Site Condition Report

Appendix B

RWE Generation UK plc

Project number: 60671988

December 2022

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
			
Georgia Bath Environmental Consultant	Kerry Thompson Principal Environmental Scientist	Alex Freeman Associate Director	Patrick Froggatt Associate Director

Revision History

Revision	Revision date	Details	Authorised	Name	Position
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Prepared for:

RWE Generation UK plc

Prepared by:

Georgia Bath
Environmental Consultant
E: georgia.bath@aecom.com

AECOM Limited
5th Floor, 2 City Walk
Leeds LS11 9AR
United Kingdom

T: +44 (0)113 391 6800
aecom.com

and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

A site visit has not been undertaken and as such, this assessment is based on previous site investigations provided by RWE which can only provide a general indication of site conditions. The comments made and recommendations given in this Report are based on the information provided by RWE in relation to previous exploratory holes. There may be exceptional ground conditions elsewhere on the site which have not been disclosed by these investigations and which have therefore not been taken into account in this Report.

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Appendices

1. Introduction

The following Site Condition Report (SCR) has been prepared by AECOM Limited (AECOM) to support an application by RWE Generation UK plc (RWE) to vary their Environmental Permit (ref. EPR/WP3036QH/V002) for Grimsby Power Station, Moody Lane, Grimsby (hereafter referred to as 'the Installation').

The Installation is regulated under an existing Environmental Permit to operate 10 x 4.8 MW net thermal input (MW_{th}) natural gas fired engines with associated electrical generators which have an aggregated net thermal input of 48 MW_{th}, operating for up to 1,500 hours per annum. This existing Medium Combustion Plant is herein referred to as 'Grimsby A'.

This Environmental Permit variation is being requested to add an additional four 9.9 MW_{th} and one 6.1 MW_{th} gas fired engines with associated electrical generators (i.e. a total additional net thermal input of 45.75 MW_{th}). This new plant is collectively referenced herein as 'Grimsby B'. Grimsby A and Grimsby B will form a single Installation but will be able to operate completely independently of one another with Grimsby B also operating for up to 1,500 hours per annum.

The variation application is made under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) ('the EP Regulations'), and is submitted in parallel with a planning application variation (DM/0561/22/FUL) to North East Lincolnshire Council (NELC).

This SCR has been prepared to cover the land area included in the revised Installation boundary (hereafter referred to as 'the Site') i.e. the current 'Grimsby A' and the proposed 'Grimsby B' site areas. The SCR has been prepared in line with Environment Agency guidance document H5 '*Environmental Permitting Regulations: Site Condition Report – Guidance and Templates*' [1].

Information reviewed during the preparation of this SCR is referenced throughout the document and is listed in Section 0.

2. Site Details

Client/Applicant	RWE Generation UK plc
Address	RWE Generation UK plc Grimsby Power Station (Gate 3) Moody Lane Grimsby DN31 2SW
National Grid Reference	525322, 411329
Site Area	Approximately 0.43 hectares
Document Reference for Site Condition Report	AECOM project reference 60671988 'Site Condition Report – Grimsby Power Station, dated 8th December 2022 (this document).
Figure References	Figure 1: Location Map Figure 2: Installation Plan Showing Potential Sources of Contamination Figures are presented in Appendix A.

3. Condition of the Land at Permit Issue

Site Location

The Site is located off Moody Lane, Grimsby, DN31 2SW, towards the western side of the wider Grimsby Power Station site.

The total area of the Site is approximately 0.43 hectares (ha). The western area of the Site comprises the current 'Grimsby A' generators (0.25 ha) and the eastern area of the site comprises the proposed 'Grimsby B' generators (0.18 ha).

A Site location map is provided as **Figure 1** in **Appendix A**.

Site Description

No site walkover has been conducted, but according to photographs provided by the client and a description and photographs contained within a recent Contaminated Land Statement report for 'Grimsby B' [2], we understand that the Site comprises the following:

- The western area of the Site is largely occupied by the Grimsby A peaking plant, with infrastructure including a workshop, lighting columns, transformer and control room and switch room in the western area, ten natural gas fired engines and a HV termination point in the central area, and two lubrication oil tanks (5,000 litres each) and lighting columns in the eastern area. There is also a generator and associated bunded diesel tank in the western part of the site;
- The eastern area of the Site (Grimsby B site) is mainly covered by concrete hardstanding, with a small area of gravel surface consisting of shingle and, in places, crushed demolition material (brick and concrete), and has received regular herbicide treatment; and
- The main feature present on Grimsby B site is a concrete bund in the north-eastern corner, where a gas oil storage tank was historically located. There is no other evidence of previous buildings or structures.

A plan of the Site is provided as **Figure 2** in **Appendix A**.

Surrounding Land Use

The current land use surrounding the Site is detailed in **Table 3-1**, below:

Table 3-1. Surrounding Land Use

Direction	Description
North	The Site is bound to the north by undeveloped land with remains of infrastructure associated with the former Huntsman Tioxide works, which was demolished in 2015. The Humber Estuary sea wall is c.430 m north of the Site.
South	The wider Grimsby Power Station site lies immediately to the south of the Site, including a gas compound. Moody Lane is situated c.100 m south of the Site, which runs southeast and turning south to the A180, and a railway is located c.320 m south which runs northwest toward Immingham Docks. Numerous commercial and industrial premises lie to the south of this road and form the South Humberside Industrial Estate / Pyewipe Industrial Estate, with the nearest, 'Dunlop Oil & Marine', located c.170 m to the southwest. The closest residential properties to the Site are houses with gardens located c.900 m to the south.
East	The Site is bound to the west by the wider Grimsby Power Station site, including undeveloped land and remains of infrastructure associated with the former Tioxide Grimsby Combined Heat and Power (CHP) plant and the former Huntsman Tioxide works. Beyond this lie commercial developments which form the Riverside Industrial Estate (c.400 m), Pyewipe waste water and sewage treatment works (c.620 m) and the Humber Estuary (c.910 m).

West	Undeveloped former industrial land and remains of infrastructure associated with the former Huntsman Tioxide works bounds the Site to the west. The Novartis pharmaceutical development is located c.270 m west of the Site, with agricultural land and numerous commercial / industrial developments located beyond.

Sources: Google Earth [3], OS Maps [4] and MAGIC Map [5].

Topography

The Site is very flat at an elevation of approximately 4 m above Ordnance Datum (m aOD).

Geology

Overview

The following information sources were reviewed to assess the geological setting of the Site:

- Published British Geological Survey (BGS) 1:50,000 scale geological maps (Sheet 90 including sheet 91 "Grimsby (including sheet 91 Saltfleet)", Solid and Drift Edition, 1990) [6];
- BGS's online Geo-Index Viewer [7], including publicly available BGS borehole records located within 250m of the Site (TA21SE280, TA21SE360, TA21SE6/A, TA21SE6/C, TA21SE86/A, TA21SE86/B and TA21SE86/D);
- Innogy Cogen Ltd's 2001 Site Report [8][1], which included a summary of intrusive ground investigations at the Tioxide Grimsby CHP plant, located to the east of the Site, by Soil Mechanics in 1999 (comprising drilling of 4 no. boreholes to a maximum depth of 22.05 m below ground level (bgl) and 32 no. trial pits) and CL Associates in 2000 (comprising further 13 no. trial pits to assess ground conditions following remedial backfilling undertaken by Soil Mechanics during the previous ground investigation works);
- ESI's 2009 Due Diligence Assessment: Land Extension Area at Huntsman Tioxide Site [9], which included drilling of 11 no. boreholes to a maximum depth of 6 m bgl. 1 no. borehole was located within the western Grimsby A area of the Site (TBH03) and 10 no. exploratory holes from the surrounding area (TBH01-02 and TBH04-11);
- RWE's 2020 Contaminated Land Statement [2]; and
- Geo-Integrity Ltd's 2017 Soil Infiltration Rate Investigation Letter Report [10], which included drilling of 2 no. boreholes to a maximum depth of 2 m bgl and digging of a hand dug trial pit to a depth of 0.35 m bgl within the western ('Grimsby A') area of the installation.

The published mapping, BGS records and available ground investigation data indicated the following geological succession underlying the Site:

Table 3-2. Anticipated Geological Succession Beneath the Installation

Stratum	Typical Description	Anticipated Thickness (m)
Made Ground	Medium to coarse gravelly cobbly sand / sandy ashy gravel. Gravel and cobbles of brick, concrete, clinker, limestone and quartz.	0.5 – 1.7
Superficial Deposits: Silt and Clay (Artificially deposited 'Warp' / Superficial Tidal Flat Deposits)	Very soft to firm organic silt / clay, with silty and sandy beds / lenses and peat towards the base.	2.6 – 4.3
Superficial Deposits: Glacial Till	Firm to very stiff clay, with sand and chalky gravel, visible grey clay linear features and occasional decomposed grass fibres and small stems.	16 – 16.3
Bedrock: Flamborough Chalk	White chalk with marl seams.	>200

[1] No appendices were included with the version the Innogy Cogen 2001 report available for review, so supporting documents such as site plans, borehole logs and laboratory analytical data have not been reviewed.

Detailed Geological Descriptions from Previous Ground Investigation Reports and Exploratory Borehole Records

A review of available information presented in published and online BGS mapping and previous ground investigation reports indicates that the Site is underlain by Made Ground, soft to firm clay of artificially deposited "Warp" / superficial Tidal Flat deposits, Glacial Till and Chalk bedrock.

Made Ground

The ESI (2009) report [9] indicated that Made Ground within the Grimsby A site, as indicated by borehole log TB03, consisted of 0.7 m of Made Ground, primarily comprising loose, gravelly sand, with gravel and cobbles of brick, concrete and clinker. The Geo-Integrity (2017) ground investigation works [10] described Made Ground encountered at the Grimsby A site as approximately 0.6 m thick of dense, red-brown and grey, sandy, ashy gravel and cobbles of concrete, brick, limestone and quartz. Within the wider area (i.e. investigation locations referenced above that were located outside of the current installation boundary, [8] [9]) Made Ground was encountered consistent with the above descriptions, up to a maximum thickness of 1.7 m. In addition, coal and furnace ash were identified.

Superficial Deposits

The ESI (2009) ground investigation report described deposits beneath Made Ground within the Grimsby A site as artificially introduced Alluvium ("Warp"), which was 3.5 m thick and comprised very soft to firm clay, with occasional silt laminae and with a peat bed towards the base [9]. ESI borehole logs from the surrounding area describe this layer as "clay", "silt" or "undifferentiated", whilst Soil Mechanics (1999) simply described the material as 'alluvium' [8]. This material is likely to have been deposited in the intertidal zone prior to the construction of a defensive wall along the Humber shore to increase the site level and prevent flooding from the Humber Estuary and is inferred to be the Made Ground shown on BGS mapping. The Geo-Integrity ground investigation works reported Tidal Flat Deposits beneath the Made Ground in the Grimsby A site, which consisted of firm, brown and grey mottled, very silty clay, with a thin band of loose, grey and brown, very silty, fine sand from 1.9 to 2.0 m bgl [10].

The ESI (2009) ground investigation report described Glacial Till encountered beneath the "Warp" within the Grimsby A area of the Site as firm to very stiff clay from 4.2 m bgl to the termination depth of 5.0 m bgl [9]. Glacial Till from the surrounding area is typically described as clay with sand and / or gravel beds or lenses.

Bedrock

Bedrock was not encountered in the 2009 or 2017 investigations. BGS geological mapping describes the Flamborough Chalk Formation bedrock underlying the installation as "*white, well-bedded, flint-free chalk with common marl seams (typically about one per metre). Common stylolitic surfaces and pyrite nodules*" [7]. According to the published BGS borehole logs located near the southern and eastern boundary of the Site, chalk gravel (inferred to be weathered chalk) was encountered at a minimum depth of 18.0 m bgl (TA21SE6/A), with a typical thickness of 1.8 m, and (unweathered) chalk was encountered at a minimum depth of 19.8 m bgl (TA21SE6/A) and was proven to >107 m bgl (TA21SE86/B and TA21SE86/D).

Soil Chemistry

Information obtained from Soilscapes [11] describes the soils within the vicinity of the Site as loamy and clayey soils of coastal flats with naturally high groundwater (Soilscape 21). Soils drain to local groundwater.

Soil chemistry information was unavailable for the Site, therefore, **Table 3-3**, below, details the publicly available soil chemistry information for five potentially harmful elements (PHEs) in soil in the vicinity of the Site from the UK Soil Observatory National Soil Inventory database [12].

Table 3-3. Estimated Soil Chemistry

Potentially Harmful Element	Estimated Geometric Mean Concentration (mg/kg)
Arsenic	13.3 – 14.93
Cadmium	0.29 – 0.33
Chromium	61 – 67
Lead	40 – 44
Nickel	21.04 – 24.35

Source: UK Soil Observatory [12]

Ground Stability Records

According to BGS mapping, no bedrock faults or other linear features were located within 500 m of the Site. The BGS Superficial Engineering Geology Dataset [7] indicates a potential risk of severe differential settlements in soft, highly compressible zones and sudden collapse of loessic deposits when saturated under engineering loads with potentially high sulphide contents of some estuarine alluvium and frost-susceptibility of near surface silty and fine sandy lithologies. Running conditions may also occur in silts and sands below the water table. In addition, the BGS Bedrock Engineering Geology Dataset [7] indicates that dissolution hollows and pipes, often infilled, frequently occur in the strong chalk bedrock beneath a thin superficial covering. Clay infills in dissolution features may give rise to stability problems and dissolution cavities may alter the excavation profile.

Mining and Mineral Extraction

According to the Coal Authority Interactive Map [13], the installation does not lie within an area at risk from coal mining.

Radon

According to the UKHSA UK Maps of Radon [14], the Site is within an area where the risk from Radon is generally considered low. The Site is not within a Radon Affected Area as less than 1% of homes are above the UK 'Action Level'. Therefore, no specific radon protective measures are likely to be considered necessary for the Site.

Hydrogeology

Aquifer Classifications

According to the DEFRA Magic Map Application website [5], the superficial Tidal Flat Deposits recorded beneath site are classified as Unproductive Strata. These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The Flamborough Chalk Formation bedrock underlying the site is classified as a Principal Aquifer. This is geology of high intergranular and / or fracture permeability, usually providing a high level of water storage and may support water supply / river base flow on a strategic scale. Generally principal aquifers were previously major aquifers.

Depth to Groundwater

According to the Innogy Cogen Ltd (2001) Site Report [8], groundwater was encountered as seepages at the base of the Made Ground, overlying the Alluvium, during ground investigations conducted in 1999 and 2000, although other trial pits were dry during these investigations. Significant amounts of groundwater were reported as strikes in boreholes from sandy horizons within the Glacial Till at depths between 7.4 and 16.5 m bgl, which rose to 1.6 m bgl after 30 minutes. The report considered groundwater depths in boreholes of between 0.5 and 1.5 m bgl as rest water levels in the near surface Made Ground. The report also noted that groundwater, particularly in the Alluvium, may be under tidal influence from the Humber Estuary.

Only a small number of groundwater strikes were reported during drilling in 2009 [9], with many boreholes remaining dry for several hours after completion. Subsequent monitoring of groundwater levels by ESI showed variation of groundwater levels between 0.8 and 5.6 m bgl, with water levels recorded in two historic boreholes (at 0.8 and 1.4 m bgl) interpreted as representing typical rest water levels at approximately 2 m aOD.

Groundwater Abstractions

AECOM have requested details of private and public groundwater supplies within 1 km of the Site from the Local Authority (NELC) and the Environment Agency (EA). In an email dated 20th July 2022, NELC confirmed that there were no recorded private groundwater abstractions within 1 km of the site. At the time of writing, no response has been received from the Environment Agency.

According to the Innogy Cogen Ltd Site Report [8], Huntsman Tioxide previously held an abstraction license (No. 4/29/10/9/40) for 3 abstractions located within the former Huntsman Tioxide works. According to the RWE 2020 Contaminated Land Statement [2], the chalk aquifer has been used on the site in the past by British Titan for water supply.

Hydrology

Surface Water Features

The closest surface water body to the Site is Mawnbridge Drain located c.240 m to the west. Mawnbridge Drain flows south-north with an outflow into the Humber Estuary c.440 north of the Site. The Humber Estuary is c.370 m northeast of the Site at its closest point.

The Site falls within the Laceby Beck / River Freshney Catchment, the main river in the catchment being the River Freshney [15]. The River Freshney and New Cut Drain lie to the south of the Site and flow southwest to northeast. Approximately 940 m south of the Site, the River Freshney is diverted to the south and east to discharge to the Humber Estuary via the docks c.1.9 km from the Site, while New Cut Drain continues northeast and discharges to the Humber Estuary immediately east of the water treatment works, approximately 980 m east of the Site. An unnamed pond and several unnamed drains are located to the west of the Site within the Novartis industrial site, at distances c.370 m or more from the Site, and an unnamed drain is also located c.390 m southeast of the Site, to the west of Gilbey Road.

Surface Water Abstractions

AECOM requested details of private and public water supplies within 1 km of the Site from the NELC and the EA. In an email dated 20th July 2022, NELC confirmed that there were no recorded private surface water abstractions within 1 km of the Site. At the time of writing, no response has been received from the EA.

Flood Risk

AECOM has reviewed UK government flood risk information for the Site [16]. The Long-Term Flood Risk mapping shows nearly all of the Site to be at 'Very Low Risk' from flooding from rivers and the sea, with only a very small part of the north-eastern extent of the Site at 'Low Risk'. Nearly all of the Site is at 'Very Low Risk' from surface water flooding, with only a very small part of the northern extent of the Site at 'Low Risk'.

The EA's Flood Map for Planning [17] indicates that the Site lies within Flood Zone 3, indicating a 1 in 100 (1%) or greater chance of flooding each year from rivers or 1 in 200 (0.5%) or greater chance of flooding each year from the sea (when the presence of flood defences, if present, are ignored).

Sensitive Land Use

According to the DEFRA Magic Map Application website [5], the Humber Estuary SSSI, Conserved Wetland Site (Ramsar), Special Area of Conservation (SAC) and Special Protected Area (SPA) are located approximately 430 m to the north of the Site. The site is located within a nitrate vulnerable zone (NVZ) with respect to surface water (Laceby Beck / River Freshney Catchment (to N Sea) NVZ). In addition, the Site is located within a SSSI Impact risk zone to trigger the requirement for assessment of planning applications for likely impacts on SSSIs/SACs/SPAs and Ramsar sites.

Historical On-Site Land Use

AECOM has reviewed available information contained in the previous ground investigation reports (listed above) and historical satellite imagery from Google Earth [3] to identify historical on-site land uses. Key information is summarised below:

- The Site was located within the former Huntsman Tioxide works, used for titanium dioxide manufacturing. These works were established in the 1940s on land reclaimed from marshland on the south bank of the Humber, until its demolition in 2015;

- A concrete bund is present in the north-eastern corner of the Site (Grimsby B site area'), where a gas oil storage tank was historically located, associated with the former Huntsman Tioxide works;
- No evidence of significant development has been identified on the south-eastern area of the site, comprising the proposed Grimsby B site area during the last 30 years; and
- Since 2018, the western part of the Site has been occupied by the Grimsby A peaking plant with, infrastructure including ten natural gas fired engines and two lubrication oil tanks (each 5,000 litres).

Key features are shown on **Figure 2** (**Appendix A**).

Historical Off-Site Land Use

AECOM has reviewed available information contained in the previous ground investigation reports (listed above) and historical satellite imagery from Google Earth [3] to identify pertinent historical off-site land uses (within c.500 m). Key information is summarised below:

- The Site is currently surrounded by undeveloped land and remains of infrastructure associated with the former Huntsman Tioxide works;
- A CHP Plant was built in 2000-2001 within an area of land leased by Huntsman Tioxide to npower [9];
- The former CHP plant was located approximately 30 m to the east of the Site, with associated fuel tanks and boilers, and a railway line, with drainage from the area with the boilers running from north to south to the east of the railway line [2]. Raw materials, including ilmenite and diesel fuel, were brought onsite via the (now demolished) railway [9];
- Diesel fuelled boilers were located approximately 90 m to the northeast of the Site, which were replaced by the former CHP plant. The boiler house is suspected to have contained asbestos within its structure [2];
- The Huntsman Tioxide works also included a de-mineralisation (70 m northeast) and a de-alkalinisation plant (80 m east), a high voltage electric substation (80 m southwest), a high pressure gas main (60 m southwest), and a sulphuric acid line, which ran in a southwest to northeast direction and parallel to the railway. This acid was stored in tanks in the north of the former works (180 m northeast) [9];
- Several commercial and industrial developments are located in the surrounding area, including the Novartis pharmaceutical development c.270 m west of the Site; and
- A railway is located c.320 m south which runs northwest toward Immingham Docks.

Statutory Pollution Information

Table 3-4, below, summarises statutory information pertaining to the Site, as confirmed by NELC via email to AECOM on 20th July 2022:

Table 3-4. Pollution Information

Permit Type	Approximate Distance from Site	Description
Part A2	480 m southeast	Permit Ref: EP/200400001/V2. Trade Name: Palagia (UK) Ltd. Description: A2 installation: Fish Meal & Fish Oil.
Part B	170 m southwest	Permit Ref: EP/200200004/V1. Trade Name: Dunlop Oil & Marine Ltd. Description: Rubber.

	480 m southeast	Permit Ref: EP/20020035/V4. Trade Name: Breedon Trading Ltd. Description: Bulk Cement.
	480 m southeast	Permit Ref: EP/200200083/V5. Trade Name: Breedon Trading Ltd. Description: Coated Roadstone.
	570 m east	Permit Ref: EP/200500004/V1. Trade Name: Copes Readymix Ltd. Description: Bulk Cement.
	630 m southeast	Permit Ref: EP/200200001A/V1. Trade Name: H Cope & Sons Ltd. Description: Mobile Crushing / Screening.
	1.0 km southeast	Permit Ref: EP/200200093/V2. Trade Name: FMG Repair Services Ltd. Description: Respraying of Road Vehicles.
	1.1 km southeast	Permit Ref: EP/200200027/V1. Trade Name: Shell Filling Station A180. Description: Unloading / Storage at Petrol Stations.
Schedule 13 SWIP	1.9 km northwest	Permit Ref: EP/201400001/V1. Trade Name: Pyrenergy EP Ltd. Description: Small Waste Incineration Plant.

Previous Ground Investigation Reports

Pertinent information relating to previous ground investigations have been summarised in this section.

Innogy Cogen Ltd; IPPC Form 1 Part B – Site Report (2001) [8],

The Innogy Cogen Ltd (2001) Site Report, which was produced to support the permit application for authorisation of the former Tioxide Grimsby CHP Plant under the IPPC regime, included a Phase 1 desk study and a review of the following previous site investigations (which were not made available for the current assessment).

- Soil Mechanics. Ground Investigation for a combined heat and power plant at Tioxide, Grimsby (for Tioxide Europe Limited). Report No: 109141, October 1999;
- CL Associates. Interpretive report on ground investigation for the C2101 Tioxide CHP plant, Grimsby (for Mowlem Engineering Power). Report No: 270114. October 2000; and
- CL Associates. Static and seismic cone penetration tests and chemical testing at Tioxide CHP plant, Grimsby (for Mowlem Engineering Power). Report No: 270126. October 2000.

Works undertaken by Soil Mechanics at the Tioxide Grimsby CHP Plant site were summarised in the Innogy Cogen Ltd report as follows:

- Excavation of 10 no. trial pits by hand to 1.8 m bgl and extended by machine or window sampling methods to 3 m bgl;
- Excavation of 22 no. secondary trial pits for a supplementary investigation and sampled for chemical testing in Made Ground only;
- Drilling of 4 no. 150 mm diameter boreholes, 1 no. of which was drilled to a depth of 22.05 m bgl and the other 3 no. drilled to 8 m bgl; and
- Soil and water sampling and analysis.

Exploratory hole locations are shown in **Figure 2** (based on locations shown on plans included within the ESI (2009) report).

Key findings were summarised as follows:

- Prior to remediation, Made Ground was encountered from ground level to depths of between 0.3 and 1.7 m bgl and the post-remediation thickness of Made Ground was reported as approximately 1.2 m. Alluvium was encountered underlying the Made Ground with a thickness of 2.8 to 4.3 m. Glacial Till was encountered from 4.0 to 5.5 m bgl with a thickness of 16.3 m and chalk was encountered from 20.5 m bgl to the

terminal depth of 22.05 m bgl. Borehole logs were not available and lithological descriptions have not been provided;

- Groundwater was encountered in many trial pits as seepages at the base of the Made Ground, although some trial pits were reported as dry. Significant amounts of groundwater were reported in boreholes associated with sandy horizons within the Glacial Till at depths between 7.4 and 16.5 m bgl, rising to 1.6 m bgl after 30 minutes. Recorded resting groundwater levels in boreholes were between 0.5 and 1.5 m bgl, which were interpreted in the Innogy Cogen Ltd report as the depths of standing water in the Made Ground. The Innogy Cogen Ltd report also stated "*the standing groundwater levels encountered in the Made Ground, Glacial Till and Upper Chalk are considered to be from separate sources, each with a piezometric level which is likely to be about 1 m bgl. However, no longer term groundwater monitoring has been carried out because of damage to the standpipes and this assumption currently cannot be confirmed*"
- In situ ground gas monitoring during trial pit excavations did not detect methane, carbon dioxide or hydrogen sulphide, although monitoring with a PID indicated petroleum-derived organic vapour was present at concentrations up to 188 ppm. The Innogy Cogen Ltd report stated "*if the source of the vapour permeated into the Alluvium and was not removed in the remediation exercise, it could still be present. However, there is some evidence from previous work to suggest that there may have been no penetration of the PAH contamination into the Alluvium*". The Innogy Cogen Ltd report also stated that "*the Alluvium is noted to have a probable organic content and organic material may be present in small amounts in the Made Ground, therefore there is a slight risk of the existence of ground gas*" .
- Chemical testing was undertaken on 40 no. soil and 9 no. water samples from the initial investigation for analysis of metals, phenols, PAH and VOC, and on 66 no. samples from the supplementary investigation for analysis of pH and TPH. TPH was present in the Made Ground across the site, with a maximum concentration of 21,500 mg/kg. The samples with the highest TPH concentrations were taken from an area to the south of the historic gas oil storage tanks, which formerly occupied the site of the CHP plant and is now located approximately 60 m to the east of the installation. The Innogy Cogen Ltd report stated "*it is understood that the TPH contaminated Made Ground material has been removed from the site and replaced with a 1.2 m thick blanket of compacted crushed building rubble […] obtained from the demolition of local domestic dwelling properties*".

Works undertaken by CL Associates at the Tioxide Grimsby CHP plant site has been summarised in the Innogy Cogen Ltd report as follows:

- Excavation of 13 no. trial pits, with the majority excavated to the top of the Alluvium at approximately 1.5 m; and
- Laboratory chemical testing on 16 no. samples obtained from Made Ground and 3 no. samples obtained from the Alluvium to assess ground conditions following remedial backfilling undertaken by Soil Mechanics during the previous ground investigation works.

A plan showing the location of the exploratory holes was not available. Key findings were summarised as follows:

- Groundwater was observed as seepages at the base of the Made Ground;
- No olfactory or visual observations of potential oil contamination were noted in the groundwater;
- Concentrations of arsenic, boron and sulphate were detected at levels exceeding the ICRCL (Interdepartmental Committee on the Redevelopment of Contaminated Land) Guidance Note 59/83 threshold for public open spaces, with a maximum concentration of 41 mg/kg respectively. TPH concentrations in 15 of the 19 samples tested exceeded the Dutch guidelines (1994) trigger value, with maximum concentrations of 2,130 mg/kg in the Made Ground and 159 mg/kg in the Alluvium. TPH concentrations were considerably lower than the maximum concentration of 21,500 mg kg detected prior to excavation and removal; and
- The pH of the samples was between 7.9 and 11.9, indicating alkaline conditions; and
- No asbestos containing material was identified.

Based on the desk study and previous ground investigation data, the report identified the main potential sources of contamination as heavy metals, oils, asbestos and ground gases and subsequently evaluated the risk to receptors. The report concluded that the risk was low due to appropriate containment / procedures for process chemicals, the operational

area being covered by hardstanding (which would limit contamination of the underlying ground), and no disposal of waste materials to ground within the CHP plant.

ESI; Due Diligence Assessment: Land Extension Area at Huntsman Tioxide Site, Grimsby (July 2009) [9]

ESI were requested by RWE npower plc to undertake an intrusive ground investigation to support an environmental permit variation prior to the purchase of land at the Huntsman Tioxide site. The activities carried out between June and July 2009 consisted of drilling 10 no. boreholes into the Alluvium, to a depth of up to 6 m bgl, with soil sampling and analysis at two depths in each borehole, as well as 4 no. groundwater and 1 no. ground gas monitoring rounds. Only 1 no. borehole was located within the footprint of the installation, with in the western ('Grimsby A') area; 9 no. boreholes were located in the surrounding area. Exploratory hole locations are shown on **Figure 2**.

The key findings of the assessment were as follows:

- Geology encountered on-site consisted of Made Ground overlying superficial deposits of Alluvium and Glacial Till. Made Ground was encountered in all exploratory holes to a depth of up to 1.2 m bgl and was described as "*loose, gravelly sand, including concrete, brick and cobbles*". Alluvium deposits had a thickness of 2.6 to 4.3 m and were described as "*soft to firm clay with occasional silt with a peaty bed towards the base*". Glacial Till deposits were described as "*stiff, brown clay with admixed sand and chalky gravel*". Bedrock was not encountered;
- Groundwater strikes were generally not observed during drilling except in a few instances, with many boreholes remaining dry for several hours indicating that recharge was "*very slow through the low permeability deposits"*. Subsequent monitoring of resting groundwater levels reported variation between 0.8 and 5.6 m bgl, with water levels in two historic boreholes (measured at 0.8 and 1.4 m bgl) reportedly indicating typical resting water levels at c.2 m AOD;
- Only one round of ground gas monitoring was undertaken, which was described as being on a windy day. The report states "*one measure of hydrogen sulphide (at 14% of its Lower Explosive Limit) and one high measure of carbon dioxide (5.9% by volume) were of some interest. However, the small available source (the Made Ground being the only reservoir with significant pore space for gas movement), the low flows and small concentrations in the gas monitoring make it extremely unlikely that any risk would be presented to human health*";
- The results of chemical testing showed isolated occurrences of high concentrations of copper (TBH04), zinc (TBH04) and titanium (TBH10). Organic compounds were present in low concentrations with the highest concentration (C16 – C35 aliphatic compounds) observed at TBH11, which the report stated "*is consistent with historic hydrocarbon spills where the lighter fractions have volatilised or been degraded within pore water…These data are consistent with observations of oil staining made during the site investigation*". No exceedances of the selected assessment criteria were reported in the human health screening assessment. In the control waters screening assessment , exceedances of Environmental Quality Standards (EQS) were identified in groundwater for copper, nickel, and zinc, and in leachate for arsenic, chromium, copper, lead, nickel, vanadium and zinc;
- Asbestos containing material was identified in the boiler house area (90 m northeast of the installation) and within the western ('Grimsby A') area of the installation at TBH03 between 0.1 and 0.7 m bgl, which was confirmed by laboratory analysis as asbestos cement containing chrysotile and crocidolite. A subsequent walkover survey conducted by an asbestos consultant confirmed the presence of asbestos cement sheeting and asbestos rope in the surface debris across the wider area. The survey concluded that "*asbestos is not expected to be widespread or encountered in large quantities…but has been shown to exist in small quantities in the surface and near surface layers*"; and
- The report evaluated the risk posed to identified receptors and concluded that the risk was low, due to various factors including the absence of an appreciable source of volatile contaminants, the slow rate of contaminant transport, protection of the chalk by several tens of metres of the overlying clayey Glacial Till and Alluvium, artesian conditions within the chalk which indicate upward groundwater movement and the commercial land use and presence of hardstanding reducing the likelihood of a pathway linking a potential source of contamination in the shallow Made Ground with site users.

Geo-Integrity Ltd; Soil Infiltration Rate Investigation – Cummins Power Station, Moody Lane, Grimsby (April 2017) [10]

Geo-Integrity Ltd were requested to carry out infiltration rate testing of the natural and Made Ground deposits to inform the design of a sustainable drainage scheme for the Grimsby Power Station site. An interpretive infiltration rate letter report dated 25th April 2017 provided an overview of a ground investigation which included 2 no. boreholes drilled to a depth of 2 m bgl (CT1 and CT2) and a hand dug trial pit to 0.35 m bgl (TP3), all located within the western ('Grimsby A') area of the installation. Investigation locations are shown on **Figure 2**. Geology encountered was described as Made Ground, between 0.60 and 0.62 m thick, consisting of dense, red-brown and grey, sandy, ashy gravel and cobbles of concrete, brick, limestone and quartz, overlying Tidal Flat deposits of firm, brown and grey mottled, very silty clay. Loose, grey and brown, very silty, fine sand was encountered in CT2, close to the south of the 'Grimsby A' area from 1.9 m bgl to the base of the borehole at 2.0 m bgl.

In-situ percolation testing reportedly indicated that Tidal Flat Deposits in CT1 (in the north of the 'Grimsby A' area) was of very low permeability (no drop in water levels over the 3 hour test period). Based on two rising head tests conducted in CT2, the permeability of the silty sand layer was reported to be $5.5x10^{-5}$ – $6.5x10^{-5}$m/s, referred to as 'medium' permeability. The report noted that the lateral continuity of the layer had not been established and long-term infiltration rates may differ. In the shallow Made Ground at TP3, a high infiltration rate of $1.5x10^{-4}$ – $1.8x10^{-5}$ was calculated, reportedly considered 'high' permeability.

RWE Generation UK, Reserve; Contaminated Land Statement (September 2020) [2]

In September 2020, RWE Generation UK produced a Contaminated Land Statement Report to support the planning application to install gas engine generators on the eastern area of the installation ('Grimsby B'). This report summarised information from the intrusive ground investigation undertaken by ESI in 2009 and specifically presented the results of chemical testing carried out at TBH03, located in the western ('Grimsby A') area of the installation, and evaluated the risk to receptors. It is noted that these results were contained in an appendix of the ESI Report which was not made available to AECOM for the current assessment; and the data has not been verified. The key points of the statement were as follows:

- Concentrations of metals in soils were described as "*moderately elevated*", with generally higher concentrations detected in the near surface test. Elevated levels of sulphate were also reportedly present near surface. However, no measurements were reported to exceed the selected generic assessment criteria (GAC) and no hydrocarbons were detected;
- Chemical testing of groundwater and leachate indicated that "*modest*" concentrations of dissolved metals and "*moderate*" concentrations of dissolved sulphate were present in soil pore water. Slow groundwater recharge was observed at TPH03;
- Only one round of ground gas monitoring was carried out which indicated generally low concentrations and flows of ground gases, although carbon monoxide was detected at 23 ppm and carbon dioxide at 1.3%v/v. VOCs were not detected and significant amounts of putrescible matter were not present within the Made Ground;
- Asbestos containing material (ACM) was identified between 0.1 and 0.7 m bgl in TBH03, which was confirmed by the laboratory as asbestos cement containing chrysotile and crocidolite. The location of the borehole was subsequently moved away from the impacted locations and no ACMs were observed at the second location; and
- The risk to human health receptors was evaluated and considered to be low, based on the most likely exposure pathway being direct contact with contaminated soils during construction and, to a lesser extent, operation. It was suggested that contaminants could flow through interconnected beds or lenses of higher permeability material (silt and sand) within the Alluvium and Glacial Till before discharging into the Humber Estuary, although the risk to Controlled Waters receptors was considered to

be low due to slow groundwater movement, lack of artificial drainage and limited leachability through the superficial deposits.

4. Permitted Activities

Overview of Site Operations

The following key processes will take place at the Site:

- Continued operation of ten (10 no.) existing natural gas fired engines, with a total thermal input of 48 MW (Grimsby A); and
- Construction and operation of five (5 no.) new natural gas fired engines, with a total thermal input of 45.75 MW (Grimsby B).

Supporting activities undertaken at the Site to support the key processes include:

- Storage and use of lubricating oil (and temporary storage of waste oil awaiting disposal).

Scheduled Activities Under Permit

Operations

The following activities require an Environmental Permit under Part A(1)(a):

- Burning of any fuel in an appliance with a rated thermal input for 50 MW or more

Directly Associated Activities

- The following Directly Associated Activities (DAAs) will be undertaken: Lubricating oil storage (4 x 5,000 litre above-ground bulk storage tanks).

Other Permits

AECOM has reviewed the EA Public Registers [18] and information supplied by RWE regarding issued Site permits. The following permits have been identified in relation to the Site:

1. EPR/WP3036QH
   MCP permit for operation of 10 no. existing generators;
   Dated 30/04/2019);
   Revocation Date: n/a (current permit).

No discharges to water, sewer or land are currently permitted at the Site, and none are proposed.

On Site Chemical Storage and Use

Chemical Storage Areas

The only chemicals / raw material proposed to be used/stored at the Site are:

- 2 x existing 5,000 litre lubricating oil ASTs (one new oil, one waste oil) servicing the existing Grimsby A plant; and
- 2 x new 5,000 lite lubricating oil ASTs (one new oil, one waste oil) servicing the proposed new Grimsby B plant.

The locations of the existing ASTs and proposed locations of the new ASTs are shown on Figure 2.

The construction of the four tanks is understood to be identical, being:

- 5,000 litres capacity (4,500 litres nominal working maximum);
- Double skinned, 3 mm thick, stainless steel (to BS10025:2004);
- Pressure tested to 0.2 bar;
- Designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds.
- The fabricated bunded area is designed to hold at least 110% of the storage tank capacity;
- Fitted with overflow prevention valves and high-level alarm;
- Lockable, integral fill (or suction/removal) point situated on top of tank;

	The oil is solely used for engine lubrication. The clean oil distribution manifold is a fully welded circuit installed at height external to each engine enclosure which runs the full length of the respective Grimsby A or B site, connecting the clean oil tank to each engine with an automatic topping system to supply the generators as required based on operational running. The manifold will be inspected on a routine basis to check for signs of damage or points of potential failure. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil, however, the location and containment measures to be implemented at the loading / unloading area are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on site and on the tanker.
On-Site Effluent Treatment	None currently undertaken or proposed. No oil-water interceptors are present or proposed.
Site Drainage	It is understood that the existing Grimsby A site does not have a formal drainage system for surface water, with rain infiltrating into the gravel beneath the site. Surface water that falls on the hardstanding either evaporates or runs off into unsurfaced (gravel) areas around the perimeter. There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil established for both Grimsby A and Grimsby B, however, the location and containment measures to be implemented at the loading / unloading area are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on site and on the tanker. A soakaway for roof drainage is proposed to be installed at the northern end of the Grimsby B site. The provisional design for the soakaway comprises 10 no. standpipes installed to the base of the Made ground (to an estimated depth of 0.6 m bgl, based on ground investigation data within the Grimsby A site). However, the surface water drainage design will be finalised following completion of additional ground investigation.

5. Changes to the Activity

Have There Been Any Changes to the Activity Boundary?	This SCR supports an application for variation of an existing permit under the MCP permitting regulations for operation of 10 no. generators at the site known as the Grimsby A site to include 5 no. proposed generators at the site known as the Grimsby B site. The permitted Site will cover both areas Grimsby A and Grimsby B, as shown on **Figure 2**.
Have There Been Any Changes to the Permitted Activities?	The nature of the activity will remain the same; the requirement to apply for a variation is triggered by the proposed combined thermal input of >50 MW. It is proposed that the 5 no. generators are constructed.
Have Any 'Dangerous Substances' Not Identified In The Application Site Condition Report Been Used Or Produced As A Result Of The Permitted Activities?	No

6. Measures Taken to Protect the Land

Pollution Control Measures And Their Integrity

Policies and Procedures

It is understood that the Environmental Management System (EMS) for the Site is certified to ISO 14001:2015.

The Site is operated under RWE's Environmental Management System Manual [19] which provides a framework for RWE's activities across the UK and covers:

- Environmental policies;
- Roles and responsibilities;
- Environmental planning;
- Compliance obligations;
- Operational, including emergency response planning; and
- Performance evaluation and reviews.

Site-specific operating instructions for the existing Grimsby A plant are understood to be maintained by RWE but have not been reviewed by AECOM. The operating instructions will be extended to cover the proposed Grimsby B plant prior to commissioning. Copies can be provided to the EA by RWE if required.

Containment

Primary Containment (storage vessels):

The two existing lubricating oil ASTs at Grimsby A are understood to be double skinned, 3 mm stainless steel tanks. The tanks are equipped with overflow prevention valves, high level alarms and lockable fill points. Site photographs indicate that the lubricating oil tanks are located on concrete plinths in an area of hardstanding. A separate internally bunded diesel tank and generator is shown to be present on the western part of the Grimsby A site, located on gravel.

It is assumed that ASTs proposed for Grimsby B will be similar to those installed at Grimsby A and will be installed new and unused and will be of the same construction.

AECOM understands that the pipework linking the lubricating oil ASTs to the generators is of welded steel construction, and is above ground. No further details on the above ground pipework has been provided. The condition of the existing tanks, fill points, pumps and pipework has not been assessed or verified by AECOM.

Secondary Containment:

AECOM understands that the lubricating oil ASTs are to be located on concrete hardstanding and will be designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity.

The diesel generator fuel tank is also understood to be internal bunded or double-skinned. No details of secondary containment with respect to the fill points, pumps, and above ground pipework has been provided. AECOM has not been able to confirm the presence or condition of internal bunding.

There will be a dedicated area for the delivery of clean lubricating oil and collection of waste oil to the Grimsby A and Grimsby B lubricating oil ASTs, however, the location and containment measures to be implemented at the loading/unloading area are still to be determined. Each tank will have an internal drip tray and bund alarm fitted. In addition, spill kits will be available on site and on the tanker.

Tertiary Containment:

Concrete hardstanding is present beneath some areas of the Site, including the lubricating oil ASTs, and the oil store, though it is not clear if any kerbs are present around the exterior of the hardstanding. AECOM understands that surface water from the hardstanding runs off onto the adjacent gravel areas.

Inspections and Maintenance

An inspection and maintenance schedule exists for the existing Grimsby A site area, which will be extended to cover the proposed Grimsby B site area prior to commissioning. The schedule was not available for review by AECOM.

7. Pollution Incidents That May Have Had an Impact On Land, and Their Remediation

Document Review

Incidents at the Site are maintained on RWE's "Madison" reporting system. No spills or releases are understood to have been recorded at the Site to date.

One environmental incident was recorded in the Grimsby A site area in September 2017 relating to a delivery of lubricating oil prior to the provision of in un-bunded containers, before arrangements had been made for secondary containment. No oil was spilled. Corrective actions: RWE to ensure sufficient temporary bunds available on site prior to oil deliveries being accepted on to site.

Previous ground investigation within the Grimsby A site area identified areas of TPH contamination, most notably to the south of the historic gas oil storage tanks, located approximately 60 m to the east of the Site, where concentrations up to 21,500 mg/kg were reported in soil. Heavily impacted soils are understood to have been removed in 1999/2000, but concentration of up to 2,130 mg/kg were still recorded post-remediation [8]. The potential for the hydrocarbon contamination to have migrated towards the installation is not known.

In addition, ESI's 2009 due diligence assessment [9] identified TPH contamination on the Grimsby A site area which was reported to be "*consistent with historic hydrocarbon spills*". No details of these potential spills are known.

Site Reconnaissance

No site walkover was undertaken by AECOM.

Based on photographs provided by RWE, the current Grimsby A site area comprises:

- A maintenance shed (reported to be operated by Cummins), a generator and bunded fuel tank on the western boundary of the site, on an area surfaced with gravel;
- Ten gas engines in the middle of the northern half of the site underlain by gravel; and
- Two lubricating oil ASTs and associated pumps and pipework located on hardstanding on the eastern boundary of the site.

Photographs show that the proposed Grimsby B site area comprises an area of open ground with perimeter fencing on the northern, eastern and western edges. The northern part of the site is occupied by a large concrete bund, which is believed to have house a former gas oil storage tank. The site surface includes both hardstanding and an unsurfaced area in the middle of the hardstanding comprising demolition rubble, with a small heap of what appears to be crushed concrete in the centre of the area of unmade ground.

8. Soil and Water Quality Monitoring

Recommendation	Limited environmental sampling has been undertaken on the Grimsby A site area, although none in the location of the current chemical (oil) storage areas. No environmental sampling has been undertaken within the Grimsby B site area. Activities have been, and continue to be undertaken, at the Site which have the potential to impact soil and groundwater quality beneath the Site. It is therefore proposed that soil and groundwater 'baseline' samples in the vicinity of the tanks in both the Grimsby A and B sites are undertaken prior to commencement of operation under the new environmental permit, which can then be used to monitor land quality during the lifetime of the permit.

9. Decommissioning and Removal of Pollution Risk

Recommendation	The Site currently has no intended decommissioning date and a closure plan will be developed during the lifetime of the operation such that it is ready for implementation when decommissioning is required. However, the risk of pollution to soil and groundwater at the Site could be reduced (prior to and during operation) by: • Additional containment measures around the ASTs, oil handling areas and pumps to contain substances in case of leaks / spills; and • Further details on the proposed operational instructions/procedures.

10. Environmental Risk Assessment & Conceptual Site Model

Introduction

This section is aimed at identifying possible risks, if any, arising from substances used or deposited on site, or from other sources of land contamination. Both past and current potentially contaminative land uses have been considered.

The following sections detail:

- A preliminary Environmental Risk Assessment (ERA), which has been undertaken to identify the relevant hazardous substances proposed to be stored and used at the Site, their locations, and those areas where existing / previous activities present a potential risk of pollution to soil and groundwater; and
- An initial Conceptual Site Model (iCSM), which has been developed for the Site with a view to assessment of potential risks to the environment from the proposed activities.

Environmental Risk Assessment

The ERA demonstrates that a 'reasonable possibility of pollution' currently exists from permitted activities undertaken at the Site, as summarised in **Table 10-1**:

Table 10-1: Preliminary Environmental Risk Assessment

	AST Locations	Transfer Pumps/Pipework
Hazardous Substance	Lubricating Oil and Diesel	Lubricating oil
Relevant Activity	Storage in ASTs	Transfer from storage area (i.e. ASTs) to operational area (i.e. generators)
Potential for Pollution from the Relevant Activity	Failure of tanks/bunds resulting in loss of hazardous substances to ground Spillages to ground during filling / emptying	Failure of pumps / valves / pipework resulting in loss of hazardous substances to ground
Existence of Pollution Prevention Measures	Yes	Fully welded circuit for transfer of clean oil to engines. Waste oil transferred from gas engines to the waste oil tank via a dedicated flexible hose reel a dedicated flexible hose reel included within the waste bulk tank.
Nature of Primary Containment	Double skinned, stainless steel tank fitted with overflow prevention valves and high level alarms	Unknown
Testing & Inspection of Primary Containment	Reportedly undertaken, but activities and schedule unknown	
Nature of Secondary Containment	Internal bunding / double skinned tanks designed and fabricated to BS799-5, in accordance with CIRIA C736 paragraph 9.2.5 and in compliance with Oil Firing Technical Association for the Petroleum Industry (OFTEC) standard OFS T200 for Steel oil storage tanks and tank bunds. The fabricated bunded area is designed to hold at least 110% of the storage tank capacity	

	Testing & Inspection of Secondary Containment	As primary containment	
	Nature of Tertiary Containment	Hardstanding present across parts of the site including the ASTs, though no tertiary containment is present.	
	Testing & Inspection of Tertiary Containment	Unknown	
	Adequacy of Pollution Prevention Measures (Y/N)	To be determined – no information on bunding; presence of raised kerbs; drainage system; integrity testing / maintenance schedule and condition of infrastructure.	
	Adequacy of Proposed Integrity Testing of Pollution Prevention Measures (Y/N)	To be determined	To be determined
	Adequacy of Documented Management System to demonstrate operator management and competence with the relevant activity	To be determined	To be determined
	Assessment of the likelihood of pollution	Reasonable possibility of pollution	

Initial Conceptual Site Model

An initial Conceptual Site Model (iCSM) has been developed to identify potentially viable source → pathway → receptors (SPR) linkages at the Site, relating to the permitted operations. The iCSM is used to assess risk of pollution to the environment and informs the design of any proposed ground investigation at the Site.

The locations of the identified sources and receptors are shown on Figure 2 (Appendix A).

Sources of Contamination

Potential sources of contamination relating to the proposed permitted activities at the Site are as follows:

S1: Lubricating oil, within ASTs and associated pipework, with the key risk being potential loss during oil handling / tank loading unloading activities; and

S2: Diesel used for onsite generator with the key risk being potential loss during diesel handling / tank loading unloading activities.

Contaminants of potential concern (CoPCs) associated with lubricating oils and fuel are considered to be TPH and PAH.

Receptors

Identified receptors which have the potential to be impacted by the permitted activities at the Site are as follows:

R1: Controlled Waters – Surface Waters (Mawnbridge Drain (240 m W) and Humber Estuary (370 m NE));

R2: Controlled Waters – Superficial Aquifer (Tidal Flat Deposits – Unproductive Strata);

R3: Controlled Waters – Bedrock Aquifer (Flamborough Chalk – Principal Aquifer); and

R4: Ecosystems (flora and fauna) – Humber Estuary SSSI/Ramsar site/SAC/SPA (370 m NE).

Pathways

Potential pathways by which identified sources may impact identified receptors at the Site are as follows:

P1: Spillage/loss of CoPCs, followed by run-off from surface direct to surface water (direct pathway);

P2: Spillage/loss of CoPCs, followed by vertical migration to shallow groundwater through unsurfaced ground or cracks in hardstanding etc. (direct pathway);

P3: Leaching of CoPCs from shallow soil where rainwater permeates the ground (i.e. unsurfaced areas, or cracks in hardstanding) and vertical migration via permeable unsaturated strata to shallow groundwater (indirect pathway);

P4: Lateral migration of CoPCs within shallow groundwater to surface water (indirect pathway);

P5: Vertical migration of CoPCs in shallow groundwater to deeper groundwater (indirect pathway);

P6: Migration of CoPCs via preferential pathways such as underground service routes (including granular backfilling materials) to shallow groundwater and surface waters (indirect pathway); and

P7: Spillage/loss or migration of CoPCs to surface water, following by direct contact/ingestion/root uptake by flora and fauna (direct or indirect pathway).

Preliminary Risk Assessment

The iCSM has identified a number of potentially complete SPR linkages relating to the proposed permitted activities at the installation. In line with Land Contamination Risk Management (LCRM) guidance **[20]**, a Preliminary Risk Assessment (PRA) has been undertaken to identify the most significant SPR linkages with respect to potential risk to environmental receptors (see Table 10-5, below). The source (S1), receptors (R1 – R4) and pathways (P1 – P6) referenced in the table below correspond to the descriptions above.

Details of the risk assessment methodology are provided in **Appendix B**.

The most significant potentially complete SPR linkages are considered to be: S1 → P4/P6/P7→ R1/R4, with a risk rating of ‘Moderate/Low’.

Table 10-5: Initial Conceptual Site Model

Source	Pathway	Receptor	Potential Severity*	Likelihood of Occurrence* (assuming suitable secondary and tertiary containment measures are in place)	Level of Risk (R&D66)*	Level of Risk (LCRM)*	Discussion
S1 (lubricating oil in ASTs or associated pipework)	P1 (direct runoff)	R1 (surface water; Mawnbridge Drain & Humber Estuary)	Medium	Unlikely	Low	Acceptable	Given the significant distance between the Site and the nearest surface water feature (Mawnbridge Drain, 240m west) direct run off of CoPC resulting from a spill / loss is considered unlikely. Furthermore, much of the land between the Site and the drain is unsurfaced ground, allowing CoPCs to infiltrate unsurfaced ground rather than flowing over the surface.
	P4 (lateral migration within shallow groundwater to surface water)			Low	Moderate/Low	Acceptable	The hydrogeological regime at the Site is currently poorly understood. However, given the proximity to the Humber Estuary, shallow groundwater (if present) is considered likely to be in hydraulic connectivity with surface water in the Humber Estuary. The low permeability nature of the superficial deposits (silt / clay) would reduce the potential for lateral migration within shallow groundwater, although some higher permeability sand lenses / layers may be present which may transmit CoPCs within groundwater towards surface water receptors.
	P6 (migration along service routes to surface water)		Medium	Low	Moderate/Low	Acceptable	The location of buried services at the installation is unknown, but it is considered possible that outfall pipes run from the vicinity of the Site (i.e., the wider power station site) to surface water features. These pipes may act as a preferential pathway for CoPCs to migrate, either within the drains (if they are compromised) or with the granular backfill / annulus.
	P2 (vertical migration to shallow groundwater)	R2 (groundwater; superficial Unproductive Strata)	Mild	Low	Low	Acceptable	CoPCs spilled at the surface may migrate to underlying superficial deposits either directly (via unsurfaced ground and / or cracks in hardstanding) or indirectly (by leaching from impacted shallow soil/Made Ground). The condition of the existing hardstanding, and the location of unsurfaced areas relative to the proposed areas of CoPC storage / use are unknown.
	P3 (leaching from shallow soils into shallow groundwater)		Mild	Low	Low	Acceptable	As above, the location of buried services at the Site is unknown. Furthermore, the depth of potential services in relation to groundwater is unknown. If buried services (including backfill around the pipes) interact with shallow groundwater, there is the potential for migration of CoPCs into the superficial aquifer.
	P6 (migration along service routes to shallow groundwater)		Mild	Low	Low	Acceptable	However, the superficial aquifer is classified as 'Unproductive Strata' and no abstractions have been identified within 1km of the Site. Permeability of the superficial deposits (silt / clay) is likely to be low, except where lenses / layers of sand may be present, limiting potential migration in groundwater.

	P5 (vertical migration from shallow groundwater to deeper groundwater)	R3 (groundwater; bedrock Principal Aquifer)	Medium	Unlikely	Low	Acceptable	The Flamborough Chalk bedrock is classified as a Principal Aquifer. However, in the vicinity of the Site, it is anticipated to be afforded protection by approximately 20m of low permeability (silt/clay) superficial deposits. It is therefore considered unlikely that CoPCs from the Site would migrate vertically into the deeper, bedrock aquifer via the pathways considered.
	P7 (direct contact/ingestion/root uptake, following spillage or migration)	R4 (ecosystems in Humber Estuary SSSI/Ramsar site/SAC/SPA)	Medium	Low	Moderate/Low	Acceptable	As above, the likelihood of CoPCs from the Site reaching surface waters (including the Humber Estuary) is considered to be low. However, if CoPCs and / or impacted groundwater reach surface water features, there is the potential for sensitive flora and fauna inhabiting the water / tidal flats SSSI / Ramsar site / SAC / SPA to come into contact with, ingest or take up CoPCs.

* see Risk Assessment Methodology in Appendix B for definitions of severity and likelihood, as well as risk level matrix

11. Initial Summary of Site Conditions

Ground Conditions	Based on desk top research and results of previous investigations on or near the Site, AECOM understands the Site to be underlain by a maximum thickness of up to 1.7 m of Made Ground followed by superficial deposits of Alluvium, Tidal Flat deposits and Devensian Glacial Till, classified as unproductive strata and anticipated to be c.18 m thick. The underlying bedrock is the Flamborough Chalk Formation, which is classified as a Principal Aquifer. Previous investigations at the Site reported water strikes in sandy lenses within the Glacial Till at depths of between 7.4 and 16.5 m bgl, which rose to 1.6 m bgl after 30 minutes. Resting groundwater levels in wells at the Site have ranged from between 0.5 m and 5.6 m bgl.
Sources of Contamination (Historic)	The Site is located within the former Huntsman Tioxide works, used for titanium dioxide manufacturing. These works were established in the 1940's on land reclaimed from marshland on the south bank of the Humber, and were subsequently demolished in 2015. Previous ground investigation within the Grimsby A site area identified areas of TPH contamination, most notably to the south of the historic gas oil storage tanks, and heavily impacted soils are understood to have been removed in 1999/2000. TPH contamination "*consistent with historic hydrocarbon spills*" were detected in a 2009 due diligence assessment. A concrete bund in the north eastern part of the Site is understood to have been the location for a gas oil storage tank, though no evidence of the tank remains. The eastern part of the Site is occupied by the Grimsby A generator plant , comprising a peaking plant with ten natural gas fired engines and two 5,000 litre lubrication oil tanks and has operated since 2018. No spills or releases have been recorded at the Site since operations commenced.
Sources of Contamination (Current)	The Site now operates under an Environmental Permit EPR/WP3036QH (issued 30th April 2019). Potential sources of contamination relating to the operations covered by the permit include lubricating oil ASTs and associated operational activities. Key contaminants of potential concern relating to these sources are: • Hydrocarbons (lubricating oil, including waste oil and diesel). No spills or releases are understood to have been recorded at the Site to date.
Pollution Risk	The risk of pollution to the environment is based on 'SPR linkages' or complete pollution pathways. Pollution pathways may be broken through good practice, e.g., operational procedures, primary/secondary/tertiary containment etc. Based on the limited information available, it would appear that adequate containment is not currently in place in all relevant parts of the site (e.g., uncertainty over surface water drainage from the Grimsby A site, absence of kerbing at the edge of areas of hardstanding, no information on containment measures for pumps and fill points, unsurfaced ground). There is therefore considered to be the potential for contamination of soil and groundwater beneath the Site to occur as a result of the permitted operations.
Recommendations	It is therefore recommended that an intrusive investigation is undertaken to provide a 'baseline' of soil and groundwater conditions at the Site at the time of commencement of the permit.

References

[1] Environment Agency, “Environmental Permitting Regulations: Site Condition Report – Guidance and Templates (H5) (version 3),” 2013.

[2] R. RWE Generation UK, “Generation Site B, Moody Lane. Contaminated Land Statement,” 2020.

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Appendix A : Figures

Appendix B : Risk Assessment Methodology

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