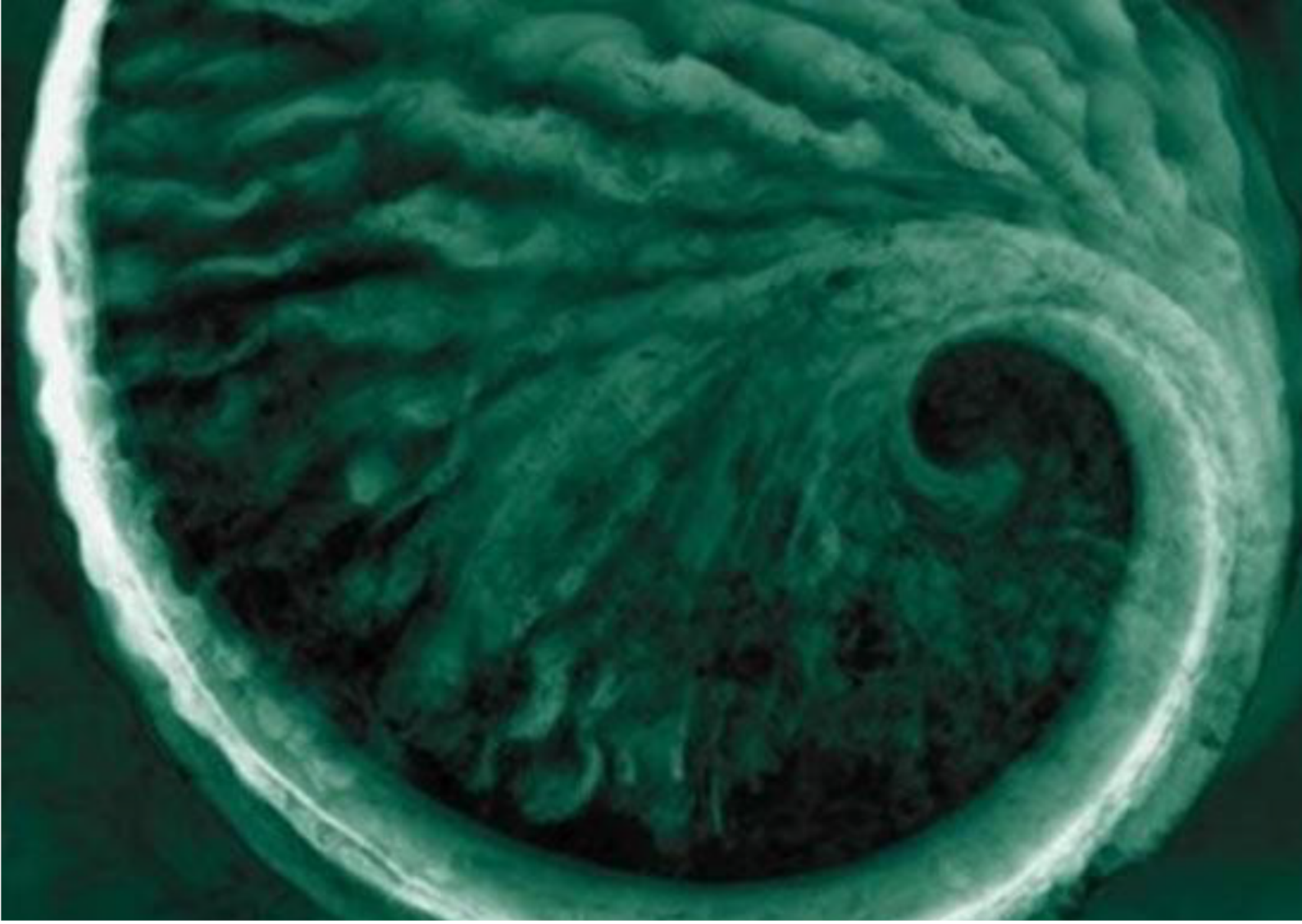

NORTH LINCOLNSHIRE GREEN ENERGY PARK

North Lincolnshire Green Energy Park

Phase 1 Environmental Site Assessment

05 January 2021

Project No.: 0483091

The business of sustainability

ERM

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North Lincolnshire Green Energy Park

Phase 1 Environmental Site Assessment

[redacted]

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Acronyms and Abbreviations

Name	Description
BGS	British Geological Survey
CHP	Combined Heat and Power
CIEH	Chartered Institute of Environmental Health
COMAH	Control of Major Accident Hazards
CSM	Conceptual Site Model
DCO	Development Consent Order
DEFRA	Department for Environment, Farming and Rural Affairs
EFW	Energy From Waste
EA	Environment Agency
EIA	Environmental Impact Assessment
EPH	Extractable Petroleum Hydrocarbons
ERF	Energy Recovery Facility
ERM	Environmental Resources Management
ESA	Environmental Site Assessment
GAC	Generic Assessment Criteria

HSC	Hazardous Substances Consents
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention and Control
LQM	Land Quality Management
m bgl	m below ground level
PAHs	Poly Aromatic Hydrocarbons
PFAS	Per- and Polyfluoroalkyl Substances
S4ULs	Suitable 4 Use Levels
SAC	Special Area of Conservation
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
UK	United Kingdom
WFD	Water Framework Directive
YALPAG	Yorkshire and Lincolnshire Pollution Advisory Group

1. INTRODUCTION

1.1 Preamble

Environmental Resources Management (ERM) was commissioned by Solar 21 ('the client') to undertake a Phase I Environmental Site Assessment (ESA) of land ('the site') required for the North Lincolnshire Green Energy Park located to the west of Flixborough, United Kingdom (UK). This Phase I ESA forms part of a wider Development Consent Order (DCO) application, which the client intends to submit to the UK Planning Inspectorate.

1.2 Background

ERM understands that the client intends to construct a new Energy Recovery Facility (ERF) and Associated Development (the Project) which constitutes a thermal combustion combined heat and power (CHP) plant with a potential power output capacity of up to 100 MWe from a total thermal capacity of 316 MWth and the client requires a Phase I ESA to be completed to inform the baseline for the EIA in support of the DCO application.

The main part of the site is located on brownfield and agricultural land to the south and east of Flixborough Wharf and south of the Flixborough Industrial Estate in North Lincolnshire. The site includes land within and adjacent to Flixborough Port (RMS Trent Ports) on the River Trent in North Lincolnshire.

1.3 Report Aim and Scope of Works

In general terms, the purpose of this assessment is to provide the client (and ultimately the Planning Inspectorate) with a good understanding of the site's history, its environmental setting and its potential to be affected by land contamination.

In line with the Yorkshire and Lincolnshire Pollution Advisory Group (YALPAG) guidance concerning the development of land affected by contamination (Technical Guidance for Developers, Land Owners and Consultants, YALPAG, v11.2 2020), this is accomplished by the following:

- Appraisal of the site's history using historical mapping and other records where available;
- Assessment of the environmental setting of the site (in terms of its vulnerability and sensitivity to contamination) by reference to geological / hydrogeological mapping and other publicly available data (e.g. UK Environment Agency (EA) records);
- Assessment of the current / proposed land use and surrounding land uses by reference to publicly available permit / licence databases.
- Review of previous reports relating to land contamination at the site and any associated remedial works;
- Formulation of a Conceptual Site Model (CSM); and
- Completion of preliminary risk assessment based on the source-pathway-receptor model, with reference to the above CSM.

1.4 Limitations

This report is based upon the application of scientific principles and professional judgment to certain facts with resultant subjective interpretations. Professional judgments expressed herein are based on the information currently available within the limits of the existing data, scope of work, budget and schedule. To the extent that more definitive conclusions are required than are warranted by the currently available information, it is specifically ERM's intent that the conclusions and recommendations stated herein will be intended as guidance and not necessarily a firm course of action, except where explicitly stated as such. ERM makes no warranties, express or implied,

including, without limitation, warranties as to merchantability or fitness for a particular purpose. In addition, the information provided to the client in this report is not to be construed as legal advice.

Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site described in the report is free of any potential environmental liability.

1.5 Report Structure

The remainder of the report is structured as follows:

- Section 2 – Site Location and Environmental Setting;
- Section 3 – Site History and Previous Works;
- Section 4 – Public Database Review;
- Section 5 – Conceptual Site Model;
- Section 6 – Refinement of Conceptual Site Model;
- Section 7 - Recommendations

The following supporting information is provided within the report annexes:

- Annex A – Figures
- Annex B – Landmark Envirocheck Report (including Historical Maps)

2. SITE LOCATION AND ENVIRONMENTAL SETTING

2.1 Site Location and Layout

The site, as identified for the purpose of this assessment, is based on the 'Red Line Boundary' published with the EIA Scoping report, which occupies a total area of approximately 5,990,000m^2 (598.5 ha) and is located on the east bank of the tidal River Trent immediately west and south of the village of Flixborough and approximately 2km to the northwest of Scunthorpe in the north east of the United Kingdom (UK). The site location is presented in Figure 1, Annex A.

The proposed site layout is presented in Figure 2, Annex A. The core scheme and Energy Recovery Facility (ERF) is located on brownfield and agricultural land to the east of Flixborough Wharf and south of the Flixborough Industrial Estate in North Lincolnshire. The wider site includes land within and adjacent to Flixborough Port (RMS Trent Ports) on the River Trent in North Lincolnshire. The project includes:

- An area surrounding the core scheme area, set aside for associated developments and mitigation;
- Extension/development to the existing wharf at Flixborough Port;
- Upgrading the 6km long private railway line connecting Flixborough Port to the Dragonby Sidings;
- A new access road, through the area set aside for associated development, to improve connectivity between Flixborough Port and the B1216; and
- Construction of gas, heat and cooling offtakes from the ERF. These offtakes will feed;
    - 1) a proposed housing development to the south of the site and north of the M180 (red shading on Figure 2), and
    - 2) North Lincolnshire Council Offices in the centre of Scunthorpe (pick shading on Figure 2).

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 Surrounding Area

The site area is located to the east of the River Trent, adjacent to Flixborough Industrial Estate, and extends to the east beyond Foxhills Industrial Estate, and to the South, encompassing the M181. Scunthorpe lies to the southeast. Land use in the area surrounding each project element within the site is further summarised in Table 1.

Table 1: Land Use Surrounding the Project Elements

Project Element	Direction	Land Use
ERF and Core Scheme	North	Flixborough Industrial Estate beyond which is agricultural land
	South	Agricultural land
	East	Agricultural land
	West	River Trent and wharf at Flixborough Port, beyond which are residential properties (Amcotts village approximately 400m west) and agricultural land
Associated Development and Mitigation	North	Agricultural land
	South	Agricultural land with Scunthorpe, including residential properties, to the southeast.

	East	Flixborough Industrial Estate lies immediately to the east in the central area for development and mitigation. The remaining land is mainly agricultural with some industrial properties at the southern end. Flixborough village is located approximately 500m to the east.
	West	River Trent and wharf at Flixborough Port, beyond which are residential properties (Amcotts village approximately 400m west) and agricultural land
Wharf Extension	North	Agricultural land
	South	Agricultural land
	East	Flixborough Industrial Estate
	West	River Trent adjacent, beyond which are residential properties (Amcotts village approximately 300m west) and agricultural land
Rail Line Upgrade	North	Agricultural land with Flixborough village located to the north of the central area of the rail line upgrade
	South	Mixed agricultural land, Flixborough Industrial Estate to the south of the western end and Normanby Enterprise Park to the south of the eastern end of the rail line upgrade.
	East	Agricultural land
	West	River Trent adjacent, beyond which are residential properties (Amcotts village approximately 300m west) and agricultural land
CHP Offtake to Council Offices	North	Foxhills Industrial Estate,
	South	Mixed residential properties, industrial properties and agricultural land.
	East	Mixed industrial, brownfields and agricultural land
	West	Agricultural land
CHP Offtake to proposed housing and industrial development	North	Agricultural land with the M181 running north-south through this project element.
	South	Agricultural land with the M181 running north-south through this project element.
	East	Agricultural land, beyond which are residential properties (Scunthorpe), the closest of which are 200m west at the northern end
	West	Agricultural land

2.3 Topography

The site is situated at an elevation of approximately 2m to 8m above Ordnance Datum (AOD) and is generally lower in the north and south and slightly elevated adjacent to Flixborough Industrial Estate. Land in the vicinity of the site is generally flat to the north and south in line with the River Trent (adjacent to the west), with an increase in elevation towards the east.

2.4 Geology

British Geological Survey (BGS) digital mapping[1] indicates that (Made Ground notwithstanding) the central and northern parts of the site are directly underlain by superficial deposits of alluvium (sand, silt and clay) described as unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta. Towards the east the site is underlain by blown sand described as sand that has been transported by wind, or sand consisting predominantly of wind borne particles. At the far east of the red line boundary, including the eastern laydown area, no superficial deposits are indicated. At the southern end of the site superficial deposits are shown as predominantly Warp (clay and silt), described as alluvium deposited by artificial flooding. The alluvial deposits, including the Warp, are identified as being in the region of three to 17m thickness (BGS borehole SE81SE21) and the blown sands are identified as being approximately 1.5m in thickness (BGS borehole SE81SE87). The 1982 BGS drift map, Sheet 89, Brigg 1:50,000, indicates that the alluvium, warp and blown sands are all underlain by sand and gravel of the Vale of York Glacial Lake Deposits.

The underlying bedrock across the majority of the site, with the exception of the proposed rail line upgrade and CHP offtake to council offices, is mapped as Mercia Mudstone Formation, described as "Dominantly red, less commonly green-grey, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite widespread; sandstones are also present". Immediately to the east of the Mercia Mudstone Formation is the Penarth Group (mudstone) The underlying bedrock at the eastern side of the site (proposed rail line upgrade and CHP offtake to council offices) is mapped as Scunthorpe Mudstone Formation, described as "Grey, variably calcareous and silty, blocky or fissile mudstone with thin beds of argillaceous limestone (bioclastic or micritic) and calcareous siltstone, particularly near base and in upper part, which is ferruginous in the type area." The Frodingham Ironstone Member (Ironstone) is recorded beneath the very eastern extent of the site, including the eastern laydown area. These (bedrock) deposits are listed as extending deeper than 30m across the site.

2.5 Hydrogeology

Environment Agency digital mapping[2] indicates that the superficial deposits (Alluvium, Warp and Blown Sands) are designated as Secondary A Aquifer units and are defined as "permeable layers that can support local water supplies, and may form an important source of base flow to rivers". The underlying bedrock (Mercia Mudstone Group, Penarth Group and Scunthorpe Mudstone Formation) are designated as Secondary B aquifer units, which are defined as "lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin cracks (called fissures) and openings or eroded layers".

Five groundwater abstractions are known to be present within 1km of the site, the nearest being an abstraction from the Blown Sands adjacent to the CHP Offtake to the south area for Spray irrigation (at Brumby Common West, Scunthorpe). The site does not lie within a groundwater Source Protection Zone (SPZ) of any type. The groundwater resources at the site have previously been classified[3] by the Environment Agency as having 'Good' quantitative status and 'Good' chemical quality in 2019 under the Water Framework Directive (WFD).

Due to the topography of the surrounding area and the proximity of the River Trent adjacent to the west, groundwater flow is inferred to be towards the west, however due to the tidal nature of the River Trent, groundwater elevations near to the river may also be tidally influenced.

[1] [redacted]
[2] https://magic.defra.gov.uk/MagicMap.aspx
[3] https://environment.data.gov.uk/catchment-planning/

2.6 Hydrology

The nearest surface water feature is the River Trent which is located adjacent to the western boundary. The River Trent, in the vicinity of the site, is within the Humber Estuary SSSI, SAC and Ramsar site.

Several other minor watercourses/field drains are present within the site's red line boundary and surrounding the site (<250m), as summarised in Table 2.

Table 2: Summary of Site Hydrology

Feature	Location	Flow Direction	Comments
River Trent (Humber Upper)	Adjacent to the western boundary	S to N	Water quality information for the Humber Upper has an overall water body classification as Moderate in 2019 under the WFD. Within the Humber Estuary SSSI, SAC and Ramsar site.
Burton and Flixborough Drain (and associated field drains)	Within the northern portion of the site	Unknown, likely S to N	Water quality not rated by Environment Agency. Discharges to the River Trent c.1.4km N of the site.
Lysaght's Drain (and associated field drains)	Within the southern portion of the site	Unknown, likely E to W	Water quality not rated by the Environment Agency.
Winterton Beck	c.20m north of railway spur	Unknown, likely S to N	Water quality not rated by the Environment Agency.

Thirty-five surface water abstractions are listed within 1km of the site, with 13 present within the site's red line boundary. The on-site surface water abstractions are listed below:

- W S Chapman & Sons, Brumby – Tributary of Warping Drain (1), for spray irrigation;
- Three abstractions: W S Chapman & Sons, Warping Drain – Reach 1, for spray irrigation;
- Three abstractions: W S Chapman & Sons, Warping Drain – Reach 2, for spray irrigation;
- Three abstractions: Norman Jackson (Flixborough) Limited, Lysaghts Drain, for spray irrigation; and
- Three abstractions: Norman Jackson (Flixborough) Limited, Burton & Flixborough Drain, for spray irrigation.

Fifty-nine discharge consents are listed within 1km of the site, seven are listed within 250m of the site boundary and 13 are listed within the site's red line boundary, of which five have been revoked. The eight active (no revocation date supplied) on-site discharge consents are listed below:

- W H Martin Limited, discharging process water into the River Trent;
- British Steel, discharging process water into the River Trent;
- Flixborough Wharf Limited, discharging final treated effluent into the River Trent;
- Sewage Disposal Works (Unknown), discharging final treated effluent into the River Trent;
- Norman Jackson (Farmers) Ltd, discharging sewage effluent into an unknown receptor;
- Crystal Polymers – Flixborough, unknown discharge into an unknown receptor;
- Lysaght's Scunthorpe Works, discharging sewage effluent into an unknown receptor; and
- North Lincolnshire Council, discharging final treated effluent onto land.

UK digital flood mapping[4] indicates that the majority of the site (adjacent to Flixborough Industrial Estate) is located within an area that has a high probability of flooding (Flood Zone 3 – area that benefits from flood defences). A flood risk assessment is currently being prepared for this site.

Based on the above, ERM considers surface water at the site to be of high vulnerability and of high sensitivity.

[4] https://flood-map-for-planning.service.gov.uk/

3. SITE HISTORY AND PREVIOUS WORKS

3.1 Site History

The history of the site has primarily been determined by reference to historical mapping dating from c.1854 to 2020. These maps were obtained by ERM as part of a Landmark Envirocheck report (ref. 269869084_1_1 01/12/2020), which was procured for the specific purposes of this assessment. Where available, other sources (such as the Environment Agency public registers and other publicly available records) have also been reviewed.

In summary, the above sources indicate that the majority of the site has comprised undeveloped / agricultural land to present day, with some development associated with Flixborough Wharf and Flixborough Industrial Estate as well as construction of the railways and other road infrastructure. A former landfill/waste management facility is located within the eastern extent of the site (proposed eastern laydown area), at least some of which appears to have been capped and reverted to agricultural land, however the Envirocheck indicates that there may be an operational registered landfill in the area of the proposed eastern laydown area (see Section 4.2.1).

Table 3 provides further detail of the history of the site and that of the surrounding area (up to 1km), as determined by reference to the historical maps and other sources where available.

Table 3: Site History

Date	On Site	Off Site (up to 1km)	Source(s)
1854 - 1907	■ The site is depicted as undeveloped / agricultural land with field drains. ■ Flixborough Stather residential properties in the centre of the site (the northern end of the proposed ERF and core scheme). ■ A 'Mineral Railway' and 'Barnsley to Barnetby Railway' are shown running east to west across the proposed laydown area at southern most extent of the site. ■ Road infrastructure associated with Scunthorpe is shown within the southeast tail of the red line boundary.	■ Predominantly undeveloped / agricultural land. ■ Road infrastructure surrounding the site in line with the present A18 and minor B roads. ■ Low density residential area present adjacent to the south of the site, labelled Scunthorpe. ■ Flixborough village adjacent to the east of the site. ■ Trent, Frodingham and Lindsey Ironworks and their associated railways are present c.100m to 1km south east of the site (south east of the CHP offtake to Council Offices).	Lincolnshire 1854, 1886, 1907; Yorkshire 1854, 1854-1855, 1855, 1892, 1893.
1908	■ No significant changes.	■ Area remains predominantly undeveloped / agricultural. ■ 'North Lindsey Light Railway' adjacent to the eastern laydown area. ■ Further expansion of the Ironworks to the south east.	Lincolnshire 1908

Date	On Site	Off Site (up to 1km)	Source(s)
1938-1946	■ Construction of Flixborough Wharf on the western side of the site along the River Trent.	■ Significant medium density residential development associated with the expansion of Scunthorpe is now present adjacent to the south.	Lincolnshire 1938-1946,
1946	■ A tank farm is present in the centre of the site (the northern end of the ERF and core scheme) adjacent to Flixborough Industrial Estate	■ Industrial development of Flixborough Industrial Estate, immediately to the north of the proposed ERF and Core Scheme, including construction of several buildings.	Lincolnshire 1946
1950-1969	■ A drain is shown adjacent to the tank farm from c.1966. ■ Construction of the railway line (mineral railway) in the eastern tail of the red line boundary associated with the adjacent Steel Works. ■ Railway sidings in the eastern laydown area.	■ Construction of nitrogen fertiliser works within Flixborough Industrial Estate on land immediately to the north of the proposed ERF and Core Scheme. ■ Ironstone Quarry adjacent to the north of the proposed eastern laydown area, with several associated opencast ironstone pits surrounding the area to the east and south. ■ The western side of the eastern laydown area is shown as a slag heap. ■ Construction and expansion of a Steel Works east of the central area of the site (associated development and mitigation), c.500m southeast of Flixborough village). ■ Significant industrial/railway development is present c.1km south east of the site, part of the Ironworks. ■ Construction of Grove Wharf and associated buildings/jettys/tanks c.1km southwest.	Lincolnshire 1950; OS 1956, 1966, 1968-1969, 1969
1971 - 1987	■ A refuse tip is shown in the eastern laydown area to the south of the quarry railway line.	■ Further significant residential expansion of the town of Scunthorpe c.1km to the east. ■ Further development of the Ironstone Quarry adjacent to the east of the site. ■ Further development of the Steelworks adjacent and c.500m to the east of the site. ■ The nitrogen fertiliser works has been renamed as a chemical works within Flixborough Industrial Estate, with a	OS 1971, 1977, 1982, 1982-1987; Additional SIMs 1980-1985

Date	On Site	Off Site (up to 1km)	Source(s)
		sludge bed adjacent to the site boundary.	
1989-1995	■ Tanks are no longer present in the centre of the site, warehouse buildings are now shown to be present here adjacent to the boundary with Flixborough Industrial Estate (the northern end of the proposed ERF and core scheme). ■ An unspecified works is shown to the west of the southern end of the proposed ERF and Core Scheme. ■ Construction of the A1077 and M181 roads in the south of the site. ■ Slight expansion in the size of the refuse tip.	■ The sludge bed and chemical works is no longer labelled adjacent to the east of the site, this is now labelled Flixborough Industrial Estate. ■ Park Ings Farm buildings have been built adjacent to the east of the site (c.800m south of Flixborough village). ■ Construction of the M180 c.900m south. ■ The ironstone quarry to the north of the proposed eastern laydown area and associated pits to the east and south have become disused and the railway lines/sidings associated with the quarry are no longer shown. ■ The steel works to the east of the central area of the site (proposed associated development and mitigation area), is no longer operational with tanks and railway sidings having been removed. This site has now been replaced with warehousing and tanks as part of Foxhills Industrial Estate and expanded further south. ■ Additional commercial / industrial development, including some tanks, is identifiable adjacent to the east (west of Foxhills Industrial Estate) labelled Skippingdale Industrial Park.	Additional SIMs 1989-1991; Large Scale National Grid Data 1994, 1995; OS 1991, 1991-1994
1999-2020	■ Minor expansion of the warehousing at the northern end of the proposed ERF and Core Scheme. ■ By c.2020 the refuse tip is no longer identified on mapping.	■ Further warehousing development north of Foxhills Industrial Estate across the land of the former quarry. ■ Minor residential expansion of Scunthorpe adjacent to the east (east of A1077).	10k Raster Mapping 1999-2000, 2000; Street View 2020; Google Earth

3.2 Previous Works

A Report on Ground Investigation was carried out by Ian Farmer Associates (1998) Limited for a proposed EFW Plant immediately north of Stather Road, at the southern end of the Flixborough Industrial Estate in 2018, to support the suitability of the site to support the construction of the power

plant. Six boreholes were advanced across the area of the proposed EFW Plant; *"The ground conditions encountered on the site was principally a thin covering of Made Ground overlying alluvial deposits of soft laminated clay, organic clay and peat onto a gravelly sand. The alluvial deposits overlay the Mercia Mudstone which appeared to be initially weathered to a gravelly clay with bedrock found at 20.10 to 22.60mbgl. Groundwater was encountered at 11.70/12.3mbgl rising to 6.3/ 6.7mbgl due to the nearby influence of the River Trent"*, with ten soil samples, one groundwater sample and four soil leachate samples scheduled for chemical analysis (metals, EPH, PAH, pH, total cyanide, soil organic matter, sulphate, sulphur and asbestos):

- The results were screened against Suitable 4 Use Levels (S4ULs), determined by LQM and CIEH, or CLEA SGVs published in Environment Agency Science Reports SC050021/SR3, and SC050021 and DEFRA C4SL (Category 4 Screening Levels) for lead, in accordance with current legislation and guidance.
- Only Nickel was detected above the Generic Assessment Criteria (GAC) in one location (BH2 at 0.5m below ground level (bgl)) at 1200mg/kg. A mean value test was applied to the results and determined the "*elevated contaminant is unlikely to present a significant risk to human health in relation to the proposed site end use and requires no further consideration"*.
- Leachate analysis of the soils was carried out to determine risks to controlled waters "*A sample of Made Ground from BH4 at 1.0mbgl indicated leachable values for arsenic, copper and lead above the water supply regulations but the content of these metals in the soil from this sample was low and below residential with gardens usage. In light of this the risk to the River Trent is considered to be a low risk"*.

Three rounds of ground gas analysis were also carried out at the monitoring well standpipes. Gas Screening Values were calculated and gas protection measures of Characteristic Situation 3 were calculated, however, the gas sampling rounds were not undertaken in compliance with guidelines *(CIRIA Document C659*). Ian Farmer Associates (1998) Limited recommended *"that a continued programme of monitoring be carried out to comply more closely with these guidelines before final design is undertaken"*.

3.3 Summary of Site Conditions

3.3.1 Observed Geology on Site

The observed geological sequence at the proposed EFW Plant on Stather Road, from the Report on Ground Investigation carried out by Ian Farmer Associates (1998) Limited, is presented in Table 4. Observed on site geology is in line with the Alluvium and Mercia Mudstone identified by the BGS.

Table 4: Geological Sequence

Strata Encountered	Depth encountered (m bgl)		Strata Thickness (m)
	From	To	
Made Ground	0.00	0.60 to 2.10	0.60 to 2.10
Light brown sandy gravelly Clay	0.6 to 1.40	1.0 to 2.0	0.40 to 1.25
Laminated light brown sandy Clay	1.0 to 2.0	1.85 to 3.20	0.85 to 1.70
Laminated organic light grey brown sandy Clay	1.85 to 3.20	4.70 to 6.70	2.85 to 4.60
Laminated brown sandy Clay with peat	6.20 to 6.70	12.20 to 12.50	5.80 to 6.0
Peat	4.70 to 6.70	11.70 to 12.30	5.60 to 7.0

Gravelly Sand	11.70 to 12.50	17.10 to 19.40	4.90 to 7.10
Brown sandy gravelly Clay	17.20	18.50	1.30
Red brown sandy gravelly Clay	17.10 to 19.40	20.10 to 22.60	1.80 to 4.20
Mercia Mudstone	20.10 to 22.60	30.0 to 30.10	7.40 to 9.30

BGS borehole (SE81SE21) within the area of the proposed ERF and Core Scheme recorded the depth of the Alluvium to c.17m bgl, underlain by the Mercia Mudstone in line with the observations by Ian Farmers Associates. This included silts, peat and clay within the top 11m with sands and gravels to c.17m bgl.

From BGS information the geological sequence in Table 4 is likely to be predominant across the majority of the site within the red line boundary, with the exception in the east where blown sands are present and an ironstone bedrock is present beneath the eastern laydown area. A conceptual east to west geological cross section using BGS boreholes across the site, is provided in Annex A, Figure 3 with a corresponding BGS borehole location plan.

3.3.2 Hydrogeology on Site

Depth to groundwater across the site recorded by Ian Farmers Associates (1998) Ltd noted groundwater strike was c.12m bgl rising to c.6.5m bgl 20 minutes after installation. On subsequent visits depth to water ranged between 1.65m bgl and 2.08m bgl, suggesting the groundwater beneath the site is confined and the potentiometric head was broadly equivalent of the level of the River Trent. Due to the topography of the surrounding area and the proximity of the River Trent adjacent to the west, groundwater flow is inferred to be towards the west, however, groundwater flow may be affected by tidal influences from the River Trent.

Based on the above, ERM considers groundwater resources at the site to be of moderate vulnerability and of moderate sensitivity.

4. PUBLIC DATABASE REVIEW

This section summarises known current / recent land use at the site and in the vicinity of the site, by reference to regulatory permitting records and other relevant contemporary records. These were obtained by ERM as part of the Envirocheck report for the specific purposes of this assessment, or are publicly available from other sources (for example the Environment Agency public registers).

4.1 Active / Operational Permits

The site is located adjacent to Flixborough Industrial Estate, with other Industrial Estates located within 1km of the site. As such, numerous permitted activities are registered within a 1km distance of the site as are summarised below:

4.1.1 IPPC Permits

Three IPPC permits / permit variations are registered to the site:

- Two entries for Pet Polymers Ltd for 'Organic Chemicals; Plastic Materials Eg Polymers', dated January 2005 and April 2013. These should now be obsolete since the permit has been varied and then surrendered.
- One entry appears registered to North Lincolnshire Council (Conesby Quarry Landfill) for 'Waste Landfilling; Greater Than 10 T/D With Capacity Greater Than 25,000T Excluding Inert Waste', dated January 2005. This permit should now be obsolete since the permit has been superseded by variation.

A further 40 IPPC permits / permit variations are reported within 1km of the site. The two nearest of these (located within 50m of the site boundary), listed as 'effective', relate to:

- Arl 018 Limited, Stather Road, located c.27m northwest of the site boundary for a 'New Medium Combustion Plant', dated July 2019; and
- North Lincolnshire Council (Conesby Quarry Landfill), located c.32m northwest of the site boundary for 'Waste Landfilling; Greater Than 10 T/D With Capacity Greater Than 25,000T Excluding Inert Waste', dated March 2016.

4.1.2 IPC Permits

Three superseded IPC permits / permit revocations are registered to the site:

- Three entries for Crystal Polymers Ltd for 'Manufacture and use of Organic Chemicals within the Chemical Industry', dated February 1994, November 1998 and August 2000. These should now be obsolete since the permits were superseded then revoked.

A further 17 superseded IPC permits / permit revocations are registered within 500m of the site, as below:

- Nine entries appear registered to Fibrogen Ltd for 'Combustion processes within the fuel and power industry'. These are reported at distances of c.111m northeast from the site.
- Five entries appear registered to Koppers Uk Ltd for 'Tar And Bitumen Processes'. These are reported at distances of c.281m-286m southeast of from the site.
- Two entries appear registered to Edinburgh Oil and Gas Ltd for 'Petroleum processes within the Fuel & Power Industry'. These are reported at distances of c.352m-355m southwest from the site.
- One entry registered to Jotun Paints (Europe) Ltd, Stather Road for 'Inorganic Chemical processes within the Chemical Industry'. This is reported at a distance of c.108m west from the site.

4.1.3 Local Authority Integrated Pollution Prevention and Control

Four Local Authority Integrated Pollution Prevention and Control permits are registered within 1km of the site, relating to:

- Can Pack Uk Ltd for 6/23 Production and Processing of Metals, c.151m south;
- Mondi Packaging 6/17 Coating, c.213m southeast;
- Corus Uk Ltd for SG6 Other Activities, c.835m southeast; and
- William Blyth Ltd for SG7 Mineral Industries, c.835m southeast;

4.1.4 Local Authority Pollution Prevention and Controls

Thirty-five Local Authority Pollution Prevention and Controls permits are registered within 1km of the site, two of which are located within the site's red line boundary. The two on-site permits relate to:

- Am Fletcher, for PG6/34 Respraying of road vehicles; and
- Just Car Clinic, for PG6/34 Respraying of road vehicles.

Eight permits are registered within 100m of the site boundary, these relate to:

- Murco Petroleum Ltd for PG1/14 Petrol filling station, c.11 west;
- Faber Prest Ports Ltd for PG3/5 Coal, coke and coal product processes, c.26m northeast;
- Stoneacre Motor Group for PG6/34 Respraying of road vehicles, c.46m northwest;
- Minelco Minerals Ltd for PG3/15 Mineral drying and roadstone coating processes, c.48m northeast;
- Minelco Minerals Ltd for PG3/8 Quarry processes including roadstone plants and the size reduction of bricks, tiles and concrete, c.54m northeast;
- Hygena Ltd for PG6/33 Wood coating, c.58m south;
- Just Car Clinic for PG1/14 Petrol filling station, c.69m southwest; and
- Tolsa Uk Ltd for PG3/8 Quarry processes including roadstone plants and the size reduction of bricks, tiles and concrete, c.79m northeast.

4.1.5 Local Authority Pollution Prevention and Control Enforcements

One entry relating to Winterton Road for Air Pollution Control Enforcement Notice (reference P35/3.5/04), c.245m north. No other details supplied.

4.1.6 COMAH Sites

Seven active COMAH permits are registered within 1km of the site, as below:

- An Upper Tier registration for Koppers Uk Limited, c.281m southeast;
- An Upper Tier registration for Boc Limited, c.487m north;
- An Upper Tier registration for Tata Steel Uk Limited, c.886 southeast;
- An Upper Tier registration for Haven Warehousing and Distribution Limited, c.116m northeast;
- A Lower Tier registration for Groveport Logistics Limited, c.937m south;
- An Upper Tier registration for Jotun Paints (Europe) Limited, c.108m west; and
- A Lower Tier registration for Colepccl Uk Ltd. C.216m southeast.

4.1.7 Planning Hazardous Substance Consents

A total of ten Hazardous Substance Consents (HSC) are reported within 1km of the site, five of which are within 250m of the site relating to:

- Two consents for Jotun Paints (Europe) Ltd c.31m and c.138m west for 'Combination of Dangerous Substances', no date supplied;
- Two consents for C C L Industries Ltd c.197m and c.202m southeast for 'Part C, Flammable Substance (Not in Parts A&B), Liquefied petroleum gas held at >1.4 bar where amount held is greater than or equal to 25 tonnes', both dated November 1992; and
- British Gas Ltd c.239m southeast for 'Part C, Flammable Substance (Not in Parts A&B), Gas or gases flammable in air, when held as a gas, where amount held is >= 15tonnes', dated January 1992.

4.2 Waste

4.2.1 Landfilling

A currently operational (as far as known) registered landfill site is reported within the site boundary, at the proposed eastern laydown area, located at Dragonby Landfill and licensed to Sita Products & Services Ltd (dated 1997). The site was previously licensed to Drinkwater Sabey Ltd (two licences dated 1992 and 1995) for a mixture of wastes including but not limited to contaminated rubbish/bags, fats, waxes, greases, paint waste, pulverised fuel ash, bitumen and waste treated timber. A second registered landfill site is located at Glebe Pit, along the eastern boundary of the southern extent of the area designated CHP Offtake to council offices, registered to Onward Holdings Ltd (dated 1978) for non-hazardous construction and excavation wastes, recorded as site dormant. A further 14 registered landfill sites are reported within 1km of the site boundary.

Two historical landfills are reported to be located within the site's red line boundary at the proposed eastern laydown area. The first is registered to Onwards Holdings Ltd at Bessemer Way Landfill, first input date August 2000. No further information supplied. The second is registered to Drinkwater Sabey Ltd at Dragonby Landfill, first input date July 1990 and last input date April 1994 for Inert and Industrial Wastes. A further eleven historical landfill sites are reported within 1km of the site's red line boundary.

One BGS Recorded Landfill site is reported to be adjacent to the east of the site boundary at the eastern extent of the CHP Offtake to Council Offices, registered to Hornsby and Goodwyn at Dawes Lane.

Two Licensed Waste Management Facilities (Landfill Boundaries) are registered within the site's red line boundary at the proposed eastern laydown area: Conesby Quarry Phase I for 'Other Landfill Sites Taking Special Waste' issued March 1988; and Conesby Quarry Landfill Epr/Bv0627il for 'Waste Landfilling; >10 T/D with Capacity >25,000T Excluding Inert Waste' effective March 2016. A further Licensed Waste Management Facility (Landfill Boundaries) is located within the site's red line boundary, registered at the Dragonby Landfill but listed as closed. A further two are registered c.765m southeast and c.961m southeast at Crosby North Landfill both for 'Waste Landfilling; >10 T/D with Capacity >25,000T Excluding Inert Waste'.

Thirty-one Licensed Waste Management Facilities (Locations) are registered within 1km of the site boundary and one surrendered Licensed Waste Management Facilities (Locations) within the red line boundary. The surrendered on-site licence relates to land/premises at Stather Road for composting. The nearest currently issued licence relates to Normanby Road c.189m northwest for Household, Commercial and Industrial Waste Landfills.

4.2.2 Waste Treatment or Disposal Sites

Fifteen registered waste treatment or disposal sites are reported within 1km of the site, three are registered within 250m of the site boundary:

- Partco Autoparts Ltd, Glebe Industrial Estate c.3m northwest of the site for waste produced by the licence holder 'Very Small (Less than 10,000 tonnes per year)';
- Anglian Water Services Ltd, Scunthorpe Depot c.193m north of the site for waste produced by the licence holder 'Small (Equal to or greater than 10,000 and less than 25,000 tonnes per year)'; and
- Quay Minerals Ltd, Gunness Wharf c.149m northeast for waste produced by the licence holder 'Medium (Equal to or greater than 25,000 and less than 75,000 tonnes per year)'.

4.3 Pollution Incidents

4.3.1 Pollution Incidents to Controlled Waters

Fifty-six Pollution Incidents to Controlled Waters have been recorded within 1km of the site, 15 of these incidents have occurred within the site's red line boundary, all relating to Category 3 – Minor Incidents. These incidents generally comprise accidental spills of waste oils or chemicals (paints/dyes) entering the River Trent or Bottesford Beck between 1995 and 1998.

4.3.2 Prosecutions Relating to Authorised Processes

Two Prosecutions Relating to Authorised Processes are recorded within 1km of the site, relating to:

- Santon Business Park c.465m east for 'Depositing, keeping and treating waste on land without a WML - 8 Month custodial sentence served' dated June 2006; and
- Site on Sterling Business Park c.534m southeast for 'Operating a waste facility without an environmental permit' dated August 2012.

4.3.3 Substantiated Pollutant Incident Register

Nineteen Substantiated Pollutant Incident Register entries are recorded with 1km of the site boundary, two of which are recorded within the site boundary. The on-site entries relate to:

- Category 2 – Significant Impact to Air by Atmospheric Pollutants and Effects: Other Atmospheric Pollutant Or Effect, dated June 2006; and
- Category 2 – Significant Impact to Land and Category 3 – Minor Impact to Water by Specific Waste Materials: Household Waste, dated June 2017.

4.3.4 Flixborough Disaster

On 1 June 1974 an explosion in a cyclohexane plant at Nypro UK (a chemical plant) occurred at the Flixborough industrial estate, resulting in the deaths of 28 people and 36 people were seriously injured. The HSE website[5] summarises the incident: "*During the late afternoon on 1 June 1974 a 20 inch bypass system ruptured, which may have been caused by a fire on a nearby 8 inch pipe. This resulted in the escape of a large quantity of cyclohexane. The cyclohexane formed a flammable mixture and subsequently found a source of ignition. At about 16:53 hours there was a massive vapour cloud explosion which caused extensive damage and started numerous fires on the site*".

At the time of the disaster, Nypro UK produced the chemical caprolactam, used in the production of nylon, from cyclohexanone. Cyclohexanone was produced by partially oxidising hot liquid

[5] Flixborough (Nypro UK) Explosion 1st June 1974 (hse.gov.uk)

cyclohexane by compressed air. Nypro UK was situated within Flixborough Industrial Estate, north of the proposed ERF.

Due to the chemical plant being destroyed by this disaster, there is potential that other chemicals, including Poly Aromatic Hydrocarbons (PAHs), metals, asbestos and PFAS (Per- and polyfluoroalkyl substances), from firefighting foam, to have had an impact on the surrounding soil and groundwater.

5. CONCEPTUAL SITE MODEL

The purpose of the Conceptual Site Model (CSM) is to identify potential contaminant linkages, based on the information available at this stage. The presence (or likely presence) of the following three elements is essential to the identification of a contaminant linkage:

- A potential contaminant (source) in, on, or under the land at a concentration which may cause harm or pollution;
- A receptor which may suffer harm as a result of contact with the above; and
- An exposure pathway by which the receptor may come into contact with the contaminant source.

Where all three of the above are present (or may be present), a “plausible contaminant linkage” is said to exist.

This section describes the potential contaminant sources, receptors and exposure pathways identified at the site in the context of the environmental setting and a proposed commercial end use. Based on this, the plausible contaminant linkages present at the site are determined.

5.1 Sources

Figure 4, Annex A presents the potential areas of concern based on the sources listed in sections 5.1.1 to 5.1.4 below.

5.1.1 Onsite Current Land Use

The majority of the site is undeveloped agricultural land with some brownfield land to the centre (in the area of the proposed ERF and Core Scheme), adjacent to Flixborough Wharf and Flixborough Industrial Estate. There is potential for some onsite storage of fuels and various other process chemicals. One registered landfill site is assumed to be operational within the red line boundary at the proposed eastern laydown area, authorised to accept a wide variety of wastes including but not limited to non-hazardous excavation wastes, contaminated rubbish, fats, waxes, greases, paint waste, pulverised fuel ash, bitumen and waste treated timber.

5.1.2 Onsite Historical Land Use

ERM’s review of the available historical mapping also indicates that tanks were present in the centre (in the area of the proposed ERF and Core Scheme) of the site between the dates of c.1946 and 1989 and the presence of railway/railway sidings and two historical landfills in the eastern laydown area since c.1950. This will likely have involved some onsite storage of fuels and various other process chemicals as well as inert wastes associated with the landfill. From the Envirocheck report a significant impact to land from household wastes has been recorded on site, at the southern end of the proposed eastern laydown area, from an incident in 2017 as well as 15 pollution incidents to controlled waters arising from locations within the red line boundary.

5.1.3 Offsite Historical Impact

ERM’s review of the available historical mapping indicates that the area to the east of the site operated as an Ironworks, Steelworks, and various landfills between c.1950 and the late 1990s. A nitrogen fertiliser plant and later a chemical works with sludge bed was also present within Flixborough Industrial Estate to the north of the proposed ERF and Core Scheme area (likely to have been Nypro UK, see section 4.3.4). As above, this will likely have involved storage (and release due to the Flixborough disaster) of various process chemicals close to the site boundary.

5.1.4 Offsite Current Land Use

The site is located within a mixed agricultural and brownfield land use area. As such, numerous permitted activities / industrial installations are currently present within the vicinity of the site, at which bulk fuel / chemical storage and use is likely. Of these, the closest / likely most relevant is Jotun Paints (Europe) Ltd located to the immediate west for their use of 'dangerous substances' and a petrol filling station adjacent to the west.

5.2 Receptors

A summary of the statutory receptors considered for inclusion in the CSM is provided in Table 5. Further detail relating to the receptors identified within the table is presented in Sections 5.3.1 – 5.3.3.

Table 5: Statutory Receptors Checklist

Receptor	On Site	Off Site
Human beings	✓	✓
Ecological systems (statutory designation)	✓	✓
Property - crops/livestock	✓	✓
Property – buildings	✓	✓
Property - domestically grown produce	✗	✓
Controlled waters – groundwater	✓	✓
Controlled waters – surface water	✓	✓

5.2.1 Human Health

Onsite Permanent Workers

In the context of a commercial land use (i.e. operation of a power station), the primary human health receptor at the site is likely to be an adult member of the regular site workforce. This is likely to include male and female workers between the ages of 18 and 65. The primary consideration relating to these workers is likely to be harmful effects caused by long term exposure to low contaminant concentrations (chronic effects).

Onsite Temporary Workers

In addition to the regular workforce, it is likely that construction /ground workers will be present onsite in the future, undertaking works during which exposure to ground contamination is likely (i.e. earthworks). Given the temporary nature of this work, the primary consideration relating to these receptors is likely to be harmful effects caused by short term exposure to contaminants at higher concentrations (acute effects).

Other Human Receptors

Given the site's location, it is highly likely that numerous human health receptors will be present in the area surrounding the site (up to 1km – i.e. neighbouring workers / residents etc.). For the purposes of the conceptual model, with the exclusion of vapour exposure associated with migratory groundwater, risk assessment of the onsite permanent receptors is considered protective of all offsite and / or temporary equivalents.

5.2.2 Controlled Waters

Groundwater

Environment Agency digital mapping indicates that the superficial deposits (Alluvium, Warp and Blown Sands) are designated as Secondary A Aquifer units and the underlying bedrock (Mercia Mudstone and Scunthorpe Mudstone) are designated as Secondary B aquifer units.

The groundwater resources at the site have previously been classified by the Environment Agency as having 'Good' quantitative status and 'Good' chemical quality in 2019 under the Water Framework Directive (WFD). Five groundwater abstractions are known to be present within 1km of the site, all for spray irrigation, and the site does not lie within a groundwater Source Protection Zone (SPZ) of any type. As such groundwater within the superficial deposits is likely to provide a baseflow to surface waters rather than a sensitive resource in its own right.

Surface Waters

The nearest surface water feature is the River Trent which is located adjacent to the western boundary. Several other minor watercourses/field drains are present within the site's red line boundary and surrounding the site (<250m). The River Trent is part of the Upper Humber Catchment and has been rated by the Environment Agency as overall water body classification as Moderate in 2019 under the WFD. The River Trent is included within the Humber Estuary SSSI, SAC and Ramsar Site.

5.2.3 Property

Buildings / Buried Utilities

The closest residential properties to the site are at Scunthorpe (immediately south of the associated development and mitigation area) or Flixborough Village to the north of the Rail Line Upgrade, neither are in close proximity to an area of potential concern. There are currently no buildings on site.

The proposed ERF and Core Scheme is located on a former tank farm, and immediately to the south of the Flixborough Industrial Estate.

5.3 Potential Pathways

5.3.1 Observed Geology

From the Report on Ground Investigation as carried out by Ian Farmer Associates (1998) Limited, the observed geology on site in the area of the proposed ERF and Core Scheme is predominantly clays to depths of c.20m bgl, where the bedrock is then encountered. An organic peat layer is present in this area between 4.7m bgl and 6.7m bgl.

5.3.2 Hydrogeology

From the Report on Ground Investigation as carried out by Ian Farmer Associates (1998) Limited, depth to groundwater was struck at depths between 11.70m bgl and 12.30m bgl. Groundwater levels 20 minutes after well installation were recorded at depths between 6.30m bgl and 6.80m bgl, suggesting the groundwater beneath the site is confined. Subsequent water level measurements on return visits were recorded at depths between 1.65m bgl and 2.08m bgl.

The potential pathways through which a contaminant source could plausibly be exposed to one of the receptors identified at the site are listed below:

Human Health:

- Migration of gases (from the landfills) / vapours by diffusion and along pressure gradients and subsequent inhalation;
- Direct / dermal contact with contaminated soils and / or groundwater;
- Ingestion of contaminated soils and groundwater;
- Inhalation of particles in windblown dusts; and
- Inhalation of groundwater derived vapours;

Controlled Waters:

- Vertical migration of mobile substances;
- Dissolution of contaminants in percolating rainwaters to shallow groundwater;
- Lateral migration of shallow groundwater to nearby surface waters;
- Migration of water via preferentially permeable subsurface structures (drainage runs etc.); and
- Surface water runoff.

Property

- Direct contact with contaminated soil and / or groundwater.

Potential Pollutant Linkages

Based on the above detailed sources, receptors and pathways, the potential pollutant linkages identified at the site are illustrated in the Conceptual Site Model, Figure 5, Annex A and further discussed in Section 6 of this report.

6. REFINEMENT OF CONCEPTUAL SITE MODEL

6.1 Assessment of Potential Pollutant Linkages

The majority of the site has an agricultural history and as such is unlikely to present a risk to either Human Health or Controlled Waters. However, the potential pollutant linkages related to the potential areas of concern detailed in Section 4 and 5 are discussed below.

6.1.1 Soil Gas Risks

Historical industrial landfill sites and historical waste management facilities have been identified in this Phase I assessment within the red line boundary of the site. These are located at the proposed eastern laydown area, identified on Figure 4, Annex A. Given the unknown nature of the burial/capping of waste, below ground migration of gases may occur. However, due to the location of the landfills being towards the east of the site/beneath a laydown area the risk of soil gases resulting from landfills and impacting on the site is therefore likely to be low as earthworks or construction works are unlikely to occur at the laydown areas.

Based on the previous investigation carried out by Ian Farmers Associates (1998) Ltd the organic clays and peats beneath the site are also a potential sources of ground gases, in the area of the proposed ERF and Scheme Core, therefore a programme of ground gas monitoring in this area may be recommended to characterise the ground gases to determine any ground protective requirements.

6.1.2 Risks to Human Health

Contamination of Soil

Based on the CSM and the limited site investigation carried out by Ian Farmers Associates (1998) Ltd, any soil contamination identified at the site in the vicinity of the proposed ERF and Core Scheme (derived from onsite storage of fuels and various other process chemicals) may, in theory, present a risk to human health by direct contact, by ingestion or via the inhalation of vapours / particulates. As the previous intrusive investigation was limited to a small area within the red line boundary there is insufficient information available to identify the underlying soil conditions. Based on the unknown underlying ground conditions across the areas of potential concern and presence of historical tank farm in the centre (northern end of the proposed ERF and Corse Scheme) shown on Figure 4, Annex A, information from an intrusive site investigation would be recommended in this area in determining the level of risk to human health.

Groundwater Vapours

Based on the CSM and the limited site investigation carried out by Ian Farmers Associates (1998) Ltd, potential groundwater impacts at the Flixborough Industrial Estate may, in theory, present a risk to human health through inhalation of groundwater derived vapours at the northern end of the proposed ERF and Core Scheme. As the previous intrusive investigation was limited to a small area within the red line boundary there is insufficient information available to identify the underlying soil conditions across the site. Based on this, information from an intrusive site investigation would be recommended in this area in determining the level of risk to human health.

6.1.3 Risks to Controlled Waters

Based on the CSM and the limited site investigation carried out by Ian Farmers Associates (1998) Ltd, impacts present in the subsurface soils at or near the Flixborough Industrial Estate may come into contact with the shallow groundwater at the site via vertical migration of mobile substances and by dissolution within percolating rainwater. Once present in the shallow groundwater these potential contaminants may migrate laterally within groundwater flow itself or via preferentially permeable structures (such as drainage runs). Depth to groundwater across the site recorded by Ian Farmers

Associates (1998) Ltd noted groundwater strike was c.12m bgl rising to c.6.5m bgl 20 minutes after installation. On subsequent visits depth to water ranged between 1.65m bgl and 2.08m bgl, suggesting the groundwater beneath the site is confined and the potentiometric head was broadly equivalent of the level of the River Trent. As no previous groundwater sampling analysis is available to ERM at the time of writing this report there is no information available to identify the underlying groundwater conditions across the site. Therefore, an intrusive site investigation in this area would be recommended to assess the level of risk to controlled waters.

6.1.4 Risk to Property

If ground is contaminated with hydrocarbon compounds, there is a potential risk of chemical attack from these compounds on foundations or other underground structures (plastic pipes and ducts etc.). Currently there are no buildings on site, however the proposed ERF and Core Scheme are located in an area formerly containing a tank farm, and to the south of the Flixborough Industrial Estate.

7. RECOMMENDATIONS

The majority of the site has an agricultural history. Based on this, development in these areas is unlikely to present a risk to either Human Health or Controlled Waters due to historical residual contamination.

There are a number of small areas of potential concern for which limited intrusive information is available, including the area immediately surrounding the Flixborough Industrial Estate, the historical tank farm, and the proposed eastern laydown areas (historical and potentially current landfill).

The historical and potentially current landfill below the eastern laydown area is unlikely to present a risk to Human Health or Controlled Waters due to the nature of the end use (limited below surface activity, non enclosed space) and distance to River Trent.

The land immediately to the north of the Flixborough Industrial Estate is to be used for mitigation and is therefore unlikely to present a risk to either Human Health or Controlled Waters due to the non intrusive nature of the work in this area.

As discussed in Section 4.3.4, the Flixborough Disaster had the potential to release metals, asbestos PAHs and PFAS into the surrounding area which could potentially be disturbed by the development of the ERF and Core Scheme, wharf extension and rail line upgrade.

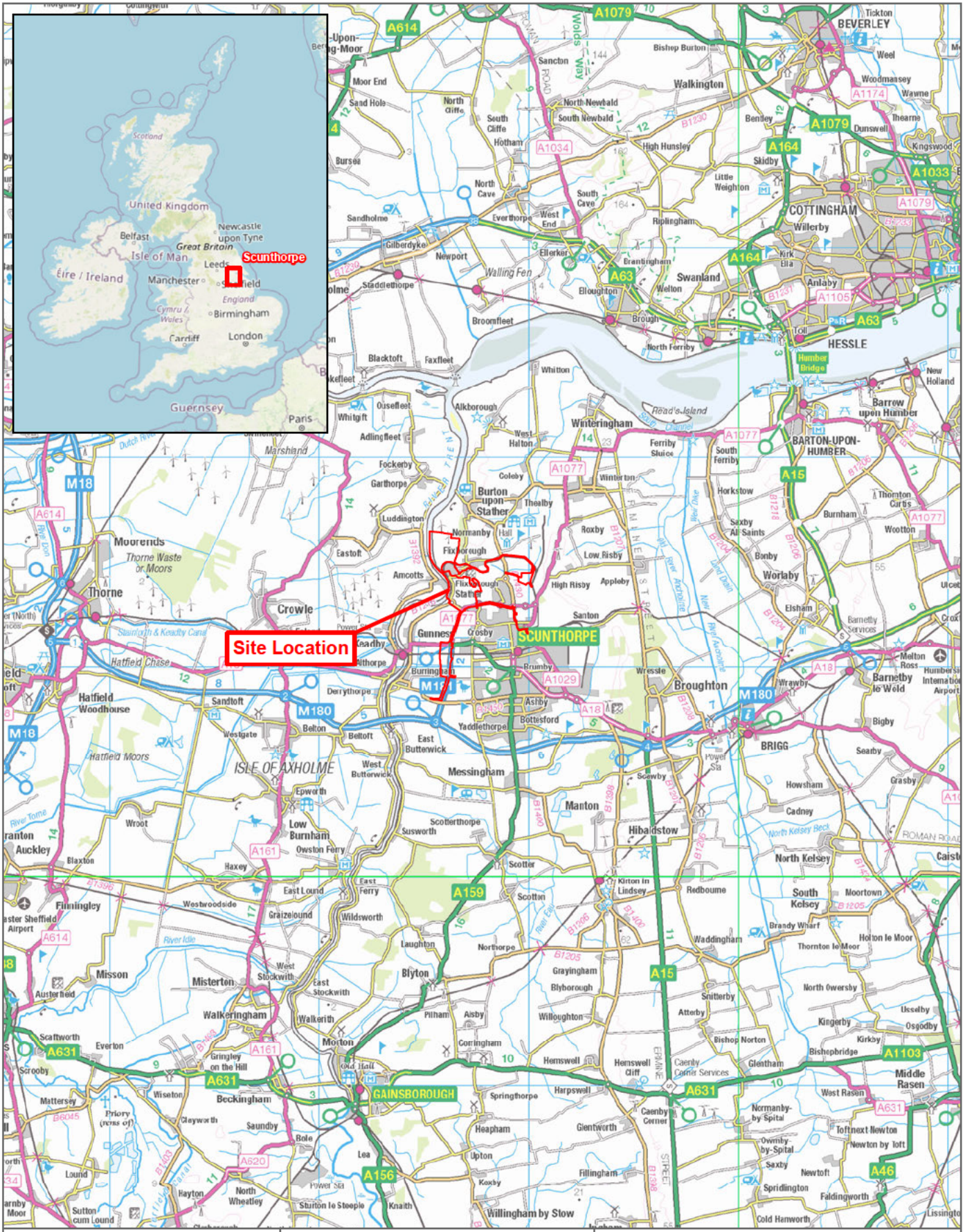
The proposed ERF and Core Scheme, wharf extension and the western end of the rail line upgrade are on the boundary of, or close to the Flixborough Industrial Estate. In addition, there is the historical tank farm at the northern end of the proposed ERF and Core Scheme. Whilst there has been a site investigation carried out by Ian Farmers Associates (1998) at the Flixborough Industrial Estate, information provided by this investigation is limited, however it is believed that the potential for gross contamination in need of whole scale remediation is considered to be unlikely, particularly based on the fact that the scheme has been designed to allow for commercial/industrial development on those higher risk areas.

In conclusion, based on the available information, it is likely that the bulk of the site poses a low risk to Human Health and Controlled Waters.

ERM therefore recommends a Phase II Intrusive Environmental Site Assessment be undertaken in order to confirm this conclusion and to establish a site baseline.

The site investigation should be predominantly focused on the areas of potential concern; close to the Flixborough Industrial Estate, the northern area of the ERF and Core Scheme, and eastern laydown area, however it would be considered prudent to have some limited investigation data from other areas of the site to establish a baseline that should also capture any potential contaminants released due to the Flixborough Disaster.

APPENDIX A FIGURES



Project Redline Boundary

0 2 4 6 8 10
Kilometres

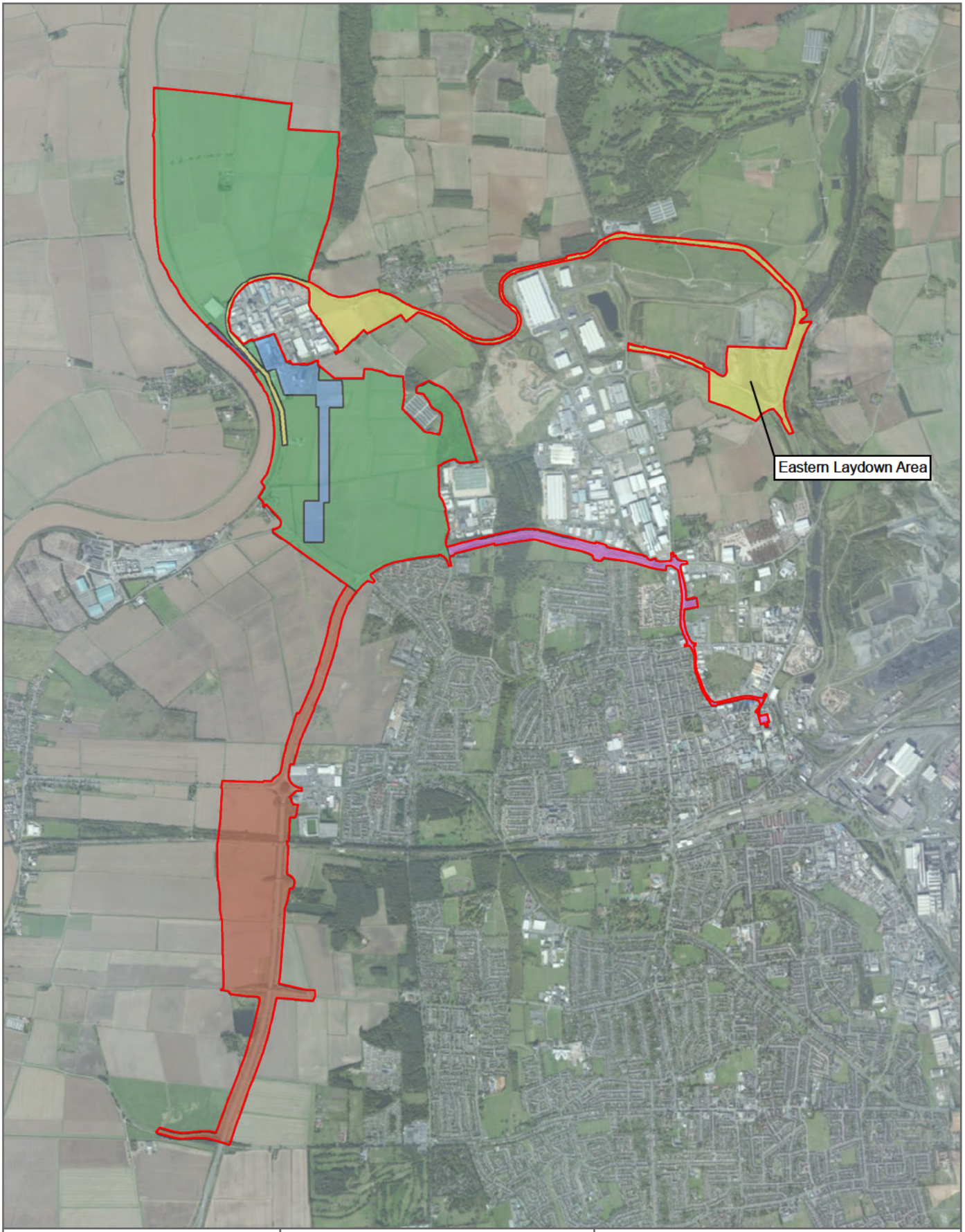
N

Figure 1
Site Location

SCALE: See Scale Bar	VERSION: A01
SIZE: A4	DRAWN: WB
PROJECT: 0483091	CHECKED: AG
DATE: 06/01/2021	APPROVED:

PROJECTION: British National Grid

Path: \\uklonsv04\London\Confidential Projects\0483091 Solar 21.HB\2. Working\6. GIS\MAPS\2020-12\0483091_SiteLocation_A01.mxd



Project Redline Boundary
Associated Development and Mitigation
CHP Offtake to Council Offices
CHP Offtake to Linc Lakes
Indicative Area of ERF and Core Scheme
Rail Line Upgrade
Wharf Extension

0 0.2 0.4 0.6 0.8 1
Kilometres

N

Figure 2
Site Layout

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: WB
PROJECT: 0483091	CHECKED: AG
DATE: 06/01/2021	APPROVED:

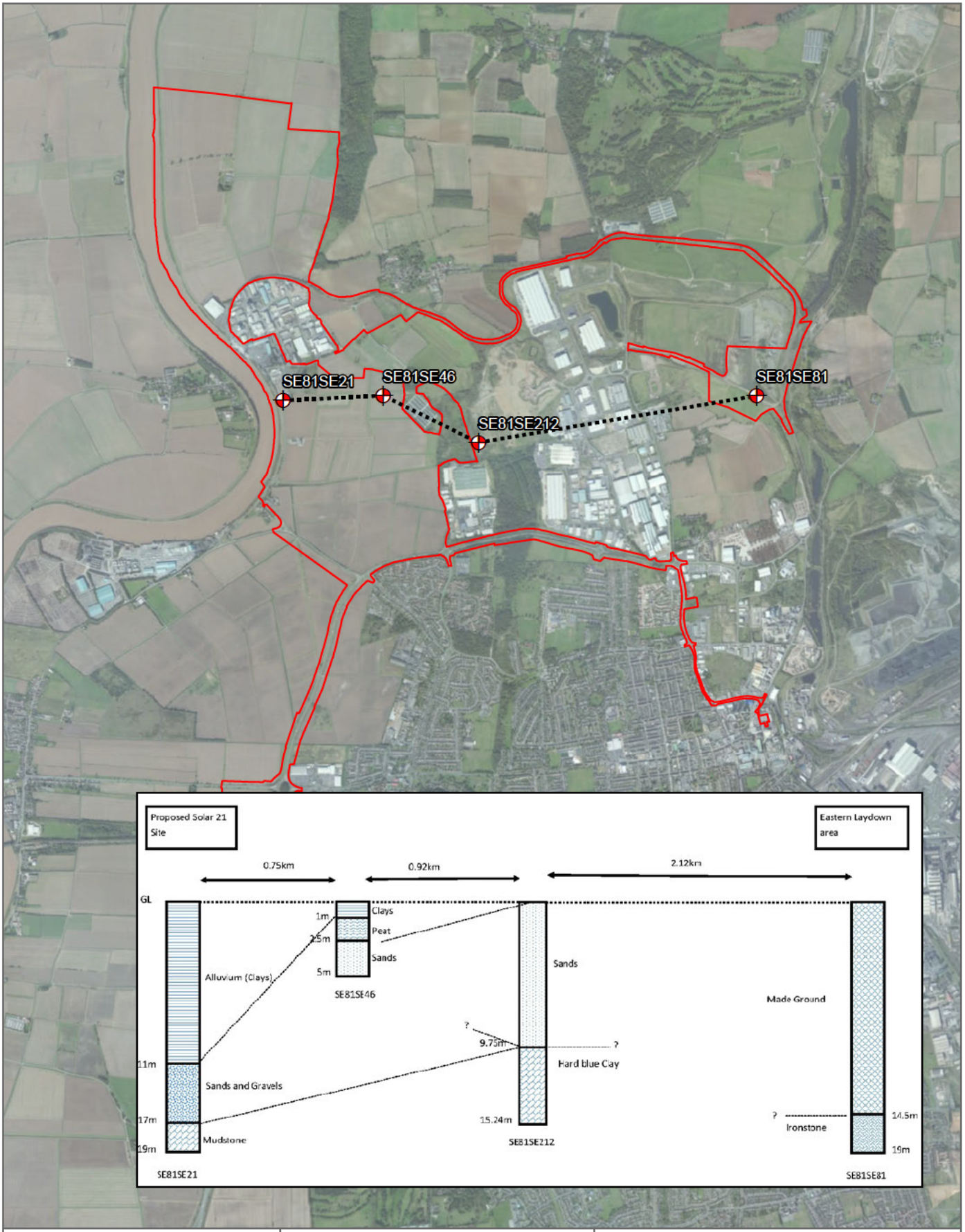
ERM

NORTH LINCOLNSHIRE GREEN ENERGY PARK

PROJECTION: British National Grid

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

Path: \\uklonsv04\London\Confidential Projects\0483091 Solar 21.HB\2. Working\6. GIS\MAPS\2020-12\0483091_ProjectElements_A02.mxd



Borehole Locations
Borehole
Project Redline

0 0.2 0.4 0.6 0.8 1
Kilometres

N

Figure 3
Indicative Cross Section and Borehole Locations

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: WB
PROJECT: 0483091	CHECKED: AG
DATE: 06/01/2021	APPROVED:

ERM

NORTH LINCOLNSHIRE GREEN ENERGY PARK

PROJECTION: British National Grid

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

Path: \\uklonsv04\London\Confidential Projects\0483091 Solar 21.HB\2. Working\6. GIS\MAPS\2020-12\0483091_BoreholeLocations_A02.mxd

Works
Existing Rail Line
Historical Rail Line (Indicative)
Project Redline Boundary
Historical Landfill / Waste Management Facility
Historical Tanks
Doesn't include potential impact of Flixborough disaster

0 0.2 0.4 0.6 0.8 1
Kilometres

N

Figure 4
Potential Areas of Concern

SCALE: See Scale Bar	VERSION: A02
SIZE: A4	DRAWN: WB
PROJECT: 0483091	CHECKED: AG
DATE: 06/01/2021	APPROVED:

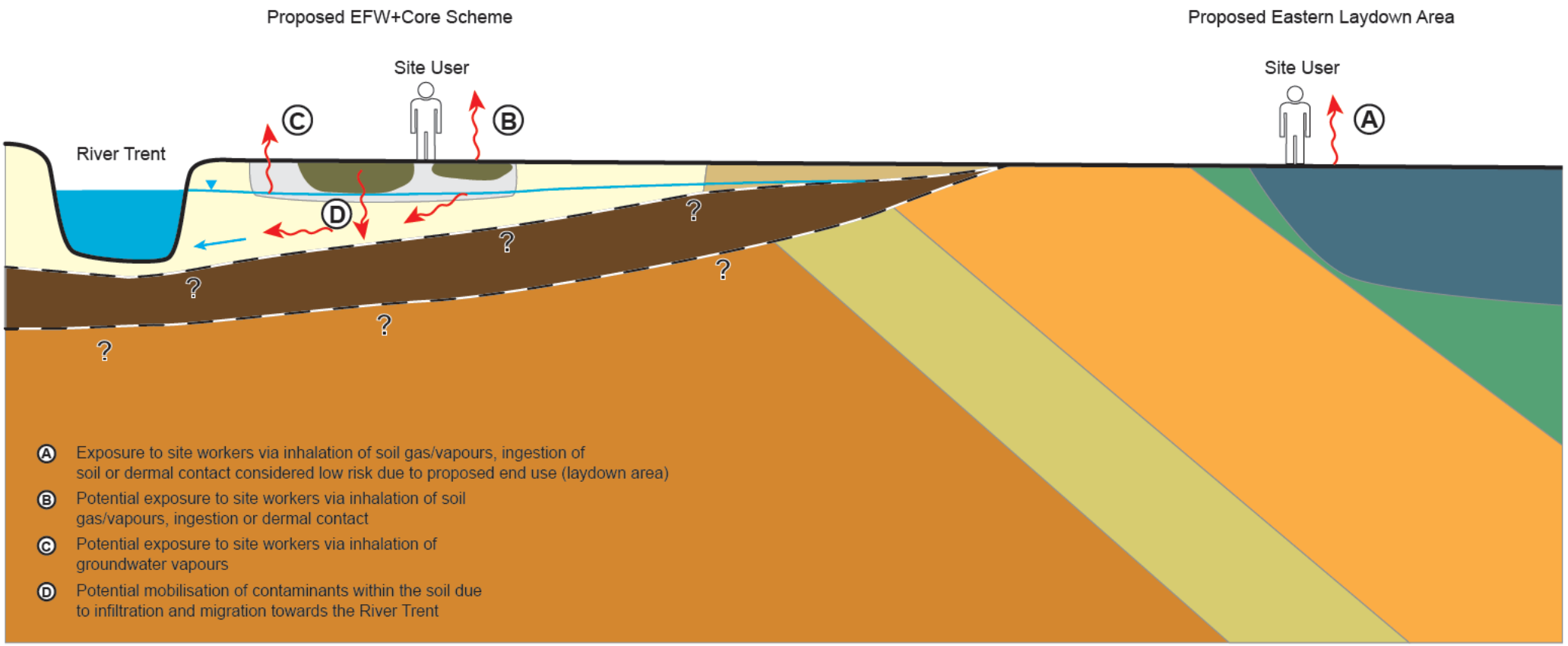
ERM

NORTH LINCOLNSHIRE GREEN ENERGY PARK

PROJECTION: British National Grid

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

Path: \\uklonsv04\London\Confidential Projects\0483091 Solar 21.HB\2. Working\6. GIS\MAPS\2020-12\0483091_Historica LandUse_A02.mxd



- Made Ground
- Alluvium
- Blown Sands
- Sands & Gravels
- Mercia Mudstone Group
- Penarth Group (mudstone)
- Scunthorpe Mudstone Formation
- Frodingham Ironstone member
- Area of historical / current landfill
- Potential residual soil contamination from historical sources (tanks, railwaylines, Flixborough Industrial Esate, Flixborough disaster)
- Water table
- Groundwater flow direction
- Contaminat pathway

Figure 5
Conceptual Site Model

SCALE: Not to Sclae	VERSION: A01
SIZE: A4	DRAWN: MTC
PROJECT: 0483091	CHECKED: SD
DATE: 08/01/2021	APPROVED:

ERM

NORTH LINCOLNSHIRE GREEN ENERGY PARK

0483091_ConceptualSiteModel_A01.ai

APPENDIX B ENVIROCHECK REPORT

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
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