the next few years. Situated approximately 1.7 km to the west of the proposed development, this information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Wilton 11 EfW, operated by Suez / Sembcorp is situated approximately 2.1 km east from the proposed development. Despite being operational since around 2018, no data are publicly available in relation to the input data required to model the site. An information request has been sent by ECL to the EA; however, at time of writing no suitable data were available.
- Haverton Hill household waste recycling centre and North East Energy Recovery Centre, both operated by Suez, are located approximately 6.5 km to the west from the proposed development. It is considered by ECL, given their distance from the proposed development, that it will not be necessary to include them in the cumulative assessment.
- Tees Eco Energy, which is currently proposed (planning and permitting granted). This site is situated approximately 6.7 km to the west from the proposed development. It is considered, given the distance of Tees Eco Energy from the proposed development, that it will not be necessary to be include it in the cumulative assessment.

4.55 The development that has been included in the cumulative assessment is the Redcar Energy Centre ("REC"). The REC will be situated at land formerly occupied by Redcar Bulk Terminal (approximately 4.8 km to the north of the proposed development) and is due to be commissioned circa 2024 to 2025. Consequently, the emissions arising from the two stacks associated with its two process lines have been incorporated into the cumulative impact assessment undertaken as part of this study. This has been carried out making use of the emissions data disclosed in the air quality chapter submitted as part of the planning application documentation for REC[6].

[6] Planning Application Reference Number: R/2020/0411/FFM. Available online via: https://planning.redcar-cleveland.gov.uk/Planning/Display?applicationNumber=R%2F2020%2F0411%2FFFM

***Table 13**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL	Short Term PC (µg/m³)	Short Term Critical Level (CL) (µg/m³)	Short Term PC as a % of the CL (µg/m³)
TCC10	0.159	30	0.53%	n/a	n/a	n/a	1.69	75	2.26%
TCC11	0.253		0.84%	n/a	n/a	n/a	4.29		5.72%
TCC12	0.145		0.48%	n/a	n/a	n/a	2.01		2.68%
TCC13	**0.861**		**2.87%**	21.52	22.38	75%	5.18		6.91%

4.56 A summary of maximum predicted GLCs of oxides of nitrogen at the modelling points is presented in Table 13. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively. Any significant impacts are highlighted in bold.

4.57 It can be seen from the data in Table 13 that the daily mean oxides of nitrogen PCs are all less than 10% of the respective critical level and therefore, are not significant at the four receptor locations identified in relation to the SSSI.

4.58 For the annual mean oxides of nitrogen PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. Consequently, the PECs have been calculated for these receptors. Using the background NO_X concentrations the PEC assessment for TCC13 is shown in Table 13.

4.59 It can be seen from the results in Table 13, that for TCC13 there will be no adverse effect (i.e., the PECs are less than 100% of the critical level).

4.60 The results of revised modelling carried out by ECL in 2022 (Table 43 in ECL, 2022) show similar results, i.e., that no adverse effect can be assumed for the modelling points (i.e., the PECs are less than 100% of the critical level).

***Table 14**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
TCC10	0.0399	20	0.20%	n/a	n/a	n/a
TCC11	0.0634		0.32%	n/a	n/a	n/a
TCC12	0.0362		0.18%	n/a	n/a	n/a
TCC13	**0.215**		**1.08%**	2.38	2.60	13%

4.61 A summary of maximum predicted GLCs of sulphur dioxide at the modelling points are presented in Table 14. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for four receptor locations identified in relation to the SSSI. Any significant impacts are highlighted in bold.

4.62 It can be seen from the data in Table 14 that, with the exception of TCC13, the annual mean sulphur dioxide PCs are all less than 1% of the critical levels and therefore are not significant at modelling points TCC10, TCC11 and TCC12.

4.63 For the annual mean sulphur dioxide PC, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. It should be noted that the latest background SO_2 concentration at TCC13, as reported by APIS, is 0 µg/m^3. However, it is suspected this value is erroneous and in the interest of being conservative the SO_2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m^3 has been used for calculating the SO_2 PEC for TCC13.

4.64 Consequently, with a PEC of 2.60 µg/m^3 (or 13% of the critical level) at TCC13, it can be assumed there will be no adverse effect (i.e., the PEC is less than 100% of the critical level).

4.65 The revised modelling data from 2022 show a similar result (ECL, 2022).

***Table 15**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	NH_3 (annual mean) - When Lichens and Bryophytes are NOT present					
	Long Term PC (µg/m^3)	Long Term Critical Level (CL) (µg/m^3)	Long Term PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL
TCC10	0.0133	3	0.44%	n/a	n/a	n/a
TCC11	0.0211		0.70%	n/a	n/a	n/a
TCC12	0.0121		0.40%	n/a	n/a	n/a
TCC13	**0.0717**		**2.39%**	0.89	0.962	32%

4.66 A summary of maximum predicted GLCs of ammonia at the four receptor locations identified in relation to the SSSI are presented in Table 15. The significance of the impacts has been determined using the 1% criteria for long-term predictions. Any significant impacts are highlighted in bold.

4.67 It can be seen from the data in Table 15 that, with the exception of TCC13) the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the modelling points assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. Consequently, PECs will need to be calculated for this receptor.

4.68 Using the relevant background NH_3 concentrations, the PEC assessment for TCC13 is shown in Table 15. As displayed by the results in Table 15 it can be assumed that there will be no adverse effect on the SSSI (i.e., the PEC is less than 100% of the critical level).

4.69 The revised modelling data from 2022 show a similar result (ECL, 2022 – Tables 45 and 46). For all modelling points it can be assumed that there will be no adverse effect on the ecological sites assessed (i.e., the PECs are all less than 100% of the critical level).

***Table 16**: Comparison of Maximum Predicted HF PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	Weekly PC (µg/m^3)	Weekly Critical Level (CL) (µg/m^3)	Weekly PC as a % of the CL (µg/m^3)	Background (µg/m^3)	PEC (µg/m^3)	PEC as %age of CL	Daily PC (µg/m^3)
TCC10	**0.00656**	0.5	**1.31%**	0.003*	0.00956	1.91%	0.0141
TCC11	**0.0135**		**2.70%**		0.0165	3.30%	0.0355
TCC12	**0.00769**		**1.54%**		0.0107	2.14%	0.0166
TCC13	**0.0177**		**3.55%**		0.0207	4.15%	0.0428

Notes to Table 16

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m^3 with an elevated background of 0.003µg/m^3 where there are local anthropogenic emission sources [7].

4.70 A summary of maximum predicted GLCs of hydrogen fluoride at the four receptor locations identified in relation to the SSSI are presented in Table 16. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for the SSSI. Any significant impacts are highlighted in bold.

4.71 It can be seen from the data in Table 16 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all modelling points.

4.72 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC10 - TCC13, inclusive, and are therefore potentially significant.

4.73 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources [8]. In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

4.74 The maximum weekly HF PC for the four modelling points listed in Table 16 occurs at TCC13 and therefore the worst-case PEC would be 0.0177 µg/m^3 (or 3.55% of the weekly critical level). It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

4.75 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

(7) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

(8) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

***Table 17**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critical Load
TCC10	0.0688	8	10	0.86%	0.69%	n/a	n/a	n/a	n/a
TCC11	**0.118**			**1.48%**	**1.18%**	10.78	10.90	**136%**	**109%**
TCC12	0.0630			0.79%	0.63%	n/a	n/a	n/a	n/a
TCC13	**0.421**			**5.26%**	**4.21%**	9.1	9.52	**119%**	95%

4.76 A summary of maximum predicted nutrient nitrogen deposition rates at the receptor locations TCC10-13 are presented in Table 17. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 3.12, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

4.77 In Table 17, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on the SSSI) of the critical load are highlighted in bold.

4.78 It can be seen from the data in Table 17 that there are predicted exceedances for nitrogen deposition at modelling point TCC11 and TCC13, with the remaining sites screening out as insignificant. This is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load (1.18% at TCC11 and 4.21% at TCC13).

4.79 If the Critical Load range is considered for Coastal stable dune grasslands (calcareous type), the PEC is only greater than 100% for the lower Critical Load (10 kgN/Ha/yr) at TCC11. It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

4.80 The revised modelling completed in 2022 shows similar results (Table 48 in ECL, 2022). There are predicted exceedances for lower critical load for Nitrogen deposition at modelling points TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant (a Critical Load range of 10-15 kgN/ha/yr has been considered). There are only predicted exceedances for the upper critical load for Nitrogen deposition at modelling points TCC13 and TCC14.

4.81 The PEC as a percentage of the lower Critical Load is only exceeded at TCC11 and TCC14 (109%). No PECs as a percentage of the upper Critical Load are exceeded. At these modelling points the baseline already exceeds the lower Critical Load.

***Table 18**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at receptor locations TCC10-13 – In-combination*

ADMS Ref.	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC 10	0.00490	1.03	0.00520	0.20	0.223	1.998	1.56	1.03	0.205	0.51%	n/a	n/a
TCC 11	0.00842	1.07	0.00894	0.28	0.223	1.998	1.56	1.08	0.289	0.87%	n/a	n/a
TCC 12	0.00448	1.07	0.00475	0.28	0.223	1.998	1.56	1.07	0.285	0.46%	n/a	n/a
TCC 13	0.0299	0.75	0.0318	0.25	0.223	1.998	1.56	0.78	0.282	**3.09%**	1.06	53%

Notes to Table 18

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

4.82 A summary of maximum predicted acid deposition rates at the identified modelling points are presented in Table 18, with the deposition velocities for grassland utilised for all four receptor locations identified in relation to the SSSI assessed.

4.83 In Table 18, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on the SSSI) of the critical load are highlighted in bold.

4.84 It can be seen from the data in Table 18 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC13.

4.85 Following the calculation of the PECs, for the modelled points with potentially significant PCs on acid deposition rates, it can be seen from the data in Table 18 that the PECs are all less than 100% of the critical load. It can therefore be assumed that there will be no adverse effects on receptors at these locations.

4.86 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

Revised air quality modelling data

4.87 A meeting was held with Natural England on 24 November 2021 during which ECL advised that NH_3 was the main contributor to nitrogen deposition arising from the proposed development. ECL noted that the modelling approach that had been adopted, where emission rates for NOx and NH_3 had been calculated from Best Available Technique – Associated Emission Levels (BAT-AELs), was likely to have over-estimated actual NH_3 emissions. It was therefore agreed that further modelling would be carried out using actual emissions data from a similar operational facility at the Resource and Energy Recovery Centre at Millerhill, Edinburgh. Further details of the modelling approach are provided in a separate report (ECL, 2021).

4.88 The revised modelling has considered the habitats with the lowest lower and upper critical loads, i.e., a precautionary approach has been adopted. The results of the revised modelling using data from the Millerhill facility show that the revised NH_3 emission rates at all modelling points are less than 1% of the critical load (Table 19). In accordance with published guidance[9], the impacts can therefore be considered insignificant.

***Table 19**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC10 – TCC13 (Installation Only)*

ADMS Ref.	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)
TCC10	8	10	0.0239	0.298%	0.239%	n/a	n/a
TCC11			0.0216	0.270%	0.216%	n/a	n/a
TCC12			0.0164	0.205%	0.164%	n/a	n/a
TCC13			0.0492	0.615%	0.492%	n/a	n/a
TCC14			0.0204	0.254%	0.204%	n/a	n/a

Notes to Table 19

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

4.89 ECL has created isopleths based on the revised modelling data (ECL, 2021). Figure 3 (reproduced from ECL, 2021) provides the nutrient nitrogen deposition rates in the area surrounding the modelled points.

[9] Environment Agency online guidance advises that if the short-term PC is less than 10% of the short-term environmental standard and the long-term PC is less than 1% of the long-term environmental standard it can be screened out as insignificant. See https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pcs.

4.90 In addition, Figure 4 has been included to allow for comparison to be made between the NH_3 emissions at the revised concentration and the NH_3 emissions at the BAT-AELs.

4.91 In Figures 3 and 4, the ecological receptors are represented by the pink annotated pins and the Installation as the red annotated circle. The results displayed are for the worst-case met year for the maximum GLC.

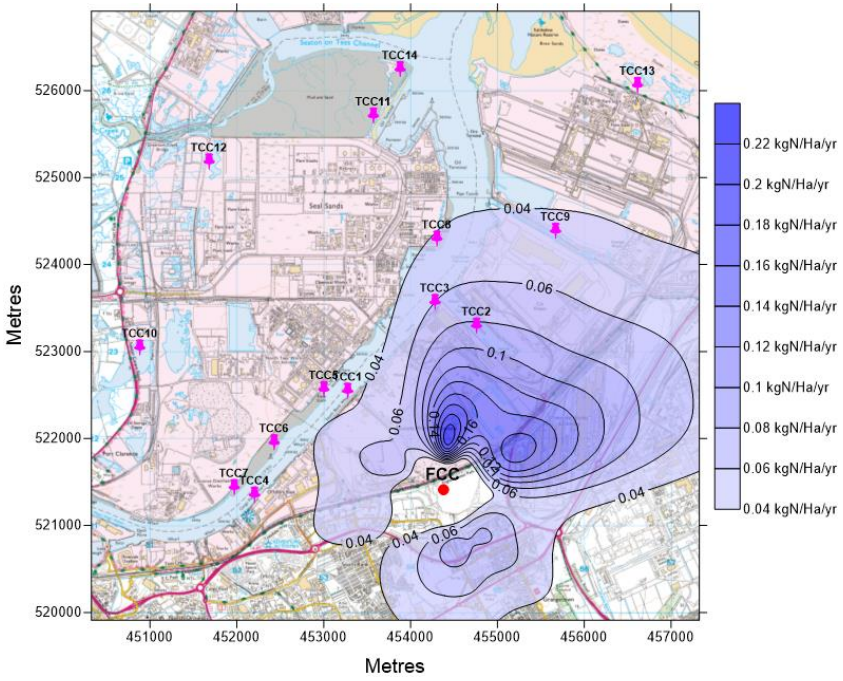


***Figure 3**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (Revised NH_3 Emission Rate) – Met Year 2020 (Source: ECL, 2021)*

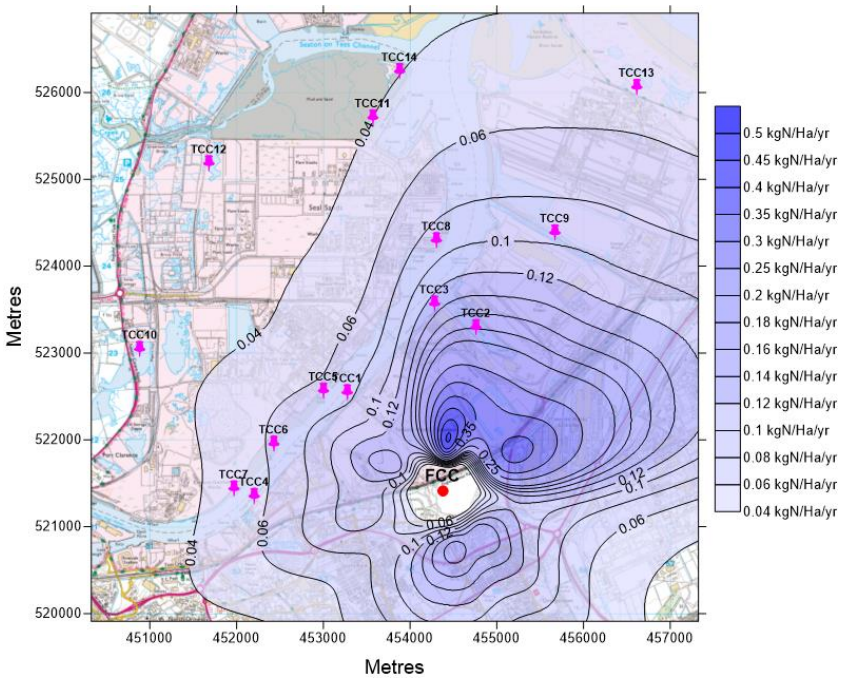


***Figure 4**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (NO_X & NH_3 at BAT-AELs) – Met Year 2020 (Source: ECL, 2021)*

4.92 Modelling of the proposed facility in-combination with the Redcar Energy Centre (REC) shows that there are exceedances predicted for nitrogen deposition at modelling points TCC11, TCC13 and TCC14 (Table 20). It should be noted that emission rates for NOx and NH_3 had been calculated from BAT-AELs for REC, and are also likely to have over-estimated actual NH_3 emissions.

***Table 20**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC10 – TCC13 (Installation + REC)*

ADMS Ref.	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC as % of Lower Critical Load	PEC as a% of Upper Critical Load
TCC10	8	10	0.0397	0.496%	0.397%	n/a	n/a	n/a	n/a
TCC11			0.0919	**1.15%**	0.919%	10.78	10.87	**136%**	**109%**
TCC12			0.0475	0.593%	0.475%	n/a	n/a	n/a	n/a
TCC13			0.382	**4.77%**	**3.82%**	9.1	9.48	**119%**	95%
TCC14			0.125	**1.56%**	**1.25%**	10.78	10.91	**136%**	**109%**

Notes to Table 27

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

4.93 In Table 20, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on the SSSI) of the critical load are highlighted in bold.

4.94 The data presented in Table 20 show that there are predicted exceedances for Nitrogen deposition at modelling points TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant. Where there are predicted exceedances of the critical load, these are 1.15%, 4.77% and 1.56% of the lower critical load and 3.82% (TCC13) and 1.56% (TCC14) of the upper critical load.

4.95 As noted in section 3.12, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has also been considered (instead of 8-10 kgN/ha/yr for acid type dunes). If the more conservative Critical Load range is applied, there is only exceedance of the lower Critical Load at TCC13 (3.82%) and TCC14 (1.25%). The upper Critical Load is only exceeded at TCC13. When the PEC is considered the only PECS that exceed 100% are for the lower Critical Load at TCC11 and TCC14.

4.96 It is important to note that the background levels are already elevated and exceed the lower critical load in the absence of the development (at TCC11 and TCC14).

4.97 The proposed development operating in isolation does not lead to a breach of the relevant nutrient nitrogen critical loads for any of the modelled points assessed. It is only the cumulative impact of both installations operating simultaneously that result in the exceedances shown in Table 20.

4.98 Table 21 demonstrates the predicted nutrient nitrogen deposition rates associated with the three scenarios that have been modelled by ECL, i.e., the Installation in isolation, REC in isolation and the cumulative scenario of the Installation's and REC's emissions.

***Table 21**: Predicted Nutrient Nitrogen Deposition Rates at Sensitive Habitat Sites (TCC10 – TCC13) For Three Scenarios*

ADMS Ref.	Nutrient Nitrogen Deposition Rate [(a)] [(b)] (kgN/ha/yr)		
	Installation Only	REC Only	Installation + REC
TCC10	0.0239	0.0310	0.0397
TCC11	0.0216	0.0714	0.0919
TCC12	0.0164	0.0356	0.0475
TCC13	0.0492	0.356	0.382
TCC14	0.0204	0.105	0.125

Notes to Table 21
(a) Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).
(b) The NO_X and NH_3 emission rates for both the Installation and REC are as discussed in Section 10.4.1 of ECL (2021).

4.99 The results presented in Table 21 show that, overall, the predicted nutrient nitrogen deposition rates for the REC are greater than those for the Installation.

4.100 ECL (2021) note that the '*greater predicted deposition rate associated with the REC scenario is largely due to REC's closer proximity to a number of the specified ecological points (TCC11 and TCC13, in particular)*'. In addition, they also note that '*the emission rates for REC are based on the BAT-AELs*' and therefore it follows that '*When accounting for normal day to day operation, it is anticipated that the actual emission rates for REC, particularly in regard to NH_3, are likely to be lower, as is the case with the FCC Installation*'.

4.101 ECL has produced isopleths (Figure 5) for nutrient nitrogen deposition rates for the installation in combination with REC. In addition, Figure 6 has been included to allow for comparisons to be made between the cumulative emissions with the Installation's actual NH_3 concentration, compared to the BAT-AELs.

4.102 In Figures 5 and 6, the ecological receptors are represented by the pink annotated pins and the Installation and REC as the red annotated circles. The results displayed are for the worst-case met year for the maximum GLC.

***Figure 5**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation (with revised NH3) + REC – NWP 2020 (Source: ECL, 2021)*

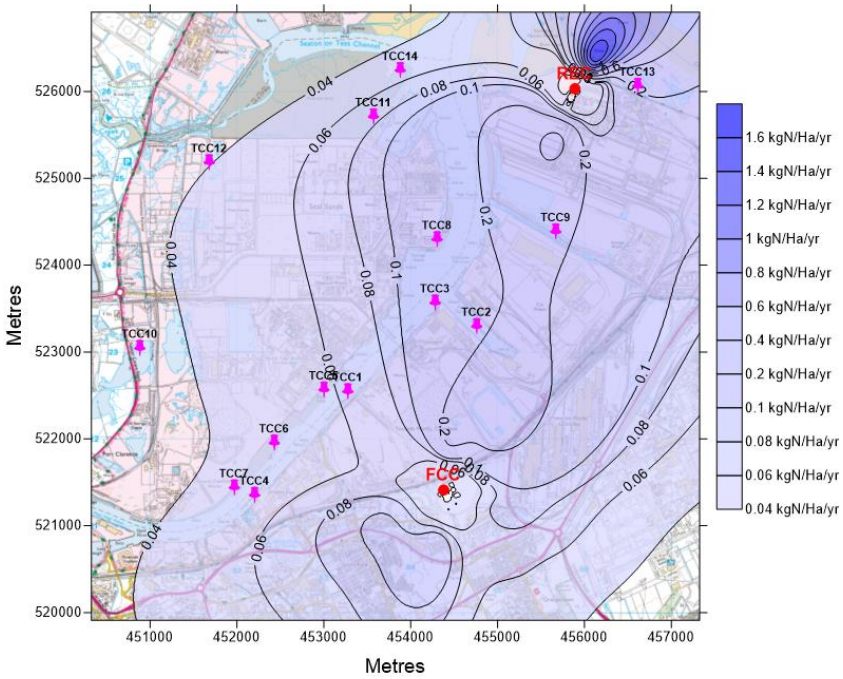
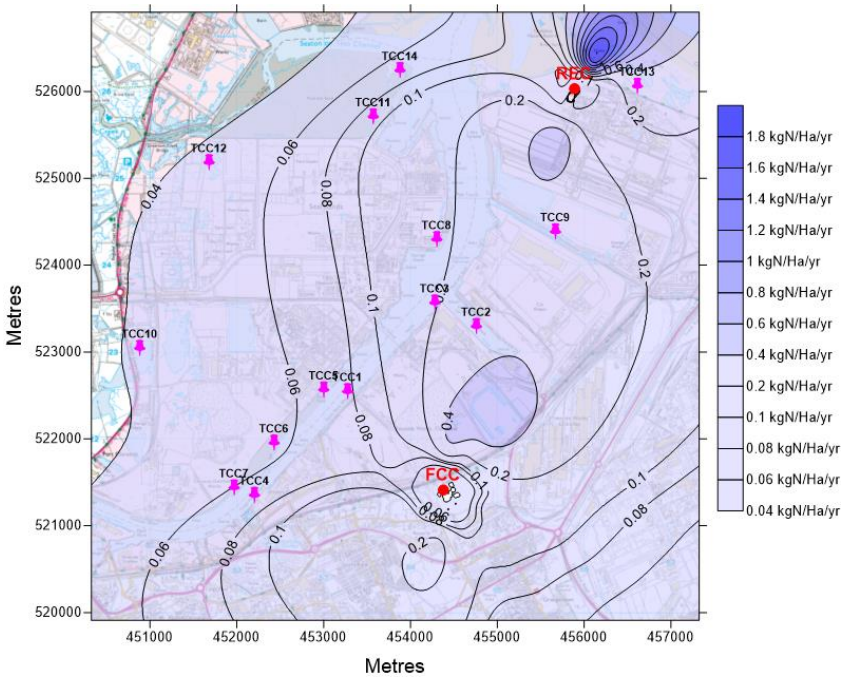


***Figure 6**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation + REC (BAT-AELs) – NWP 2020 (Source: ECL, 2021)*



Habitat sensitivity at modelling point

4.103 Table 22 provides an evaluation of the points where modelling has identified a potential exceedance of a critical load or level. In each case the habitats present are identified and related to the qualifying features (birds) of the SSSI. The locations of all air quality modelling points are shown on Figure 2.

4.104 Mapping presented on the MAGIC website shows the locations of coastal priority habitats in relation to the site. It should be noted that the only coastal priority habitat that occurs within the inner and central estuary is intertidal mudflats – all other coastal priority habitats are located at the coast or the extreme outer part of the estuary.

4.105 As previously noted, TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; and TCC13 is sand dune. TCC10 to TCC13 are all located within the boundary of the Teesmouth and Cleveland Coast SSSI. TCC14, which is located close to TCC11, is saltmarsh and sand dune.

***Table 22**: Evaluation of modelling points TCC10 to TCC13*

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC10		TCC10 is a saline lagoon located at Saltholme (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saline lagoon habitat to the development site. The modelling point is approximately 3.6 km to the west-north-west of the Site.	The only exceedance predicted at this location is hydrogen fluoride (1.30% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point.
TCC11 TCC14		TCC11 is saltmarsh located at Seal Sands (as mapped on the MAGIC website). Natural England has also advised that sand dune is present and Ian Bond (INCA – email dated 12 January 2022) has advised that there is a narrow fringe of dune present. TCC14 is located on the saltmarsh and sand dune habitat to the north of TCC11.	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. The modelling point is approximately 4.3 km to the north-west of the Site.	The cumulative assessment predicts that nitrogen deposition will be 0.118 kgN/ha/yr, which is 1.48% of CL (lower) and 1.18% of CL (upper); the PEC is 136% of CL (lower) and 109% of CL (upper). However, the background concentration is 10.78 kgN/ha/yr, which exceeds the CL (lower and upper). These figures have been calculated for 'Coastal stable dune grasslands - acid type'. For pioneer low-mid mid-upper saltmarsh the nitrogen CL range is 10-20 kg N/ha/yr, i.e., the cumulative impact will be of lower significance.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC12		TCC12 is saltmarsh located close to Seal Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. The modelling point is approximately 4.7 km to the north of the Site.	The only exceedance predicted at this location is hydrogen fluoride (1.03% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point
TCC13		TCC13 is coastal sand dune located at Coatham Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of coastal sand dune habitat to the development site. The modelling point is approximately 4.8 km to the north-east of the Site.	When the development is considered alone nitrogen deposition is predicted to be 0.107 kgN/ha/yr, which is 1.34% of CL (lower) and 1.07% of CL (upper); the PEC is 115% of CL (lower) and 92% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.421 kgN/ha/yr, which is 5.26% of CL (lower) and 4.21% of CL (upper); the PEC is 119% of CL (lower). However, the background concentration is 9.10 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type'[10], which is a habitat that is present at or near this modelling point. It is also noted the background concentration already exceeds the CL (lower) in the absence of the development. The PEC does not exceed the CL (upper). Exceedance is predicted at this location for hydrogen fluoride (1.07% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point.

[10] The APIS website advises the following for 'Coastal stable dune grasslands - acid type': 1. Potential negative impact on species due to impacts on the species' broad habitat. 2. Potential positive impact on species due to impacts on the species' food supply.

Nitrogen deposition to the River Tees and Tees Estuary

4.106 During the consultation meeting on 24 November 2021, Natural England advised that the assessment needs to consider nitrogen deposition to the River Tees and Tees Estuary. Their concern was that nitrogen deposition may contribute to nutrient enrichment of the water, which Natural England has advised is resulting in the formation of algal mats on mudflats (which makes it difficult for some birds to feed).

4.107 It is estimated that the area of the river and estuary downstream of the transporter bridge (OSGR NZ 49989 21308 – this is estimated to mark the extent of potentially significant effects) is approximately 880 ha. Extrapolating the data shown on Figure 36 in ECL (2021) a worst-case nitrogen deposition of 0.08 kg/Ha/yr has been assumed for the whole river and estuary area. This equates to total nitrogen deposition of 70.4 kg/yr for the whole river and estuary area. If it is assumed that the average depth of the estuary is 1 m (which is likely to be an under-estimate) this equates to 70.4 kg nitrogen deposition in 8.8 million m3 or 8 mg/m3, which is equivalent to 0.008mg/l.

4.108 Water quality monitoring of the Tees Estuary at Smiths Dock (https://environment.data.gov.uk/water-quality/view/sampling-point/NE-45400834) reported dissolved organic nitrogen levels that ranged from 0.76 mg/l (31 March 2021) to 3.49 mg/l (5 March 2021). The estimated total nitrogen deposition therefore equates to between 0.23% and 1.05% of the baseline dissolved organic nitrogen levels.

4.109 The above calculation is necessarily extremely crude and does not account for factors such as river flow, discharge, tidal mixing etc. Nevertheless it does demonstrate that deposition arising from the proposed development will make an insignificant contribution to nitrogen levels in the river and estuary based on current baseline levels.

5 Conclusion

5.1 Air quality modelling has been carried out by ECL for the proposed ERF using a total of fourteen modelling points. The choice of air quality modelling points includes sensitive habitats within the boundary of the Teesmouth and Cleveland Coast SSSI. TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; TCC13 is sand dune; and TCC14 is saltmarsh and sand dune.

5.2 Air quality modelling has predicted small exceedances for nitrogen deposition at modelling points TCC11, TCC13 and TCC14. The exceedance has been predicted based on information available on the APIS website, i.e., effects have been considered for 'Coastal stable dune grasslands (acid type)' where the Critical Load of 8-10 kgN/Ha/yr is exceeded.

5.3 This is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 and TCC14 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has also been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

5.4 Based on this higher Critical Load range there would only be an exceedance of the Lower Critical Load for one receptor (TCC11) and only when it is considered in combination with the anticipated emissions from the Redcar Energy Centre.

5.5 Small exceedances are also predicted for NOx (modelling point TCC13), SO_2 (modelling point TCC13) and NH_3 (modelling point TCC13). In all cases the exceedances of the 1% threshold are small; however, the PEC is less than 100% of the critical level and so it can be assumed that there will be no adverse effect.

5.6 Whilst exceedances of the 1% threshold are predicted for hydrogen fluoride (at modelling points TCC10, TCC12 and TCC13), the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. No exceedance is predicted for SO_2 or acid deposition.

5.7 Overall, it is concluded that the small increase in nitrogen deposition are not likely to have an adverse effect on the conservation status of any qualifying habitat and hence the integrity of the Teesmouth and Cleveland Coast SSSI. This conclusion has been reached through consideration of changes against a baseline where there is exceedance of the lower Critical Load / Level for these pollutants.

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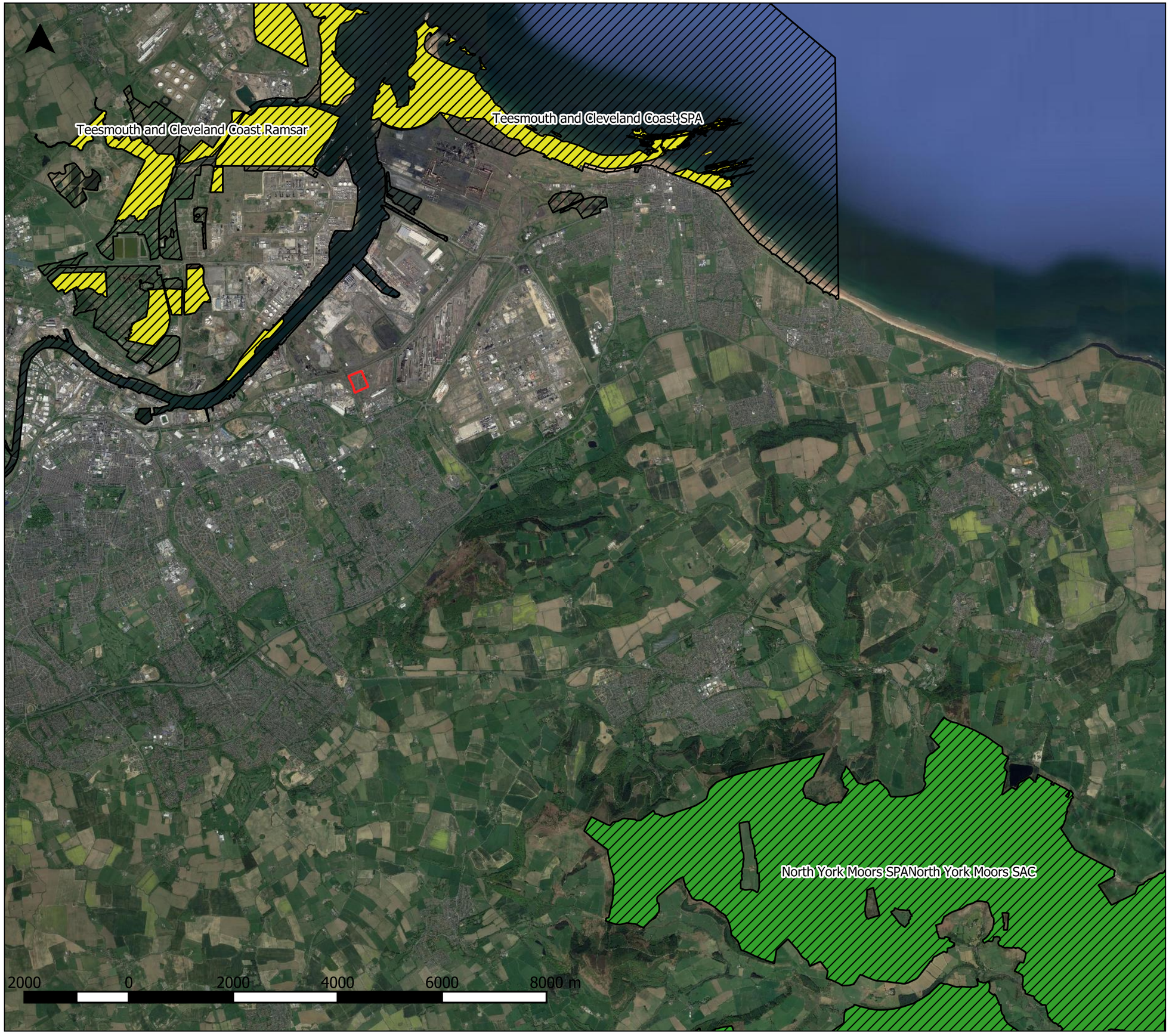
7 Figures

Figure 1: Location plan showing European designated sites (the Teesmouth and Cleveland Coast SSSI covers the same area as the SPA and Ramsar site combined)



Legend

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar
- Site boundary

BSG | ecology

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JOB REF: P20-1004

PROJECT TITLE

Grangetown Prairie Energy Recovery Facility

DRAWING TITLE

Figure 1: Site Location

DATE: 19.8.2021 SCALE: 1:7,000

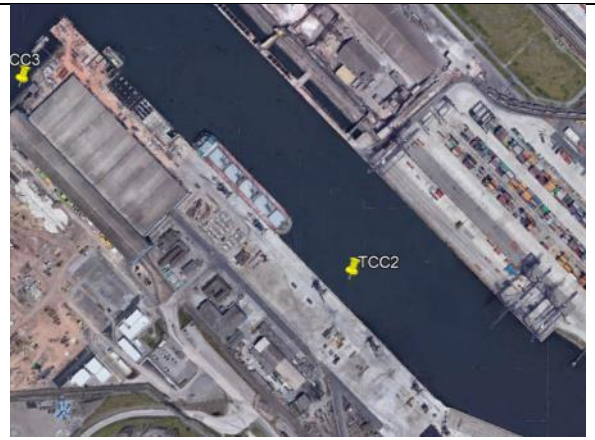
DRAWN: HB STATUS: Final

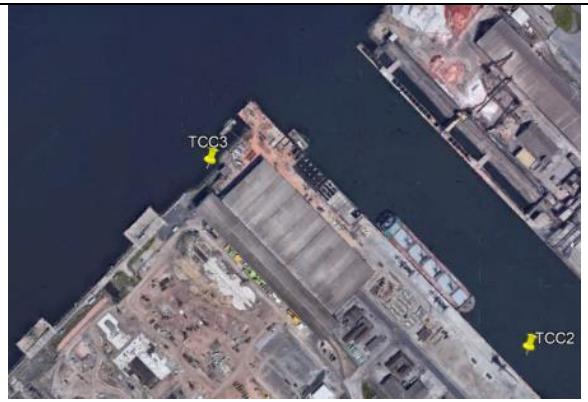
Document path

Figure 2: Air quality modelling locations

(Source: ECL, 2022)

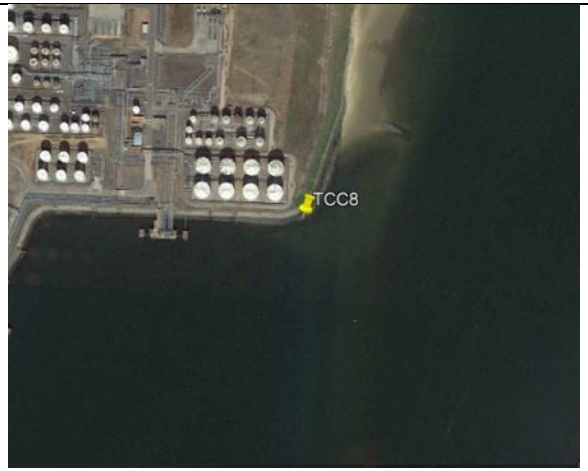
***Table 29**: Evaluation of modelling points*

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC1		TCC1 is located on a section of the estuary where there is a quay consisting of a raised deck supported on pillars. There appears to be minimal if any intertidal habitat – images on Google Earth Pro show water alongside the quay whilst other areas are exposed at low tide (for example TCC5 on the screen capture to the left).	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat with small areas present between the quay platform and the shore and on the north side of the estuary (at TCC5). Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.110 kgN/ha/yr, which is 1.37% of CL (lower) and 1.10% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.139 kgN/ha/yr, which is 1.73% of CL (lower) and 1.39% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC2		TCC2 is located within the Tees Dock which is a facility characterized by reinforced dock walls. There appears to be no intertidal habitat (which is expected for a key dock facility) – images on Google Earth Pro show water alongside the quay whilst elsewhere in the estuary intertidal habitats are shown as being exposed. The same images also indicate that the dock has been a busy facility.	Examination of the Government's MAGIC mapping website shows that there are no coastal priority habitats within or near the dock: the nearest coastal priority habitats are small localised areas of intertidal mudflat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.210 kgN/ha/yr, which is 2.62% of CL (lower) and 2.10% of CL (upper); the PEC is 115% of CL (lower) and 92% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.287 kgN/ha/yr, which is 3.59% of CL (lower) and 2.87% of CL (upper); the PEC is 116% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				For NOx the PC is predicted to be 0.477 ug/m^3: this is 1.59% of CL and PEC is 121% of CL. The cumulative assessment shows that for NOx the PC is predicted to be 0.662 ug/m^3: this is 2.21% of CL and PEC is 121% of CL. However, the background concentration is 35.78 ug/m^3, which exceeds the CL. The CL[18] for open water and its associated vegetation has been used for this assessment; however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC3		TCC3 is located on the southern bank of the main estuary close to the Tees Dock. The quayside appears to be characterized by a boulder reinforced slope with adjacent sections with retaining walls. There appears to be no or very limited intertidal habitat (which is expected for the adjacent dock facilities) – images on Google Earth Pro show water alongside the quay whilst elsewhere in the estuary intertidal habitats are shown as being exposed.	Examination of the Government's MAGIC mapping website shows that there are no coastal priority habitats near the modelling point: the nearest coastal priority habitats are small localized areas of intertidal mudflat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.143 kgN/ha/yr, which is 1.79% of CL (lower) and 1.43% of CL (upper); the PEC is 114% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.201 kgN/ha/yr, which is 2.51% of CL (lower) and 2.01% of CL (upper); the PEC is 115% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website. For NOx the PC is predicted to be 0.301 ug/m^3: this is 1.003% of CL and PEC is 120% of CL. The cumulative assessment shows that for NOx the PC is predicted to be 0.433 ug/m^3: this is 1.44% of CL and PEC is 121% of CL. However, the background concentration is 35.78 ug/m^3, which exceeds the CL. The CL for open water and its associated vegetation has been used for this assessment;

[18] The APIS website advises the following for littoral and supralittoral sediments 1. No expected negative impact on species due to impacts on the species' broad habitat. 2. Potential positive impact on species due to impacts on the species' food supply.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC4		TCC4 is located on a section of the estuary where there is a reinforced bank with adjacent sections with reinforced quay walls. There appears to be minimal if any intertidal habitat at the modelling location – images on Google Earth Pro show water alongside the bank whilst other areas are exposed at low tide (for example TCC7 on the screen capture to the left).	Examination of the Government's MAGIC mapping website shows that no coastal priority habitat is present near the modelling location but intertidal mudflat is present along the northern side of the estuary with small areas of this habitat to the west and east along the southern side of the estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	The cumulative assessment predicts that nitrogen deposition will be 0.0857 kgN/ha/yr, which is 1.07% of CL (lower) and 0.86% of CL (upper); the PEC is 113% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC5		TCC5 is located on a section of the estuary where intertidal mudflats are exposed at low tide. No other coastal priority habitats are thought to be present.	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.103 kgN/ha/yr, which is 1.29% of CL (lower) and 1.03% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.129 kgN/ha/yr, which is 1.61% of CL (lower) and 1.29% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC6 & TCC7		TCC6 and TCC7 are located on a section of the estuary where an area of intertidal mudflats is exposed at low tide. No other coastal priority habitats are thought to be present.	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone for TCC6 nitrogen deposition is predicted to be 0.110 kgN/ha/yr, which is 1.38% of CL (lower) and 1.10% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment for TCC6 predicts that nitrogen deposition will be 0.132 kgN/ha/yr, which is 1.65% of CL (lower) and 1.32% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC8		TCC8 is located on the northern bank of the main estuary close to the Tees Dock. The bank appears to be a mixture of boulder reinforced slope with adjacent sections with concrete revetment. The location is on the edge of an area of intertidal mudflats (as mapped on the MAGIC website).	Examination of the Government's MAGIC mapping website shows that intertidal mudflat is the only coastal priority habitat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.098 kgN/ha/yr, which is 1.23% of CL (lower) and 0.98% of CL (upper); the PEC is 113% of CL (lower) and N/A for CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.183 kgN/ha/yr, which is 2.29% of CL (lower) and 1.83% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website. The cumulative assessment shows that for NOx the PC is predicted to be 0.396 ug/m^3: this is 1.32% of CL and PEC is 165% of CL.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				However, the background concentration is 49.10 ug/m^3, which exceeds the CL. The CL for open water and its associated vegetation has been used for this assessment; however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC9		TCC9 is located in the Dabholm Cut, which is a narrow channel with an outflow structure at the eastern end. The Cut appears to receive effluent from the adjacent sewage treatment works to the north-east. The Cut is characterized by sloping banks on both sides, which are either grass or reinforced.	Examination of the Government's MAGIC mapping website shows that the coastal priority habitat intertidal mudflat is present along the whole of the Cut. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.174 kgN/ha/yr, which is 2.18% of CL (lower) and 1.74% of CL (upper); the PEC is 107% of CL (lower) and 86% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.314 kgN/ha/yr, which is 3.43% of CL (lower) and 3.14% of CL (upper); the PEC is 109% of CL (lower). However, the background concentration is 8.40 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC10		TCC10 is a saline lagoon located at Saltholme (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saline lagoon habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.30% of the CL).	Modelling does not predict that the long-term PC is greater than 1% for European sites, and/or the PEC is greater than 70% for European sites.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC11 TCC14		TCC11 is saltmarsh located at Seal Sands (as mapped on the MAGIC website) TCC14 is located on the saltmarsh and sand dune habitat to the north of TCC11	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. No exceedance is predicted at this location.	The cumulative assessment predicts that nitrogen deposition will be 0.118 kgN/ha/yr, which is 1.48% of CL (lower) and 1.18% of CL (upper); the PEC is 136% of CL (lower) and 109% of CL (upper). However, the background concentration is 10.78 kgN/ha/yr, which exceeds the CL (lower and upper). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat and saltmarsh are the only coastal priority habitats that are present in this part of the estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website. For pioneer low-mid mid-upper saltmarsh the nitrogen CL range is 10-20 kg N/ha/yr, i.e., the cumulative impact will be of lower significance.
TCC12		TCC12 is saltmarsh located close to Seal Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.03% of the CL).	Modelling does not predict that the long-term PC is greater than 1% for European sites, and/or the PEC is greater than 70% for European sites.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC13		TCC13 is coastal sand dune located at Coatham Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of coastal sand dune habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.07% of the CL).	When the development is considered alone nitrogen deposition is predicted to be 0.107 kgN/ha/yr, which is 1.34% of CL (lower) and 1.07% of CL (upper); the PEC is 115% of CL (lower) and 92% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.421 kgN/ha/yr, which is 5.26% of CL (lower) and 4.21% of CL (upper); the PEC is 119% of CL (lower). However, the background concentration is 9.10 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type'[19], which is a habitat that is present at or near this modelling point. However, this habitat is of importance for supporting nesting terns but none have been recorded near this location (see Section 4.2.4). It is also noted the background concentration is 9.1 kgN/ha/yr, i.e., there is already exceedance of the CL (lower) in the absence of the development. The PEC does not exceed the CL (upper).

[19] The APIS website advises the following for 'Coastal stable dune grasslands - acid type': 1. Potential negative impact on species due to impacts on the species' broad habitat. 2. Potential positive impact on species due to impacts on the species' food supply.

Nitrogen deposition to the River Tees and Tees Estuary

6.112 During the consultation meeting on 24 November 2021, Natural England advised that the HRA needs to consider nitrogen deposition to the River Tees and Tees Estuary. Their concern was that nitrogen deposition may contribute to nutrient enrichment of the water, which Natural England has advised is resulting in the formation of algal mats on mudflats (which makes it difficult for some birds to feed).

6.113 It is estimated that the area of the river and estuary downstream of the transporter bridge (OSGR NZ 49989 21308 – this is estimated to mark the extent of potentially significant effects) is approximately 880 ha. Extrapolating the data shown on Figure 36 in ECL (2022) a worst-case nitrogen deposition of 0.08 kg/Ha/yr has been assumed for the whole river and estuary area. This equates to total nitrogen deposition of 70.4 kg/yr for the whole river and estuary area. If it is assumed that the average depth of the estuary is 1 m (which is likely to be an under-estimate) this equates to 70.4 kg nitrogen deposition in 8.8 million m3 or 8 mg/m3, which is equivalent to 0.008mg/l.

6.114 Water quality monitoring of the Tees Estuary at Smiths Dock (https://environment.data.gov.uk/water-quality/view/sampling-point/NE-45400834) reported dissolved organic nitrogen levels that ranged from 0.76 mg/l (31 March 2021) to 3.49 mg/l (5 March 2021). The estimated total nitrogen deposition therefore equates to between 0.23% and 1.05% of the baseline dissolved organic nitrogen levels.

6.115 The above calculation is necessarily extremely crude and does not account for factors such as river flow, discharge, tidal mixing etc. Nevertheless it does demonstrate that deposition arising from the proposed development will make an insignificant contribution to nitrogen levels in the river and estuary based on current baseline levels.

7 Conclusion

7.1 Air quality modelling has predicted small exceedances for nitrogen deposition at eight modelling points for Sandwich tern and little tern. The birds themselves are not vulnerable to elevated levels of nitrogen deposition; however, some of the habitats upon which they depend may be sensitive to increased nitrogen deposition. The exceedance has been predicted based on information available on the APIS website, which indicates that effects need to be considered for 'Coastal stable dune grasslands (acid type)' where the Critical Load of 8-10 kgN/Ha/yr is exceeded.

7.2 This is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 and TCC14 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has also been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

7.3 Based on this higher Critical Load range for nitrogen deposition there would only be an exceedance of the Lower Critical Load for one receptor (TCC11) and only when it is considered in combination with the anticipated emissions from the Redcar Energy Centre. It is noted that the lower CL is already exceeded in the absence of development.

7.4 Saltmarsh is present at modelling point TCC11. There is currently no evidence that terns are nesting in any of the dune habitat that has been considered in the air quality modelling for this assessment. It is therefore concluded that no adverse effects are likely in relation to the conservation status of any tern species that is a qualifying feature of the SPA and Ramsar site.

7.5 Small exceedances are also predicted for NOx (two modelling points) and NH_3 (two modelling points). In all cases the exceedances of the 1% threshold are small: none of the PECs are greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's).

7.6 Whilst exceedances of the 1% threshold are predicted for hydrogen fluoride (twelve modelling points), the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. No exceedance is predicted for SO_2 or acid deposition.

7.7 Evaluation of the modelling locations in the estuary (TCC1 to TCC9) has concluded that they are typically characterised by hard-engineered banks or quay walls with minimal or no intertidal habitat present (many areas remain flooded at low tide). Where intertidal habitat is present this is limited to mudflats, which is not considered to be vulnerable to the effects of elevated nitrogen deposition. There are no saltmarsh or sand dune or other sensitive coastal priority habitats in the vicinity of the proposed development site: the nearest sand dunes are at Coatham Sands, approximately 4.8 km to the north-east, and the nearest saltmarsh is at Seal Sands, approximately 4.2 km to the north of the proposed development (modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats).

7.8 Air quality modelling has also predicted exceedances for NOx at modelling points TCC2, TCC3 and TCC9 for Sandwich tern and little tern (for supralittoral sediment). There are predicted exceedances of the long-term (30 ug/m^2) and short-term (75 ug/m^2) Critical Level for supralittoral sediment. At modelling points TCC2 and TCC3 the long-term CL is exceeded in the absence of development.

7.9 As noted above, the habitats at many of the modelling points are either intertidal mudflat or are permanently inundated with sea water. Mudflat is not considered to be sensitive to elevated NOx levels of the magnitude predicted for the proposed development due to the effects of inundation, dilution, tidal mixing and dispersal.

7.10 It is also understood that parts of the estuary are subject to dredging in order to maintain a navigable channel. The removal of sediment will inevitably result in the removal of nutrients contained within those sediments.

7.11 Examination of the evidence base for the Teesmouth and Cleveland Coast SPA / Ramsar extension (Natural England, 2015; Natural England, 2018; Natural England, 2019) indicates that, whilst some tern species may feed within the estuary (and potentially in the vicinity of the areas where small-scale exceedance of nitrogen deposition and NOx are predicted), most of the qualifying species are associated with more distant areas. Terns are mainly piscivorous and it is concluded that the predicted air quality changes are not likely to affect prey availability and hence the conservation status of these species.

7.12 Overall, it is concluded that the small increases in nitrogen deposition, NOx and NH_3 at some modelling points are not likely to have an adverse effect on the conservation status of any qualifying species and hence the integrity of the Teesmouth and Cleveland Coast SPA / Ramsar site. This conclusion has been reached through consideration of changes against a baseline where there is exceedance of the lower Critical Load / Level for these pollutants.

7.13 The Habitats Regulations Assessment screening process has concluded that the proposed development is not directly connected with or necessary to the management of any European Site.

7.14 The HRA screening identified that a likely significant effect may arise as a result of changes in air quality during the operation of the ERF when considered alone. No other likely significant effects have been identified for the Teesmouth and Cleveland Coast SPA / Ramsar site or for any other European site.

7.15 The initial screening assessment of likely significant effects has been carried out in the absence of mitigation measures and is therefore compliant with the judgment People Over Wind - *Sweetman vs Coillte* (European Court, 12 April 2018).

7.16 An appropriate assessment has been completed, which includes further air quality studies, and this has concluded that the proposed development, based on the scientific evidence that is available, will not have an adverse effect on the integrity of the Teesmouth and Cleveland Coast SPA / Ramsar site alone and in combination with other plans and projects.

8 References

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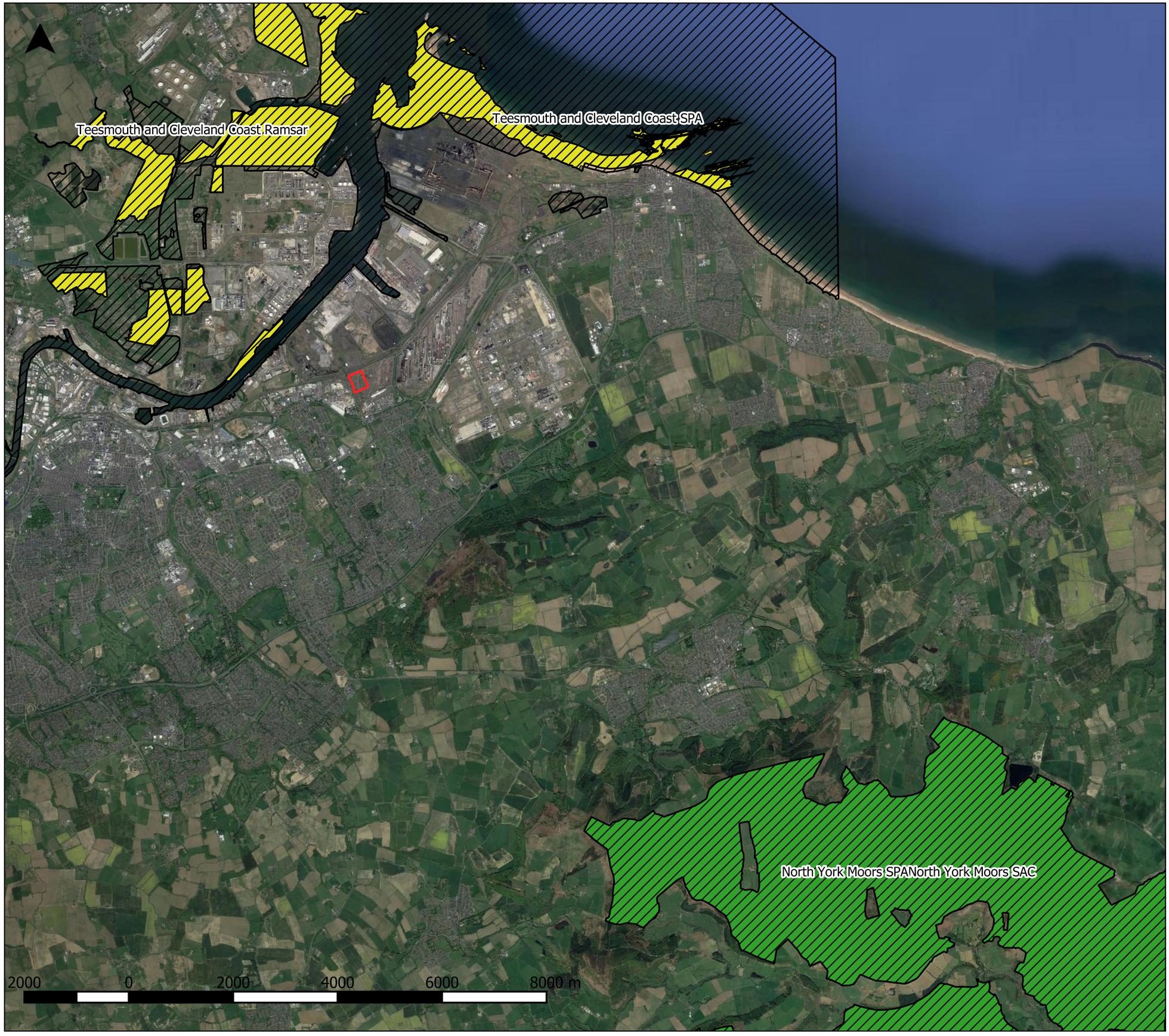
9 Figures



Legend

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar
- Site boundary

BSG | ecology

OFFICE: Newcastle
T: 0191 303 8964

JOB REF: P20-1004

PROJECT TITLE

Grangetown Prairie Energy Recovery Facility

DRAWING TITLE

Figure 1: Site Location

DATE: 19.8.2021 SCALE: 1:7,000

DRAWN: HB STATUS: Final

Document path

Figure 2: Air quality modelling locations

(Source: ECL, 2022)

APPENDIX III
NE DAS – MEETING MINUTES

Natural England Call

Client: Natural England

Project: Grangetown ERF

Held At: Microsoft Teams

Time & Date: Wednesday 24th November 2021
09:00am

Present:	Nick Lightfoot	(NL)	Natural England	(NE)
	Lewis Pemberton	(LP)	Natural England	(NE)
	David Molland	(DM)	FCC	(FCC)
	Tim Heard	(TH)	ECL	(ECL)
	Sarah Burley	(SB)	ECL	(ECL)
	Sara Maile	(SM)	ECL	(ECL)
	Steve Betts	(SBT)	BSG Ecology	(BSG)
	Sam Thistlethwaite	(ST)	Identity Consult Planning	(ICP)

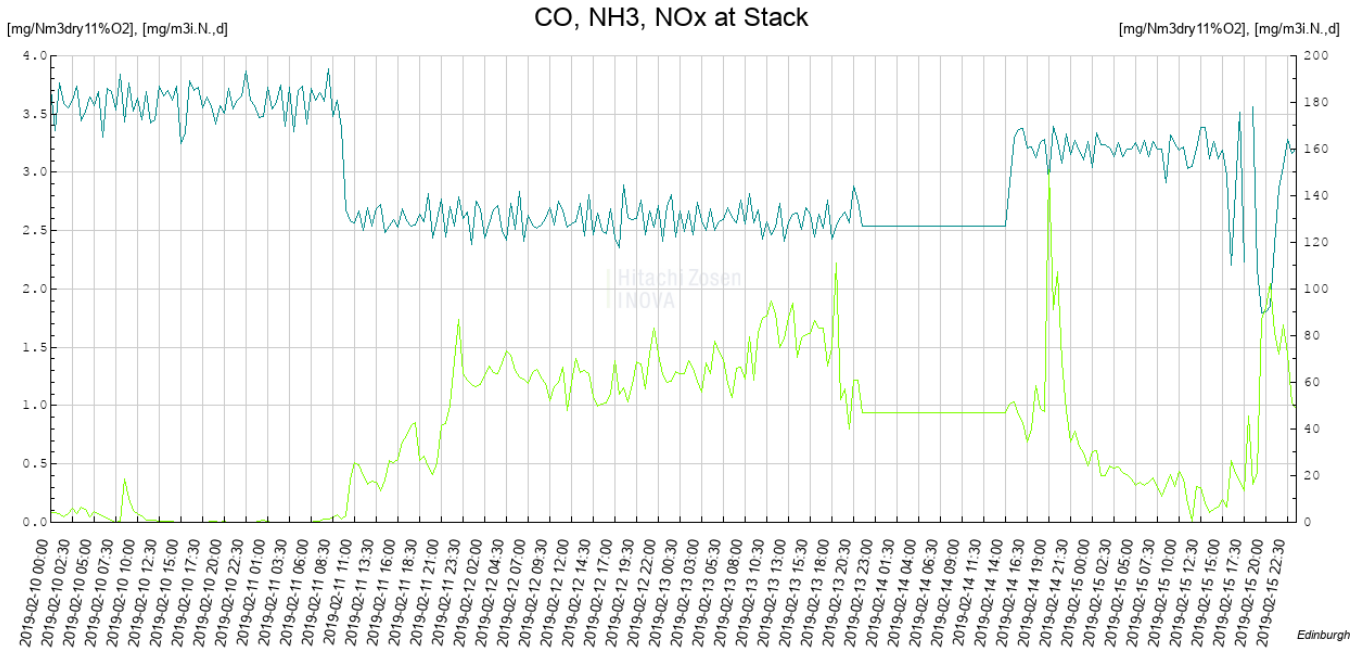
Originator	Approved	Version	Date Issued	Issued To	Version Comments
ST	ST	1	26/11/2021	As Listed Above	-

		Action
1	**Introduction to Project**	
1.1	The discussion started with general introductions from all parties followed by DM providing an overview of the planning and permitting process undertaken to date.	
2	**Planning and Permit Timescales**	
2.1.	DM confirmed that the deadline for final bid submission was likely to be in February 2022.	
3	**Air Dispersal Model**	
3.1	TH provided an overview of the dispersal model, explaining that it was based upon two 90m high stacks.	
3.2	TH shared the image of the sensitive receptors chosen for assessment and explained the distribution and justification for choosing them.	
3.3	SBT advised that the air quality modelling points included the most sensitive ecological habitat receptors (saltmarsh, dunes and lagoons), but that they also included intertidal mudflats, which are considered to be the least sensitive habitat.	
3.4	NL confirmed that the air dispersal model had selected the appropriate receptors.	
3.5	Of the air quality modelling locations chosen, NL thought that receptors TCC10-13 were the most sensitive in ecological terms, and in particular TCC11 – Seal Sands and TCC13 – South Gare and Coatham Dunes were the key ones and that the more detailed assessment of these locations was the correct approach. This was because of the presence of saltmarsh at TCC11 and dunes at TCC13 (the concern about these locations was in relation to impacts on the habitats and therefore this relates to the integrity of the SSSI and is not an issue for the HRA).	
3.6	NL stated that the fact that there were already pre-existing exceedances within the surrounding area made it difficult to assess the impact of the proposals.	
3.7	In relation to Seal Sands, NL stated that the high nutrient loading was becoming a problem allowing algal mats to become established thereby making it less favourable for feeding birds.	
3.8	SBT queried whether the algal growth had been positively linked to high nutrient levels or if this was just part of the natural development of a salt marsh habitat, and as such potentially a positive thing. NL didn't think it was but agreed to check with colleagues on this point.	
3.9	Similarly NL confirmed that the high nutrient loading was also a concern for the Coatham Dunes habitat.	
3.10	SB suggested sharing the existing data being generated by FCCs Millerhill site in Edinburgh as it would be helpful and would provide a more realistic reflection of what the likely emission levels would be.	**AP1 SB**
3.11	NL agreed that this would be helpful.	
3.12	SB asked if there was anything else that could be included in the assessment. NL confirmed that the model was pretty good especially in relation to the assessment of in combination effects.	

3.13	NL asked if there are any other mitigation measures (at source) that could be employed. DM responded stating that there may well be and that he and SB would look into this and provide an update.	**AP2 SB DM**
3.14	SBT asked if NL was aware of any other pre-existing sources significant sources of pollution that may be specifically impacting on the habitats at Seal Sands or Coatham Dunes. NL was not aware of any but agreed to take it away and check.	
4	**Biodiversity Net Gain Position**	
4.1	SBT asked about the Biodiversity Net gain (BNG) proposed for the site and whether Natural England would be commenting on this, NL advised that they would be commenting and stated that it was one of his colleagues that would be dealing with that element of the proposals.	
4.2	DM explained the proposal for dealing with BNG within the bid and that the required up lift would be delivered offsite by the landowner for the wider regeneration area, South Tees Development Corporation.	
4.3	DM explained that despite it being addressed off site, opportunities were being explored on site to deliver biodiversity benefit where possible and NL agreed that there was some benefit in doing this.	
4.4	SBT explained the issues affecting the site in relation to Open Mosaic Habitats that had developed on the site following the closure of the steelworks. SBT raised the issue of needing to keep a balance between the landscaping requirements. SBT/DM agreed to share the landscape masterplan and BNG report produced for the site.	
4.5	ST shared the BNG report and the landscape masterplan after the meeting	
5	**Any Other Business**	
5.1	NL wanted to know more about the reference to water borne pollutants. The HRA report states that it was “unlikely that non-synthetic compounds would be issued by activities at the site”. NL felt that this needed to be clarified especially in relation to the use of the term “unlikely” and what mitigation would be provided so that they become unlikely.	

APPENDIX IV
HZI CEMS DATA – MILLERHILL, EDINBURGH

Plant	Edinburgh
Timeframe	10.02.2019 00:00 - 15.02.2019 23:59
Averaging	30'



Signal		#values	mean	stdev	Min	Max
NOx 30 min Average, 1CFB40CQ902-ZJ51	[mg/Nm3dry11%O2]	288	147.43	24.18	89.89	258.56
NOx 24 h Rolling Average, 1CFB40CQ903-ZJ50	[mg/Nm3dry11%O2]	0	0.00	0.00	0.00	0.00
NH3 24 h Rolling Average, 1CFB43CQ903-ZJ50	[mg/Nm3dry11%O2]	0	0.00	0.00	0.00	0.00
Conc NO Comp EmiMeas, 1CFB41CQ901-XE01	[mg/m3i.N.,d]	255	96.06	15.88	57.26	166.93
Conc NO2 Comp EmiMeas, 1CFB42CQ901-XE01	[mg/m3i.N.,d]	255	2.55	0.20	1.84	3.31
Conc NH3 Comp EmiMeas, 1CFB43CQ901-XE01	[mg/m3i.N.,d]	255	0.75	0.62	0.00	3.03
Conc N2O Cmn, 1CFB44CQ901-XE01	[mg/m3i.N.,d]	255	0.26	0.60	0.00	5.67
Conc CO Comp EmiMeas, 1CFB50CQ901-XE01	[mg/m3i.N.,d]	255	4.91	4.55	1.10	48.33
Conc NOx EmiMeas, 1CFB40CQ901-XE01	[mg/m3i.N.,d]	255	149.80	24.42	89.98	259.17
NO 30 min Average, 1CFB41CQ902-ZJ51	[mg/Nm3dry11%O2]	288	94.53	15.73	57.07	166.54
NO2 30 min Average, 1CFB42CQ902-ZJ51	[mg/Nm3dry11%O2]	288	2.54	0.19	1.85	3.30
NH3 30 min Average, 1CFB43CQ902-ZJ51	[mg/Nm3dry11%O2]	288	0.77	0.59	0.00	3.03
CO 30 min Average, 1CFB50CQ902-ZJ51	[mg/Nm3dry11%O2]	288	5.45	10.38	1.10	132.01
NO 24 h Rolling Average, 1CFB41CQ903-ZJ50	[mg/Nm3dry11%O2]	0	0.00	0.00	0.00	0.00
NO2 24 h Rolling Average, 1CFB42CQ903-ZJ50	[mg/Nm3dry11%O2]	0	0.00	0.00	0.00	0.00
CO 24 h Rolling Average, 1CFB50CQ903-ZJ50	[mg/Nm3dry11%O2]	0	0.00	0.00	0.00	0.00

APPENDIX V
NE DAS LETTER

Date: 13 January 2022
Our ref: DAS A002818 / 371306
Your ref: 4710149699

Steven Betts
BSG Ecology
4 Riverside Studios
Amethyst Road
Newcastle Business Park
Newcastle Upon Tyne
NE4 7YL

Customer Services
Hornbeam House
Crewe Business Park
Electra Way
Crewe
Cheshire
CW1 6GJ

0300 060 3900

BY EMAIL ONLY

Dear Mr Betts,

Discretionary Advice Service (Charged Advice)
DAS A002818
Development proposal and location: Energy Recovery Facility at Grangetown Prairie

Thank you for your consultation on the above dated 14 October 2021, which was received on the same date.

This advice is being provided as part of Natural England's Discretionary Advice Service. BSG Ecology (on behalf of FCC Environment (UK) Ltd) has asked Natural England to provide advice upon:

A review of the shadow Habitat Regulations Assessment, with a focus on the initial findings and interpretation of air quality modelling data, to provide the following:

- Advice on potential impacts on designated or proposed designated sites
- Advice on non-biological survey / modelling work
- Advice on the information for a draft Habitats Regulations Assessment.

This advice is provided in accordance with the Quotation and Agreement dated 19 October 2021.

The following advice is based upon the information within:

1. Grangetown Energy Recovery Facility Report to Inform a Habitats Regulations Assessment; *BSG Ecology (*August 2021) [referred to as **Review Document 1**]
2. Grangetown Energy Recovery Facility Biodiversity Improvement Plan; *BSG Ecology* (August 2021) [referred to as **Review Document 2**]
3. Air Dispersion Modelling Assessment of Releases from the Proposed Energy Recovery Facility at Tees Valley; *ECL. and FCC Environmental* (December 2021) [referred to as **Review Document 3**]

Protected sites

Natural England is satisfied that, on the basis of the objective information provided, it can be excluded that the proposed plan or project will have a significant effect on the Teesmouth and Cleveland Coast Special Protection Area (SPA) and Ramsar site, either individually or in combination with other plans or projects.

However, it would be beneficial to provide additional details in Review Document 1 regarding the

conclusion of no Likely Significant Effects from the “Introduction of non-synthetic compounds – Abnormal or emergency operating conditions” (pg. 18).

Natural England is not yet satisfied that the proposed operations are not likely to damage any of the interest features of the Teesmouth and Cleveland Coast SSSI. It is noted in Review Documents 1 and 3 that the Predicted Environmental Concentration (PEC) for Nutrient Nitrogen would:

- for the installation *alone*, exceed the Lower Critical Load at two sensitive ecological receptors (TCC11 and TCC13) and would exceed the Upper Critical Load at one of these receptors (TCC11).
- *in combination* with other relevant developments, exceed the Lower Critical Load at 11 receptors (TCC1 – TCC9, TCC11 and TCC13) and would exceed the Upper Critical Load at one receptor (TCC11).

However, the aerial deposition modelling is based on the most sensitive habitat type, *Coastal stable dune grasslands (acid type)*, which is not present at any of the ecological receptors. When the appropriate Critical Load range is considered for habitat types at all of the receptors there would not be an exceedance, except for at one receptor.

There are areas of *Coastal stable dune grasslands (calcareous type)* at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), which has a Critical Load range of 10-15 kgN/ha/yr (instead of 8-10 kgN/ha/yr for acid type dunes). **Based on this higher Critical Load range there would only be an exceedance of the Lower Critical Load for one receptor (TCC11) and only when it is considered in combination with the anticipated emissions from the Redcar Energy Centre.**

Given that the predicted exceedance is small and should be taken in the context with the elevated background concentrations, Natural England does not require further information at this stage. However, Natural England requests that an assessment of the potential impacts of Nutrient Nitrogen deposition on the dune system at the Seal Sands Peninsula (SSSI unit 9 and TCC11 in the assessment provided) is provided when the planning application is submitted in order to address these uncertainties.

Other advice
There are also other possible impacts resulting from this proposal that you should consider when developing your planning application. These issues, together with where you may find further guidance, are summarised below.

Biodiversity Net Gain

Natural England welcomes the commitment to include environmental enhancements in the development site to offset the impacts on existing habitat.

Natural England have discussed the approach taken by BSG Ecology, in liaison with INCA and in the absence of the original baseline survey, to re-estimate the baseline Biodiversity Unit score as 49.7 and agree that the approach taken to do so is reasonable.

To further improve the provision of on-site net gains for biodiversity, Natural England recommends minimizing the extent of ‘modified (or amenity) grassland’ and to instead create additional ‘other neutral grassland’ or ‘Open Mosaic Habitat’.

Furthermore, Natural England encourages the applicant to liaise with South Tees Development Corporation to ensure that the baseline assessment matches theirs and that they are made aware of the Biodiversity Units created by this development.

Green Infrastructure
The proposed development is within an area that Natural England considers could benefit from enhanced green infrastructure (GI) provision. Multi-functional green infrastructure can perform a range of functions including improved flood risk management, provision of accessible green space,

climate change adaptation and biodiversity enhancement. Evidence and advice on green infrastructure, including the economic benefits of GI can be found on the Natural England Green Infrastructure web pages.

For clarification of any points in this letter, please contact Nick Lightfoot on 02080 261194.

This letter concludes Natural England's Advice within the Quotation and Agreement dated 19 October 2021.

☒ The advice provided in this letter has been through Natural England's Quality Assurance process

The advice provided within the Discretionary Advice Service is the professional advice of the Natural England adviser named below. It is the best advice that can be given based on the information provided so far. Its quality and detail is dependent upon the quality and depth of the information which has been provided. It does not constitute a statutory response or decision, which will be made by Natural England acting corporately in its role as statutory consultee to the competent authority after an application has been submitted. The advice given is therefore not binding in any way and is provided without prejudice to the consideration of any statutory consultation response or decision which may be made by Natural England in due course. The final judgement on any proposals by Natural England is reserved until an application is made and will be made on the information then available, including any modifications to the proposal made after receipt of discretionary advice. All pre-application advice is subject to review and revision in the light of changes in relevant considerations, including changes in relation to the facts, scientific knowledge/evidence, policy, guidance or law. Natural England will not accept any liability for the accuracy, adequacy or completeness of, nor will any express or implied warranty be given for, the advice. This exclusion does not extend to any fraudulent misrepresentation made by or on behalf of Natural England.

Yours
Nick Lightfoot
Northumbria Area Team

Cc commercialservices@naturalengland.org.uk

Annex 1
European Protected Species

A licence is required in order to carry out any works that involve certain activities such as capturing the animals, disturbance, or damaging or destroying their resting or breeding places. Note that damage or destruction of a breeding site or resting place is an absolute offence and unless the offences can be avoided (e.g. by timing the works appropriately), it should be licensed. In the first instance it is for the developer to decide whether a species licence will be needed. The developer may need to engage specialist advice in making this decision. A licence may be needed to carry out mitigation work as well as for impacts directly connected with a development. Further information can be found in Natural England's 'How to get a licence' publication.

If the application requires planning permission, it is for the local planning authority to consider whether the permission would offend against Article 12(1) of the Habitats Directive, and if so, whether the application would be likely to receive a licence. This should be based on the advice Natural England provides at formal consultation on the likely impacts on favourable conservation status and Natural England's guidance on how the three tests (no alternative solutions, imperative reasons of overriding public interest and maintenance of favourable conservation status) are applied when considering licence applications.

Natural England's pre-submission Screening Service can screen application drafts prior to formal submission, whether or not the relevant planning permission is already in place. Screening will help applicants by making an assessment of whether the draft application is likely to meet licensing requirements, and, if necessary, provide specific guidance on how to address any shortfalls. The advice should help developers and ecological consultants to better manage the risks or costs they may face in having to wait until the formal submission stage after planning permission is secured, or in responding to requests for further information following an initial formal application.

The service will be available for new applications, resubmissions or modifications – depending on customer requirements. More information can be found on Natural England's website.