TEESWORKS

DORMAN POINT ENVIRONMENTAL STATEMENT

VOLUME 3: TECHNICAL APPENDICES
APPENDICES TO CHAPTER J (CLIMATE CHANGE GHG)

DECEMBER 2020

Dorman Point, South Tees
Volume 3: Appendices

Chapter J: Climate Change

1 December 2020

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Appendix J1: Meeting Notes from Consultation

Minutes

ARUP

Project title	South Industrial Zone, South Tees	Job number	276320-04
Meeting name and number		File reference	
Location	Virtual conference	Time and date	12:00 12 June 2020
Purpose of meeting	Consultation on existing and emerging local climate change policy for Redcar and Cleveland Borough Council		
Present	Redcar and Cleveland Borough Council (RCBC) – Rebecca Wren [RW], Planning Strategy Manager Arup – Keith Robertson [KR], Tom Wardley [TW]		
Apologies			
Circulation			

Action

1. Existing climate change policy

- Introductions
- KR explained that Arup are undertaking a GHG assessment to identify the impact of the South Industrial Zone, South Tees site following standard methods for an EIA GHG Assessment.

2. Existing climate change policy

- KR summarised the relevant local policies that had been identified from the Redcar and Cleveland Borough Council Local Plan (policies SD 6 and LS 4) and asked if there were any other policies that should be considered.
- RW confirmed that these were the most relevant policies to the GHG assessment.

3. Emerging climate change policy

- RW stated that RCBC are in the early stages of developing a new Environment Strategy which will be a high-level document outlining the council's responsibilities across several environmental topics, including climate change.

Prepared by	Tom Wardley
Date of circulation	
Date of next meeting	TBC

Minutes

Project title	Job number	Date of Meeting
South Industrial Zone, South Tees	276320-04	12 June 2020

Action

- RW confirmed that discussions are currently ongoing regarding the direction of the new Environment Strategy and that are no additional upcoming documents or policies that should be referenced or considered as part of this assessment.
- KR asked whether the Council had any supplementary planning documents (SPD) related to climate change and environmental impacts.
- RW confirmed that no SPD currently exists but council officers are discussing the need for an SPD to advise on construction techniques for reducing emissions and environmental impact. This is likely to focus mainly on residential development.

Appendix J2: Assessment Data and Detailed Assumptions

South Industrial Zone, South Tees

Appendix J2: Technical Appendix

Appendix J: Climate Change

December 2020

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J1.0 Construction Assessment

J1.1 The assessment of GHG emissions are based on information provided by the client team in Chapter B (Project Description) and assumptions made in agreement with the client team.

Construction of buildings

J1.2 Total building footprint areas for the proposed development were provided and the Project Description states that 10% of building footprint area will be used as office space whilst the remainder will be B2/B8 use types. Arup was advised by the client that the building space will be split evenly (50/50) between single storey warehouse buildings and 2-storey warehouse/factory buildings. This is expected to average as 1.5 storeys.

J1.3 At the current stage of development, no information is available regarding the type, quantity and volume of materials that would be used in the proposed development. Therefore, high level industry benchmarks from RICS guidance [1] have been used to provide a preliminary estimate of product stage embodied carbon emissions. The possible – single point benchmark for each building type has been used.

J1.4 The footprint, gross floor areas and high-level embodied carbon benchmarks are summarised in Table 1.

Table 1: Building floor area schedule and embodied carbon benchmarks

Building type	Footprint area (m^2)	Number of storeys	Gross floor area (m^2)	Embodied carbon benchmark	Unit
Office units	9,290	1.5	13,935	925	$kgCO_2e/m^2$
Industrial units	83,612	1.5	125,418	543	$kgCO_2e/m^2$

J1.5 In the absence of information on material quantities, a typical benchmark of 6.25% of product stage emissions has been used to estimate emissions from the transport of materials to site, in line with the London Energy Transformation Initiative Embodied Carbon Primer [2].

J1.6 Similarly, no information is available regarding the use or type of construction plant. Therefore, a typical benchmark of 6.25% of product stage emissions has been used to estimate emissions from the construction process in line with the London Energy Transformation Initiative Embodied Carbon Primer [2].

Construction of outdoor infrastructure

J1.7 At this stage of the design, no information is available regarding the use of outdoor space. In agreement with the client team, it has been assumed that 90% of total outdoor floor space will be concrete hardstanding and the remaining 10% will be tarmac road surfacing. Therefore, the following surface areas for each surface use type have been used:

1 Concrete hardstanding: 436,588 m^2

2 Tarmac road surface: 48,510 m^2

J1.8 To calculate material volumes, typical depth specifications for each surface use type have been used based on professional experience from similar projects:

1 Concrete hardstanding: 650mm concrete, 300mm aggregate subbase; and

2 Tarmac road surface: 300mm asphalt, 300mm aggregate subbase.

J1.9 Typical densities and carbon factors for materials were obtained from the Embodied Energy and Carbon ICE Database [3] which provides estimates of the cradle-factory carbon factors for a range of typical construction materials. The quantities of the key construction materials and the factors used are summarised in Table 2.

Table 2: Estimated construction material quantities and carbon factors for outdoor infrastructure

Material type	Estimated volume (m^3)	Density (kg/m^3)	Estimated mass (tonnes)	Carbon factor ($kgCO_2e$ /kg)
Concrete	283,782	2200	624,321	0.103
Asphalt	14,553	2300	33,472	16.2
Aggregate	145,529	2240	325,986	0.007

J1.10 Material transportation for construction was assumed to be by HGV. According to RICS Professional Statement on Whole Life Carbon [4] a transport distance of 50km is suggested for the type of materials included in the calculation.

J1.11 Emissions for the HGV haulage were based on an average laden vehicle, and the factor used was for *All HGVs*, equivalent to 0.11 $kgCO_2e$/t.km, taken from the UK Government GHG Conversion Factors for Company Reporting [5].

J1.12 No allowance has been made for waste generated from construction materials as it is assumed that the site is balanced for cut/fill material.

J1.13 No data is available regarding the quantity of demolition material that will be removed from the site for disposal.

J1.14 An estimate was made for construction plant energy emissions using a typical benchmark of 6.25% of product stage emissions has been used to estimate emissions from the construction process in line with the London Energy Transformation Initiative Embodied Carbon Primer [2].

J1.15 Chapter I (Socio-Economic) states that the number of full-time construction workers will be 95-101. As a worst-case scenario, emissions associated with the commuting of 101 construction staff every day (365.25 days per year) have been estimated.

J1.16 The Tees Valley Travel to Work Survey [6] provides data for the number of workers commuting to Redcar and Cleveland from surrounding regions. The one-way travel distances assumed for each region and the proportion of daily commutes originating in each region are summarised in Table 3. It should be noted that, in line with Chapter I (Socio-Economic), the extent to which construction jobs will be taken up locally cannot be confirmed until the occupiers are known and contracts are met.

Table 3: Summary of commuting distance assumptions for construction workers

Origin	Proportion of workers in RCBC	Assumed distance (km)
Redcar and Cleveland	72%	10
Middlesbrough	11%	15

Origin	Proportion of workers in RCBC	Assumed distance (km)
Stockton-on-Tees	8%	20
Hartlepool	1%	25
Darlington	1%	30
County Durham	1%	60
Tyne and Wear	1%	80
North Yorkshire	4%	100
Elsewhere	1%	300

J1.17 The 2011 UK Census Journey to Work [7] data provides information on typical modes of transport for travelling to work in the South Tees area (Census zone E02002517). The assumed proportion of kilometres travelled by each transport mode is summarised in Table 4.

J1.18 The emissions arising from vehicle trips are based on the BEIS GHG factors [5] for corporate reporting, which provide a per-passenger-km factor for a range of travel modes and vehicle types. The assumed vehicle emissions factors used for the construction assessment are also shown in Table 4.

Table 4: Summary of transport mode split assumptions

Transport mode	Proportion of total kilometres travelled	Carbon factor ($kgCO_2e/km$)
Car	82%	0.2098
Car passenger	8%	0.2098
Bus	3%	0.103
Motorcycle	1%	0.0303
Bicycle	3%	0
On foot	3%	0

J2.0 Operational Assessment

J2.1 The assessment of operational emissions is based on information provided by the client team in the Project Description and assumptions made with the agreement of the client team.

J2.2 Given the uncertainty surrounding the use of the site, operational emissions have been estimated for regulated energy use within buildings and transport within the boundary of the Redcar and Cleveland council area.

Building operation

J2.3 High level industry benchmarks from CIBSE TM46 [8] have been used to provide a high-level view of regulated energy use within buildings. The benchmarks used for each building use type are summarised in Table 5.

Table 5: Benchmarks for regulated energy use within buildings

Building type	Gross floor area (m^2)	Electricity benchmark (kWh/m^2)	Thermal benchmark (kWh/m^2)
Office units	13,935	95	120
Industrial units	125,418	35	180

J2.4 In the absence of a detailed energy strategy for the proposed development, it has been assumed that all energy will be supplied from the national grid. To calculate the emissions associated with thermal energy, the current carbon factor for natural gas received through the UK gas mains grid network of 0.18387 $kgCO_2e/kWh$ has been used in accordance with UK Government GHG Conversion Factors for Company Reporting [5].

J2.5 The electricity grid is forecast to reduce in carbon intensity over the period of the project, meaning that the GHG emissions from electricity use will reduce per kilowatt hour (kWh). The extent and rate at which this will happen is unclear. The assessment was in accordance with UK Government GHG Conversion Factors for Company Reporting [5]. The carbon factor used for the 2033 assessment year is therefore 0.23314 $kgCO_2e/kWh$.

Operational transport

J2.6 Average daily vehicle movements for the proposed development were taken from Chapter C (Transport). These numbers are based on survey data from similar sites and consider employee commuting, site visitors, and HGV and LGV movements. These are summarised in Table 6.

Table 6: Operational transport movements

Vehicle type	Total
Person trips (excluding HGVs and LGVs)	5,413
LGVs	1,558
HGVs	1,113
Total daily vehicular trips	8,084

J2.7 It has been assumed that this is the average number of trips for every working day (Monday to Friday) in a given year. The number of working days for the 2033, the assessment year, has been taken as 253.

J2.8 The origin and destinations of employee and visitor trips have been apportioned according to the Tees Valley Travel to Work Survey data [6], as summarised in Table 3, however, for operation transport the total kilometres travelled within the Redcar and Cleveland boundary has been estimated based on the most likely transport route for each location. These are summarised in Table 7.

J2.9 It has been estimated that all HGVs and LGVs movements will travel 10 km within the Redcar and Cleveland boundary before joining the closest trunk roads.

Table 7: Summary of commuting distance assumptions for operational journeys by employees and visitors

Origin	Proportion of workers in RCBC	Assumed distance (km)
Redcar and Cleveland	72%	10
Middlesbrough	11%	10
Stockton-on-Tees	8%	10
Hartlepool	1%	10
Darlington	1%	10
County Durham	1%	10
Tyne and Wear	1%	10
North Yorkshire	4%	35
Elsewhere	1%	35

J2.10 In line with the construction worker transport calculations, transport modes for employee and visitor trips have been taken from the *2011 UK Census Journey to Work* data [7]. These are summarised in Table 4.

J2.11 The CO_2 emissions per km from passenger cars is dependent on the range of vehicle / engine types. The Department for Transport (DfT) has produced forecasts of the projected fleet mix for UK vehicles in light of national policy on the phasing-out of petrol/diesel vehicles, with sales of new petrol/diesel vehicles projected to reduce to zero by 2040, at the latest. It is assumed that for the period 2040 – 2060 that the remaining proportion of petrol/diesel vehicles reduces linearly to zero. The assumed split of diesel, petrol and hybrid or electric vehicles (EVs) for the 2033 assessment year is shown in Table 8.

Table 8: Car fleet split assumed for 2033

Car type	Proportion of cars in 2033
Diesel	47%
Petrol	33%

Hybrid/EV	20%

J2.12 It is assumed that there are also improvements in vehicle efficiency over the assessment period. Efficiency improvements are modelled using a percentage improvement over the period based on data from the DfT. This has been applied to all transport modes apart from HGVs for which no improvements in efficiency are assumed. The carbon factor for each transport mode for the 2033 assessment year is summarised in Table 9.

Table 9: 2033 carbon factors used for each transport mode taking into account improvements in vehicle efficiency

Car type	**Carbon factor for 2033 ($kgCO_2e/km$)**
Car	0.138
Bus	0.089
Motorcycle	0.098
Bicycle	0
On foot	0
Light Goods Vehicles	0.215
Heavy Goods Vehicles	0.867

J3.0 Abbreviations & Definitions

BEIS	UK Government Department of Business, Energy and Industrial Strategy
BREEAM	Building Research Establishment Environmental Assessment Method
CEnv	Chartered Environmentalist
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent (where other GHGs have been converted into an equivalent mass of CO_2)
DCO	Development Consent Order
DEFRA	Department for Environment Food and Rural Affairs
EIA	Environmental Impact Assessment
ES	Environmental Statement
GHG	Greenhouses gases as defined by the Kyoto Protocol (1997)
HGV	Heavy goods vehicle
ICE	Inventory and Carbon and Energy
IEMA	Institution of Environmental Managers and Assessors
ktCO2e	Kilotonnes of carbon dioxide equivalent
LGV	Light goods vehicle
LULUCF	Land use, land use change and forestry
MtCO2e	Megatonnes of carbon dioxide equivalent
NPPF	National Planning Policy Framework
RCBC	Redcar and Cleveland Borough Council
RCBC	Redcar and Cleveland Borough Council
RICS	Royal Institute of Chartered Surveyors
STDC	South Tees Development Corporation
tCO2e	Tonnes of carbon dioxide equivalent

J4.0 References

1 RICS (2014) Methodology to calculate embodied carbon of materials

2 London Energy Transformation Initiative (2020) Embodied Carbon Primer

3 Circular Ecology Ltd. (2019) Embodied energy and carbon – The ICE database version 3.

4 RICS (2017) Whole life carbon assessment for the built environment

5 Department for Business, Energy & Industrial Strategy (2020) BEIS GHG conversion factors.

6 Tees Valley Combined Authority (2011) Census 2011 Travel to Work Patterns

7 Office for National Statistics (2011) 2011 Census Method of Travel to Work

8 Chartered Institute of Building Services Engineers (2008) TM46 Energy Benchmarks

9 Department for Business, Energy and Industrial Strategy (2019) Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisals