NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning (Applications Prescribed Forms and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

Infrastructure (Environmental Impact Assessment) Regulations 2017

North Lincolnshire Green Energy Park

Volume 6

Environmental Statement

6.2.3 Project Description and Alternatives

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Acronyms and Abbreviations

Name	Description
ACC	Air Cooled Condensers
AGI	Above Ground Installation
BAT	Best Available Techniques
BEIS	Department for Business, Energy and Industrial Strategy
CBMF	Concrete Block Manufacturing Facility
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DHN	District Heat Network
DHPWN	District Heat and Private Wire Network
dML	deemed Marine Licence
EIA	Environmental Impact Assessment
EMFs	Electric and Magnetic Fields
ERF	Energy Recovery Facility
ES	Environmental Statement
EU	European Union
EV	Electric Vehicle
FGT	Flue Gas Treatment
FGTr	Flue Gas Treatment residue
H_2	Hydrogen
HRA	Habitat Regulations Assessment
IBA	Incinerator Bottom Ash
IDB	Internal Drainage Board
IED	Industrial Emissions Directive
LDF	Local Development Framework
MCAA	Marine and Coastal Access Act
MMO	Marine Management Organisation
MWHe	Electrical generation in megawatt-hours (electric)
MWhth	Heat generation in megawatt-hours (thermal)
NLGEP	North Lincolnshire Green Energy Park
NPPF	National Planning Policy Framework
NPS	National Policy Statement

Name	Description
NSIP	Nationally Significant Infrastructure Project
PA	Planning Act
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPG	Planning Practice Guidance
PRF	Plastic Recycling Facility
PV	Photovoltaic
PWN	Private Wire Network
RDF	Refuse Derived Fuel
RHTF	Residue Handling and Treatment Facility
SOCC	Statement of Community Consultation
SoS	Secretary of State
SuDS	Sustainable Drainage Systems
TCPA	Town and Country Planning Act
UK	United Kingdom
WFD	Waste Framework Directive

1. INTRODUCTION

1.1.1.1 The North Lincolnshire Green Energy Park (NLGEP) (the Project), located at Flixborough, North Lincolnshire, is a Nationally Significant Infrastructure Project (NSIP) comprising an Energy Recovery Facility (ERF) capable of converting up to 760,000 tonnes of non-recyclable waste into 95 MW of electricity and a carbon capture, utilisation and storage (CCUS) facility which will treat a proportion of the excess gasses released from the ERF to remove and store carbon dioxide (CO_2) prior to emission into the atmosphere. The design of the ERF and CCUS will also enable future connection to the Zero Carbon Humber pipeline, when this is consented and operational, to enable the possibility of full carbon capture in the future.

1.1.1.2 The NSIP incorporates a switchyard, to ensure that the power created can be exported to the National Grid or to local businesses, and a water treatment facility, to take water from the mains supply or recycled process water to remove impurities and make it suitable for use in the boilers, the CCUS facility, concrete block manufacture, hydrogen production and the maintenance of the water levels in the wetland area.

1.1.1.3 The Project will include the following Associated Development to support the operation of the NSIP:

- a bottom ash and flue gas residue handling and treatment facility (RHTF);
- a concrete block manufacturing facility (CBMF);
- a plastic recycling facility (PRF);
- a hydrogen production and storage facility;
- an electric vehicle (EV) and hydrogen (H_2) refuelling station;
- battery storage;
- a hydrogen and natural gas above ground installations (AGI);
- a new access road and parking;
- a gatehouse and visitor centre with elevated walkway;
- railway reinstatement works including, sidings at Dragonby, reinstatement and safety improvements to the 6km private railway spur, and the construction of a new railhead with sidings south of Flixborough Wharf;
- a northern and southern district heating and private wire network (DHPWN);
- habitat creation, landscaping and ecological mitigation, including green infrastructure and 65 acre wetland area;
- new public rights of way and cycle ways including footbridges;
- Sustainable Drainage Systems (SuDS) and flood defence; and
- utility constructions and diversions.

1.1.1.4 The Project will also include development in connection with the above works such as security gates, fencing, boundary treatment, lighting, hard and soft landscaping, surface and foul water treatment and drainage systems and CCTV.

1.1.1.5 The Project also includes temporary facilities required during the course of construction, including site establishment and preparation works, temporary construction laydown areas, contractor facilities, materials and plant storage, generators, concrete batching facilities, vehicle and cycle parking facilities, offices, staff welfare facilities, security fencing and gates, external lighting, roadways and haul routes, wheel wash facilities, and signage.

1.1.1.6 The overarching aim of the Project is to support the UK's transition to a low carbon economy as outlined in the Sixth Carbon Budget (December 2020), the national Ten Point Plan for a Green Industrial Revolution (November 2020) and the North Lincolnshire prospectus for a Green Future. It will do this by enabling circular resource strategies and low-carbon infrastructure to be deployed as an integral part of the design (for example by re-processing ash, wastewater and carbon dioxide to manufacture concrete blocks and capturing and utilising waste-heat to supply local homes and businesses with heat via a district heating network).

1.1.1.7 It is intended that the Project will be delivered in six phases and will take approximately six years to construct. It is anticipated that construction will commence in year one following the grant of DCO and the ERF will commence operation in year four, with all of the other elements of the Project, with the exception of the DHPWN, in operation by year six. Further details are provided in the Phasing Strategy Workbook (**Document Reference: 6.2.13**).

1.1.1.8 The Project incorporates some limited optionality in relation to the easternmost extent of the DHPWN and two alternative route options are proposed (options A and B).

1.1.1.9 For the purposes of clarity within this document, the following terminology has been established;

- *The Order Limits* - refers to the limits of the land covered by the Development Consent Order.
- *The Project* - refers to the whole of the development as referred to in Section 3. This relates to the actual built infrastructure, not the land on which it would be constructed;
- *The Energy Park Land* – this is an area within the Order Limits, containing the core elements of the Project (ERF, CO_2 capture, ash treatment and concrete block manufacturing, plastic recycling facility, visitor centre, hydrogen production and re-fuelling station) located north of Ferry Road West (B1216);
- *The Northern District Heat and Private Wire Network (DHPWN) Land* - this is an area within the Order Limits on which the Northern DHPWN would be constructed;

- *The Southern District Heat and Private Wire Network (DHPWN) Land* - this is an area within the Order Limits on which the Southern DHPWN would be constructed; and
- *The Railway Reinstatement Land* - this is an area within the Order Limits within which the railway line will be reinstated.

1.1.1.10 The Project and its principal elements are presented on Figure 1.

2. SITE AND SURROUNDINGS

2.1.1.1 For the purposes of providing clarity within the Environmental Impact Assessment, the land within the Order Limits (the Application Land, see Figure 3) is divided into four distinct geographical areas relating to the specific elements of the Project.

2.2 The Energy Park Land

2.2.1.1 The Energy Park Land is located on land within and to the south of Flixborough Industrial Estate, to the west of Scunthorpe, North Lincolnshire. The Energy Park Land encompasses an area within and adjacent to Flixborough Wharf (RMS Trent Ports) on the east bank of the River Trent. The Flixborough Wharf and Flixborough Industrial Estate together form an industrial complex that has supported a range of businesses and industrial activities since the early 1900s. Existing infrastructure at the site includes roads, a rail spur, a 155m long Wharf, weigh bridge, cranes, warehousing and stock sheds, workshops and portable offices.

2.2.1.2 Large industrial facilities within the wider Flixborough Industrial Estate and on adjacent land include a cement works, wind turbines, grain processing facilities, and a small power station that has a feedstock of chicken litter and bone meal.

2.2.1.3 The Project will have transport connectivity by road, rail, and river to sea via the River Trent and River Humber, with the latter two used for freight transport only. Land adjacent to the Flixborough Industrial Estate included within the Order Limits is currently a mix of both brownfield land and areas used for arable agriculture, comprising a number of fields separated by hedgerows and well-established drainage ditches which are maintained by the Internal Drainage Board (IDB).

2.3 The Northern District Heat and Private Wire Network (DHPWN) Land

2.3.1.1 The route of the Northern DHPWN runs from the ERF down the new access road to the southern end of the Energy Park Land where the B1216 (Ferry Road West) meets the A1077 (Phoenix Parkway). The route follows the A1077 towards the east, passing the Skippingdale Retail Park on its south side and crossing the common land at Atkinsons' Warren / Foxhills Plantation.

2.3.1.2 East of the common land, the route passes south of the Foxhills Industrial Park where the Northern DHPWN Land incorporates rough grassland with hedges to the north of the A1077 and agricultural land and use of highways land.

2.3.1.3 Since submission of the PEIR this area of the Order Limits has been refined to remove the southern extent of the Northern DHPWN. Prior to the statutory consultation, the Northern DHPWN extended south along A1430 (Normanby Road) and terminated at the North Lincolnshire Council Offices. The route will now terminate at the Warren Road junction with Normanby Road. The route has been amended to reduce noise and traffic impacts on

local residents during construction, and to improve the constructability of the network. Furthermore, an alternative Northern DHPWN route (Option B) has been incorporated for consideration. In summary the two alternative route options for the Northern DHPWN at the roundabout junction with the A4130 (Normanby Road) are as follows:

- Option A - the route passes south towards the built-up urban centre of Scunthorpe via Normanby Road, where the route remains lined on both sides by residential and industrial areas; or
- Option B –the route continues on the A1077 until the junction with Bessemer Way to the south. The route will follow Bessemer Way until the junction with Warren Road turning due west to meet the Normanby Road.

2.4 The Southern District Heat and Private Wire Network (DHPWN) Land

2.4.1.1 The route of the Southern DHPWN runs from the southern end of the Energy Park Land where the B1216 (Ferry Road West) joins and A1077, and then heads south through the agricultural land on the west side of the A1077. It will pass under the IDB drain north of the roundabout.

2.4.1.2 At Doncaster Road, the Southern DHPWN will pass under the carriageway and continue south across the agricultural land, where it will pass under the Crowle to Scunthorpe railway line and terminate in the field to the north of the B1450 (Burringham Road).

2.4.1.3 Although the route of the Southern DHPWN has not changed, the area of this element of the Project has been significantly reduced as the understanding of construction requirements has increased. This is most apparent within the agricultural land to the east of the A1077, where the Order Limits have been reduced to include only the land needed for construction and operation of the Southern DHPWN. This has reduced the Order Limit in this area from approximately 400m wide, to approximately 40m wide.

2.5 The Railway Reinstatement Land

2.5.1.1 The disused railway line between the main Network Rail line at Dragonby and the Wharf at Flixborough previously served the port operations through the delivery of steel and other materials to and from British Steel at Scunthorpe up until its closure in 2012. The line runs in a roughly east-west direction, weaving between the industrial settings of Normanby Industrial Estate, the mineral workings, industrial developments at Dragonby Rail Sidings, slag dumping zones, quarries, and arable agricultural land, on a mix of embankments and cuttings that are lined with trees along much of the line length.

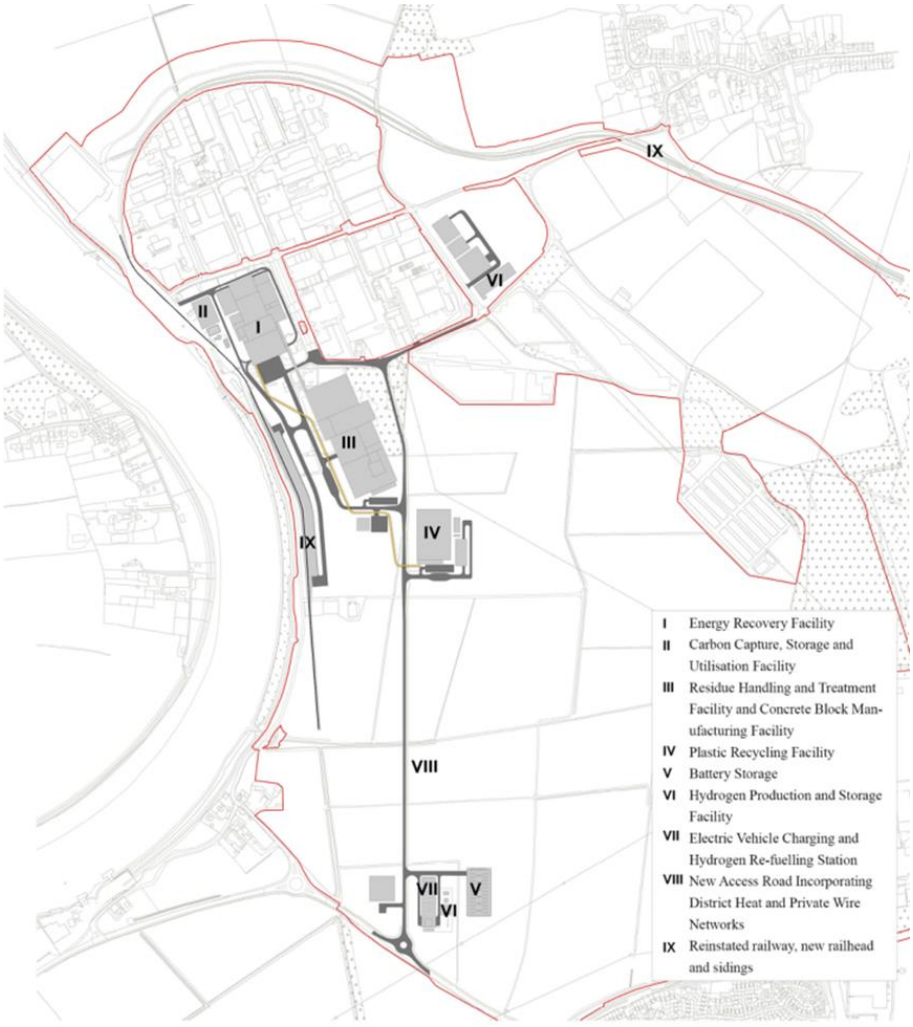
2.5.1.2 The line passes immediately to the north of the Normanby Enterprise Park before winding around a long ‘s’ bend to the south of Flixborough village and looping around the northern edge of Flixborough Industrial Estate, where the line terminates at the Wharf edge.

2.5.1.3 Although the route of the railway reinstatement has not changed, the area of this element of the Project has been significantly reduced within the Order Limits as the understanding of construction requirements has developed. This is most apparent within the agricultural land to the north and south of Hopeton Street, adjacent to Dragonby Rail Sidings.

3. DESCRIPTION OF THE PROJECT

3.1.1.1 This section sets out a detailed description of each element of the Project, including their spatial location, together with an explanation of the importance and relevance of each element. Section 6 describes how these elements will be constructed, while Section 7 describes how they will work during operation. Together, these three sections provide the description of the Project which defines the basis of assessment for the Environmental Statement (ES). Figure 1 identifies the principal elements of the Project.

Figure 1: Project – Principal Elements[1]



[1] Figure 1 shows the Principal elements of the Project, full details are shown on the Works Plans (Document Reference: 4.4).

3.2 Parameters for the assessment

3.2.1.1 Table 1 presents the maximum parameters for each element of the Project, for the purposes of the ES assessment. Figure 1 shows an indicative layout based on the parameters in Table 1 although the exact positions will not be finalised until the detailed design stage.

Table 1: Project Element Parameters for ES Assessment

Project Element		Maximum Footprint	Maximum Height (above Finished Floor Level (FFL))	Maximum height (above ordinance datum level (AOD))
ERF	Tipping hall (with workshops underneath)	87.5x 60m	31m	37.6m
	Bunker hall	92x 40m	43m	49.6m
	Boiler hall	105x 60m	55m	61.6m
	Flue Gas Treatment (FGT) hall	41x 60m	45m	51.6m
	Turbine hall (including district heating and water treatment plant)	80x37m	25m	31.6m
	Bottom Ash hall	37x37m	25m	31.6m
	Transformer compound	52x22m	10m	16.6m
	Switchyard	93x44m	10m	14.6m
	ERF stack windshield[2]	10m diameter	120m	126.6m
	Back up boilers stack windshield[3]	3m diameter	53m	59.6m
	Back up generator stack	0.85m diameter	55m	61.6m
	Administration and control room and offices	30x100m	43m[4]	49.6m
	Air Cooled Condensers (ACC) / Air Blast Chillers (ABC)	75m x 35m	50m[5]	56.6m

[2] Will contain 3 individual flues

[3] May contain up to 3 individual flues

[4] Roof height of 43m to allow ability to situate above ERF

[5] Situated above 25m tall turbine hall, not 50m from ground level.

Project Element		Maximum Footprint	Maximum Height (above Finished Floor Level (FFL))	Maximum height (above ordinance datum level (AOD))
	Carbon capture utilisation and storage facility	79m x 66m	50m	56.6m
	Carbon dioxide storage tanks	28x20m	20m	26.6m
	Fire water tank	11.3m diameter	19.3m	25.9m
	Fire water pumphouse	6x6m	6.5m	13.1m
	Gatehouse	32x12m	5m	11.6m
RHTF & CBMF	Process building and storage areas	280x130m	25m	30.1m
	Admin building	62x10m	21m	26.1m
Plastic Recycling Facility	Pre-processed material storage	65x35m	10m	13.9m
	Heat exchange building	35x17m	15m	18.9m
	Post processed storage	5x16.4m	15m	18.9m
	Electrical rooms	15x7m	10m	13.9m
	Process building	130x80m	25m	28.9m
	Admin building	62x10m	21m	24.9m
Battery storage facility		115x58m	8.5m	11.5m
Electric vehicle and hydrogen refuelling station		95x80m	12.5m	15.5m
Northern hydrogen production and storage facility		100x25m	8m	12.6m
Northern Gas AGI		60x60m	5m	9.6m
Southern hydrogen production and storage facility		100x25m	8m	11.6m
Southern Gas AGI		60x60m	5m	10.1m
DHPWN		Up to 30m working width	Up to 3m below ground	-

Project Element		Maximum Footprint	Maximum Height (above Finished Floor Level (FFL))	Maximum height (above ordinance datum level (AOD))
Visitor Centre		41x36m	16m	19.05m
Elevated walkway		700m in length x 4m width	12m	Maximum of 17.05m
Access road		-	-	5.2m (allows for 1m deviation from current design)

3.2.1.2 Notwithstanding the indicative layout provided at Figure 1, there are currently two elements of the Project where the Applicant is seeking some limited optionality as described in the following bullet points. For these two elements, each option is assessed separately in the ES chapters where the options will have different effects for each specific technical topic. The details of these options are presented below.

- Two alternative options (A and B) have been included for the routing of the Northern DHPWN as set out in Section 2.3 above. The Applicant is seeking approval for both options as alternatives to each other and will decide which option to pursue during the detailed design process.
- The ERF will use either fuel oil or natural gas for auxiliary firing. Both options may be installed concurrently, to allow for flexibility depending on the availability of fuel, but only one will be used at a time:

– if the ERF uses natural gas for auxiliary firing, there will be a gas AGI located in the north of the site, to allow for offtake of natural gas and injection of hydrogen produced on site into the gas grid; and / or

– if the ERF uses fuel oil for auxiliary firing, there will be a fuel oil tank located within the works extent for the ERF. This tank will be located in a bund which is sized for 110% of the volume within the tank.

- The ES assumes that that both fuel options would be in place, but only one would be operating at any time, as a worst-case assessment.

3.2.2 The NSIP

Energy Recovery Facility

3.2.2.2 Energy Recovery Facilities (ERFs) are vital in supporting the UK's ambition to process waste in an efficient and effective manner, thereby helping to reduce the impact of waste on climate change and avoid landfilling. UK waste policy clearly identifies the need for new recycling and recovery infrastructure which is backed by a government commitment of zero avoidable waste to landfill by 2050. A modern ERF recovers energy using a thermal treatment process to generate low carbon electricity and heat from non-recyclable waste. An ERF is classified by how efficiently the energy is recovered from the waste (R1 rating). The R1 rating for the proposed ERF is 0.747, well above the 0.65 level that defines the facility as an energy

recovery operation. The development of the District Heat Network (DHN) (part of the DHPWN) using heat produced by the ERF will further improve the R1 rating.

3.2.2.3 The ERF will be capable of efficiently[6] recovering energy stored within waste products. The ERF will have a capacity to convert up to 760,000 tonnes of waste per year into electricity, with a maximum gross output of up to 95 megawatts electrical power (MWe). Energy is released through combustion of the waste and the heat released by the combustion process is utilised within a boiler to generate steam, used to drive a steam turbine and electricity generator. The waste used to fuel the facility is known as Refuse Derived Fuel (RDF), made up of municipal solid waste, or commercial or industrial waste of a similar composition, that has undergone treatment and sorting to remove larger inert/non-combustible materials, fine materials (including a proportion of organic matter) and any waste that could not be recycled.

3.2.2.4 The RDF will be delivered to the ERF by a combination of rail, road, and river transport, the details of which are presented in Section 7.2.2. Upon arrival at the ERF, the RDF enters the enclosed delivery area, where it will be tipped into the bunker hall. The facility will be equipped with duty and standby fuel cranes, each of which will be capable of feeding all boilers independently. The cranes will mix the fuel to improve homogeneity and will transfer RDF from the bunker hall into the feed hoppers. The feed hoppers will transfer RDF onto the combustion grate.

3.2.2.5 Following combustion, ash from the process will be transferred to the RHTF, described in Section 3.2.3.2.

3.2.2.6 The main ERF building will house the following key components;

- tipping hall;
- bunker hall;
- boiler hall;
- turbine hall (with ACC / air blast coolers on the roof);
- flue gas treatment system;
- district heating equipment;
- switchyard;
- water treatment facility;
- bottom ash hall;
- administration and control room, offices and gatehouse;
- exterior storage tanks for ammonia, diesel and fire water; and
- CO_2 capture, utilisation and storage facility (CCUS).

3.2.2.7 Further details of each of these elements are presented below. In addition, all buildings will be designed to allow for the future installation of solar photovoltaic panels.

[6] R1 energy efficiency calculations for the Project suggest values of between 0.747 and 0.755 will be achieved by the Project.

Tipping hall

3.2.2.8 The tipping hall will be situated at the southern end of the main ERF building and provide a reception area for incoming RDF to the facility, delivered by road transport or by secondary handling vehicle (for example a telehandler) from the Wharf or railhead. Within the tipping hall, delivery vehicles transfer RDF directly to the RDF bunker. The tipping hall will measure no greater than 87.5m by 60m.

Bunker hall

3.2.2.9 The bunker hall will be situated within the main ERF building to the north of the tipping hall behind (to the south-west of) the administration building and north-east of the turbine hall. Prior to being loaded into the boilers, RDF will be stored and mixed within the bunker to improve homogeneity.

3.2.2.10 The bunker hall will be no greater than 92m by 40m and will be set into the ground, with its floor 10m below finished floor level and constructed of reinforced concrete that is impervious to water and gas. The fuel bunker will be a water retaining structure, designed to prevent leachate entering the surrounding ground.

Boiler hall

3.2.2.11 The boiler hall will be located immediately north of the bunker hall and will be the largest element of the ERF, no greater than 105m by 60m. The boiler hall is where the main combustion process will take place and will contain the combustors and associated boilers. The boiler hall will contain three lines, each with a thermal output up to 105.3MW_{th}. Each line will be equipped with a thermal recovery unit to recover thermal energy from the flue gas and generate superheated steam.

Turbine hall

3.2.2.12 The turbine hall will be located on the east side of the ERF and will measure no greater than 80m by 37m. The turbine hall will contain the steam turbine which will generate electricity from the superheated steam produced in the boiler hall.

ACC or ABC

3.2.2.13 The cooling system for the ERF will consist of either ACC or ABC, both of which will be located on the roof of the turbine hall to reduce the footprint of the ERF (Table 1).

Flue Gas Treatment system

3.2.2.14 The flue gas treatment system will be housed within a flue gas treatment hall which will measure no greater than 41m by 60m. Each line will also be equipped with a flue gas treatment system, which will clean the flue gas and reduce the concentrations of acid gases, nitrogen oxides and particulate matter.

Stacks

3.2.2.15 There will be a total of up to seven individual flues, contained within three separate stacks. The three ERF flues, which will be contained in a single stack windshield, will rise from the roof of the ERF and are proposed to be up to 120m in height. In addition, there may be up to three individual back-up boiler stacks of up to 53m in height which will be contained within a single stack windshield, and a back-up generator stack of up to 55m in height.

District heating equipment

3.2.2.16 The DHN will be supplied by a steam bleed from the ERF turbine, waste heat recovered from the energy recovery process or by back up boilers used when the ERF is not in operation. The equipment required to export heat from the facility will be housed in a room north of the turbine hall. This will include:

- back-up boilers fired by either diesel or natural gas, complete with its dedicated flue stack up to 53m tall (see paragraph 3.2.2.15), to provide a guarantee of supply in the event that all three of the ERF lines are out of service;
- shell and tube heat exchangers, used to transfer heat from the steam to the district heating circuit;
- pumps to supply pressure for the district heating network;
- condensate pumps, used to return the condensed steam to the ERF steam cycle; and
- a water treatment system for the DHPWN circuit water.

Switchyard including substation

3.2.2.17 The facility will be equipped with the necessary equipment to import and export electrical power to the National Grid. This equipment will be split over two areas, one south of the bottom ash building and turbine hall, which contains the step-up transformers and equipment to supply the private wire network on site, and client and Distribution Network Operator (DNO) switchyards located northeast of the facility, close to the gas AGI. The client-side switchgear will contain disconnectors necessary to allow the facility to disconnect independently from the national grid, whereas the DNO switchyard will contain tariff metering equipment and disconnectors which allow the DNO to disconnect the facility from the national grid.

3.2.2.18 The ERF switchyard will contain the electrical switchgear and step-up transformers (substation) necessary for the facility to connect into the Northern Power grid 132kV network. Equipment will also be included to allow for supply of electrical power to the private wire element of the DHPWN at 33kv or 11kv. It will include feeds to the hydrogen production and storage facility, battery storage units, and electrical vehicle charging station.

Water treatment facility

3.2.2.19 The water treatment facility will be located on the ground floor of the main ERF building. The facility will take water from the mains supply and treat it to remove impurities to make it suitable for use in the boiler and carbon capture plant.

3.2.2.20 The treatment process will involve either reverse osmosis or ion exchange producing demineralised water for the energy from waste facility. The rejected water from this process will be used in other processes within the ERF and will ultimately be discharged to the bottom ash extractor. The ERF will be designed to be zero-discharge, with no process effluent discharged to sewer. However, process effluent may be created by high water demand and will be stored on site and either discharged to the local sewerage network or via tankers to an off-site licensed treatment facility.

Bottom ash hall

3.2.2.21 The bottom ash hall will be located to the east of the bunker hall and south of the turbine hall and will house a storage area for Incinerator Bottom Ash (IBA), and an inclined conveyor, which will feed the larger, high level conveyor used for the transportation of ash from the main ERF building to the RHTF.

3.2.2.22 Located within the main ERF building, the bottom ash hall will measure no greater than 37m by 37m.

Administration and control room, office and gatehouse

3.2.2.23 The administration and control room and office areas will be situated on the southern side of the ERF building, to reduce night-time light effects across the River Trent at Amcotts. This element of the ERF will include offices, welfare, the plant control room, and operational facilities. A gatehouse and associated weighbridges will control HGV and other operational vehicles accessing the ERF and the RHTF.

Exterior storage tanks

3.2.2.24 The facility will use ammonia for reduction of nitrogen oxides within the flue gas, and may use diesel for auxiliary firing, firing the emergency back-up generator and the backup boilers. These tanks are located west of the ERF building, situated to allow for unloading of reagents. Both tanks will be stored within bunds, sized for 110% of the volume of the tank.

3.2.2.25 The facility will also be equipped with a fire water tank, sized to surpass the minimum requirements of NFPA 850[7]. The fire water tank will be located south of the carbon storage tanks and will contain a volume of up to 1,785 m^3.

[7] National Fire Protection Agency (2020) Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

Carbon capture, utilisation and storage facility

3.2.2.26 The CCUS will be located to the north and west of the main ERF building (Figure 1), where combustion gasses from the ERF are diverted for treatment and CO_2 removal prior to being emitted through the stack.

3.2.2.27 The carbon capture process involves the pre-treatment of flue gas to remove impurities such as acid gases and particulates. Once pre-treated, the gas is then fed through an amine absorber, where the CO_2 in the flue gasses bond with the amine solution. The condensate created will be collected and either discharged to the foul water network or treated through an incorporated water treatment plant, with flue gas impurities and waste removed from the condensate going to the CBMF.

3.2.2.28 The remaining flue gasses are then re-heated and diverted back to the ERF stack to be emitted to atmosphere, whilst the amine solution is heated again to release the CO_2, for capture and storage in pressurised containers. The stored CO_2 will then be used for conversion of the FGTr to aggregates, or used off site.

3.2.2.29 The CCUS facility will be sized to capture at least 54,387 tpa of the CO_2 emitted by the ERF.

3.2.2.30 Further details of the carbon capture process and the chemistry of the emissions from the plant are presented in Chapter 5: Air Quality (**Document Reference 6.2.5**).

3.2.2.31 The Applicant is exploring the option to link the facility up to the proposed Zero Carbon Humber pipeline which has been selected as part of the East Coast Cluster to provide the infrastructure for carbon capture and storage. Once this project is consented and operational, the Project could become one of the first ERFs to become carbon negative.

3.2.3 The Associated Development

RHTF and CBMF

3.2.3.2 The ash produced following combustion within the ERF will be treated onsite in a facility that will adjoin the ERF. The residues derived from the combustion of the feedstock are classed in two categories: IBA, which is the non-combustible residue which remains in the bottom of the combustion units, and flue gas treatment residue (FGTr); which comprises fine particles of ash and residues from the flue gas treatment system and flue gas condensate. The whole of the RHTF will be housed within a single building under negative pressure, comprising an ash maturation area, internal heaped storage areas for the storage of treated ash, silos for storage of cement and FGTr, maintenance areas and a large (approximately 71m by 68m) area of hardstanding to allow safe vehicle access and egress, and movements between the facility and the CBMF.

3.2.3.3 The wet IBA will be transferred to the maturation area in the RHTF via conveyors where the IBA will mature for up to eight weeks, allowing chemical reactions to complete within the IBA and for the water content in the ash to reduce. The ash is then treated mechanically by particle size

using trommels to separate the fractions. Larger particles are crushed once any metals have been removed using over-band magnets for ferrous metals and eddy current separators for non-ferrous metals. The smaller particles are then sorted further using additional trommels, producing a non-hazardous aggregate graded by particle size. The IBA treatment area will comprise covered bays for maturation of ash, and enclosed mechanical treatment building under negative pressure and storage bays for the aggregate product.

3.2.3.4 FGTr will be processed using carbonation, in which cement, a filler material such as quarry fines and CO_2, are mixed with the treated FGTr in a humid environment. The material cures for up to seven days in a chamber. During this process, the cementitious materials expand and encapsulate the hazardous materials within the FGTr, forming a non-hazardous aggregate.

3.2.3.5 Once both IBA and FGTr have been treated, they will both be stored in the bulk storage area ready for transfer to and use in the concrete block manufacturing facility.

3.2.3.6 Once treated, the ash residues will be transferred from the RHTF to the CBMF which will be located to the south of RHTF and will receive approximately 125,000 tonnes of treated IBA and FGTr per year.

3.2.3.7 The CBMF will combine the treated ash with imported sand and cement, delivered by road, river and train, to manufacture approximately 285,000 tonnes of concrete blocks per year. The manufactured blocks will then be exported to market from the site via road, river and train.

Plastic recycling facility (PRF)

3.2.3.8 A PRF will be constructed on land to the south and east of the RHTF and the process building will have maximum dimensions of 130m by 80m, and a maximum height of 25m. The PRF will take source-segregated waste plastics (Polyethylene terephthalate, High-density polyethylene, and Polypropylene) and treat this incoming feedstock through a series of washing, grinding, sorting and extruding process to produce pellets or flakes of 'raw' plastics, free of contaminants that can be used to manufacture new plastic products without the use of fossil fuels.

3.2.3.9 Approximately 24,000 tonnes of clean and re-usable plastics could be produced per annum. Up to 500 tonnes per annum of metals will be produced for recycling, with up to 500 tonnes of unsuitable oversize material processed by the ERF.

3.2.3.10 The rationale for including the PRF in the Project is to directly address concerns raised by consultees during the non-statutory consultation period. Concerns were raised that the operation of the ERF would detrimentally affect recycling rates, and that potentially recyclable plastic could find its way into the RDF stream due to a lack of recycling facilities. By including the PRF in the Project, the Applicant will be able to source RDF that has undergone a higher degree of sorting, allowing more recyclable plastics to be processed at the PRF.

3.2.3.11 It may be noted that the size of the PRF at this stage is quite large in comparison to the other elements of the Project. This is to allow flexibility in

the design of the PRF, and it is anticipated that the scale of the building will be reduced and refined. However, this larger size has been used as the basis of the ES assessment for the purposes of undertaking a worst-case assessment.

Hydrogen production and storage facilities

3.2.3.12 The Project will include up to two H_2 production and storage facilities (Table 1) supporting the 2050 Net Zero Target[8]. The first facility will be located at the south of the Energy Park Land, adjacent to the Electric Vehicle (EV) and H_2 re-fuelling station. The southern facility will comprise a standalone building, housing Polymer Electrolyte Membranes (PEM) units, with additional ancillary equipment, including pumps, heat exchangers, fin-fan coolers, oxygen separators, buffer tanks, compressors, high pressure gas storage, and pipework needed to feed H_2 to the distribution hub, outside of the electrolyser building.

3.2.3.13 The second H_2 production facility will be located to the north of the Energy Park Land, adjacent to the Gas AGI described in Section 3.2.3.19. The northern facility will be of a similar design to the southern, incorporating a standalone building housing an electrolyser and the additional ancillary buildings to incorporate the necessary ancillary equipment. However, at this location, the pipes will feed H_2 to the AGI for future distribution into the gas grid.

3.2.3.14 The H_2 production facilities will require a total water supply of up to 16,000 tpa, which could draw on water recycled from the ERF or the mains supply. This quantity of water will produce up to 1,700 tonnes of H_2 per annum (56,000 MWh) enough to heat the equivalent of 23,000 homes.

Electric vehicle and hydrogen re-fuelling station

3.2.3.15 The southern boundary of the Energy Park Land, adjoining the B1216 (Ferry Road West) will be the location of the EV and H_2 re-fuelling station and battery storage facility (Table 1). This site will be made up of a hardstanding area with access roads, covering approximately 120m by 65m, with a number of electrical re-fuelling points for both domestic cars and HGV sized vehicles. The canopies of the re-fuelling station will incorporate solar photovoltaic panels to maximise the environmental benefits of the Project.

3.2.3.16 The site will also include a H_2 distribution hub, for the re-fuelling of H_2 vehicles, including access and egress from the EV centre and user amenities typical of traditional fuelling / service stations such as a shop, seating and waiting facilities and toilets.

Battery storage

3.2.3.17 The battery storage facility will have a storage capacity of 45MWh_e and a peak discharge of 30MW_e and will be located to the east of the southern H_2 production and storage facility. The battery storage facility will comprise an area of approximately 6,700m^2 (Table 1) and will include an area of

[8] HM Government (2021) *UK Hydrogen Strategy*

hardstanding with containerised battery units, surrounded by security fencing and planting. The battery storage area will be used to store power generated at the ERF or from the national grid. The stored electricity may be used for electrical vehicle charging and/or energy arbitrage, to increase self-consumption of electricity on site or to provide support to the operation of the national grid such as frequency and voltage regulation.

Hydrogen and natural gas above ground installation (AGI)

3.2.3.18 The Project will include the construction of up to two new gas AGIs which will facilitate the export of hydrogen to the gas grid or to the DHPWN at a point in the future when the concept has been validated. The AGIs may also be used for the supply of natural gas to the ERF to facilitate auxiliary firing and firing of back-up boilers for the district heating scheme. Each AGI would measure no more that 60m by 60m, with plant within each AGI no taller than 5m.

3.2.3.19 The ERF will utilise natural gas (or diesel fuel) for auxiliary firing. One AGI will be located to the north of the Energy Park Land, on the east side of Flixborough Industrial Estate to the north of Stather Road. In this position the northern gas AGI could be used for both the supply of gas to the ERF, and the export of H_2 to the gas grid or to the DHPWN in the future.

3.2.3.20 The second AGI will be located to the south of the Energy Park Land, adjacent to the EV and H_2 re-fuelling station, and the southern gas AGI will only be used for the export of H_2 to the gas grid or to the DHPWN in the future.

3.2.3.21 For the purposes of this ES, it has been assumed that AGI infrastructure will be constructed at both locations.

Access road and parking

3.2.3.22 Road vehicle access to the Energy Park will be provided via a new purpose-built access road which will connect the Energy Park to the B1216 Ferry Road West and Stather Road. The new road will connect at a new roundabout located between the A1077 and Neap House. The new road will be approximately 1.3km long and will include a new 3m wide shared pedestrian/cycle footway along its route separated from the carriageway with a minimum 3m verge. Edge treatments along both sides of the road will incorporate drainage and structural planting to soften the appearance of the road and provide separation between road users and pedestrians. The new access road will include high voltage cables for the grid connection, the cables for the PWN, the DHN, gas pipes and fibre communication within the service corridors of the new access road.

3.2.3.23 The new access road and all associated services, including the PWN and DHN are shown as Phase 1 in the Indicative Phasing Plan (**Document Reference 4.9**) and will be constructed before development of any other Work packages. This commitment is secured by Requirement 14 of the draft DCO (**Document Reference 2.1**).

3.2.3.24 This will allow all construction and operational traffic to be directed away from Flixborough Village and Neap House. In addition, once the new access

road is constructed, Stather Road north of the IDB pump station will be permanently gated and stopped up to prevent vehicle access to all but emergency vehicle traffic and authorised users, to facilitate the construction of the rail head, and to improve the current traffic situation at Neap House.

3.2.3.25 In addition to the new access road, a total of 159no. car parking spaces will be provided to serve the following buildings: ERF/Railhead (43no.); Plastic Recycling Facility (42no.); CBMF (42no.); Visitor Centre (26no.); and EV and H_2 Re-fuelling Station (6no.). Parking will be located to the south of the tipping hall, RHTF and plastic recycling buildings respectively, and to the east of the Visitor Centre. Provision for cycle/motorcycle parking and pedestrian access will also be included as part of the Project.

Visitor Centre

3.2.3.26 The Project will include a Visitor Centre that will be located to the south of the gatehouse and the RHTF close to the main entrance to the site, lying to the west side of the new access road. This will integrate public access to the newly established wetland area, visitor parking provision, the new cycle ways and provide secure educational access to view the facility from an elevated walkway.

Elevated walkway

3.2.3.27 To facilitate the safe movement of pedestrians between the various Energy Park buildings, an elevated walkway will be constructed for both staff and the general public. General public visiting the facility will have access to the walkway controlled via the visitor centre and it will incorporate a canopy to provide rain shelter to those using it. From the visitor centre the elevated walkway will extend in two directions: north to access the RHTF, and following that the main ERF building; and to the east of the visitor centre spanning the access road to provide safe access to the PRF.

3.2.3.28 The covered walkway will be approximately 700m in overall length, 4m wide, and will be elevated to no higher than 12m (FFL).

3.2.3.29 The Applicant is also considering whether the covered walkway can be used as a living wall as an additional enhancement, which would reduce the visual impact, to compliment the landscaping and to contribute to the Biodiversity Net Gain (BNG).

Railway Reinstatement and Dragonby sidings

3.2.3.30 The Project will include the reinstatement of the existing 6km Dragonby to Flixborough branch line. To facilitate the re-opening of the line, it will be necessary to undertake some essential maintenance and vegetation clearance which will allow the line to operate safely over the lifetime of the Project.

3.2.3.31 To provide continued amenity access across the branch line, the Project will include the provision of an upgrade to the existing at grade infrastructure for the footpath (FLIX175) crossing to the south west of Flixborough and re-establishment of the footpath (FLIX178) crossing to the south east of Flixborough through the provision of a pedestrian bridge. These measures

are required to ensure that the crossings meet the appropriate safety standards and to reduce the risk of the public crossing the rail line once it has been re-commissioned.

3.2.3.32 There is evidence that the branch line is currently used as an informal recreational walking route without consent. In order to provide the continued amenity access along the route of the branch line, the Applicant is proposing to provide a new footpath along the southern side of the branch line, between the existing Public Right of Way FLIX178 and Atkinson's Warren, which is open access land. This will create a link via the open access land to FLIX177.

3.2.3.33 The essential maintenance to the existing rail infrastructure will include:

- clearance of all vegetation to at least 5m each side of the running rails;
- removal of existing trackwork and ballast, the extent of which will be determined following an upcoming loading gauge assessment;
- upgrading of an existing at grade crossing and the provision for a pedestrian bridge;
- repairs to existing drainage, fencing and at-grade crossings; and
- relaying with replacement ballast, geotextile and track work including signalling and safety features.

3.2.3.34 The sidings at Dragonby will be reinstated to facilitate movements overnight being held at Dragonby. The sidings will provide a holding area for trains between the railhead and the main line, particularly during overnight periods when the main line may be closed for engineering works.

New railhead

3.2.3.35 The Project will include the construction and operation of a new railhead to the south of Flixborough Wharf, with the primary purpose of facilitating the delivery and export of materials at scale to and from the Project, reducing the need for road vehicle movements.

3.2.3.36 Trains will then move to and from the railhead via the Flixborough branch line, to new sidings to be provided at Dragonby Sidings to the south east.

3.2.3.37 The railhead will be located along the west side of the Energy Park, between the ERF and the east bank for the River Trent. It will be set back from the river to reduce potential impacts on riparian ecological receptors and will comprise three parallel tracks or sidings which will facilitate the offloading and loading of trains. The railhead will also incorporate a hardstanding apron for the movement of slave vehicles and associated turning areas.

DHPWN

3.2.3.38 Both DHPWNs (the Northern and Southern DHPWN) will include the same buried utilities infrastructure; comprising insulated supply and return pipework for heat and cabling to supply electrical power to the PWN.

Biodiversity Net Gain (BNG) and Ecological Mitigation

3.2.3.39 The Project has a target of 10% BNG in recognition of the requirement set by the Environment Act 2021 for NSIPs as well as development permitted under the Town and Country Planning Act 1990. Where possible, the landscape design, surface water drainage strategy and flood mitigation has been designed to increase the BNG and additional habitats have been integrated to improve the existing ecology.

Green infrastructure

3.2.3.40 Landscape, biodiversity, environment and people have been the key considerations in the development of the green infrastructure proposals, ensuring that potential impacts (direct and indirect) are mitigated and opportunities for biodiversity enhancement are identified and maximised as part of the conceptual design forming a set of design codes, which sit in the Design Principles and Codes (**Document reference: 5.12).**

3.2.3.41 Given that much of the Application Land is located adjacent to the River Trent and within Flood Zones 2 & 3, the importance of the existing drainage network and the need for attenuation ponds to mitigate the existing flood risk, has created an opportunity to combine and integrate these features creating a new wetland landscape to the west of the new access road which will provide flood mitigation and ecological mitigation. This wetland landscape will create ecologically diverse habitats that, together with the enhancements along Lysaght's Drain to the east of the new access road and the biodiversity enhancement area in the northeast part of the Application Land, improve the ecological connectivity between the River Trent and the Phoenix Parkway Nature Reserve to the east of the Energy Park Land. The wetland features will incorporate the planting of reeds, rushes, lowland meadow species and wet woodland. The remaining fields to the east of the new access road will remain in agricultural use but will also be used, as part of the flood management strategy, to flood to slightly deeper depths than currently estimated in a future extreme tidal event overtopping the bank of the River Trent.

3.2.3.42 The wetland will be designed to create opportunities for protected and notable species including amphibians, birds, bats, water vole, otter, other small animals and invertebrates. Long-term management of the wetland will maintain its productivity and help secure long-term gains for biodiversity. The wetland landscape will incorporate a number of informal paths that facilitate physical activity, play, and relaxation through improved quality and access to open space/nature for both local residents and people working at the Project and Flixborough Industrial Estate. The informal pathways will be linked to the Visitor Centre, the new cycleways and footpaths as shown on the Public Access Plan at Figure 5.25 of the Design and Access Statement **(Document Reference: 5.3)**.

3.2.3.43 Structural landscape planting mitigation, underpinned by a detailed understanding of local landscape character, views/visual amenity, will be embedded into the Design Principles and Codes **(Document Reference: 5.12).** A design code is a set of simple, concise, illustrated design requirements that are visual and numerical wherever possible to provide specific, detailed parameters for the physical development of a site or area.

3.2.3.44 Mitigating any adverse landscape and visual impacts where they may arise has been a priority in developing the design and layout of the Project. Existing structural landscape has been retained wherever possible and extensive new areas of planting are proposed. An integrated approach has been taken to help provide landscape proposals that are capable of delivering wider green infrastructure benefits.

3.2.3.45 Consideration of the impact on the local community relating to the access to public rights of way, has played a central role in the development of the green infrastructure proposals. Joining up and creating new routes enabling access for walkers and cyclists including those who are mobility impaired, as shown in the Rights of Way and Access Plans **(Document Reference: 4.3)**, in and around the vicinity of the Project has been maintained and enhanced within the Order Limits. Any temporary severance of Public Rights of Way will be addressed through the provision of alternative routes. The green infrastructure proposals aim to provide accessibility and permeability of the area surrounding the Project using new and well-placed routes. This will facilitate walking and cycling routes for commuting to the Project and Flixborough Industrial Estate, and provided equally accessible alternatives through the wetland area, during the operational stages of the Project.

Public access

3.2.3.46 Enabling and promotion of public access throughout the site will be a key outcome for the Project and will include a number of measures to encourage public access and interact/ connect with the landscape around the Project. This will be achieved by the provision of several new access routes around the security perimeter of the site, as well as the public open spaces around the Visitor Centre and wetland areas, as described within the Design Principles and Codes **(Document Reference: 5.12)**. Health and safety is a key consideration in the development of these public access elements of the Project, including the separation of motorised and non-motorised users. Access to the ERF and associated works will be controlled by a swipe card system which will ensure that members of the public are kept away from the operational areas of the facility.

New pedestrian footpaths / cycleways

3.2.3.47 The Project will include several new footpaths adjacent to the existing public highway and across what is currently agricultural land to the south of Flixborough Industrial Estate. One of these will be a dedicated shared foot and cycle way alongside the east side of the new access road between Ferry Road West (B1216) and the ERF building. This will be separated from the road by a 5m wide verge.

3.2.3.48 In addition to the main access, three further pedestrian access routes, as shown on the Rights of Way and Access Plans **(Document Reference: 4.3)** will be created across the Energy Park Land:

- Stather Road, north of Neap House and the pumping station, will be closed to vehicles, but will be maintained as an access to allow walking and cycling along the River Trent in a north – south direction.

- From the stopped-up section of Stather Road, a new pedestrian / cycle access will be created orientated west – east, which will run from Stather Road to the new access road, with a new public right of way, orientated west – east, continuing to the open land at Foxhills Plantation / Atkinson's Warren, providing a new circular walking route and connectivity between the river and the northern edge of Scunthorpe.
- A new public right of way will be provided to the east of Flixborough Industrial Estate, connecting footpath FLIX/175 and FLIX/304, providing a new link that avoids the walking along Stather Road.

3.2.3.49 All of these public access routes will be enhanced to act as ecological corridors incorporating structural planting to provide visual screening. Details of these public access routes are shown in Figure 5.25 in the Design and Access Statement **(Document Reference: 5.3)**.

3.2.3.50 The Project will also include a new footpath link from FLIX178 to Atkinson's Warren.

New Informal paths

3.2.3.51 The area of wetland habitat created between the River Trent and the new access road will also contain informal paths that allow public access to the wetlands. These informal paths will link to the existing and proposed access routes and provide connectivity to both the refuelling station and the ERF in the north.

Sustainable Drainage (SuDS) and flood defences

3.2.3.52 The Energy Park Land is located behind the existing Environment Agency flood defences within the floodplain of the River Trent, and presents a number of technical challenges to deliver the requirements of the relevant National Policy Statements (particularly Overarching National Policy Statement (NPS) for Energy (EN-1). NPS EN-1 confirms the aims of planning policy on development and flood risk are to ensure that flood risk from all sources of flooding is taken into account to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. The NPS goes on to state that where new energy infrastructure is exceptionally necessary in such areas, policy aims to make it safe whilst not increasing flood risk elsewhere, and reducing flood risk if possible. The National Planning Policy Framework (2021) reiterates this latter point.

3.2.3.53 The Project will increase the overall area of hardstanding, which could increase the rate of rainfall runoff. The introduction of new buildings onto the floodplain has the potential to displace floodwater to other areas if the current flood defences are overtopped. To address this risk and to meet the requirements of the NPPF, the Project will include several embedded sustainable drainage systems and flood mitigation measures.

3.2.3.54 The Project and access road will be elevated above any future extreme tidal event, taking into account the Environment Agency calculations of future sea level rise due to climate change. This will reduce the risk of tidal and fluvial flooding of the Project for its lifetime and facilitate safe access and

egress including for the businesses already established on the Flixborough Industrial Estate. The raised development, flood defences and the new access road will also provide a secondary flood defence to users in the Flixborough Industrial Estate by reducing the existing level of flood risk to the other businesses.

3.2.3.55 The Project will include the construction of a flood wall along First Avenue wrapped around the west of Flixborough Industrial Estate; and a flood embankment to protect Park Ings Farm (the existing poultry farm) located to the north of Skippingdale Retail Park. This will prevent the raised development from displacing floodwater into the industrial estate or poultry farm.

3.2.3.56 A series of ponds and swales combined with landscape and ecological design features, to create an area of wetland habitat, will be introduced adjacent to the development buildings, with the largest being to the west of the access road, and east of the River Trent.

3.2.3.57 Further details of these SuDS and flood defence elements of the Project can be found in the Flood Risk Assessment at Annex 3 of the ES (**Document Reference 6.3.3**).

Lighting

3.2.3.58 The lighting requirements of the Project will be designed and installed in line with the Indicative Lighting Strategy at Annex 4 of the ES (**Document Reference 6.3.4**) opting for the minimal level of operational lighting requirements. The potential impacts of artificial lighting or reflected light on identified sensitive natural habitats, neighbouring occupiers, and the wider landscape, will be managed to minimise any potential adverse impacts.

3.2.3.59 The Indicative Lighting Strategy details how the Project will minimise the impact of obtrusive light and undue light spill on to surrounding areas, protected natural environments, sensitive receptors including the River Trent and the proposed new areas of wetland habitats.

4. CHANGES SINCE PEIR

4.1.1.1 Several changes in the design of the Project have been made since the submission of the PEIR in June 2021. These changes have been made following developments in design work, input from ongoing technical and ecological studies and taking account of responses to consultation. Mitigation strategies have been incorporated into the Project design informed by responses to the scoping and PEIR reports from statutory consultees and members of the public through the informal consultation process and Statutory Consultation process.

4.1.1.2 The main changes to the Project following the Scoping Report are:

- Removal of the extension to the Wharf at Flixborough;
- Expansion of the railway sidings at Dragonby;
- Removal of hydrogen fuel cells;
- Removal of the need for a standalone RDF storage facility, with 13,000 tonnes of RDF now stored within the bunker;
- Inclusion of power export within the private wire network;
- Stopping up of Stather Road and introduction of new public access routes;
- Provision of flood defence along First Avenue and next to the existing Park Ings Farm located to the north of Skippingdale Retail Park;
- Inclusion of a PRF; and
- An elevated walkway to provide safe pedestrian access.

4.1.1.3 The further main changes to the Project following the PEIR are:

- The inclusion of First Avenue, Flixborough Industrial Estate into the Order Limits to facilitate the construction of underground utilities;
- The inclusion of part of Bellwin Drive, Flixborough Industrial Estate into the Order Limits to provide construction access for the ERF;
- A section of highway land along Ferry Road West has been removed by streamlining the construction of the new roundabout;
- Connesby Quarry has been removed from the Order Limits as a construction laydown compound due to potential archaeological sensitivity in that area;
- An area on the Flixborough Industrial Estate has been removed where proposed flood defences have been replaced by a flood wall and establishing a Flood Evacuation Plan as discussed with the Environment Agency;
- Areas to the north and south of the railway line have been consolidated to match the planned screening, biodiversity habitats and public rights of way;
- The areas required for the DHPWN have been consolidated and include construction zones and construction compounds;

- The Northern DHPWN has been shortened to manage the impact of construction noise and traffic disruption; and
- The Northern DHPWN now includes an additional route option to mitigate traffic disruption and noise impacts on residents during construction.

5. ROCHDALE ENVELOPE

5.1 Rochdale envelope

5.1.1.1 The detailed design of the Project will be determined post-consent once the Applicant has appointed a contractor(s) (as is usual with infrastructure projects of this type and scale). The draft DCO submitted with the Application (**Document Reference 2.1**) includes requirements for details of the final design to be submitted and approved by the relevant planning authorities prior to construction. The assessment of the Project is therefore based on a set of parameters referred to as the 'Rochdale Envelope'.

5.1.1.2 PINS Advice Note Nine: Rochdale Envelope (April 2012) (Version 2) sets out advice for using the Rochdale Envelope approach for the assessment of NSIP applications.

5.1.1.3 The ES provides an assessment of the likely significant environment effects of the Project based on the Rochdale Envelope using the key parameters set out on the Works Plans **(Document Reference 4.4**), in Table 1 of this document (replicated in Part 3 of Schedule 1 of the draft DCO **(Document Reference 2.1)**), and as described in this chapter.

5.1.1.4 In order to provide a robust assessment, each topic specific assessment presented in Chapters 5 - 17 has been undertaken on a reasonable worst-case scenario for that given topic. The reasonable worst-case scenario for each topic differs. Each chapter sets out the selected scenario for that topic, however all assessments have been undertaken within the broadest reasonable parameters.

6. CONSTRUCTION AND COMMISSIONING

6.1 Construction Environmental Mitigation

6.1.1.1 The Project is likely to be constructed over a six-year period in six phases as shown on the Indicative Phasing Plan (**Document Reference 4.9**). However, the final phasing scheme will be submitted to the local planning authority for approval in accordance with Requirement 2 of the draft DCO (**Document Reference 2.1**).

6.1.1.2 Prior to the commencement of construction and demolition activities within the Order Limits, all relevant mitigation measures required in advance of construction as identified in the ES will be put in place. These mitigation measures will be monitored (by a clerk of works) on a regular basis and at the start of the main phases of the development. The sequence of construction works have to be aligned with those aspects of the environment that cannot be relocated or protected due to seasonal parameters. All ecological mitigation will remain in place until the completion of the particular phase of the works. Ecological mitigation measures will be implemented as detailed in Section 7 of ES Chapter 10 (**Document Reference 6.2.10**).

6.1.1.3 A Soil Management Plan (SMP) will be prepared as part of the Construction Environmental Management Plan (CEMP) pursuant to Requirement 4 of the draft DCO **(Document Reference 2.1)** (see also outline SMP, Appendix J of the Code of Construction Practice (CoCP) (**Document Reference 6.3.7)**. The SMP will identify the removal, segregation, and organised stockpiling of excavated material, together with imported fill[9], across the whole Project. Based on the outcome of the material assessment, areas within the Order Limits will be identified for stockpiling of topsoil, clay, reclaimed construction material and material unsuitable for reuse on the Project, which will be removed from the Application Land. The unsuitable material will be managed in accordance with the Construction Waste Management Plan (WMP) (see also outline Construction WMP, Appendix G of the CoCP (**Document Reference 6.3.7)**.

6.1.1.4 In the event that ongoing ground gas monitoring indicates the presence of ground gas, protective measures may be required in the design of some buildings. Site evaluation and risk assessment processes and the development of protective measures would be in accordance with BS8485:2015+A1:2019. Operational monitoring of ground gas would be required as part of system verification.

6.1.1.5 Based on the design of the sustainable drainage system (SuDS) as shown indicatively on the Indicative Surface Water Drainage Plan (**Document Reference 4.16**), for the Project, detention basins, retention ponds and swales will be constructed. These constructions will happen at various points during the Project delivery but will be completed and landscaped by the time the ERF is commissioned. The SuDS will be integrated into the

[9] Circa 500,00mt of earthworks material, specified in accordance with the Specification for Highway Works Series 600, will be required to raise land levels in accordance with the requirements of the Flood Risk Assessment. This assumption has been utilised in preparing the air quality and transport assessments.

existing surface water drainage system and feed to the existing surface water pumping station located north of Neap House.

Construction Working Hours

6.1.1.6 The days and time during which construction activity will normally take place on the Application Land are as follows:

- 07:00 – 19.00 hours Monday – Friday (noting that workforce traffic will arrive at the site during the hours of 06:00 to 07:00);
- 07:00 – 13:00 hours Saturday with work taking place after 13:00 up to 23:00 hours subject to agreement with North Lincolnshire Council (NLC) on the nature of works and associated noise controls to be set out in the CEMP;
- no working on Sundays, Bank or Public Holidays unless with specific agreement of NLC; and
- no working during night-time hours of 23:00 to 07:00 except with specific agreement of NLC and/or in the event of an emergency.

6.2 Contractors Compounds and Site Set-Up

6.2.1.1 A number of contractor's compounds and lay down areas are required within the Order Limits for the construction of the Project and these are located as follows (see also Figure 4 and Figure 6):

Table 2: Compounds and Lay Down Areas

Area	Location
1	Neap House (New access road)
2	South of Stather Road
3	Between Stather Road and First Avenue – unnamed road
4	Off new access road – required for Plastic Recycling Facility
5	DHPWN – A1077
6	DHPWN – A18/A1077
7	DHPWN – Nuddock Wood Lake
8	DHPWN – A1077/Clayfield Road
9	Scunthorpe North 132kV Substation
10	Dragonby Sidings

6.2.1.2 The contractor's compound and lay down area for the ERF will be located to the south of Stather Road (Area 2). The main office and welfare facilities will be located to the southern part of the contractor's compound, and the full extent of this area will be secured by Heras fencing. California Bearing Ratio tests (CBR) will be carried out on the existing land to determine the locations for the laydown of large, heavy items required in the construction of the ERF. The main access to the contractors' compound will be via Stather road until the new access road has been constructed. Where possible temporary connections into the existing services will be created; if

not, then a stand-alone facility will be constructed, which will be decommissioned when the Project is complete, and the contractor's compound removed.

6.2.1.3 A second contractor's compound (Area 1) will be established to the southern part of the Energy Park Land close to the B1216 and will be in the location of the proposed EV and H_2 refuelling station. This compound will serve the main access road construction between the B1216 and Stather Road. This compound will provide the offices and welfare facilities for the contractors constructing the new access road between the B1216 and Stather Road. This compound will be sized to accommodate the earth moving vehicles and estimated workforce required to construct the access road. All sub-base material used in the construction of the compound will be utilised in the construction of the EV and H_2 refuelling station.

6.2.1.4 Areas 3 to 9 are required to deliver the Northern and Southern DHPWN and will be secured using Heras fencing and the topsoil will be stripped and stockpiled for the reinstatement of the compound. Type 1 sub-base will be placed to form the working platform and site offices and welfare facilities will be established. As both DHPWNs progress the compounds will be removed after the completion of that section. The compounds will then be fully reinstated.

6.2.1.5 For the Railway Reinstatement Works, a contractor's compound will be established at Dragonby Sidings (Area 10). This compound will be secured using Heras fencing to isolate it from the operations at the sidings. All reinstatement works on the railway will be served from this compound. Satellite welfare facilities will be required along the route of the railway which will be located within the red line boundary.

6.3 Demolition Works

6.3.1.1 There are a number of buildings and structures that will require demolition prior to the commencement of the ERF. It is currently anticipated that these buildings and structures will be demolished at the beginning of the first phase of construction when construction compounds are being established. The demolition contractor's compound will be set up on the site of the former Glanford House, and the area of RMS Ports, which contains the four large storage sheds to be demolished, will be securely fenced off in accordance with the Construction (Design and Management) Regulations 2015.

6.3.1.2 Any necessary environmental mitigation will be put in place prior to the commencement of the demolition works. Sack filters will be applied to the access points of the surface water drainage system. Cladding will be removed from each shed, followed by the dismantling of the steel frame structure, all of which will be recycled on site where possible or transported off-site for recycling. The existing foundations will be broken up along with the existing hard standing area. Any hazardous material will be removed from the site. Recycling and disposal of materials will be undertaken in accordance with the Construction WMP (see also outline Construction WMP, Appendix G of the CoCP **(Document Reference 6.3.7)**). Material that is considered reusable in the construction of the ERF or associated works

will be stockpiled in accordance with the SMP which will be produced by the Contractor (see also outline SMP, Appendix J of the CoCP **(Document Reference 6.3.7)**).

6.4 Service Diversions and New Services

6.4.1.1 There are a number of existing services that will be located and diverted in the process of delivering the Project as shown on the Indicative Utility Diversion Drawings (**Document Reference 4.17**). These service diversions will be carried out in the first phase of the Project (year 1) when the alignment of the new access road and associated junctions are being constructed. The majority of the diversions will involve exposing the existing service and establishing the new route. The services will be directly buried and marked in accordance with best practice. Where new and existing services are present, especially around the new access road, then ducts will be installed to accommodate all proposed services. Services will be installed within the access road service corridors for those parts of the Project that will be delivered after the commissioning of the ERF, such as the DHPWN and communications network.

6.4.1.2 The service corridors on either side of Stather Road and First Avenue adjacent to Flixborough Industrial Estate will require close coordination, especially as the ERF export cables must be routed to the main substation, which is located to the east of the industrial estate.

6.4.1.3 If a gas supply is provided to the ERF, then the pipeline from the AGI to the ERF will need to be located on the opposite side of the road to the main export cables.

6.5 District Heat and Private Wire Network (DHPWN) and Grid Connection

6.5.1.1 The district heating supply and the return pipelines, the High Voltage (HV) cables, gas pipes and communication fibre, will run along Stather Road and then follow the route of the new access road until it meets the junction of the B1216 and A1077. At this location there will be a below-ground pressure balancing plant as the pipeline takes routes to the northeast (Northern DHPWN) and south (Southern DHPWN). The services that are integrated within the new access road and head south will be direct buried. This involves excavating a trench to the designed depth and width to accommodate the pre-insulated pipes and cables. Where direct burial is not possible trenchless techniques such as horizontal directional drilling or thrust boring may be used.

6.5.1.2 The north-eastern route of the DHPWN as it enters Scunthorpe will be directly buried as outlined above until it reaches the more heavily built-up areas. At this point the construction will be a mixture of direct burial and directional drilling techniques. When the pipeline reaches the junction of the A1011 and B1430 the construction will be direct buried but under the existing road as there is very little space in the footpaths which will already have a significant number of services present. There will be the requirement for small compounds along the pipeline route for the welfare and storage

facilities required by the contractors. The indicative size and locations have been presented on Figure 4.

6.5.1.3 A number of surface features (including areas of environmental importance, major junctions and heavily wooded areas) will have to be navigated by the routing of the DHPWN as it enters Scunthorpe. These surface features will require directional drilling techniques, where ducts are bored from the surface at one side of the obstruction and surface at the other side. The pre-insulated pipes and cables are then threaded through these ducts.

6.5.1.4 The method of construction for the sections of the pipeline within the road will be similar to those mentioned above. Agreed traffic management measures will be put in place so that sections of the road can be excavated. The pre-insulated pipes and cables will be installed and backfilled in accordance with the local authority's highway specifications. The intention will be to place any pressure balancing/valve chambers within the confines of the receiving buildings in order to avoid below ground structures in the road.

6.6 New Access Road

6.6.1.1 Following the implementation of any advance environmental mitigation which may be required, the main alignment of the access road will be established. This alignment will cross several surface water / drainage features that will have to be addressed. This will be carried out by the installation of pipes or culverts based on the flow rate and capacity of the watercourse. For larger watercourses, box culverts or bridges will be inserted by damming the upstream section and over-pumping whilst excavating and installing the culvert/bridge sections together with headwalls. The surface features will be carried out in advance of the main road construction progress.

6.6.1.2 Based on the findings of the ground investigation, the road corridor will be stripped of topsoil and stockpiled in a suitable location for reuse following construction. The road corridor will then be excavated to the formation level as designed; this will also include the service corridors that will run on either side of the road. Imported sub-base will be placed in layers and consolidated to the correct ground bearing capacity. The surface water drainage, concrete kerbs and service ducts will be installed and cast in place. The tarmac base course will then be laid, followed by the wearing course. Whilst the road formation is being laid, the street furniture (lamp posts, manhole covers, duct covers, etc.) will be installed together with the electrical services.

6.6.1.3 Towards the end of the main access road construction phase, the new connections with Stather Road south of the Flixborough Industrial Estate and the B1216, will commence. This will require traffic management measures at both locations whilst the new junctions are being constructed. The construction will follow the same format as outlined above and will be graded into the existing road construction. Once completed, the new access will become live, and Stather Road will be closed to public traffic north of the existing pumping station.

6.6.1.4 As the new access road construction progresses north, the main access to the ERF will commence following the same form of construction as outlined above. However, the wearing course will not be laid until the main works have been completed. The internal access road will be constructed up to the location of the access ramp to the Tipping Hall.

6.7 Railway Reinstatement Works/New Railhead and Sidings

6.7.1.1 Based on the recommendations of the railway condition assessment report, it is anticipated that the whole length of the existing rail track will be removed and replaced together with the removal and replacement of the top one metre of ballast. This will entail the removal of the existing rails, which will be removed from the site for recycling and the top one metre of ballast material which will be placed to one side, stockpiled, and used in the reconstruction of the rail sidings.

6.7.1.2 A loading gauge assessment has been undertaken that has assessed clearances through the bridged sections, determining the works required to each of the bridges. Starting from Dragonby sidings, the progressive reconstruction of the rail line will progress towards Flixborough Wharf. This will allow the timely delivery of new ballast and rails as the works progress down towards the existing Wharf. Locally sourced rail lines will be used were possible.

6.7.1.3 A new section of rail sidings will be constructed to the south of the existing Wharf. A new railhead will be constructed, which will involve the removal of the existing surface and excavation to the defined formation level. There will be the need to construct retaining walls where there is a difference in the level of the ERF and the rail line (see Indicative Railway Drawings, **Document Reference 4.15**). Construction will likely move progressively south using the new rail construction as the means for providing the materials necessary for the construction. Following the installation of the new rail line, the associated services to the rail line will be installed, and then the full line will be commissioned.

6.8 Visitor Centre

6.8.1.1 It is proposed that the new Visitor Centre will be located to the south of the main access road to the ERF. The Visitor Centre will have its accommodation spread over 3 no. floor levels. The ground floor level will be set to match that of the raised main access road. This ground floor level will incorporate accessible car parking spaces, coach drop off bay, and covered cycle racks, and from here access to the building's lift and stair core will be provided. The top floor will contain the majority of the visitor accommodation and from where access to the elevated walkway will be provided. The ground floor level will be connected via stairs and ramps to the existing lower ground level from where access routes to the main car park and the proposed wetland/ecological area will be provided.

6.8.1.2 The extents of the footprint of the building and car parking area will have the topsoil removed. The site will be excavated to formation level and imported material will be placed so that the ground slab sits below the flood level as identified in the flood risk assessment. The superstructure will be either steel

or timber frame construction with infilled panels and glazing together with internal partition walls. Where possible, recycled materials will be used and a low energy design strategy adopted.

6.9 Energy Recovery Facility

6.9.1.1 Following the demolition of some of the existing buildings at Flixborough Wharf, Bellwin House, Wharfeside Court and the area south of the Stather Road, the existing tarmac and concrete hard standing area will be broken up and assessed as to whether it could be used in the construction of the Project. If this is the case it will be stockpiled, if not then it will be removed from the Site. The footprint of the ERF will be raised approximately 2.6m above the existing ground level (6.6m AOD). This will require the construction of a combination of reinforced concrete retaining walls and embankments to facilitate the increased floor level. The location of the fuel bunker will be established, and a sheet pile cofferdam constructed. The sheet pile construction will act as permanent formwork, and the area within the piled structure will be excavated to a depth of approximately 10 metres. The bunker will be designed as a water-retaining structure and constructed to avoid any floatation of the structure. Due to the depths of the bunker, it is envisaged that groundwater will need to be managed. This will be achieved by creating a sump point where the water can be pumped out of the bunker construction and discharged into the local surface water system or suitable lagoon or to feed the wetland area.

6.9.1.2 Construction traffic movements to import this material have been assessed in the construction traffic impacts. Imported sub-base material will be brought to the site by road, rail or boat via the Wharf. This will be placed, starting from the north of the Energy Park Land and working southwards towards Stather road. The imported material will be compacted in layers and terraced until it achieves the level as determined by the flood risk assessment. The installation of precast concrete driven piles will start at the north of the raised platform and move south towards Stather Road. It will be during this stage that the piles for the tower cranes will be incorporated into the piling strategy. The pile heads will be broken out and incorporated into the pile cap. The foundation slabs for the turbine and the boilers, together with all other high load components, will commence. This will be followed by the foundations for the rest of the turbine hall together with the carbon capture utilisation and storage facility.

6.9.1.3 It is envisaged that three tower cranes will be required due to the reach and access required for the construction. The steel erection of the mainframe will commence with the boiler hall, followed by the turbine hall. As the steelwork for the boiler hall and turbine hall is progressing, the raised slab for the tipping hall will be constructed and connected with the bunker. The boilers will be constructed from east to west, starting with boiler number one. The boiler is made up of a series of prefabricated sections that will be connected on-site together with localised site installation pipework and intermediate steelwork. The ductwork from the boilers will be installed towards the three flues in the ERF Stack, and these three flues will be erected up to the roof level of the boiler hall. The air-cooled condensers or air blast chillers will be installed above the turbine hall. Once the steelwork on the boiler hall and

the turbine hall is complete, both structures will be made watertight by the installation of the steel cladding around the frame. During this period, the ERF circulation road will be constructed to enable the delivery of the turbine, generator, and transformers.

6.9.1.4 Once the turbine hall is watertight, the turbine will be delivered to the Site and skidded into position onto its plinth together with the generator. Process works within the boiler hall and turbine hall will continue whilst the steelwork for the carbon capture plant, the administration building, and the roof of the tipping hall are installed. At the same time, the pillars to the ramp structure will be installed, and the ramp units dropped into place and connected to the tipping hall floor. The three flues will be installed to the roof level of the Boiler Hall, and then the last sections will be placed using a mobile long reach crane capable of reaching the final stack height. The interior fit-out of the turbine hall will be completed in readiness for commissioning of the plant.

6.10 Switchyard, substation and northern AGI

6.10.1.1 The main sub-station and an AGI will be located to the east of Flixborough Industrial Estate, just off Stather Road. The extents of the development area will be made secure with permanent security fencing. The topsoil will be stripped and stockpiled, and the ground will be taken down to formation level, with a retaining structure likely to be required due to changes in levels. A layer of sub-base material will be imported and compacted to act as a piling mat. Precast concrete driven piles will then be installed. The pile heads will be broken out and incorporated into the pile cap. The ground slab will then be laid together with any service ducts and pipework. The sub-station building will be constructed together with the concrete plinths for the AGI. When the substation building is complete, the transformer and switchgear will be skidded into position, and the facility will be commissioned. Following the commissioning of the substation, the AGI will be completed and commissioned.

6.11 Residue Handling and Treatment Facility

6.11.1.1 Whilst the ERF piling is carried out, the site for the RHTF will be stripped of topsoil and stockpiled. The site will then be made up with imported sub-base material to the level outlined in the flood risk assessment (Annex 3 of the ES, **Document Reference 6.3.3**). The piling rigs will then move from the ERF site to the RHTF. Piling will commence from the north of the RHTF and work towards the south, finishing on the border of the CBMF. The pile heads will be broken out and incorporated into the pile caps, and then the ground slab will be cast ready for the installation of the superstructure. The RHTF will be of a steel frame construction with steel cladding to the walls and roof in accordance with the architectural strategy. A mobile crane will be brought on-site to erect the steel structure together with the installation of internal mezzanine floors. Once the superstructure is watertight, the internal fit-out will commence in preparation for the delivery of the internal equipment required for processing the ash. Whilst the internal fit-out takes place, the external hard standing fencing and landscaping will take place. The facility will be commissioned and prepared for operation.

6.12 Concrete Block Manufacturing Facility

6.12.1.1 The phasing of the CBMF construction has yet to be finalised. The CBMF will be located on the site of the main contractors' compound for the ERF; therefore, the compound will be reduced to accommodate the CBMF. The sequence of construction will be as follows. The extents of the site will be stripped of topsoil and stockpiled where this has not already been undertaken to prepare the construction compound. Imported sub-base material will be brought on-site and compacted in layers in accordance with the level outlined in the flood risk assessment (Annex 3 of the ES, **Document Reference 6.3.3**). Piling using precast concrete driven piles will commence from the north of this site and work towards the south. The pile heads will be broken out, and the ground slab will be cast whilst being tied into the pile caps. A crane will be brought to the site for the erection of the steel frame and cladding. Once the building is watertight, then the internal fit-out will commence together with the delivery of the manufacturing equipment necessary for creating the blocks. Whilst the internal fit-out takes place, the external hard standing fencing and landscaping will take place. The facility will be commissioned and prepared for operation.

6.13 Plastic Recycling Facility

6.13.1.1 The extents of the site will be stripped of topsoil and imported sub-base material will be brought on to the site and compacted in layers in accordance with the level outlined in the flood risk assessment. Piling using precast concrete piles will commence from the north of the site and work towards the south. The pile heads will be broken out, and the ground slab will be cast whilst being tide into the pile caps. A mobile crane will be brought to the site for the erection of the steel frame and cladding to the building as outlined in the architectural scheme. Once the building is watertight, then the internal fit-out will commence together with the delivery of the manufacturing equipment necessary for the plastic recycling. Whilst the internal fit-out takes place, the external hard standing fencing and landscaping will take place. The facility will be commissioned and prepared for operation.

6.14 EV and Hydrogen Refuelling Station

6.14.1.1 The EV and H_2 Refuelling Station is located on the east side of the new access road with the junction on the B1216. The contractor's compound established for the construction of the new access road will remain in place and fenced off for security purposes.

6.14.1.2 Works will commence by extending the security fence to the extents of refuelling station and the extent of the site will have the topsoil removed and stockpiled. Imported sub-base material will be placed in layers up to the level identified within the flood risk assessment. A piling rig will be brought to the site and commence from the north side of the development, working towards the south. The pile heads will be broken out and the ground slab cast and tied into the pile caps. A mobile crane will be brought to the site and commence the erection of the steel frame structure for the accommodation part of the refuelling station. Once the building is

watertight, then the internal fit-out will commence. Whilst the internal fit-out takes place, the external hard standing fencing and landscaping will take place. The facility will be commissioned and prepared for operation.

7. OPERATION

7.1.1.1 This section provides a detailed description of the operation of each element of the Project.

7.2 ERF

7.2.1 Hours of operation

7.2.1.1 The main ERF building will be capable of operation for 24 hours a day, seven days a week, with occasional period's offline for maintenance. The facility will have an availability to process fuel of 91.3%, equivalent to 8,000 hours per annum at full load.

7.2.2 Deliveries and traffic movements

7.2.2.1 The main operational deliveries to the ERF will be the RDF, which will be delivered by a mixture of road, rail, and river freight. Details of this split, and the worst-case assumptions for the purposes of assessment are presented within the individual topic chapters.

7.2.2.2 Operational deliveries by road, rail and river will be capable of running 24 hours a day, seven days a week, which is in line with the current consented hours for the port; however, the capacity of the reception bunker will remove he need for night-time unloading.

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7.2.3 Water use

7.2.3.1 The primary use of water in the ERF will be for the production of steam in the boiler hall. To protect against damage to the boiler equipment, steam will be made up from de-mineralised water, which will be sourced from the water treatment facility within the ERF building. Water for the treatment facility, process usage and potable usage, will be sourced from the main Anglian Water utilities network, at a rate of approximately 77,000 m^3 per year, but this will be offset by the use of recycled water where practicable.

7.2.4 Generation and removal of wastes and effluents

7.2.4.1 The primary sources of wastes and effluents in the ERF will be ash from the combustion process, and treatment residues from the water treatment facility. Both IBA and FGTr are to be transferred to the CBMF following on-site treatment and are thus not considered waste products.

7.2.4.2 Residues from the treatment of water will be stored on site and periodically removed by tanker to an appropriately licenced waste treatment facility, or will be disposed of via the mains sewer, subject to agreement with Severn Trent.

7.2.4.3 Further details relating to the treatment and disposal of waste are presented in Chapter 15: Waste (**Document Reference 6.2.15**).

7.2.5 Emissions to air

7.2.5.1 The emissions to air from the ERF are directly linked to the Carbon Capture process and are therefore considered under Section 7.3.5 below.

7.2.6 Sources of noise

7.2.6.1 The primary sources of noise from the operation of the ERF will be loading and unloading operations, the ACC or ABC, turbine hall and compressors.

7.2.6.2 Other sources of operational noise will include operational vehicle movements around the site and ventilation louvres.

7.2.7 Power consumption

7.2.7.1 Although a net producer of electrical power, the ERF will require its own power supply to run the numerous items of plant and control systems (parasitic load). The ERF will have a parasitic load of approximately 9.5 MWe. Under normal operational conditions, this load will be taken from the power generated by the ERF or from the solar photovoltaic panels, prior to being exported to the grid or used across the site. However, the ERF will also be able to draw power from the grid via an existing connection when required.

7.2.7.2 During periods of back-up or auxiliary firing, the plant may also use diesel or natural gas. For auxiliary firing, it is estimated that the facility will either use 925 tonnes of diesel, or 847 tonnes of natural gas per annum.

7.3 Carbon capture, utilisation and storage facility

7.3.1 Hours of operation

7.3.1.1 As the CCUS facility will be an integral part of the ERF, it too will be a 24 hours a day, seven days a week operation, with shutdowns only for scheduled maintenance.

7.3.2 Deliveries and traffic movements

7.3.2.1 Deliveries to the CCUS facility will be limited to occasional maintenance vehicles and deliveries of operational consumables, such as amines.

7.3.2.2 Once captured, a small quantity of the CO_2 will be utilised in the CBMF, whilst the remaining CO_2 will be transported off site by train or ship for utilisation in other parts of the country. The East Coast Cluster has been selected by BEIS as one of two regions to supported for carbon capture, usage and storage. The Applicant is a member of Zero Carbon Humber, which represents the Humber region in the East Coast Cluster partnership. It is the intention that this facility will join up with the proposed Zero Carbon Humber pipeline which will transport the CO_2 to the disused gas fields in the North Sea. This government-backed program has just commenced its own DCO process and early options for the route of the pipeline pass very close to the Application Land.

7.3.3 Water use

7.3.3.1 The CCUS facility will require a source of water for production of amine solutions. This water will be derived from the main Anglian Water utilities network via the water treatment plant located in the main ERF building, but this will be offset by the use of recycled water where reasonably practicable.

7.3.3.2 The CCUS facility will use approximately 43,000 m^3 of water per year and will use small volumes of demineralised water intermittently.

7.3.4 Generation and removal of wastes and effluents

7.3.4.1 The CO_2 capture plant will produce approximately 10 m^3/h of effluent. Effluent will be disposed of via the mains sewer, subject to agreement with Severn Trent, or where reasonably practicable it will be treated for re-use. There will also be emissions to the air (see Section 7.3.5 below).

7.3.5 Emissions to air

7.3.5.1 The CCUS facility will operate in tandem with the ERF flue gas treatment system to reduce the pollutants emitted by the facility. The carbon capture CCUS facility will reduce the emissions of carbon dioxide. However, the use of amine solvents for carbon capture, introduces additional pollutants, which has been addressed in the assessment of air quality impacts (Chapter 5, **Document Reference 6.2.5**). These pollutants include solvent amines; volatile amines; nitrosamines; nitramines; and aldehydes. These additional pollutants will also be dealt with by the Project.

7.3.5.2 Table 3 below presents a list of emissions from the ERF and CCUS facility.

Table 3: Emissions from the ERF and CCUS facility

Emissions from the ERF and CCUS facility
Sulphur dioxide
Hydrogen chloride
Oxides of nitrogen
Carbon monoxide
Carbon dioxide
Ammonia
Mercury
Hydrogen fluoride
Metals and particulates
Solvent amines
Nitramines and Nitrosamines

7.3.6 Sources of noise

7.3.6.1 The CCUS facility will use ACC or ABC to reject heat from the process, as well as compressors and pumps to increase pressures within the system.

Compressors will be placed within the building, whereas coolers will be placed outside the building.

7.3.7 Power consumption

7.3.7.1 The CCUS facility will be powered directly from the electricity generated by the ERF.

7.4 Residue handling and treatment facility

7.4.1 Hours of operation

7.4.1.1 As for the main ERF, the RHTF will have the ability to operate 24-hours a day, seven days a week always when the ERF is in operation.

7.4.2 Deliveries and traffic movements

7.4.2.1 The treatment of FGTr through the carbonisation process will require deliveries of approximately 17,400 tonnes per annum of cement and fillers to be transported to the facility. These deliveries will be made via a mixture of road, rail and river. Details of which are presented in Chapter 13 of the ES (**Document Reference 6.2.13**).

7.4.3 Water use

7.4.3.1 The treatment of FGTr through the carbonisation process will require the use of approximately 8,700 m^3 of water per year. This water will be sourced from the onsite water treatment plant which will be fed from the main Anglian Water network but this will be offset by the use of recycled water where reasonably practicable.

7.4.4 Generation and removal of wastes and effluents

7.4.4.1 The RHTF will not generate any solid wastes but will process the waste from the ERF to make it re-usable within the CBMF.

7.4.4.2 All movements of residues (ash) will be by covered conveyors or slave vehicles between the RHTF and the CBMF.

7.4.4.3 In processing the IBA, water from the ash will be expelled by the process and collected prior to disposal to the sewer network, subject to agreement with Severn Trent, or periodically removed by tanker to an appropriately licenced waste treatment facility.

7.4.5 Emissions to air

7.4.5.1 The only emissions to air that will be derived from the RHTF will be from wastewater in the form of evaporation.

7.4.6 Sources of noise

7.4.6.1 The sources of noise within the facility will be as follows:

- operational vehicle movements around the facility;
- compressors used in the FGTr treatment facility;

- equipment used to crush ash within the bottom ash treatment facility; and
- trommels used to sort reprocessed ash.

7.4.7 Power consumption

7.4.7.1 The facility will have a total power consumption of approximately 1,500 MWhe per annum, to be supplied from the ERF.

7.5 Concrete block manufacturing facility

7.5.1 Hours of operation

7.5.1.1 The CBMF will be designed to be able to operate for 24 hours per day, 365 days a year, with occasional offline periods for maintenance. Concrete block manufacture is a batch process.

7.5.2 Deliveries and traffic movements

7.5.2.1 In addition to the use of treated ash from the ERF, the CBMF will use sand and cement to manufacture the concrete blocks. The CBMF will use approximately 95,000 tonnes of sand and 52,000 tonnes of cement each year.

7.5.2.2 These materials will be delivered to the CBMF via the river, road and rail networks. Detail of these movements are presented in more detail in Chapter 13: Traffic and Transport (**Document Reference 6.2.13**).

7.5.3 Water use

7.5.3.1 Water is a key ingredient in the manufacturing of concrete blocks and as such the CBMF will have its own water supply, provided by the Anglian Water network. The facility will use approximately 12,700m^3 per year of water but this will be offset by the use of recycled water where reasonably practicable.

7.5.4 Generation and removal of wastes and effluents

7.5.4.1 The manufacture of concrete blocks will not produce any solid waste that will require disposal, other than general office wastes which will be disposed of with other office wastes from across the Project. Effluent will either be reused or collected prior to disposal to the sewer network, subject to agreement with Severn Trent, or periodically removed by tanker to an appropriately licenced waste treatment facility.

7.5.5 Emissions to air

7.5.5.1 The manufacture of concrete blocks will not require the release of any controlled emission to the air. The whole of the manufacturing facility will be covered, with no external storage of aggregates.

7.5.6 Sources of noise

7.5.6.1 The facility will contain the following sources of noise:

- concrete mixers;
- operational traffic movements around the site; and
- concrete block manufacturing machines.

7.5.7 Power consumption

7.5.7.1 The concrete block manufacturing process will require approximately 1,100MWh of electrical power each year. This power will be supplied directly by the ERF along an onsite private wire network.

7.6 Hydrogen production facility

7.6.1 Hours of operation

7.6.1.1 The hydrogen production facility will have the capacity to operate a 24-hours a day and 365 days per year, which is therefore what has been used as the basis of the assessment. The operation of the hydrogen production facility will be dictated by a number of economic factors, including the price of electricity on the grid and the demand for hydrogen.

7.6.1.2 As per other elements of the Project, the hydrogen production facility will be subject to shutdowns for scheduled maintenance.

7.6.2 Deliveries and traffic movements

7.6.2.1 Once operational, deliveries to the hydrogen production facility will be minimal, as the main ingredients to produce hydrogen are electricity, which is generated at the ERF, and water, which will also be delivered to the hydrogen production facility via a pipeline from the ERF.

7.6.2.2 The traffic movements associated with the hydrogen production facility will therefore be limited to staff and maintenance.

7.6.3 Water use

7.6.3.1 Water is the key component in the production of hydrogen. The hydrogen production facility will use an electrolyser, which will produce hydrogen through electrolysis. Electrolyser plants work by running an electrical current through a body of water to decompose the water into its constituent oxygen and hydrogen elements.

7.6.3.2 The hydrogen production facility will use approximately 16,000m^3 water per year but this will be offset by the use of recycled water where reasonably practicable.

7.6.4 Generation and removal of wastes and effluents

7.6.4.1 The only ‘wastes’ associated with the production of hydrogen through electrolysis are oxygen, and reject water. All reject water from the electrolyser plant will be discharged to the wetlands, the public sewer or returned to the plant for re-use.

7.6.4.2 Oxygen will be vented to the atmosphere or re-used in the combustion process, and as oxygen is not harmful, there will be no need for this to be vented via a stack.

7.6.5 Emissions to air

7.6.5.1 As stated in Section 7.6.4.2 the only emission to air from the hydrogen production facility will be oxygen.

7.6.6 Sources of noise

7.6.6.1 The production of hydrogen by electrolysis is an intrinsically quiet process, involving very few moving or mechanical parts that produce sounds of any significance. However, the collection and purification of the hydrogen will require the use of pumps and compressors that have the potential to be audible within close proximity.

7.6.6.2 All sound generating equipment within the compression / purification unit will be constructed within appropriate acoustic enclosures to reduce the potential for potentially significant noise effects from the hydrogen production facility. Further details of the embedded mitigation that will be employed are presented in Chapter 7: Noise (**Document Reference 6.2.7**).

7.6.7 Power consumption

7.6.7.1 As stated in Section 7.6.3 above, hydrogen production requires water and electrical power. The electrolyser will use up to 80,000 MWhe, whilst the compressor / purification unit will use a further 6,500 MWhe. It is anticipated that the majority of this power will be generated on site at the ERF, however there is the potential to use electricity from the national grid to power the hydrogen production facility at times when the cost of electricity is low or when the national grid needs to increase demand for balancing purposes.

7.7 Hydrogen and natural gas above ground installation (AGI)

7.7.1 Hours of operation

7.7.1.1 The AGI will be capable of operating 24 hours a day and 365 days per year, with shutdowns only for scheduled maintenance.

7.7.2 Deliveries and traffic movements

7.7.2.1 The operation of the AGI will not require any significant deliveries or traffic movements. There will be a limited number of movements (approx. 2 per month) for workers to undertake inspections and maintenance.

7.7.3 Water use

7.7.3.1 The AGI will not have a water supply or require the use of any water during its operation.

7.7.4 Generation and removal of wastes and effluents

7.7.4.1 The operation of the AGI will not generate any wastes other than maintenance related consumables which will be removed from the site by staff undertaking maintenance.

7.7.5 Emissions to air

7.7.5.1 Under normal operational conditions, there will not be any emissions to air from the AGI. However, under exceptional circumstances, it may be necessary to vent gas to the atmosphere.

7.7.6 Sources of noise

7.7.6.1 During the operation of this AGI, the only element that could have the potential to generate noise will be the venting of gas for safety reasons through pressure valves and the compressors that have been accounted for in the hydrogen section.

7.7.6.2 Gas venting will be an abnormal and rare event, details of which are presented in Chapter 7: Noise (**Document Reference 6.2.7**).

7.7.6.3 Any necessary noise mitigation will be provided to control the noise from pressure release valves.

7.7.7 Power consumption

7.7.7.1 The AGIs will comprise mechanical plant which will control the flow of gas to and from the gas network. They will require a power supply to operate and control the various valves, switches and control systems within the plant.

7.8 Electric vehicle and hydrogen re-fuelling station

7.8.1 Hours of operation

7.8.1.1 The EV and H_2 refuelling station will operate 24 hours a day and 365 days per year as is the case for a large proportion of petrol and diesel filling stations across the UK.

7.8.2 Deliveries and traffic movements

7.8.2.1 As with all vehicle fuelling stations, the majority of traffic movements will be vehicles using the station for hydrogen fuelling or electrical recharging. The five HGV electric charging bays, one hydrogen bus refuelling bay and 13 car charging bays are expected to generate 560 vehicle movements per day (including 140 HGVs and 62 buses).

7.8.2.2 In addition to its primary use, there will be a smaller number of delivery vehicle movements associated with the station, required to facilitate the operation of the on-site service area / shop etc.

7.8.2.3 Further details of the traffic movements are presented in Chapter 13: Traffic and Transport (**Document Reference 6.2.13**).

7.8.3 Water use

7.8.3.1 The EV and H_2 refuelling station will not require the use of any water for its primary operational function; however, a small amount of water will be used in the public and staff toilets. All of this water will be sourced from the Anglian Water network, but this will be offset by the use of recycled water where reasonably practicable.

7.8.4 Generation and removal of wastes and effluents

7.8.4.1 The EV and H_2 refuelling station will not generate any waste as a result of its primary operational function; however, a small amount of waste will be generated by the fuelling station facilities; shop, etc. Waste from these facilities will be collected as part of the wider office and municipal waste of the Project and recycled or disposed of by an appropriately licenced waste contractor.

7.8.4.2 Effluents from the bathrooms and kitchen facilities will be disposed of to the local public sewer.

7.8.5 Emissions to air

7.8.5.1 The operation of the EV and H_2 refuelling station will not require or result in any emissions to the air.

7.8.6 Sources of noise

7.8.6.1 The primary source of noise associated with the EV and H_2 refuelling station will be from traffic using the station. As hydrogen and electric vehicles are generally much quieter than conventional internal combustion powered vehicles, the noise from these vehicles is anticipated to be low. Further details are provided in Chapter 7: Noise (**Document Reference 6.2.7**).

7.8.7 Power consumption

7.8.7.1 The EV and H_2 refuelling station will require a power supply to operate and control the various valves, switches and control systems within the plant, as well as providing lighting and any additional parasitic load.

7.8.7.2 The primary electrical output from the station will be from fulfilling its primary function as a vehicle charging station.

7.9 DHPWN

7.9.1 Hours of operation

7.9.1.1 Both DHPWNs will operate 24 hours a day, 365 days a year.

7.9.2 Deliveries and traffic movements

7.9.2.1 As entirely buried services, the DHPWNs will not require any deliveries or generate any operational traffic movements. Occasional maintenance and inspection traffic will be generated.

7.9.3 Water use

7.9.3.1 The district heating element to the DHPWN will require a minimal amount of operational 'top-up' water use, however, the exact quality is unknown but likely to be negligible.

7.9.4 Generation and removal of wastes and effluents

7.9.4.1 The DHPWN will not generate any wastes or effluents that will require removal.

7.9.5 Emissions to air

7.9.5.1 Under normal operation, the DHN will not produce emissions to air. For periods when the ERF is not in operation, back-up boilers and generators will be installed. These boilers and generators will be fuelled by either natural gas, hydrogen or low sulphur fuel oil, and will produce flue gas when in operation. This flue gas will be emitted from the back up boilers stack and the back up generator stack which are separate to the ERF stack.

7.9.5.2 The PWN will not generate any emissions to air.

7.9.6 Sources of noise

7.9.6.1 The DHN will produce noise within the ERF building, from the district heating pumps which produce pressure to drive the heated fluid around the heating network. Batteries will also provide resilience to the PWN and will not produce any additional noise.

7.9.6.2 The PWN will produce noise from the related transformers and switchgear, located south of the Bottom ash hall within the ERF boundary.

7.9.7 Power consumption

7.9.7.1 The DHN will have a parasitic load of 778 MWhe of electrical power annually, which is used to drive the pumps. The PWN will also have a small parasitic load that consumes power, and all power passing through the cables will be supplied to customers.

7.10 Plastic recycling facility

7.10.1Hours of operation

7.10.1.1 The PRF will operate up to 8,300 hours per annum, based on an availability of 95%.

7.10.2Deliveries and traffic movements

7.10.2.1 The primary traffic movements associated with the plastic recycling facility will be from the delivery of waste plastics which will form the feedstock of the facility. Full details of these movements are presented in Chapter 13: Traffic and Transport (**Document Reference 6.2.13**).

7.10.3Water use

7.10.3.1 The PRF will require up to 49,000 m^3 of water per annum. The process will be designed to reuse this water within the process, and as such only 9,800 m^3 of water per annum will be required from the Anglian Water network. This will be offset by the use of recycled water where reasonably practicable.

7.10.4Removal of wastes and effluents

7.10.4.1 The PRF will generate up to 9,800 m^3 of wastewater per year, up to 500 tonnes of metals and up to 500 tonnes of oversize materials. Metals will be removed from site for recycling or sale, oversize material will be disposed of in the ERF and wastewater will be treated on site and discharged to the public sewer or recycled subject to agreement with Severn Trent, or periodically removed by tanker to an appropriately licenced waste treatment facility.

7.10.5Emissions to air

7.10.5.1 The PRF will not produce any emissions to the air.

7.10.6Sources of noise

7.10.6.1 The PRF will produce noise from the following sources:

- de-wiring and bale breaking equipment;
- wet grinders; and
- operational traffic.

7.10.7Power consumption

7.10.7.1 The PRF will use up to 30,500 MWhe of power per annum, which is to be supplied by the ERF via a private wire supply. Power will be used to drive the grinders, shredders, washing equipment, dryers and extruders which operate within the building.

7.11 Dragonby to Flixborough rail line

7.11.1Hours of operation

7.11.1.1 The upgraded rail line will be capable of operating 24 hours per day, 365 days per year to support deliveries to the ERF plant and the CBMF. The reinstated sidings at Dragonby and the new railhead at Flixborough Wharf will remove the need for rail traffic up or down the railway overnight. The commercial capacity of Network Rail's network will require rail traffic to be held at Dragonby overnight. The sidings will provide a holding area for trains between the railhead and the main line, particularly during overnight periods when the main line may be closed for engineering works.

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7.11.2Deliveries and traffic movements

7.11.2.1 Operation of the rail line itself will not require any deliveries or traffic movements in its own right since its primary function will be to facilitate the

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movement of rail freight to and from the ERF. As the line will be a single line, with two-way movements, it is anticipated that there will be one movement approximately every 4 hours.

7.11.3Water use

7.11.3.1 The rail line will not require any operational water use.

7.11.4Removal of wastes and effluents

7.11.4.1 The rail line will not generate any wastes or effluents that will require removal.

7.11.5Emissions to air

7.11.5.1 The primary emissions to air from the railway line will be from the diesel-powered trains which will operate along the line to deliver and export freight to and from the ERF. As the line will be a single line, with two-way movements, it is anticipated that there will be one movement approximately every 4 hours.

7.11.5.2 Given the limited number of train movements per day, the impacts from emissions are anticipated to be minimal and therefore further detailed analysis is not proposed. Justification for this position is presented in Chapter 5: Air Quality (**Document Reference 6.2.5**).

7.11.6Sources of noise

7.11.6.1 The sources of noise associated with the operation of the rail line will be the trains themselves. As the line will be a single line, with two-way movements, it is anticipated that there will be one movement approximately every 4 hours.

7.11.6.2 Further details of the noise associated with these rail movements is presented in Chapter 7: Noise (**Document Reference 6.2.7**).

7.11.7Power consumption

7.11.7.1 The rail line upgrade will also include an upgrade to the rail power supply which will be required to operate signals and emergency equipment.

7.12 Railhead

7.12.1Hours of operation

7.12.1.1 The Project will include the construction and operation of a new railhead to the south of Flixborough Wharf, with the primary purpose of facilitating the delivery and export of materials at scale to and from the Project, reducing the need for road vehicle movements. The railhead will be capable of operating 24 hours per day, 365 days per year to support deliveries to the ERF plant and the CBMF; however, the capacity of the reception bunker, together with the new railhead at Flixborough Wharf and the Dragonby sidings, negates any need for night-time unloading.

7.12.1.2 Trains will then move to and from the railhead via the Flixborough branch line, to new sidings to be provided on the Dragonby Sidings to the south east.

7.12.2Deliveries and traffic movements

7.12.2.1 Operation of the railhead itself will not require any deliveries or traffic movements in its own right since its primary function will be to facilitate the movement of rail freight to and from the ERF. As the line will be a single line, with two-way movements, it is anticipated that there will be one movement approximately every 4 hours.

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7.12.3Water use

7.12.3.1 The railhead will not require any operational water use.

7.12.4Removal of wastes and effluents

7.12.4.1 The railhead will not generate any wastes or effluents that will require removal.

7.12.5Emissions to air

7.12.5.1 The primary emissions to air from the railhead will be from the diesel-powered trains which will operate at the port to deliver and export freight to and from the ERF. It is anticipated that there will be one movement approximately every 4 hours.

7.12.5.2 Given the limited number of train movements per day, the impacts from emissions are anticipated to be minimal and therefore further detailed analysis is not proposed. Justification for this position is presented in Chapter 5: Air Quality (**Document Reference 6.2.5**).

7.12.6Sources of noise

7.12.6.1 The sources of noise associated with the operation of the railhead will be the trains themselves, and vehicles used for the loading and unloading of trains. It is anticipated that there will be one train movement approximately every 4 hours.

7.12.6.2 Further details of the noise associated with these rail movements is presented in Chapter 7: Noise (**Document Reference 6.2.7**).

7.12.7Power consumption

7.12.7.1 The railhead will require a power supply which will be used to operate signals, emergency equipment, and lighting.

7.13 Summary of Cross-site Effluent Control Strategy

7.13.1.1 The network has been designed to split up trade effluent and domestic effluent. The trade effluent will be treated and reused in the various processes on site. An effluent treatment plant facility will be located in the ERF building. This will mean that there is no trade effluent discharge to the

public sewer or to the wetland areas. The domestic effluent will discharge to the public sewer as agreed with Severn Trent Water.

7.13.1.2 Due to the geography of the development effluent control strategy comprises 3 networks.

7.13.1.3 Network 1 has been designed to take any domestic foul effluent from the southern hydrogen and natural gas ABIs and the EV and H2 refuelling station, PRF, visitor's centre and the CBMF, and discharge to the existing public sewer located in Bellwin Drive. Due to topography and proposed levels, a gravity connection to the existing public sewer cannot be achieved and a pumping solution will be required. The strategy will be to collect foul water from the gas above ground installations and the facilities located on the EV and H2 refuelling station and discharge by a gravity system to a pumping station, which will pump to another pumping station located to the north of the PRF. This will in turn, pump to the public sewer. The trade effluent in this area will be pumped via a separate system to the treatment plant located in the ERF facility.

7.13.1.4 Network 2 has been designed to take any domestic foul effluent from the ERF and adjacent facilities and discharge, via gravity, to the existing public sewer located on Bellwin Drive. The trade effluent in this area will discharge direct to the treatment plant located in the ERF facility.

7.13.1.5 Network 3 has been designed to take any domestic foul effluent from the hydrogen and natural gas above ground installations (AGI) located to the north eastern part of the Project. Buildings will be drained by gravity to a pumping station that will pump the flow to the existing public sewer located on Bellwin Drive. The trade effluent in this area will be pumped via a separate system to the treatment plant located in the ERF facility.

7.13.1.6 The pumping stations will be designed to adoptable standards. At this stage it is anticipated that emergency storage will be required and will be designed in accordance with Sewers for Adoption. Proprietary tank systems are proposed to provide this storage.

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Due to the geography of the development the areas have been split up into three areas.

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8. DECOMMISSIONING

8.1.1.1 The ERF will be designed to be operational from Year 4 following the grant of DCO consent (anticipated to be 2028) with a 35 year design life (25 + 10) (up to 2063) and a two year construction/operation programme contingency (up to 2065), after which time it will be decommissioned or repowered depending on the nature of the electricity market and energy mix at the time. The civil works will be designed to have an operational life of up to 50 years.

8.1.1.2 All other elements of the Project will be designed to be operational for the life of the ERF.

8.1.1.3 For the purposes of the impact assessment, it will be assumed that all elements except the DHN will be decommissioned.

8.1.1.4 At the end of the facilities operating life a Decommissioning Report will be prepared. The Decommissioning Report will explain how the facility decommissioning will be implemented and the measures taken to ensure that the facility is handed over to the demolition contractor in a safe and secure condition and is hazard free to an acceptable level.

8.1.1.5 Decommissioning will comprise the removal of all items and restoration of sites. It is likely that some underground structures, including cables and pipelines, may be flushed and left in situ to avoid any adverse environmental impacts associated with their removal. Due regard will be paid to all best practice guidelines on the decommissioning of projects which are relevant at the time. Where possible, items of plant will be re-cycled or re-used.

9. CONSIDERATION OF ALTERNATIVES

9.1 Introduction

9.1.1.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (Infrastructure EIA Regulation 2017) require that an Environmental Statement (ES) should include a description of the reasonable alternatives (for example in terms of location and design) that have been studied by the developer which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of environmental effects.

9.1.1.2 NPS EN-1 does not contain a requirement to consider alternatives. However, paragraphs 4.4.1 and 4.4.2 highlight requirements under the Infrastructure EIA Regulations 2017 and Habitats Regulations regarding the consideration of alternatives, notably:

> *'applicants are obliged to include in their Environmental Statement, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicants choice, taking into account the environmental, social and economic effects, and including, where relevant, technical and commercial feasibility' and*
>
> *'In some circumstances there are specific legislative requirements, notably under the Habitats Directive, for the [SoS] to consider alternatives. These should also be identified in the Environmental Statement by the applicant.'*

9.1.1.3 The Renewable Energy Infrastructure NPS (EN-3) does not contain a general requirement to consider alternatives or to establish whether the proposed project represents the best option. Paragraph 2.1.3 states:

> *'It is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites for renewable energy infrastructure …'*

9.1.1.4 PINs Advice Note 7 (version 7, May 2020) identifies that PINs consider a good ES to be one that (inter alia):

> *'explains the reasonable alternatives considered and the reasons for the chosen option taking into account the effect of the Proposed Development on the environment'*

9.2 The Need for the Project

9.2.1.1 There is a growing body of UK energy and climate change law, policy and guidance which highlights an urgent need for new energy generation infrastructure, particularly from renewable sources such as energy from waste and carbon capture equipped power stations. Alongside this drive for new low carbon energy generation, the UK Government has committed to achieving net zero greenhouse gas emissions by 2050 and decarbonisation of the energy sector by 2035.

9.2.1.2 The Government plans to close all coal-fired power stations by 2025, consequently, there is an urgent national need for new, renewable and low carbon energy generation. The demand for energy is also becoming more complex. National Grid expects there to be up to 36 million more electric vehicles on UK roads by 2040. The Project will help address these changing patterns of demand by combining energy recovery with a range of energy storage technologies at the same site.

9.2.1.3 Landfill capacity is set to decline over the next decade as the UK Government strives to meet its obligation to reduce general waste disposed of in landfill to 10% of the Municipal Solid Waste (MSW) produced. That will have a direct impact on the region within 100 miles of Flixborough, where 2.9 million tonnes of general waste was sent to landfill in 2019, of which 866,000 tonnes were received by landfill sites in North Lincolnshire. In 2019 the Yorkshire & Humber and East Midlands regions sent the largest share of household waste to landfill compared to all regions in the UK. For further information please refer to the RDF Supply Assessment (**Document Reference 5.2**).

9.2.1.4 Energy Recovery Facilities (ERFs) have a fundamental part to play in the waste hierarchy, particularly to reduce the amount of non-recyclable waste going to landfill. The diversion of waste away from landfill to ERFs in turn reduces the commercial viability of landfill operations alongside landfill tax and helps to decrease their role in the hierarchy further.

9.2.1.5 NPS EN-1 identifies the important role of Energy from Waste (EfW) as a source of large-scale renewable energy generation at paragraphs 3.4.3-3.4.4. It confirms that the principal purpose of the combustion of waste, or similar processes (for example pyrolysis or gasification) is to reduce the amount of waste going to landfill in accordance with the Waste Hierarchy and to recover energy from that waste as electricity or heat. The Waste Hierarchy explains that only waste that cannot be re-used or recycled with less environmental impact and would otherwise go to landfill should be used for energy recovery. ERFs therefore have an important role in the Waste Hierarchy by recovering energy from non-recyclable waste. The Project will also be sourcing bulk waste including both non-recyclable and certain recyclable waste. Through an on-site located PRF, it is directly supporting the Waste Hierarchy and ensuring that recyclable plastics present in the waste stream will be segregated at source before being processed on site. As demonstrated by the RDF Supply Assessment (**Document Reference 5.2**) the Project is consistent with the principles in the Waste Hierarchy and furthermore is one of only a small number of pipeline ERF projects that incorporate Carbon Capture and Storage.

9.2.1.6 NPS EN-1 at paragraph 3.4.4 notes that EfW can provide 'dispatchable' power, providing peak load and base load electricity on demand, constituting an important contribution to the security of UK electricity supplies and which becomes even more crucial as increasing levels of intermittent renewables are constructed. It is necessary to bring forward new renewable electricity generation projects as soon as possible, and the need for such projects is therefore urgent. The Project would make a material

contribution towards that need, generating up to 95 MW, and would be brought into operation as soon as 2026.

9.2.1.7 There is therefore a clear and urgent national need for this type of infrastructure as set out in the energy NPSs. The Project would also meet an urgent local need to reduce the amount of waste going to landfill within the East Midlands and Yorkshire & the Humber region as described in the Planning Statement (**Document Reference 5.1**).

9.2.1.8 The Project would also meet a number of other important local and national policy aims through the inclusion of other renewable and low carbon technologies including a DHPWN, a PRF, a CCUS, hydrogen production and storage facility, battery storage and EV and H_2 refuelling station.

9.2.1.9 In identifying reasonable and relevant alternatives, regard has been had to their ability to meet these needs, as compared to the Project.

9.3 The 'Do Nothing' approach

9.3.1.1 A 'do nothing' scenario in which the Project does not proceed is the baseline against which the impacts of the Project will be compared within the EIA. The individual elements of the Project are reliant on each other, and the benefits rely on all parts of the Project to be part of an integrated design. The 'do nothing' scenario is therefore no development on the site.

9.3.1.2 In the 'do nothing' scenario, whilst the adverse effects of the Project would not be realised, neither would the benefits of the development nor would the urgent national and local need for an ERF be met.

9.4 Alternative Sites

9.4.1.1 The Project is for an ERF at Flixborough, to meet the urgent national need, but also an identified regional need within the East Midlands and Yorkshire & the Humber regions, which have the highest proportion of waste going to landfill in the UK. A large proportion of the site, including the areas proposed for the ERF, CCUS and part of CBMF, also falls within an existing industrial estate (the Flixborough Industrial Estate). This is therefore an appropriate site for the facility proposed. Notwithstanding this, the sub-section below briefly outlines the process undertaken by the Applicant in identifying the site.

9.4.2 Stage One – Initial Commercial Site Finding Exercise

9.4.2.1 The first stage of the site selection process undertaken by the Applicant was an initial commercial site finding exercise for a suitable location for an ERF within the UK. The primary purpose of this search was to identify a site for an ERF within the UK which would be commercially viable. At this stage, the Applicant was not considering the other uses now included within the Project, however, part of the consideration was to select a site which would have the flexibility to be capable of providing wider sustainability benefits such as the DHPWN and the production of low carbon transport fuels if required.

9.4.2.2 An initial UK-wide long list of sites was produced, which was informed by the Applicant's assessment of estimated capacity gaps for residual waste suitable for energy recovery by region. Further information on energy recovery levels is provided in the RDF Supply Assessment (**Document Reference 5.2**) and is referred to above.

9.4.2.3 The long list of sites identified by the Applicant through this site finding exercise is listed below and shown on Figure 5 in Appendix A:

- Energy Recovery and Visitor Centre - Riverside Waste Transfer and Recycling Centre, Jameson Road, Fleetwood, FY7 8TW
- Shoreham Recycling Centre and Cement Works, Albion Wharf, Albion Street, Southwick, West Sussex, BN42 4ED
- Easter Langlee Farm Landfill Site, Galashiels, TD1 2NU
- Hanson Non-Operational Brickworks, Stairfoot, Barnsley, South Yorkshire, S70 3NS
- Pilkington Glass Site, Land at Cowley Hill Works, St Helens, Merseyside
- GEEC Site, Fort Industrial Park, Dunlop Way, Castle Bromwich, Birmingham
- Aecom Site, land at Seal Sands, Billingham, Teesside
- British Steel Site, Brigg Road, Scunthorpe, North Lincolnshire, DN16 1XA
- Tata Chemicals Site, Lostock Gralam, Rudheath, Northwich CW9 7WL
- Tata Steels Site, Port Talbot, SA13 2NG
- Carlton Forest Distribution Centre, Blyth Road, Worksop, S81 0TT
- Flixborough Wharf, RMS Ports, Flixborough, DN15 8TH

9.4.2.4 The long list of sites was then reviewed primarily according to commercial viability taking into account a number of different factors. Factors influencing commercial viability included the size of the site, the availability of refuse derived fuel sources, availability of a suitable grid connection, potential users of heat and power in the vicinity, proximity to existing ERFs, amount of waste within the region going to landfill, transport links, potential expansion area to include future best available techniques such as carbon capture and the willingness of landowners to enter into commercial negotiations.

9.4.3 Stage Two – Identification of Short List

9.4.3.1 The review of the long list identified two potentially viable sites for an ERF. The remainder were discounted for commercial viability reasons:

- British Steel Site, Brigg Road, Scunthorpe, North Lincolnshire, DN16 1XA
- Flixborough Wharf, RMS Ports, Flixborough, DN15 8TH

9.4.3.2 Both of the short-listed sites were located within the East Midlands & Yorkshire and the Humber region, which was identified as having few ERFs

and the highest proportion of waste going to export or to landfill in the UK, and so could potentially meet this need.

9.4.3.3 The two short-listed sites were then considered in relation to the following key criteria:

- Accessibility/potential accessibility by road, rail and other sustainable transport modes.
- Character of setting and whether it was suitable for an industrial type of development.
- Availability of grid connection of the capacity required to deliver a viable project.
- The availability of the site and the willingness of landowners to enter into commercial discussions.

9.4.3.4 Both short-listed sites performed well in terms of the first two criteria. They are both located within and/or adjoining industrial estates, both have the ability for access by road and rail, although the Flixborough site performed better as there was also the option to utilise the existing Wharf and the railway connection. A further consideration which weighed against the British Steel Site was that it is a COMAH site and the owners were concerned about the additional traffic in and out of the restricted site.

9.4.3.5 In relation to grid connection and capacity, Scunthorpe Main substation was at full capacity with the supply to Scunthorpe Steel Works whilst the Scunthorpe North substation supplying Flixborough Wharf had export capacity available which required less strengthening of the Northern PowerGrid and National Grid infrastructure to achieve the necessary export and import capacity. Flixborough Wharf therefore performed better against this criteria.

9.4.3.6 As both sites performed well in planning terms, the Applicant approached landowners in both areas to identify willingness to proceed. The landowners of the British Steel Site confirmed that the site was not available and would not enter into discussions and therefore the Applicant proceeded with negotiations on the Flixborough site. Notwithstanding the availability of compulsory purchase powers within the DCO regime, the existence of a willing landowner is a valid consideration, particularly when two sites both have good planning merits.

9.5 Benefits of Project site

9.5.1.1 The Flixborough Industrial Estate site also had a number of benefits, although both sites were technically suitable for an ERF of this nature and scale.

- The site had very good access to sustainable transport connections benefitting from its proximity to the River Trent and options to utilise or develop the existing Wharf (already in use by RMS Ports). Utilising the Wharf combined with the opportunity to reinstate the disused railway between the Wharf and Dragonby Sidings would result in the potential for fewer deliveries by road and a considerable reduction in the potential for likely significant effects to the environment.

- It is located predominantly on a brownfield site within an industrial context.
- Northern PowerGrid contracted to supply 63MW of electricity export to the grid with additional upgrading at the Keadby Primary substation. This has since been increased to 95MW export and 50MW import with twin resilient 132kv connections, further reinforcing the suitability of the site and the grid connectivity. This has delivered greater energy security and resilience for the potential future energy users.
- The site is generally located within and adjacent to an existing industrial area as an operational port and there is similar development and other tall structures within the local environment on the east side of the River Trent.
- The concentration of landfill sites in the East Midlands including the Roxby Gullet landfill site, was a factor in confirming that waste feedstock supply capable of diversion from landfill for the facility would exist.
- A significant proportion of the site benefited from a previously issued (but now lapsed) outline planning permission (known as Glanford Park) granted in May 1991 for an industrial business park, sewage treatment plant and fire and ambulance station (determined under call-in procedure - reference YH5264/219/19 and LPA reference 7/1021/89). Whilst this permission had lapsed, there was some history of a very large scale development proposal being viewed as acceptable on the site.
- The Lincolnshire Lakes Development provided a demand for a district heat network for both new-build housing and commercial off takers that could be included in the design from the start.
- The announcement of a new Scunthorpe hospital has been made public and will have the potential to rely on low carbon heat and power from the Project.

9.6 Alternative locations within site

9.6.1.1 The potential impacts of flooding were a key consideration in the design development for the Project and the outcome of this design development informed where each element of the Project was located on site. Consideration of the impacts of flooding was particularly important due to the type of infrastructure proposed for the Project, and the need for it to be operational 24/7. As such, early consideration and testing of how the design of the project could improve the existing flood defence protecting the Flixborough Industrial Estate were considered.

9.6.1.2 A number of alternatives were considered when deciding how to managed flood control for the site including raising flood defences and providing additional flood storage. However, it was determined that these strategic interventions were unlikely to be viable and, instead, flood modelling was carried out and used as part of the initial siting work undertaken by the team, focusing on the locations of the ERF and the RHTF and CBMF as these buildings have a strong functional relationship and need to be located within close proximity to maximise the efficiency and output of the Project.

9.6.1.3 The design and placement of the facilities was focussed within the area of land identified for the Project as publicised within the non-statutory consultation in Summer 2020. This land was identified as it was located in close proximity to the existing Wharf, rail infrastructure and road network, allowing waste to be readily delivered by road, river and rail. Although the site is within both Flood Zone 3a and 3b (high risk from flooding and functional floodplain), the Technical Guidance Note on flood risk (March 2012) acknowledges that essential infrastructure may be permitted where it can be demonstrated that the flood risk is not increased elsewhere, is safe and operational during a flood and avoids loss of floodplain storage and that the exception test has been passed, i.e., that the sustainability benefits of the development outweigh the flood risk. Please refer to Chapter 9 of the ES (**Document Reference 6.2.9**) and the flood risk assessment (**Document Reference 6.3.3**).

9.6.1.4 Taking the above into account, the following three options were considered for the placement of the ERF and RHTF and CBMF as shown in Figure 2.

Figure 2: NLGEP – Initial Option Study

9.6.2 Northern Option

9.6.2.1 It was considered that the northern option would be perceived as extending Flixborough Industrial Estate into an area of relatively undeveloped countryside when compared with the central and southern options. The northern edge of the industrial estate is clearly defined by the existing railway line, beyond which the landscape character is noticeably different. The existing railway line also meant that the northern location was constrained in terms of functional and operational relationship with Flixborough Industrial Estate. The northern option would have required greater levels of traffic movements through the industrial estate to accommodate the delivery of RDF by road and river, increasing the impact of traffic, noise and air quality on the existing users of the industrial estate. The flood modelling assessed the impact of raising the development platforms and the railway line however this resulted with an extensive increase in flood levels to the west of the River Trent including the village of Amcotts, north of the site and within Flixborough Industrial Estate. The northern option was therefore discounted.

9.6.3 Southern Option

9.6.3.1 The location south of the Flixborough Industrial Estate would have required the railhead to be located further south nearer Neap House and away from the ERF. This would have resulted in increased turnaround times of the trains and distance that RDF would need to travel to the tipping hall. This location was also further away from the Flixborough Industrial Estate and would occupy a greater area of agricultural land in comparison to the central option. The flood modelling similarly identified that a raised development platform, for the ERF and RHTF and CBMF, up to the edge of the flood embankment would have resulted in increased flood extents and depths to the north and south of the site and within the solar farm to the east. For these reasons the southern option was discounted.

9.6.4 Central Option

9.6.4.1 In comparison to the northern and southern option, the central option maximised the use of brownfield land and had a stronger relationship with the industrial estate, railhead and Wharf. The redevelopment of previously developed land was considered an appropriate response to the local landscape in comparison to the northern and southern options, with built development form integrated into the existing industrial context. The flood modelling identified that the central option had the lowest impact in comparison to the northern and southern option, with flood depths increasing only on agricultural land to the south. This option was then further developed and tested through a number of cross-disciplinary workshops and design sessions to mitigate any increase in flood risk as well as in response to PEIR stakeholders, feedback and consultation.

9.6.4.2 For all three options, an extension to the Wharf was considered to accommodate additional vessel movements, however this was discounted as the Harbour Authority identified that the capacity constraints of the tidal

River Trent would not support additional berthing space and that the existing Wharf had sufficient capacity to facilitate the Project requirements.

9.7 Alignment of buildings

9.7.1.1 Following the decision to proceed with the Central Option, the RHTF and CBMF were realigned so that the footprint of the buildings ran north south rather than east west. This change in orientation reduced the flood risk within parts of the Flixborough Industrial Estate providing some benefits.

9.7.1.2 The EV charging and H_2 re-fuelling station was located at the southern end of the new access road instead of being co-located with the ERF at the northern end of the new access road. The southern location can more easily serve vehicles associated with the Project as well as being within close proximity to the A1077 and Scunthorpe. Its proximity to these was an important consideration in helping to promote and make renewable fuelling infrastructure more readily accessible to local businesses, the local authority and the public.

9.7.1.3 The initial location of the PRF resulted in an increase in flood levels within the solar farm located to the east. The location of the PRF was shifted south after further flood modelling which removed the increase in flood levels within the solar farm. The orientation of the PRF was optimised to reduce the amount of agricultural land required and the access junction relocated to the southern site in order to stagger the junctions onto the new access road. This avoided the relocation of existing over ground utility infrastructure and avoided the need to culvert or divert the existing drainage infrastructure, avoiding unnecessary costs and disturbance to these existing assets.

9.7.1.4 For further detail on design decisions impacting the location of elements on the site such as noise, visual impact and access, refer to the Design and Access Statement (**Document Reference 5.3**).

9.8 Alternative Technologies

9.8.1.1 The alternatives considered in relation to the technology chosen for the Project are set out below.

9.8.2 Bubbling and circulating fluidised bed combustors

9.8.2.1 Andritz and Valmet were invited to submit proposals for a facility, but operational sites could only reference the use of unsegregated MSW with a lower net calorific value (NCV) compared to that experienced for RDF in the UK. The higher NCV inherent in the UK for RDF samples and the need to pulverise the feedstock before combustion reduced the suitability of these technologies but the ongoing development of these technologies will continue to be reviewed.

9.8.3 Advanced Thermal Technologies

9.8.3.1 These technologies, including pyrolysis and gasification, should in theory provide a technical solution for managing up to 760,000 tonnes of RDF per annum, but the operational track record has shown these technologies have

not performed commercially and reliably. Recent success with the commissioning of the Hooton site in Liverpool is being monitored closely.

9.8.4 Water-cooled moving grate technologies

9.8.4.1 Suitable approaches have been received from a number of successfully established technology providers who can demonstrate a good track record of operational availability, environmental management and energy recovery efficiency.

9.8.4.2 Water-cooled moving grate technologies have delivered consistent operational performance levels both in the UK and globally using RDF feedstock and has established reliable environmental data for an ERF project of this type and scale. The ability to optimise the performance to deliver R1 efficiency with minimised planned or unplanned outages, is a critical factor in technology selection. Proven capability for this technology to support the integration to deliver the environmental benefits of the low carbon DHPWN, CBMF, PRF, H_2 production and storage, battery storage and low carbon transport fuels transport, provides greater certainty in the deliverability of the Project.

9.8.4.3 The Project has engaged Fichtner Consulting Engineers to short-list a number of leading technology providers in this category to submit detailed proposals for the ERF proposed and are evaluated and assessed in more detail within the ES.

9.8.5 Carbon Capture and Storage Readiness

9.8.5.1 The Project includes a CCUS facility which is sized initially to capture approximately 7.5% of the CO_2 emitted by the ERF for utilisation on site as part of the ash recycling into concrete products. The space provided for CCUS will facilitate expansion for up to 30% of the CO_2 to be captured. The Project is a member of East Coast Cluster partnership that is one of two clusters successful under the BEIS Phase 1 CCUS. The partnership is a group of regional CO_2 emitters and infrastructure owners that combines the ambitions for carbon capture in the Humber and Teesside regions. The Project has applied to BEIS as part of the Phase 2 funding and is engaged to link the facility up to the proposed Zero Carbon Humber pipeline which is proposed to intersect the DHPWN. Once this project is consented and operational, the Project could become one of the first ERF's to become carbon negative. At this stage, it is not however a reasonable deliverable alternative as the Zero Carbon Humber Pipeline has not yet been consented.

9.9 Alternatives designs and design evolution

9.9.1.1 As part of the on-going design process, consideration has been given to a range of design options. Decisions taken regarding the concept design of the Project have, where relevant and possible, been informed by environmental appraisal and assessment work and by consultation with stakeholders.

9.9.1.2 As noted above, the principal driver for the location of key components of the Project was flood risk modelling and this has then informed the location of other components.

9.9.1.3 Table 4 summarises the design iterations of note that have taken place to date and the reasons for the iteration, noting where the change related to reducing potential impacts on the environment or sensitive receptors, as required by the Infrastructure EIA Regulations 2017.

Table 4: Summary of Design Evolution

Description of design element	Summary of options considered	Comparison of environmental effects	Outcome
Alternative locations	Two alternative options for the location of the ERF, ash processing and CBMF were considered: ■ Locating elements to the north of Flixborough Industrial Estate ■ Locating elements entirely to the south of Flixborough Industrial Estate	The alternative options would have resulted in increased agricultural land take and greater encroachment into agricultural land beyond the existing estate. They would have increased flooding depths and extents to west of the River Trent and around the estate and increased the distances between the ERF and point of arrival of waste, reducing the efficiency of handling and processing.	The ERF, RHTF, and CBMF have been located within and immediately adjacent to Flixborough Industrial Estate to maximise the use of previously developed land and reduce agricultural land take.
Alternative roundabout locations	Two alternative options were considered for the location of the new roundabout along Ferry Road West: ■ the western option which introduced a fourth arm on the existing roundabout ■ the eastern option which would replace the existing Ferry Road West/A1077 Junction with a new four armed roundabout. ■ Central option which allows for a new roundabout to be constructed 'offline'	The western option would have required substantial works to culvert a large ditch and would have required the relocation of protected species. The eastern option would have caused significant disruption to the existing junction and would have resulted in a parallel and longer new access road being constructed to Ferry Road West, requiring additional land take and ground reprofiling and increased construction activities and material required for construction. The central option reduces the length of junction an amount of material.	The roundabout is proposed be located as per the central option to avoid direct impacts to protected ecological species, existing drainage channel and disruption to the A1077.
Alternative access road alignment	Options for a wide corridor for the new access road was considered, including: ■ moving the road further west of the proposed alignment. ■ moving the road further east of the proposed alignment	Locating the access road further west would have increased flood depths within the Order Limits. Locating the road further east would have unnecessarily increased land take.	The new access road is proposed to be located to the east of the River Trent, away from the foot of the flood bank so not to act as a barrier to the flow of flood water during a flood event.

Access to CBMF and RHTF	Alternative access to RHTF and CBMF were considered including two access points directly from the new access road, and an access to the west of the buildings.	The option with two access points directly to the east of the buildings resulted in increased number of security gate entrances and junctions along the new access road which increased land take. The single access to the west of the buildings provided fewer junctions and security gates and created a safer active travel route.	Access to the RHTF and CBMF will be from the internal access road to the west of the buildings.
Alternative layouts	Combining the RHTF and CBMF into one building or having them housed in separate buildings was considered during the design process.	Combining the two processes into one facility avoided unnecessary movement of material across the internal access road and resulted in a more efficient layout. Consolidating into one building requires less land take and reduced the amount of land that was required to be raised out of the flood plain.	The two facilities to be combined into single building.
Alternative layouts	Battery storage, EV and H_2 refuelling station	Multiple location options were assessed including discussion with NLC and Highways Agency to optimise traffic flow described in the access road alignment	The facility is now clustered either side of the new access road
District Heating Network and Private Wire Network	Alternative options were considered for the routing of the DHPWN, including the following: ■ Southern route, with cables either side of the A1077 and M181. North eastern route with options to run either along Normanby Road or Mannaberg Way and Bessemer Way to the new hospital. This option included an alternative to follow the B1216.	The route on the eastern side of the A1077 and M181 of the southern option would require crossing the M181 to access the developments, which wasn't supported by Highways England. Additionally, there is a ditch east of the road along the length of the A1077 which would make construction more difficult. The north-eastern route via the B1216 would have noise and traffic impacts on residents during construction.	The routing of the DHPWNs follow the main trunk roads from the ERF to the Lincolnshire Lakes housing development (the southern route) and the proposed hospital (the north-eastern route).
Location of visitor centre	Potential to locate visitor centre within ERF or as standalone facility.	It was decided that the visitor centre would be located as a standalone facility to showcase all of the elements of the Project, including the wetland area. Initially considered co-location with security gatehouse however this was dismissed in favour of a location to the south of the CBMF to assist with legibility and orientation.	Decision to locate the visitor centre to the south of the CBMF. Inclusion of an elevated walkway connecting the visitors centre with the ERF, CBMF and PRF.

APPENDIX A FIGURES

Date: March 2023

Deleted: May

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NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title Figure 4b
Project Elements

Client Information

Client	North Lincolnshire Green Energy Park Ltd
PINS Proj No	EN010116
Date	26/05/2022
Drawn by	MTC
Checked by	NW
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	11,000
ArcMap File	\\UKSSMBNAF-

PROJECT_DESCRIPTION_ES_ProjectElements_A01

Legend

- Order Limits
- Demolition
- Existing Port
- Areas for Potential Future Mitigation
- Surface Access
- Utilites
- Temporary Construction Haul Road
- Non-motorised Paths with Landscape Planting
- Construction Laydown (Indicative Size / Location)*
- Construction Laydown Limits of Deviation
- Flood Management
- Wetland / SuDs

Landuse

- Sub Station
- Carbon capture and associated curtilage landscape
- ERF and associated curtilage landscape
- Visitor Centre
- Concrete manufacturing and plastic recycling facility with associated curtilage landscape
- Gas AGI and associated curtilage landscape
- Energy storage and refueling station and associated curtilage landscape
- Flood Defence Bund

Railway Reinstated

- Dragonby Siding Expansion
- Railhead
- Railspur Upgrade

*Not all laydown areas are shown on the plan. Where laydown areas would be located within the footprint of the the building to be constructed, they have been omitted from the plan to improve clarity.

Layer Source Information

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title Figure 4c
Project Elements

Page 4 of 4

Client Information

Client	North Lincolnshire Green Energy Park Ltd
PINS Proj No	EN010116
Date	26/05/2022
Drawn by	MTC
Checked by	NW
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	11,000
ArcMap File	\\UKSSMBNAF-

PROJECT_DESCRIPTION_ES_ProjectElements_A01

Legend

- Order Limits
- Demolition
- Existing Port
- Areas for Potential Future Mitigation
- Surface Access
- Utilites
- Temporary Construction Haul Road
- Non-motorised Paths with Landscape Planting
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- Wetland / SuDs

Landuse

- Sub Station
- Carbon capture and associated curtilage landscape
- ERF and associated curtilage landscape
- Visitor Centre
- Concrete manufacturing and plastic recycling facility with associated curtilage landscape
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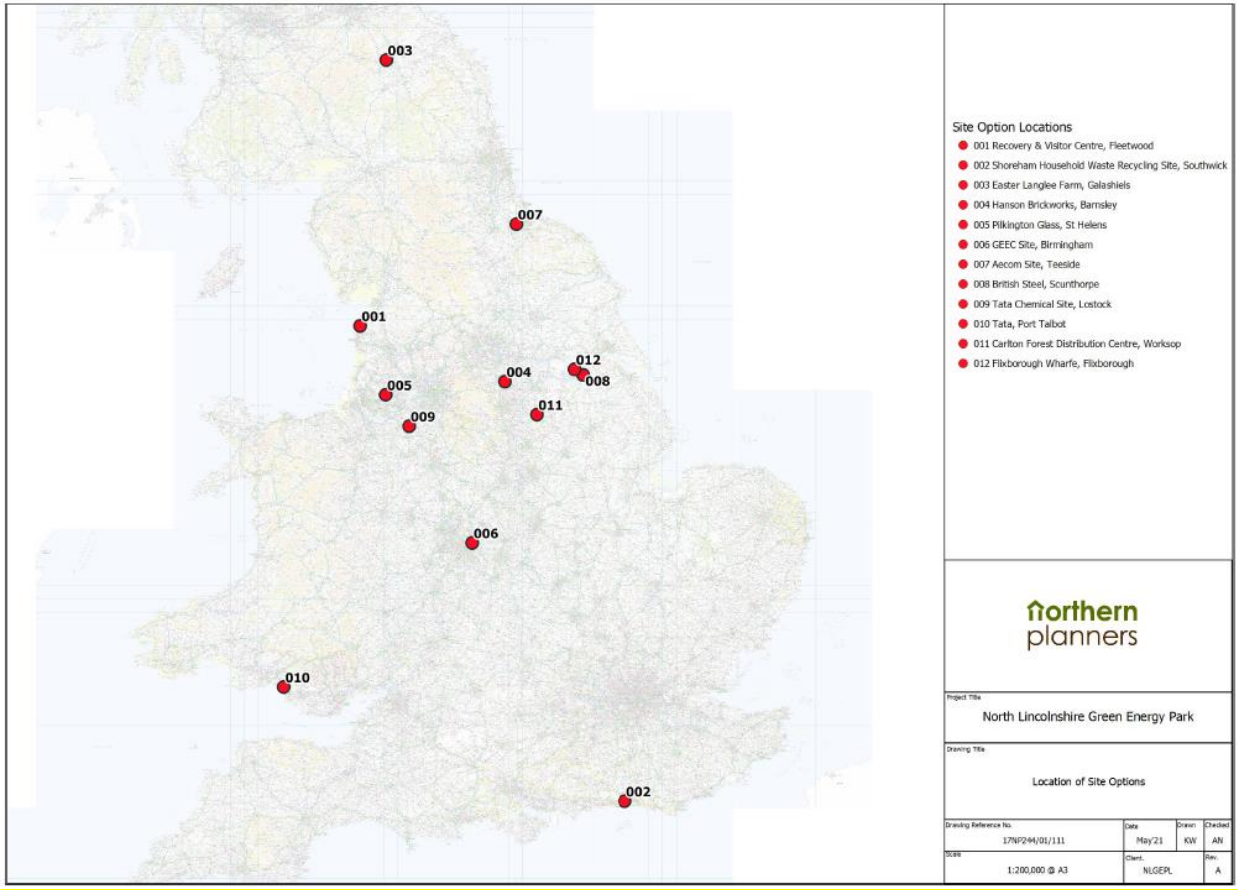
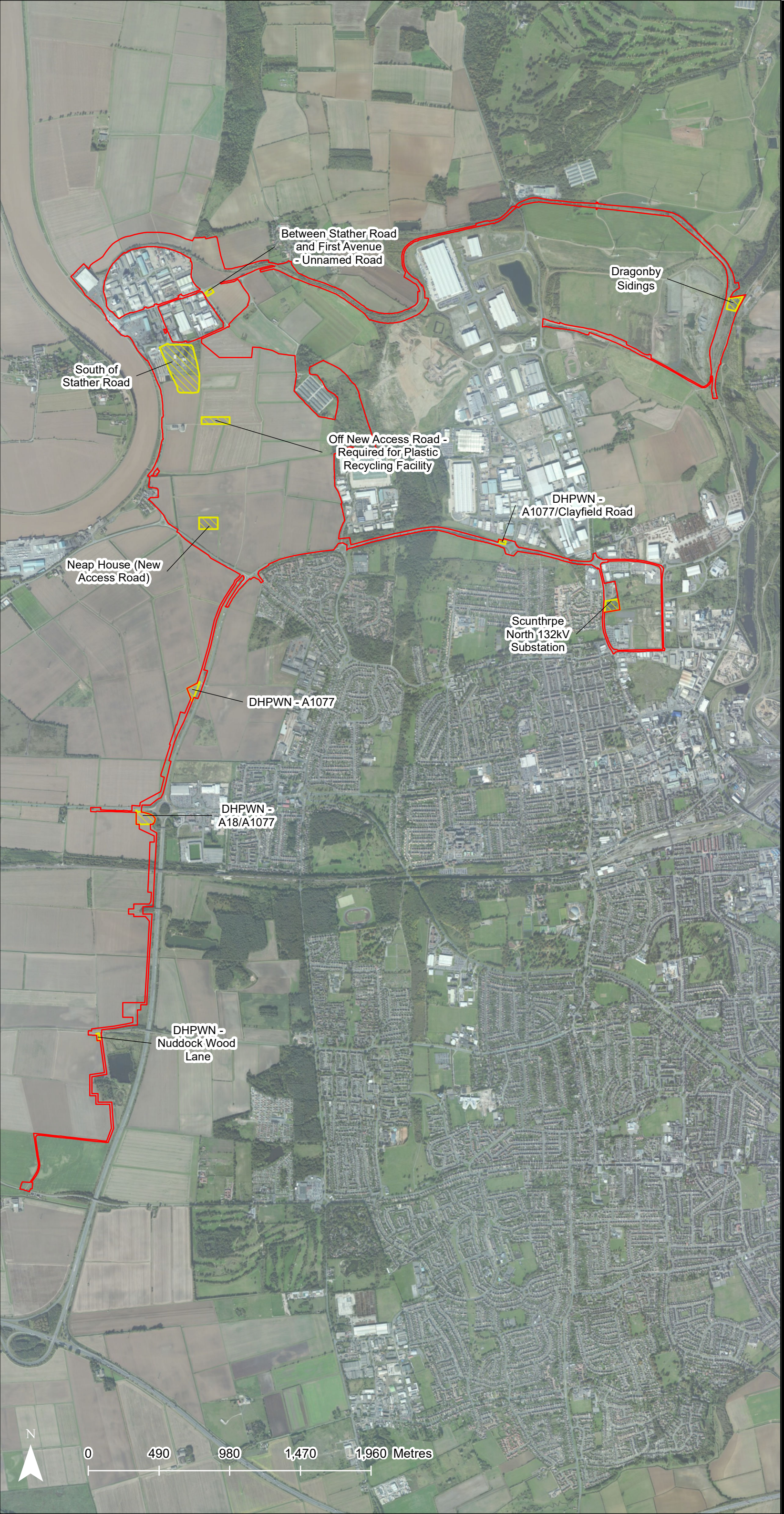
Figure 5: Location of Site Options (Long List)





NORTH LINCOLNSHIRE GREEN ENERGY PARK

ERM

North Lincolnshire Green Energy Park

Title Figure 6
Location of Construction Compounds

Client Information

Client	North Lincolnshire Green Energy Park Ltd
PINS Proj No	EN010116
Date	26/05/2022
Drawn by	MTC
Checked by	NW
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	25,001
ArcMap File	\\UKSSMBNAF-

PROJECT_DESCRIPTION_ES_ConstructionCompounds_A01

Legend

- Order Limits
- Construction Compounds

*Not all laydown areas are shown on the plan. Where laydown areas would be located within the footprint of the the building to be constructed, they have been omitted from the plan to improve clarity.

Layer Source Information

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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