LIGHTHOUSE GREEN FUELS DCO

Environmental Impact Assessment Scoping Report Appendices

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Appendix 5-A
Designated Sites

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Table 1 Scoped In Designated Nature Conservation Sites

Name	Designation	Minimum Distance to Proposed Scheme (km)
North York Moors	Special Protection Area (SPA) Special Area of Conservation (SAC) Site of Special Scientific Interest (SSSI)	11.1
Northumbria Coast	SPA	14.1
Teesmouth and Cleveland Coast	SPA SSSI	0 (directly adjacent)
Durham Coast	SAC SSSI	14.1
Briarcroft Pasture	SSSI	10.3
Hart Bog	SSSI	13.1
Lovell Hill Pools	SSSI	7.2
Pike Whin Bog	SSSI	13.6
Saltburn Gill	SSSI	13.4
North York Moors	SSSI	11.1
Whitton Bridge Pasture	SSSI	10.9
Durham Coast	SSSI	12.5
Aislaby Wood	Ancient Woodland Inventory (AWI)	13.6
Alders Plantation	AWI	10.8
Amerstone Gill Wood	AWI	10.8
Atkinson Wood	AWI	12.7
Bank Wood	AWI	14.5

Name	Designation	Minimum Distance to Proposed Scheme (km)
Basselton Wood	AWI	7.4
Black Moor Plantation	AWI	9.4
Blackwell Crook Wood	AWI	11.9
Brierley Beck Wood	AWI	9.2
Brierley Wood	AWI	10.8
Bullister Gill	AWI	11.7
Bunkerdale Wood	AWI	12.5
Capon Wood	AWI	10.9
Cliff Ridge Wood	AWI	10.9
Clock House Wood	AWI	11.3
Close Wood	AWI	8.6
Conn's Gill	AWI	10.5
Crow Wood	AWI	11.9
Dog Kennel Wood	AWI	12.3
Dunsdale Plantation	AWI	8.5
Dunsdale Wood	AWI	7.6
Easby Wood	AWI	13
East Close Wood	AWI	8.2
Ellers Wood	AWI	10.8
Fanny Bank Wood	AWI	10.9

Name	Designation	Minimum Distance to Proposed Scheme (km)
Foxton Bridge Wood	AWI	12.5
Guisborough Woods	AWI	10.8
Harrison Close Wood	AWI	9.5
Hazel Grove	AWI	11.2
Hesleden Dene	AWI	13.5
Hilton Wood	AWI	11.4
Howl Close Plantation	AWI	8.8
Kill Gill	AWI	11.0
Lee's Wood	AWI	9.8
Margaret Coey Wood	AWI	14.8
Middleton Wood	AWI	11.8
Mill Bank Wood	AWI	13.7
Newsham Bank Wood	AWI	14.9
Newton Hanzard Plantations	AWI	9.3
Newton Wood	AWI	10.3
Park Wood	AWI	8.3
Ravenscar Wood	AWI	11.7
Rigg Wood	AWI	12.7
Rookery Plantation	AWI	10.1
Rudby Wood	AWI	14.5

Name	Designation	Minimum Distance to Proposed Scheme (km)
Saltburn Gill	AWI	13.4
Scriddles Wood	AWI	11.4
Slacks Wood	AWI	11.7
Spell Close Wood	AWI	11.3
Spring Bank Wood	AWI	11.2
Stainby Wood	AWI	6.9
Stainsby Wood	AWI	7.2
Stockdale Wood	AWI	11.3
The Howls	AWI	9.0
Thomas's Wood	AWI	9.4
Thornaby Wood	AWI	7.8
Thorny Close Wood	AWI	12.6
Thorpe Wood	AWI	9.1
Tidkinhow Wood	AWI	14.2
Tocketts Mill Wood	AWI	9.3
Village Wood	AWI	8.9
Waterfall Wood	AWI	11.1
Whinny Bank	AWI	14.6
Whinny Bank Wood	AWI	10.8
Wilton Wood	AWI	5.7

Name	Designation	Minimum Distance to Proposed Scheme (km)
Wilycat Wood	AWI	12.6
Wygrave Wood	AWI	14.6
Barwick Pond	Local Nature Reserve (LNR)	9.5
Bassleton Wood and the Holmes	LNR	7.3
Black Bobbies Field Thornaby	LNR	6.6
Berwick Hills	LNR	1.8
Billingham Beck Valley	LNR	4.0
Castle Eden Walkway	LNR	11.1
Charlton's Pond	LNR	2.9
Cowpen Bewley Woodland Country Park	LNR	3.2
Flatts Lane Woodland Country Park	LNR	5.3
Guisborough Branch Walkway	LNR	7.7
Linthorpe Cemetery	LNR	2.7
Hardwick Dene & Elm Tree Woods	LNR	7.2
Hart to Haswell Walkway	LNR	12.7
Hart Warren	LNR	12.0
Greatham Beck	LNR	5.3
Quarry Wood	LNR	9.1
Greenvale	LNR	8.4

Name	Designation	Minimum Distance to Proposed Scheme (km)
Norton Grange Marsh	LNR	5.4
Stillington Forest Park	LNR	12.0
Summerhill	LNR	7.7
Thorpe Wood	LNR	9.1
Spion Cop Cemetery	LNR	10.7
Seaton Dunes and Common SSSI	LNR	3.5
Stainton Quarry	LNR	7.6
Errington Wood	LNR	8.6
Eston Moor	LNR	5.7

Appendix 7-A Interim Ecological Information Report

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EXECUTIVE SUMMARY

WSP UK Ltd (WSP) was instructed by Lighthouse Green Fuels Ltd (hereafter referred to as the ‘Applicant’) to complete a Preliminary Ecological Appraisal (PEA) of areas of land at Port Clarence, near Stockton-on-Tees (hereafter referred to as the ‘Site'). Proposals for the Site are to be submitted under a Development Consent Order (DCO) for the development of the UK’s first commercial-scale waste-to-sustainable aviation fuel (SAF) project (hereafter referred to as the 'Proposed Scheme’). Current details of what the Proposed Scheme will comprise are provided in **Chapter 2: Site and Proposed Scheme Description** of the **Environmental Impact Assessment (EIA) Scoping Report**, to which this document is appended.

The Site is located at National Grid Reference: NZ 519 232 and covers a total area of approximately 205.66 hectares. The Site is located within a heavily industrialised landscape. Urban development and heavy industry dominates areas to the north, south and east of the Site, with a nature reserve, RSPB Saltholme, present to the west.

At the time of writing, the full PEA assessment across the PEA Survey Area has not yet been completed and therefore this Interim Ecological Information Report has been produced for the purposes of supporting the Scoping Report at this stage.

Surveys completed to date have noted the presence of a range of habitats on Site and within the wider PEA Survey Area. These habitats have been determined to offer suitability to support a range of species/species groups, including breeding birds, wintering birds, otter, water vole, and badger.

Due to the current completion status of the PEA and further species surveys, no definitive conclusions have been made from the data collected to date. Appropriate recommendations for further survey, avoidance, mitigation and compensation in relation to designated sites, habitats and protected or notable species would be made upon completion of the desk study and field surveys, with details presented in the Preliminary Environmental Information Report (PEIR) and Environmental Statement (ES).

Disclaimer

1. INTRODUCTION

1.1. PROJECT BACKGROUND

1.1.1. WSP UK Ltd (WSP) was instructed by Lighthouse Green Fuels Ltd (LGF) (hereafter referred to as the 'Applicant') to complete a Preliminary Ecological Appraisal (PEA) of areas of land at Port Clarence, near Stockton-on-Tees (hereafter referred to as the 'Site').

1.1.2. Proposals for the Site are to be submitted under a Development Consent Order (DCO) for the development of the UK's first commercial-scale waste-to-sustainable aviation fuel (SAF) project (hereafter referred to as the 'Proposed Scheme'). Current details of what the Proposed Scheme will comprise are provided in **Chapter 2: Site and Proposed Scheme Description** of the **Environmental Impact Assessment (EIA) Scoping Report**, to which this document is appended.

1.2. ECOLOGICAL BACKGROUND

1.2.1. The main portion of the Site is located at National Grid Reference: NZ 519 232. The Site covers a total area of approximately 205.66 hectares. The Site is located within a heavily industrialised landscape. Overall, the landscape context of the Proposed Scheme is strongly influenced by the presence of urban development and heavy industry, much on reclaimed land, to the north, south and east of the Site and along the banks of the River Tees to the south and east.

1.2.2. A Royal Society for the Protection of Birds (RSPB) nature reserve, RSPB Saltholme, is located to the west and is enveloped by areas of the Site in one location (the Site wraps around Dorman's Pool). RSPB Salthome is of national and international importance for bird populations which use the area, and is covered by several overlapping statutory nature conservation designations[1]. The potential impacts of the Proposed Scheme to this area are being assessed in detail, and surveys are being undertaken partly following advice received through consultation with Natural England via their Discretionary Advice Service (DAS).

1.3. SCOPE OF REPORT

1.3.1. The Applicant commissioned WSP to undertake a full PEA of the Site in April 2023. The PEA would comprise two elements: a desk study of biological information in the public domain and obtained from third parties and a field survey. The field survey is undertaken to identify and record the habitats on Site

[1] Site of Special Scientific Interest (SSSI), Special Protection Area (SPA) and Ramsar site.

and within a 50m buffer (the 'PEA Survey Area') and their suitability for protected and notable species.

1.3.2. At the time of writing, a full PEA assessment across the PEA Survey Area has not yet been completed due to access limitations on part of the Site. To provide an update on the progress of ecological assessments made to date and to demonstrate that the assessment methods being used are in accordance with national and local legislation and policy requirements, the Applicant has commissioned WSP to produce this Interim Ecological Information Report for the purposes of supporting the Scoping Report.

1.3.3. The objectives of the Interim Ecological Information Report are to:

- provide details of the methodology being used for the PEA to demonstrate compliance with relevant nature conservation legislation and planning policy;
- provide a high-level overview of ecological information for the areas which have been assessed during the PEA so far, with reference to whether legally protected and/or notable sites, species or habitats are present or likely to be present; and
- Provide a high-level summary of any initial findings undertaken as part of further species-specific surveys undertaken to date.

1.3.4. A full PEA report and associated survey findings will be provided alongside the PEIR to be submitted as part of the DCO process. In addition, a number of species-specific survey reports shall also be prepared to document the findings of further species surveys undertaken. The PEA and species survey reports shall inform the impact assessment presented in the ES.

1.4. RELEVANT LEGISLATION AND POLICY

1.4.1. The ecological assessment being undertaken for the Proposed Scheme is subject to various national legislation and policy. Information on relevant legislation and policy is included in **Chapter 7: Terrestrial Ecology** and **Chapter 8: Marine and Freshwater Ecology** in the **EIA Scoping Report**. As this Interim Ecological Information Report is being submitted as an Appendix (**Appendix 7-A**) to the **EIA Scoping Report**, legislation and policy information is not repeated here but will be included for completeness in the finalised version of the PEA report.

2. METHODS

2.1. OVERVIEW

2.1.1. This PEA and the required surveys are being conducted with reference to current good practice guidance published by the Chartered Institute for Ecology and Environmental Management (CIEEM, 2017a; 2017b; 2020) and guidance contained in the British Standard document 'Biodiversity – Code of Practice for Planning and Development', BS 42020:2013 (British Standards Institution (BSI), 2013).

2.1.2. The PEA encompasses the following elements:

- An ecological desk study;
- A UK Habitat Classification (UKHab) survey; and
- A protected/notable species assessment.

2.2. DESK STUDY

OVERVIEW

2.2.1. A full desk study is being completed for the Site and surrounding area following best practice guidance published by CIEEM (CIEEM, 2020). Separate desk studies will be undertaken for both the terrestrial ecology and aquatic ecology elements of the overall assessment. Details of both are provided below.

TERRESTRIAL ECOLOGY

2.2.2. The following data sources have been (and will be) consulted to inform the baseline review:

- The Multi Agency Geographic Information for the Countryside (MAGIC) website[2];
- Ancient Woodland Inventory (AWI)[3];
- Biological records received from the Environmental Records Information Centre (ERIC) North East;
- Wetland Bird Survey (WeBS) reports received from the British Trust for Ornithology (BTO); and
- Supplementary bird data from Teesmouth Bird Club (TBC).

2.2.3. The desk study to date has included a review of publicly available resources and databases to determine the presence of protected sites, Habitats of Principal Importance (HPI) (as defined by the Natural Environment and Rural Communities Act 2006 (NERC)) and woodland listed on the AWI. The search radii include:

2 www.magic.defra.gov.uk
3 https://naturalengland-defra.opendata.arcgis.com/datasets/ancient-woodland-england/explore

- statutory designated sites of international importance and those listed within the National Site Network[4] up to 10km from the Site;
- statutory designated sites of local and national importance[5] up to 2km from the Site;
- HPI and woodland listed on the AWI up to 1km from the Site;
- historic European Protected Species (EPS) licences granted within 2km of the Site; and
- a review of open source 1:25,000 Ordnance Survey mapping to identify any mapped waterbodies and watercourses within 500m of the Site.

2.2.4. The desk study will also include a review of existing ecological baseline information held by relevant third parties. Desk study records will only be considered if they are recent (from the last 10 years) and/or if they relate to species that may be supported by habitats within the Site. Following current good practice guidance (CIEEM, 2017a and 2020), the following records have been requested and obtained from the Environmental Records Information Centre for the North East of England (ERIC North East).

- Records of legally protected and notable species within 2km of the Site; and
- Records of non-statutory sites designated for nature conservation value within 2km of the Site.

2.2.5. WeBS data provided by the BTO has provided count data from recent surveys (previous five years[6]) for birds within the following targeted WeBS survey 'sectors' within or adjacent to the Site for review. The sites include:

- Dorman's Pool (part of RSPB Saltholme, enveloped by the Site);
- Reclamation Pond (within the Site); and
- Tees Estuary opposite Smiths Dock and Hargreaves Quarry.

2.2.6. TBC has also been contacted to determine availability of supplementary survey data in relation to bird assemblages in areas surrounding the Site.

2.2.7. The findings of the desk study will be incorporated into the full PEA report. The desk study is being carried out by a suitably experienced ecologist with previous experience of carrying out desk studies of a similar nature.

AQUATIC ECOLOGY

2.2.8. In addition to the above, an aquatic-specific desk study will also be undertaken to review existing ecological baseline information available in the public domain and to obtain any information held by relevant third parties. For the purpose of the

[4] Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites.
[5] Sites of Special Scientific Interest (SSSI), Local Nature Reserves (LNR) and National Nature Reserves (NNR).
[6] The most recent five years in which data has been recorded by BTO surveyors; not necessarily the most recent five years prior to issue of this report.

desk study exercise, records will be collated within various radii, based on hydrological connectivity with the Site. The following data sources will be used to inform the data search:

- Natural England's MAGIC online web resource will be consulted to identify statutory designated sites that are hydrologically connected to the Site. Hydrological connectivity will be determined using Ordnance Survey maps and aerial photographs.
- The current Water Framework Directive (WFD) status for the catchment within which the Site is located will be obtained from the Environment Agency's Catchment Data Explorer website (Environment Agency, 2023a).
- Freely downloadable datasets (available from the Environment Agency's Ecology and Fish Data Explorer (Environment Agency, 2023b)) will be consulted to identify any existing aquatic survey data relevant to the Site. This includes records of any protected or notable species of conservation concern and Invasive Non-Native Species (INNS).
- Freely downloadable datasets (available from Environment Agency TraC Fish Counts (Environment Agency, 2023c)) will be consulted to identify any estuarine fish data relevant to the Site. This includes records of any protected or notable species of conservation concern and INNS.

2.2.9. The findings of the aquatic desk study will also be incorporated into the full PEA report.

2.3. HABITAT SURVEY

TERRESTRIAL ECOLOGY

2.3.1. At the time of writing, a UKHab survey of the PEA Survey Area (covering the Site and a surrounding 50m buffer, where access is available) is currently being conducted. UKHab survey visits commenced in April 2023 and are due for completion in August 2023 (dependent on access availability). A Habitat Condition Assessment (HCA) in accordance with the Defra Biodiversity Metric Version 4.0 (Natural England, 2023a) is being carried out concurrently to the UKHab classification survey for use in a Biodiversity Net Gain assessment, which is to be reported on separately.

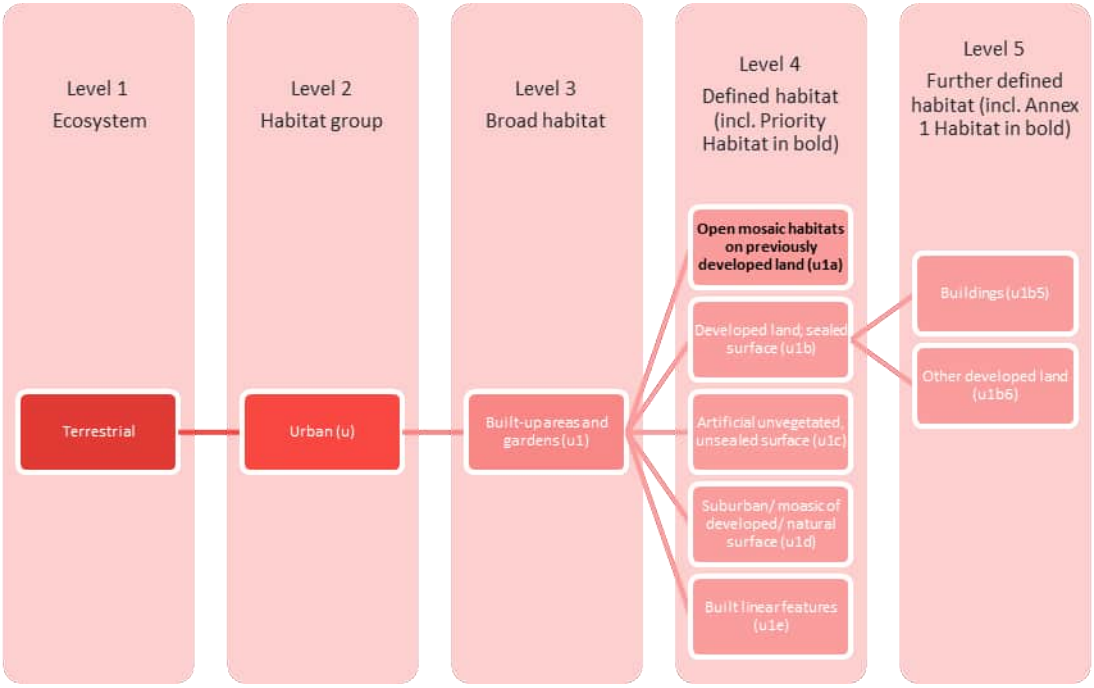
2.3.2. Habitats are being described and mapped in accordance with the Professional Version 1.1 of the UKHab classification survey methodology using the following documents:

- UKHab Classification User Manual (hereafter 'UKHab User Manual') (UK Habitat Classification Working Group, 2020a);
- UKHab Field Key Version 2.1 (UK Habitat Classification Working Group, 2020b); and

- The UKHab Classification Habitat Descriptions Version 1.1 (UK Habitat Classification Working Group, 2020c).

2.3.3. The UKHab system classifies habitats according to their vegetation types and structure, following a principal hierarchy of 'Primary Habitats' (**Chart 2-1**, below). Primary Habitats include ecosystems (level 1); broad habitat types (level 2 and 3); defined habitats, including Priority Habitats (level 4); and further defined habitats, including Annex I Habitats (level 5). Each Primary Habitat has an alpha-numeric code, unique to UKHab (i.e. different to other habitat survey methods such as Phase 1 habitat survey (JNCC, 2016)).

Chart 2-1 - UKHab Primary Habitats Hierarchy - Urban Example



2.3.4. A non-hierarchical system of numeric codes ('Secondary Codes') can then be used to provide more information on a habitat from the following categories:

- Mosaic habitats;
- Land use;
- Green infrastructure;
- Environmental qualifiers; and
- Hydrological regime.

2.3.5. Primary Habitat and Secondary Codes are being assigned to each habitat feature within the Site. Relevant Secondary Codes will be stated in the full PEA within the habitat descriptions, where relevant.

2.3.6. Text descriptions, including plant species for each habitat type, are being recorded during the UKHab surveys. A list of plant species is being compiled with

relative plant species abundance estimated using the DAFOR[7] scale. A list of plant species with their scientific names will be provided in the full PEA report. Where appropriate, consideration is being given to whether habitats qualify, or could qualify, as a HPI following habitat descriptions published by the JNCC (JNCC, 2008).

2.3.7. Target notes are being made during the UKHab surveys to identify areas too small to be mapped and to note any evidence or observations of protected and/or notable species. Common INNS plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) that are evident and incidentally recorded during the habitat surveys are also being target-noted. This includes Himalayan balsam *Impatiens glandulifera*, Japanese knotweed *Reynoutria japonica* and giant hogweed *Heracleum mantegazzianum*. It should be noted that detailed mapping of INNS, or a full survey of the PEA Survey Area for all invasive plant species, is beyond the scope of the PEA and so will not be included in the full PEA report.

AQUATIC ECOLOGY

2.3.8. An aquatic habitat survey (covering both freshwater and marine habitats) will be undertaken to assess the ecological receptors of all waterbodies present at the Site and within an appropriate Zone of Influence (ZoI) (as defined in **Chapter 8: Marine and Freshwater Ecology** of the **EIA Scoping Report**. The survey will be led by a qualified aquatic ecologist who is 'capable-accomplished' in habitat/species survey design, planning and fieldwork, and species identification as per the current CIEEM Competency Framework (CIEEM, 2021).

2.3.9. The potential for the aquatic habitats to support legally protected and/or notable aquatic species will be assessed through field observations of various channel and bank characteristics. The characteristics that will be recorded include substrate type and water depth, riparian vegetation, large wood habitat, artificial modifications, and notable features. Photographs will be taken to further detail specific features.

2.3.10. The aquatic field-based assessments will be based on standard sources of guidance on habitat suitability assessments for key faunal groups (detailed in **Section 2.4**, below) and supplemented by professional experience and judgement.

2.3.11. Any pertinent watercourse access details, in terms of suitability to carry out further in-channel surveys, will also be noted.

[7] D = dominant, A = abundant, F = frequent, O = occasional, R = rare.

2.4. PROTECTED AND NOTABLE SPECIES

2.4.1. The potential for the Site and surrounding area to support legally protected and notable species is being assessed using desk study results combined with field observations during the habitat surveys. The assessment of habitat suitability for protected and notable species is being based on professional experience and judgement. This is being supplemented by standard sources of guidance and best practice on habitat suitability assessment for key faunal groups of relevance to the Site, including:

- Birds (Gilbert *et al*., 1998 and Bibby *et al*., 2000);
- Badger *Meles meles* (Harris *et al*., 1989, Roper, 2010 and Andrews, 2013);
- Otter *Lutra lutra* (Chanin, 2003);
- Water vole *Arvicola amphibius* (Strachan *et al*., 2011 and Dean *et al*., 2016);
- Reptiles (Froglife, 1999 and Gent and Gibson, 2003);
- Amphibians (Oldham *et al*., 2000, English Nature, 2001, Gent and Gibson, 2003; Amphibian and Reptile Groups of the United Kingdom (ARG UK), 2010);
- Invertebrates (Drake *et al*., 2007 and Kirby, 2001);
- White-clawed crayfish *Austropotamobius pallipes* (Peay, 2002);
- Eel (Tesch, 2003);
- Salmonid fish (Hendry and Cragg-Hine, 1997);
- Marine fish (Marine Management Organisation (MMO), 2016); and
- Marine mammals (Special Committee on Seals (SCOS), 2018 and International Council for the Exploration of the Seas (ICES), 2019).

2.4.2. The protected and notable species assessment undertaken as part of the PEA is to inform the requirements for further, more detailed species-specific surveys. Full details of the protected and notable species assessment will be detailed within the full PEA report.

2.4.3. Further species surveys will be undertaken to confirm the presence or likely absence of a species and, if present, provide further information on the number and distribution of the species. Further species surveys currently identified and ongoing include:

- Breeding birds – commenced in April 2023 and currently ongoing. Further surveys to be undertaken until August 2023;
- Wintering and passage birds – commenced in January 2023 and continued until (and including) March 2023. Further surveys to be undertaken September to December 2023;
- Otter and water vole – commenced in April 2023 and ongoing (due to access limitations); and
- Reptiles – commenced in May 2023 and ongoing.

2.4.4. Findings of these surveys will be presented within the species-specific technical reports.

ZONES OF INFLUENCE

2.4.5. Surveys for the species/species groups listed above, as well as the UKHab survey, are subject to various ZoI that extend beyond the boundary of the Site. The various ZoI have been stipulated to ensure that a sufficient geographical area has been assessed to allow all reasonably foreseeable impacts to be taken into account. Further details on the ZoI and survey areas used for the assessment are provided in **Chapter 7: Terrestrial Ecology** and **Chapter 8: Marine and Freshwater Ecology** of the **EIA Scoping Report**.

2.5. NOTES AND LIMITATIONS

2.5.1. At the time of writing, the below specific limitations currently apply to this assessment. It is anticipated that this list will be updated for the full PEA report.

- Records held by local biological record centres and local recording groups are generally collected on a voluntary basis. Therefore, the absence of records within a data set does not necessarily demonstrate the absence of species; it may simply indicate a gap in recording coverage.
- The UKHab survey of the whole PEA Survey Area is being carried out over a number of days but covering certain areas over the period of a single day. As such, only a selection of all species that occur within these areas may be recorded. However, through use of desk study information to supplement survey data, it is considered that an accurate assessment of the potential for the PEA Survey Area to support protected species or those of conservation concern is possible. A UKHab map will be produced following the survey from field notes and plans. Whilst this will provide a sufficient level of detail to fulfil the requirements of the full PEA, the map will not be intended to provide exact locations of key habitats.
- As mentioned previously, at the time of writing, a number of locations within and surrounding the Site have not been able to be surveyed due to access limitations. It is anticipated that access will be agreed in due course to allow the survey effort to be completed. However, if any areas remain inaccessible and cannot undergo a detailed assessment, the implications of this will be discussed in the full PEA report, species-specific report and/or the ES.
- Due to the assessment being incomplete at the time of writing, the scope of species included within this assessment is based on currently available information from desk study and survey elements that have been completed. Based on any additional findings, this scope may be subject to change.
- Due to the survey effort being incomplete at the time of writing, any results presented below are not finalised and are therefore subject to change. Furthermore, no discussion of survey findings is provided, as it is not

considered possible to make an accurate assessment of findings or draw any valid conclusions at this stage.

3. RESULTS

3.1. DESIGNATED SITES

3.1.1. The identification of international, national and local statutory designated sites for nature conservation and WFD-designated waterbodies as part of the desk study has been completed. The results are provided in **Chapter 7: Terrestrial Ecology** and **Chapter 8: Marine and Freshwater Ecology** in the **EIA Scoping Report**.

3.1.2. Details of any local non-statutory designated sites located within the Site or surrounding 2km will be identified during a review of the data obtained from ERIC North East. Details will be provided in the full PEA report.

3.2. HABITAT SURVEY

UKHAB SURVEY

3.2.1. As highlighted in the previous section of this report, the UKHab survey is ongoing at the time of writing. The findings discussed below are subject to change and modification following further survey information being collated. The full findings for the habitats within the PEA Survey Area will be presented in the full PEA.

3.2.2. At the time of writing, ten different UKHab habitat types have been recorded within the Survey Area. Each habitat type (including their unique alpha-numeric Primary Habitat code) are listed below:

- h3 dense scrub
- g3c other neutral grassland
- u1 built-up areas and gardens
- h3d bramble scrub
- f2e reed beds
- h3h mixed scrub
- r1 standing open water and canals
- u1b developed land; sealed surface
- w1g other woodland; broadleaved
- g3c6 Lolium-Cynosurus grassland

3.2.3. An overview of the habitats recorded to date is provided on **Figure 2-2** of the **EIA Scoping Report**.

INVASIVE NON-NATIVE SPECIES

3.2.4. A number of INNS have been incidentally recorded during the UKHab survey in various locations within and surrounding the Site. Full details will be included in the full PEA report once the entirety of the UKHab survey is complete. In summary, species recorded to date include Japanese knotweed, giant hogweed,

wall cotoneaster *Cotoneaster horizontalis*, and Himalayan cotoneaster *Cotonesater simonsii*. These species have been found in areas subject to regular human disturbance, including areas of Port Clarence close to Wilton Engineering Wharf, around industrial facilities along Huntsman Drive, and adjacent to the Augean waste management site, south of Huntsman Drive.

3.2.5. It has also been recommended that a dedicated INNS survey of the Site be undertaken to help determine any constraints relating to the Proposed Scheme, with detailed results and mapping provided in an INNS report.

3.3. PROTECTED AND NOTABLE SPECIES ASSESSMENT

3.3.1. The potential for the Site and wider survey areas to support legally protected and notable species is being assessed using the results of the desk study and observations made during field surveys (PEA and species-specific surveys) undertaken to date. Details will be presented in the full PEA report and species-specific reports for all species scoped into the assessment.

BIRDS

3.3.2. Suitable habitat to support nesting birds has been noted within areas of the Site and surrounding surveyed area (500m, as agreed with Natural England; **Chapter 7: Terrestrial Ecology**) covered by surveys to date. These include woodland, scrub, and various grassland habitats, as well as wetland mosaic habitat within the RSPB Saltholme reserve.

3.3.3. During the PEA surveys undertaken to date, common and widespread bird species have been noted within the Site and wider survey area. During the breeding bird and wintering bird surveys, a number of protected and notable species have been identified. This includes qualifying bird species of the surrounding internationally designated sites. As these surveys are only partially completed, full details of the species, numbers and distribution of birds recorded shall be presented within the full PEA and technical bird survey reports.

BADGERS

3.3.4. Following surveys to date, habitats suitable for badgers have been noted to be limited. Habitats within the Site and wider survey area (30m; **Chapter 7: Terrestrial Ecology**) are heavily disturbed and generally lacking habitat suitable for sett building.

3.3.5. Some mammal holes have been recorded adjacent to the River Tees, to the south of the Site. However, these holes have been assessed to be indicative of rabbit *Oryctolagus cuniculus* rather than badger. No field signs indicative of badger, such as snuffle holes or well-worn mammal trails, have been noted during surveys to date.

OTTER

3.3.6. The PEA surveys and a single standalone otter survey completed to date have located 13 waterbodies and watercourses within the Site and surrounding areas. The River Tees especially provides suitability to support foraging and commuting, with the species known to be present along this watercourse (desk study and local knowledge). To date, no signs of otters have been recorded within surveyed areas. However, a number of terrestrial habitats within the Site and surrounding areas have been noted to have suitability for resting otters.

3.3.7. A second otter survey is scheduled to be undertaken in August 2023. Detailed results of both otter surveys will be provided in the otter and water vole survey technical report to be produced following completion of the surveys.

WATER VOLE

3.3.8. The PEA surveys and single standalone water vole survey completed to date have noted that the Site and wider survey area (250m; **Chapter 7: Terrestrial Ecology**) have potential to support water vole. The Site has a number of ditches where potential signs of water vole have been recorded, such as droppings and grazed grass. The ditches on Site have been assessed as being suitable for water vole due to them being vegetated with tall grass and having areas suitable for burrow building within the banks of the ditches. Water vole are also known to be present at the RSPB Saltholme reserve to the west of the Site (local knowledge).

3.3.9. A second water vole survey is scheduled to be undertaken in August 2023. Detailed results of both water vole surveys will be provided in the otter and water vole survey technical report to be produced.

REPTILES

3.3.10. Following surveys to date, some areas of the Site have been considered potentially suitable to support reptiles. The Site includes areas of grassland and scrub habitat suitable to support commuting, foraging and basking reptiles.

3.3.11. A reptile presence/likely absence survey is being undertaken, although no reptiles have been recorded in the limited areas surveyed to date. Details of survey findings will be included in a reptile survey technical report upon completion of the seven survey visits.

AMPHIBIANS

3.3.12. Ponds and other waterbodies have been identified on Site and within 500m of the Site, based on aerial imagery and mapping. The surveys conducted to date have assessed 32 waterbodies as part of a Habitat Suitability Index (HSI) assessment for great crested newt (GCN) *Triturus cristatus*. Most of the water bodies surveyed to date have been deemed to be of 'poor' suitability and unlikely to support breeding GCN. Five of the waterbodies have been assessed to be of either 'below

average' or 'average' suitability. HSI surveys are ongoing. Grassland and scrub habitats identified on Site potentially offer suitable shelter and foraging habitat for amphibian species, including GCN. However, these habitats are poorly connected to waterbodies and suitable terrestrial habitats surrounding the Site due to manmade modifications to the landscape and active industrial areas.

3.3.13. Further details of the locations of ponds and their suitability to support GCN and other amphibians will be provided in the full PEA.

INVERTEBRATES

3.3.14. No notable invertebrate species have been recorded during the surveys completed to date.

WHITE-CLAWED CRAYFISH

3.3.15. No aquatic surveys have been completed at the time of writing; therefore, no information in relation to white-clawed crayfish is currently available.

EELS

3.3.16. No aquatic surveys have been completed at the time of writing; therefore, no information in relation to eels is currently available.

SALMONID FISH

3.3.17. No aquatic surveys have been completed at the time of writing; therefore, no information in relation to salmonid fish is currently available.

MARINE FISH

3.3.18. No aquatic surveys have been completed at the time of writing; therefore, no information in relation to marine is currently available.

MARINE MAMMALS

3.3.19. No aquatic surveys have been completed at the time of writing; therefore, no information in relation to marine mammals is currently available.

4. DISCUSSION AND CONCLUSIONS

4.1.1. A discussion of the survey findings will be presented as part of the impact assessment presented within the ES, upon completion of the PEA desk study and field surveys and species-specific surveys. The discussion will consider the potential for effects on designated sites, legally protected species, notable species, and notable habitats as a consequence of the Proposed Scheme. Full details of avoidance, mitigation and compensation measures will also be within the ES.

5. REFERENCE LIST

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Appendix 9-A Water Constraints Maps

PINS Reference: **EN010150**

July 2023

Volume 2

N

Seaton Dunes and Common LNR

Cowpen Bewley Woodland Country Park LNR

East Saltholme Pool Nature Reserve

Paddy's Pool Nature Reserve

Dorman's Pool Nature Reserve

West Saltholme Pool Nature Reserve

Back Saltholme Pool Nature Reserve

Billingham Beck Valley LNR

Charlton's Pond LNR

Berwick Hills LNR

Linthorpe Cemetry LNR

0 0.4 0.8 1.6 2.4 3.2 KM

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km Buffer Zone
- Groundwater Study Area - 5km Buffer Zone
- Teesmouth and Cleveland Coast - Sites of Special Scientific Interest
- Teesmouth and Cleveland Coast - Ramsar Sites
- Local Nature Reserve- LNR
- Teesmouth National Nature Reserve
- Teesmouth and Cleveland Special Protection Areas - Marine Components GB

It should be noted that mapping data for the RSPB Nature Reserves is not available. The location of these have been labelled on the figure (e.g. 'Dorman's Pool Nature Reserve').

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-1 Water Constraints Map: Designated Sites

SCALE @ A1:	CHECKED:		APPROVED:
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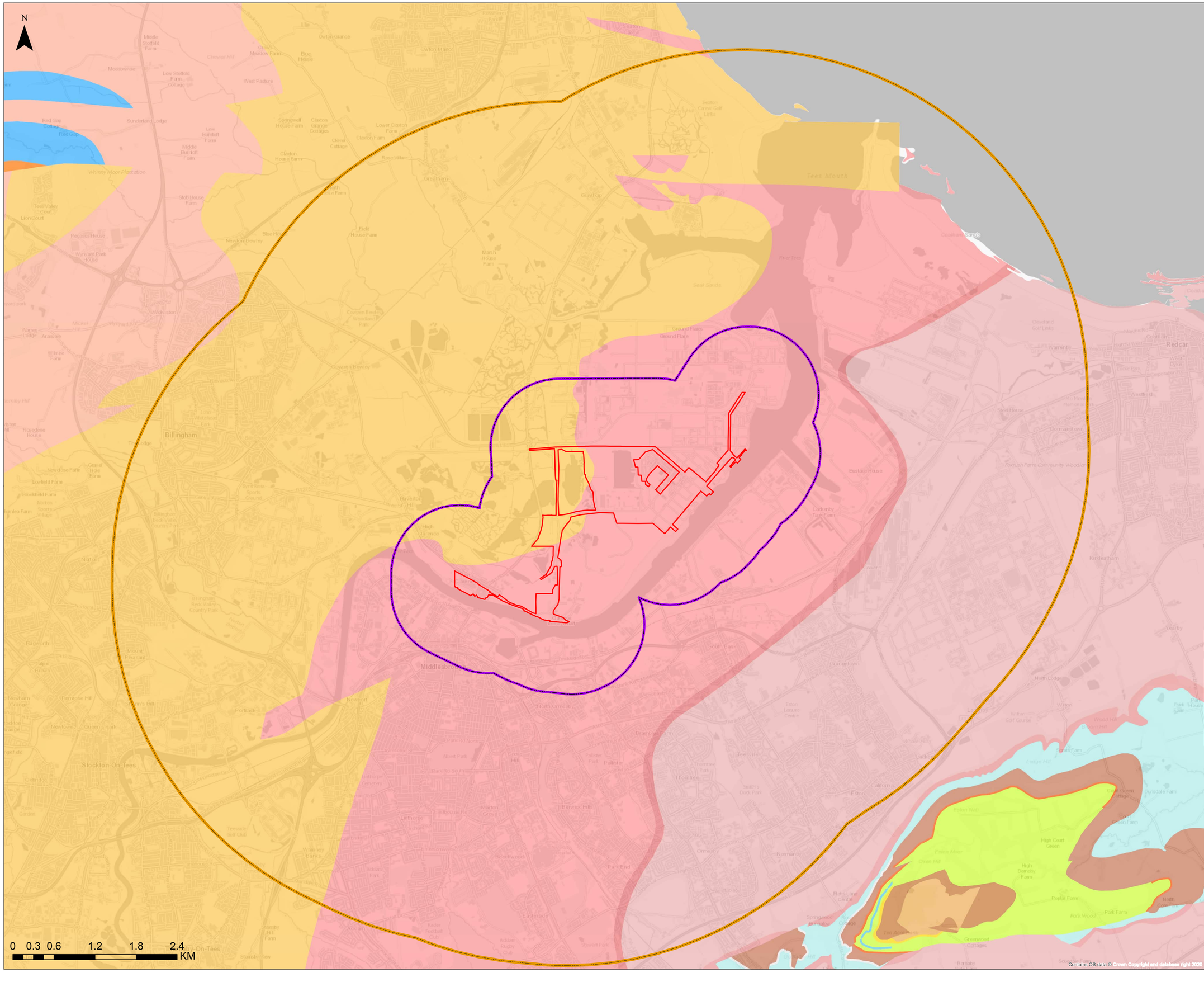
DRAWING No: 70102442-WSP-RP-ES-0901 REV: 2



Information Classification:

PUBLIC

Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km Buffer
- Groundwater Study Area - 5km Buffer

BGS Geology: Bedrock Geology

- Sherwood Sandstone Group - Sandstone
- Mercia Mudstone Group - Mudstone
- Penarth Group - Mudstone
- Redcar Mudstone Formation - Mudstone
- Seaham Formation – Limestone, Dolomitic
- Edlington Formation – Mudstone, Calcareous
- Roxby Formation – Mudstone, Calcareous
- Staithes Sandstone Formation - Sandstone
- Cleveland Ironstone Formation – Mudstone, Sandstone and Ironstone
- Whitby Mudstone Formation - Mudstone
- Cloughton Formation – Sandstone, Siltstone and Mudstone
- Crinoid Grit Member - Sandstone
- Moor Grit Member - Sandstone
- Scarborough Formation – Mudstone, Sandstone and Limestone
- Eller Beck Formation – Mudstone, Sandstone, and Ironstone
- Dogger Formation - Sandstone

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-2: Bedrock Geology

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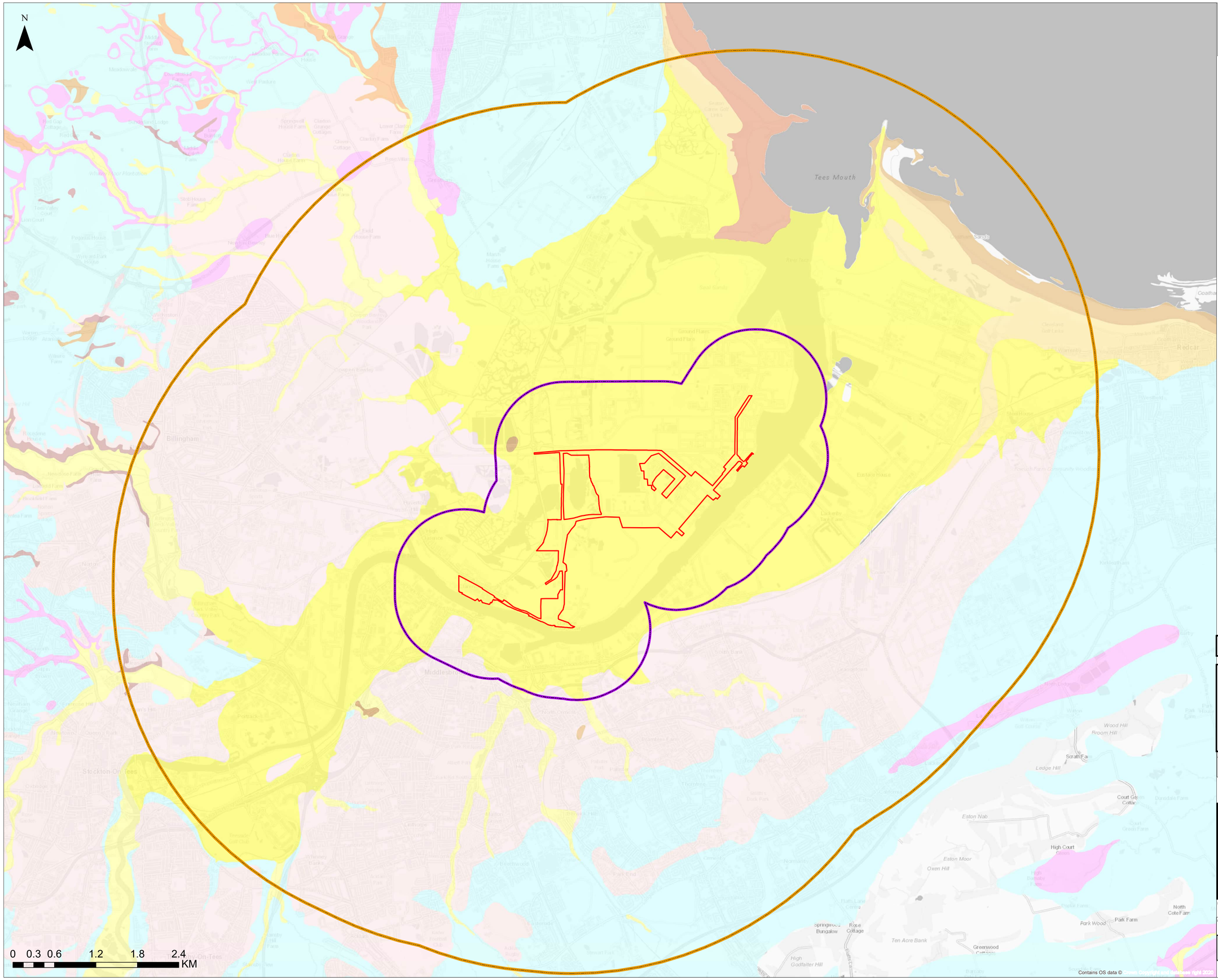

Information Classification:

PUBLIC

Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km Buffer
- Groundwater Study Area - 5km Buffer

BGS Geology: Superficial Deposits

- Glaciofluvial Deposits, Devensian – Sand and Gravel
- Till, Devensian - Diamicton
- Glaciolacustrine Deposits, Devensian - Sand
- Tidal Flat Deposits – Sand and Silt
- Peat - Peat
- Head – Clay, Silt, Sand and Gravel
- Blown Sand - Sand
- Lacustrine Deposits – Clay and Silt
- Alluvium – Clay, Silt, Sand and Gravel
- River Terrace Deposits (Undifferentiated) – Sand and Gravel
- Marine Beach Deposits – Sand and Gravel
- Beach and Tidal Flat Deposits (Undifferentiated) - Sand

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-3: Superficial Deposits

SCALE @ A1:	CHECKER:		APPROVER:
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PROJECT No:	DESIGNER:	DRAWN:	DATE:
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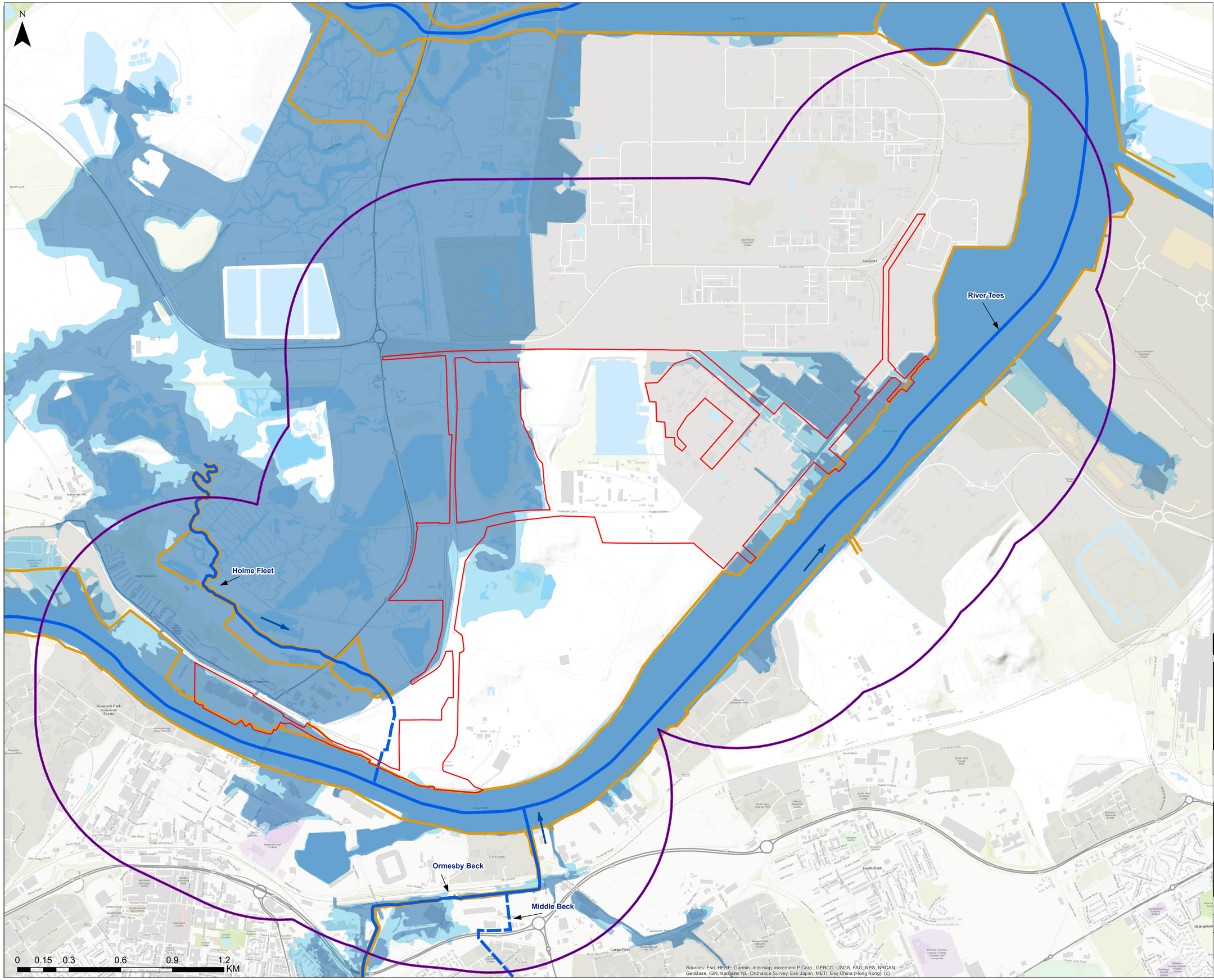

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km Buffer Zone
- Main Rivers
- Culverted River Section
- Flood Defences
- Flood Zone 3
- Flood Zone 2
- Flow Direction

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS:	FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT:	Lighthouse Green Fuels Ltd.
PROJECT:	Lighthouse Green Fuels
TITLE:	Figure 9-4 Water Constraints Map: Flood Zones and Main Rivers

SCALE @ A1: 1:10000	CHECKED: ES		APPROVED: JG
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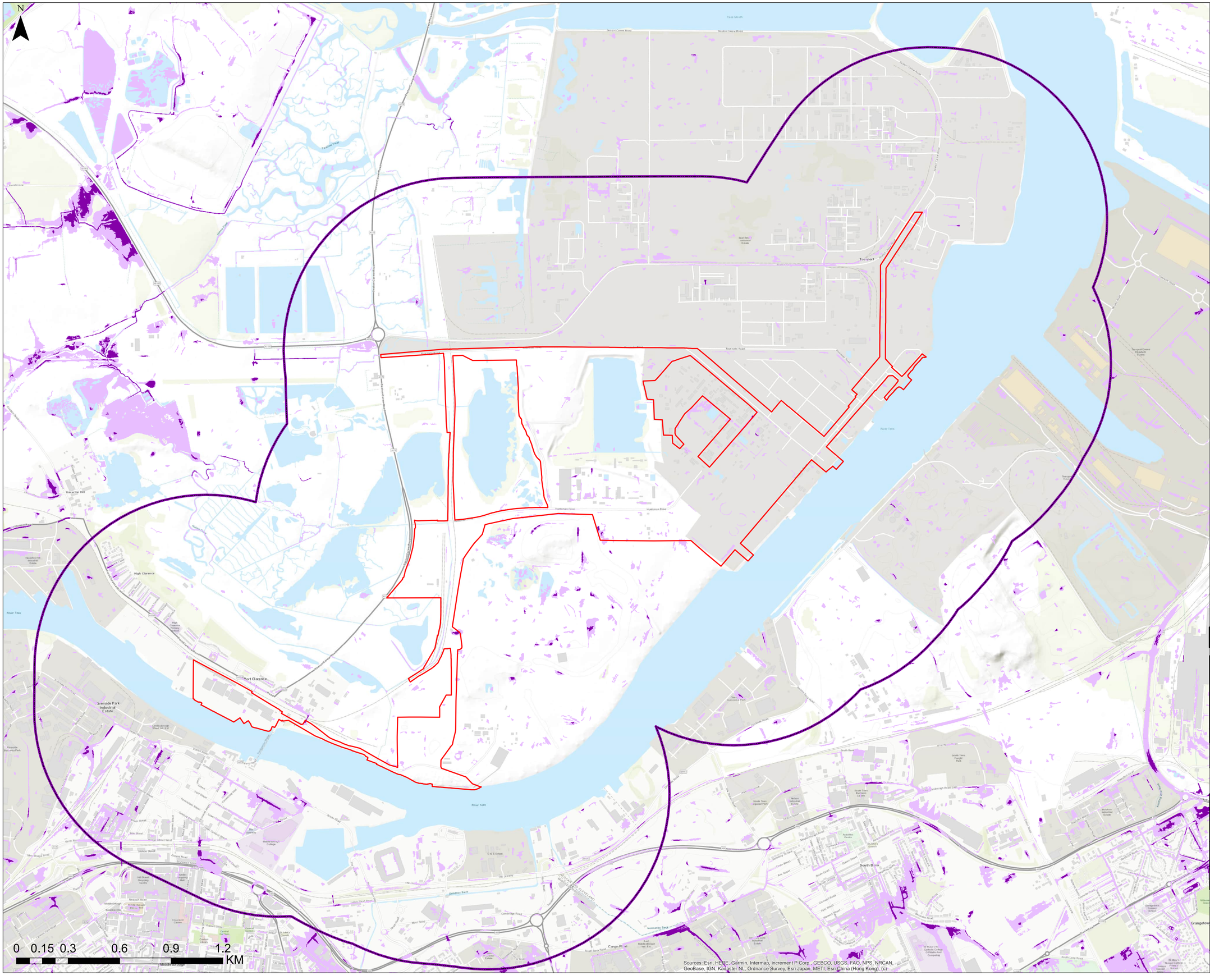
DRAWING No: 70102442-WSP-RP-ES-0904			REV: 2



DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km Buffer Zone

Risk of Flooding from Surface Water (Probability of Occurence)

- High (Greater than 1 in 30 Years)
- Medium (Between 1 in 30 and 1 in 100 Years)
- Low (Between 1 in 100 and 1 in 1000 Years)

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-5 Water Constraints Map: Risk of Flooding from Surface Water

SCALE @ A1:	CHECKED:		APPROVED:
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PROJECT No:	DESIGNED:	DRAWN:	DATE:
70102442	ES	AV	09/07/2023

DRAWING No: 70102442-WSP-RP-ES-0905 REV: 2

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Surface Water Study Area - 1km
- Buffer Zone
- Flood Risk From Reservoirs: When River Levels are Normal
- Flood Risk From Reservoirs: When There is also Flooding from Rivers

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-6 Water Constraints Map: Risk of Flooding from Reservoirs

SCALE @ A1:	CHECKED:		APPROVED:
1:25000	ES		JG
PROJECT No:	DESIGNED:	DRAWN:	DATE:
70102442	ES	AV	09/07/2023

DRAWING No: 70102442-WSP-RP-ES-0906 REV: 2

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N

1/25/04/134

1/25/04/068

1/25/04/164

0 0.05 0.1 0.2 0.3 KM

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

Proposed DCO Application Boundary

Groundwater Abstractions

Abstractions (Licence Number)

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

Note - Multiple abstractions under same licence are highlighted with black points. Table 9-4 in the Water Environment and Flood Risk (Chapter 9) provides more information on target supply and purpose of use.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-7 Groundwater Abstractions (licensed)

SCALE @ A1:	CHECKED:	APPROVED:
1:3000	MW	JK

PROJECT No:	DESIGNED:	DRAWN:	DATE:
70102442	MW	AV	18/07/2023

DRAWING No:	REV:
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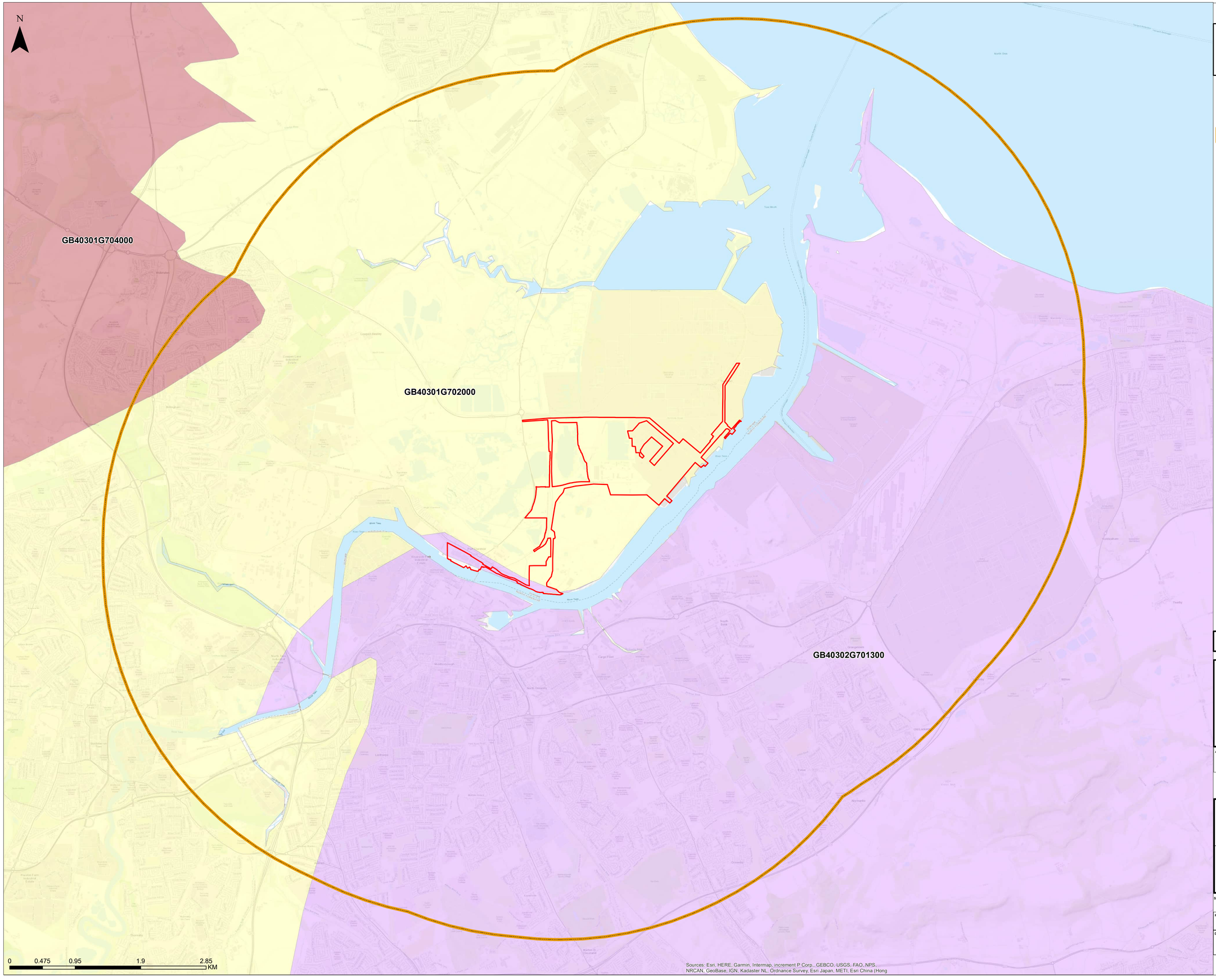

DO NOT SCALE

Information Classification:

PUBLIC

Information that is available to the general public and is intended for distrubution outside WSP.

Key

- Proposed DCO Application Boundary
- Groundwater Study Area - 5km Buffer

WFD Groundwater Body (Cycle 3)

- Tees Sherwood Sandstone - GB40301G702000
- Skerne Magnesian Limestone - GB40301G704000
- Tees Mercia Mudstone and Redcar Mudstone - GB40302G701300

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: FINAL

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd.

PROJECT: Lighthouse Green Fuels

TITLE: Figure 9-8 Water Framework Directive (WFD) Groundwater Bodies

SCALE @ A1:	CHECKED:		APPROVED:
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DRAWING No:	REV:
70102442-WSP-RP-ES-0908	2

Appendix 17-A: Preliminary Environmental Risk Assessment

PINS Reference: **EN010150**

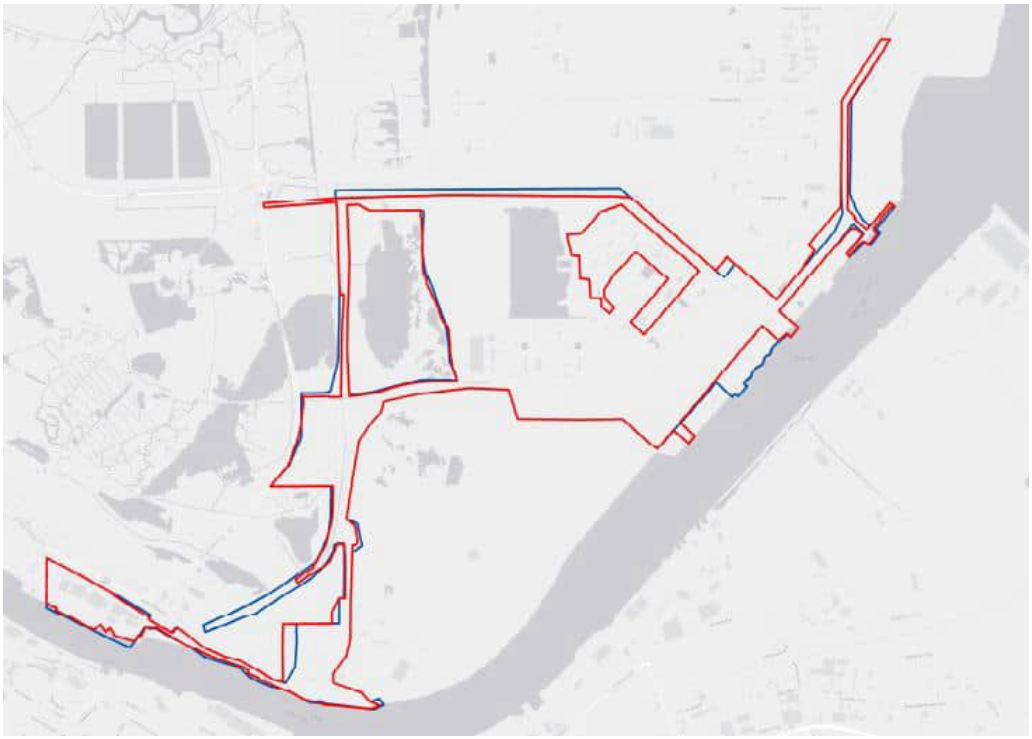
July 2023

Volume 2

PREAMBLE

This Preliminary Environmental Risk Assessment and associated data collation was based on the version of the Proposed Scheme Consent Order (DCO) Application Boundary at the time the Groundsure Report was commissioned. The Proposed DCO Application Boundary has subsequently been revised, as such the boundary shown on the Groundsure Report differs slightly to the Proposed DCO Application Boundary at the time of EIA Scoping submission. **Insert 1** below shows the relationship between these two boundaries.

Insert 1 – Relationship Between Current and Superseded Proposed DCO Application Boundary



Whilst it is acknowledged that there are some differences between these boundaries, it is not considered that these are sufficiently extensive as to materially impact on the assessment undertaken herein, hence we are of the opinion that the findings and conclusions of this report remain applicable to the Proposed Scheme.

It is noted that although the primary data sources (primarily the Groundsure Report) included within this Preliminary Environmental Risk Assessment refer to the Proposed DCO Application Boundary at the time the Groundsure Report was commissioned, the

figures produced for inclusion within Appendix A of this report are based on the current Proposed DCO Application Boundary, shown in **Insert 1**. Unless stated otherwise when referring to 'the Site' reference is being made to the current Proposed DCO Application Boundary.

1. INTRODUCTION

1.1. BACKGROUND

1.1.1. Lighthouse Green Fuels Ltd (LGF) (the 'Applicant') is submitting an application for a Development Consent Order (DCO) to develop a waste to Sustainable Aviation Fuel (SAF) facility (the 'Proposed Scheme') on land at Port Clarence, near Stockton-on-Tees, Teesside (the 'Site'). The location of the Proposed Scheme is shown in Figure 1, **Appendix A**.

1.2. OVERVIEW AND OBJECTIVES

1.2.1. The Applicant has instructed WSP UK Ltd to prepare a Phase 1 Preliminary Environmental Risk Assessment (PERA) for the Proposed Scheme. The aim of this PERA is to identify potential constraints relating to contamination which may impact on the proposed redevelopment and provide sufficient baseline information to inform the Geology & Soils Chapter of the Environmental Impact Assessment (EIA) **Scoping Report** (to which this is appended, as **Appendix 17-A**). The overall objective is to aid the client in support of the DCO application process and inform proposed environmental assessments.

1.2.2. At the time of writing, access to complete a Site walkover had not been undertaken, and as such this report has been prepared solely on the basis of desk based research.

1.2.3. The Site (as per Figure 1 which shows the current Proposed DCO Application Boundary) has an area of approximately 205.66 hectares (ha) and is located in the North Tees Complex Industrial Estate.

1.3. SOURCES OF INFORMATION

1.3.1. The information presented within this report has been collated from the following sources:

- Groundsure Enviro + Geo Insight (Ref: GSIP-2023-13564-13638) and Groundsure Insight Historical Ordnance Survey mapping (based on the Proposed DCO Application Boundary at the time the Groundsure Report was commissioned)
- British Geological Survey (BGS) Onshore GeoIndex online viewer (logs included in **Appendix B**)
- Zetica UXO Pre-Desk Study Assessment, April 2023 (included in **Appendix C**)
- Coal Authority Interactive Map viewer
- BGS 1:50,000 map, Sheet 33 Stockton Solid and Drift Geology
- BGS 1:10,000 map, Sheet NZ52SW, Solid and Drift Geology
- EA Catchment Data Explorer

- DEFRA Magic Map website
- Cranfield Soil and Agrifood Institute Soilscapes

1.3.2. The following publicly available report has been used in the production of this report. WSP does not have reliance on the information within this report but has included factual details for background knowledge.

- Atkins Member of the SNC Lavalin Group (July 2018) Groundworks Teesside (Former TV1 and TV2), Baseline Ground Investigation Factual Report for Millennium EFW Ltd (henceforth referred to as Atkins 2018).

1.4. CONFIDENTIALITY STATEMENT AND LIMITATIONS

1.4.1. This report is addressed to and may be relied upon by Lighthouse Green Fuels only as the Applicant, who has sole use and reliance. This report shall not be relied upon or transferred to any other parties without the express written authorisation of WSP. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party. General limitations of the assessment are included as **Appendix D**.

2. BACKGROUND

2.1. SITE DESCRIPTION AND WALKOVER

2.1.1. Pertinent Site details are summarised in **Table 2-1**. A general Site layout plan is included as Figure 2**, Appendix A**. It is noted that at the time of writing, access had not been granted to complete a Site walkover. The following is therefore based on readily available desk based information sources.

Table 2-1 - Site Details

Site Address		**Land at Port Clarence, near Stockton-on-Tees, Teesside, TS2 1TT**
Site Location		Port Clarence, Teesside
National Grid Coordinates		Approximate centre – 451702 522463
Current Use	General	The majority of the Site currently comprises non-operational land. Areas of the Site comprise partially developed Energy from Waste (EfW) facilities for which planning permission was obtained in 2011 and 2013, however, these developments were suspended in November 2015 with the operator announcing they were exiting the EfW market in April 2016. These partially developed areas are known as TV1 and TV2 (as shown on Insert 2-1). An operational Materials Recycling Facility (MRF), operated by N + P Group is located to the west of TV1 and TV2. The northern area of the Site comprises non-operational brownfield land comprising hardstanding tracks and areas used for car parking. The extent of the southwestern and southern boundary of the Site encompasses Port Clarence and Clarence Wharf. Port Clarence is currently occupied by Port Clarence Logistics and the Wilton Group. The remainder of the Site currently comprises existing access roads, jetties, railway lines and open land.
	Ground Cover	Ground cover across the Site is anticipated to comprise variably hardstanding, gravel cover and scrubland.
	Elevation and Topography	The Site is relatively flat, lying at an elevation of approximately 6m Above Ordnance Datum (AOD).
	Access	Access across the Site is limited and with the exception of the former TV1 and TV2 areas access is restricted to all operational and non-operational areas. Access is largely limited to public access roads as follows: ▪ North of the existing facility (un-named)

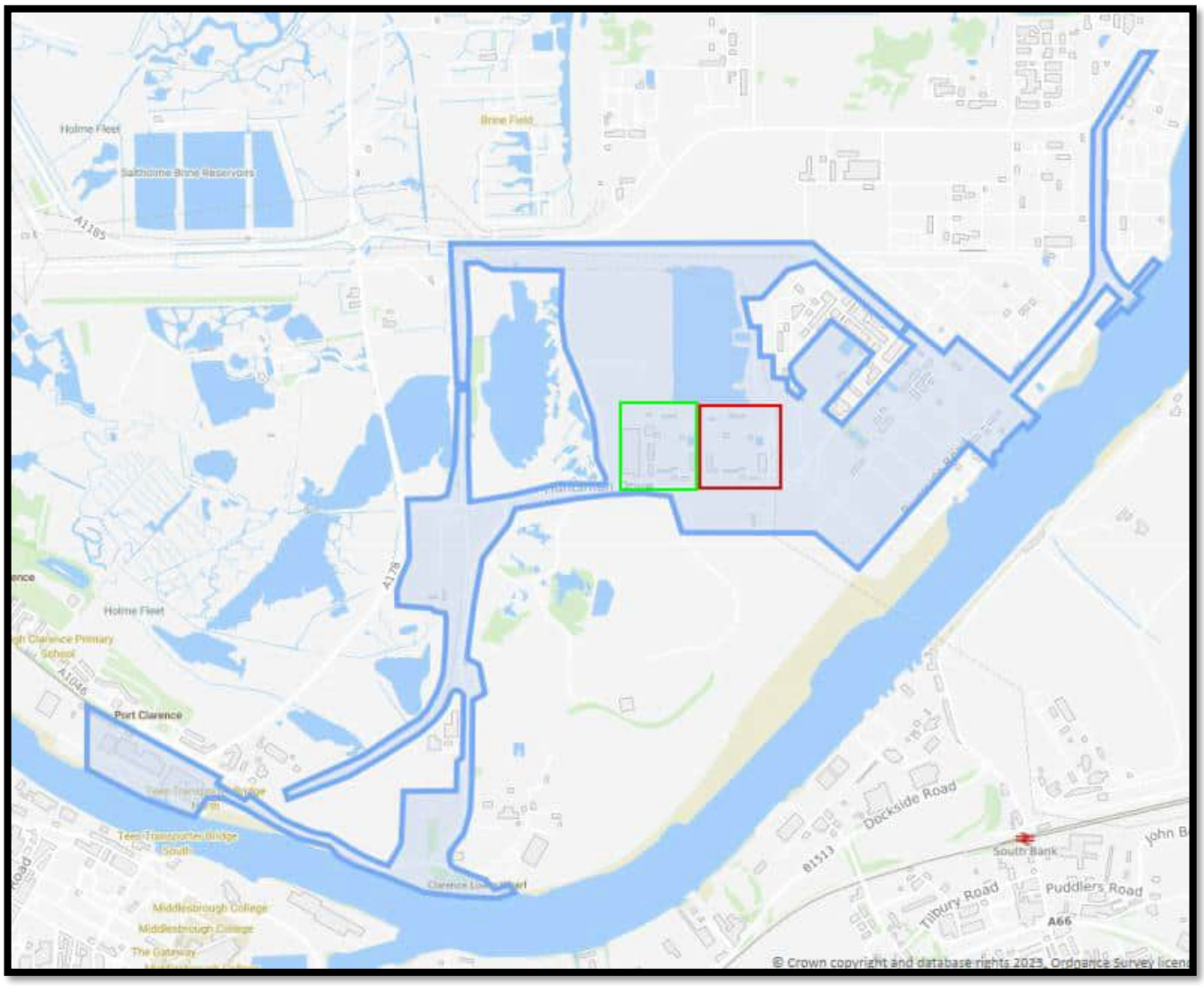
Site Address		Land at Port Clarence, near Stockton-on-Tees, Teesside, TS2 1TT
		▪ South of the existing facility (Huntsman Drive) ▪ North of the Port Clarence Area (A1046, Port Clarence Road) ▪ West of the Site (A178, Seaton Carew Road).
	Boundaries	The existing facilities and infrastructure (operational and non-operational) are secured with steel palisade fencing, public access is prohibited to other areas of the Site with wooden fencing.
Surrounding Land Uses		The Site is situated within a heavily industrialised area of Teesside and is surrounded to the north, south and east by a mixture of operational and non-operational industrial facilities. Industries of note include the following: ▪ Augean Waste Management Services (active landfill), adjacent to the south-east of the Site; ▪ Riverside Road Bulk Liquid Storage and Jetties, adjacent and intersecting the eastern extent of the Site; ▪ Seal Sands Navigator Terminals, adjacent to the north-eastern extent of the Site; ▪ Teesside Biomass and Industrial Chemicals Limited, adjacent to the south of the Site; ▪ Teesside Gas Processing Plant, approximately 200m north of the Site; and ▪ Billingham Community Fire station, adjacent to the north-west of the Site. Residential properties forming the small village of Port Clarence are situated off Site, to the north of the south western extent of the Site boundary. Port Clarence is the only residential area in close proximity to the Site. The area to the west has an industrial past, however, currently comprises open land with surface water bodies. A number of nature reserves have been established to the west, including the following: ▪ Dorman's Pool Nature Reserve; ▪ Saltholme East Pool Nature Reserve; ▪ RSPB Saltholme; and ▪ Paddy's Pool Nature Reserve.

2.2. EXISTING INFORMATION

2.2.1. An existing Baseline Ground Investigation Factual Report (Atkins 2018) reviewed during the production of this report covers part of the Proposed Scheme boundary including the TV1 (8 ha) and TV2 (6.5 ha) facilities and a Slag Stack / Laydown area

(1.5 ha) to the immediate north of TV2. The area of TV1 is shown in red and TV2 in green on **Insert 2-1**.

Insert 2-1 - TV1 and TV2 Areas



2.2.2. The Atkins 2018 baseline factual report references the following three reports which were used to inform the scope of the 2018 ground investigation.

- Atkins, 2010. Air Products Plc and Chemicals UK Renewable Energy from Waste Project Teesside Phase 1 Environmental Site Assessment.
- Atkins, 2012. Phase 3 Area of the Impetus Reclamation Ponds Site, Stockton on Tees - Geo-Environmental Interpretative Report.
- Atkins, 2014. Tees Valley 2 Energy from Waste Facility - Geo-Environmental Interpretative Report (covering the 2013 investigation).

2.2.3. As the most recent report, the following summary is based on the Atkins 2018 baseline factual report. The Site is described as predominantly surfaced by gravel

with plant areas on concrete hardstanding and roads partially asphalted. The Slag Stack/ Laydown areas is described as vacant land.

2.2.4. The report states that historically the Site was reclaimed from tidal mud flats and was developed into a waste facility in 2010. The surrounding off-Site refinery infrastructure development took place in the mid-1970's and there is a landfill off-Site to the southwest which began as spoil heaps in 1990 and has expanded since.

2.2.5. A ground conditions overview describes Made Ground over Tidal Flats (superficial deposits, Secondary Undifferentiated Aquifer) over the Mercia Mudstone (bedrock, Secondary B Aquifer). A reclamation pond is located immediately north of the Site and the River Tees is 500m south. Proximal ecologically sensitive sites include a RAMSAR, Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI). The report recorded a medium risk from UXO.

2.2.6. The scope of works included 21 no. boreholes to between 9m – 11m bgl (metres below ground level), installation of 16no. monitoring wells, chemical analysis of soils, leachate and groundwater, ground gas monitoring and groundwater sampling.

2.2.7. Ground conditions encountered during intrusive investigation were recorded as Made Ground to between generally between 4.6m to 6.1m thick with several boreholes not proving the maximum depth (greater than 9-10m bgl). Made Ground was underlain by organic clay/silt or sand. Visual and olfactory evidence of contamination was noted in several locations comprising sulphurous, ammoniacal, hydrocarbon or organic odours. Groundwater was recorded between 4.0 - 5.0m bgl (1.035m to 1.61m AOD).

2.2.8. Soil chemical results (from 35no samples of Made Ground analysed) recorded detectable metals, polyaromatic hydrocarbons (PAHs) and mid to longer chain petroleum hydrocarbons. Soil results were not compared against any assessment criteria however the minimum and maximum results for each analyte are presented and for some analytes the maximum concentrations were 1-2 orders of magnitude higher than the minimum. The most notable analytes included PAHs, longer chain aromatic hydrocarbons, copper, lead and zinc. No volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) were detected in soil samples analysed. Asbestos was not identified within any of the samples analysed.

2.2.9. Leachate results (from 10no. samples analysed) recorded sporadic leachable inorganics (i.e., sulphate and chloride), metals (predominantly arsenic, cadmium, copper, lead and zinc) and PAHs (naphthalene, acenaphthylene, acenaphthene, fluorene, and phenanthrene).

2.2.10. Groundwater results (from 16no. samples analysed) recorded no detectable PAHs or petroleum hydrocarbons. Detectable vinyl chloride (chlorinated hydrocarbon), bis(2-chloroethyl) ether (plasticiser) and metals were recorded in groundwater samples analysed.

2.2.11. Ground gas results recorded maximum methane (0.12%v/v), carbon dioxide (0.4%v/v) and a maximum flow rate of 0.8l/hr (litres per hour).

3. SITE SETTING

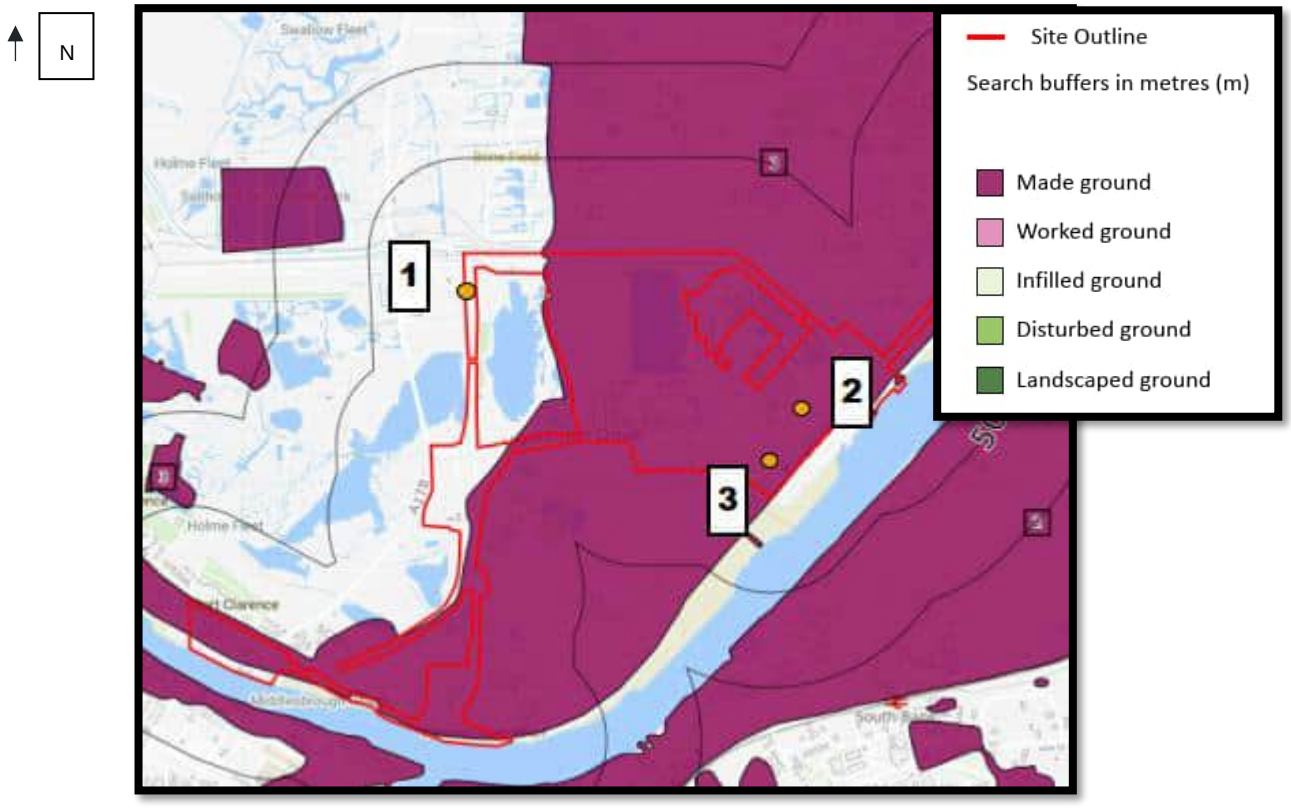
3.1. GEOLOGY

3.1.1. Information reviewed from the published British Geology Survey (BGS) 1:50,000 geological map series (Sheet 33, Stockton, Solid) and within the Groundsure report indicates the majority of the Site is underlain by Made Ground over superficial deposits comprising Tidal Flat Deposits (formerly Estuarine and Marine Alluvium) underlain by bedrock of the Mercia Mudstone Group (MMG) with the Sherwood Sandstone Group (SSG) underlying the access road along the western edge.

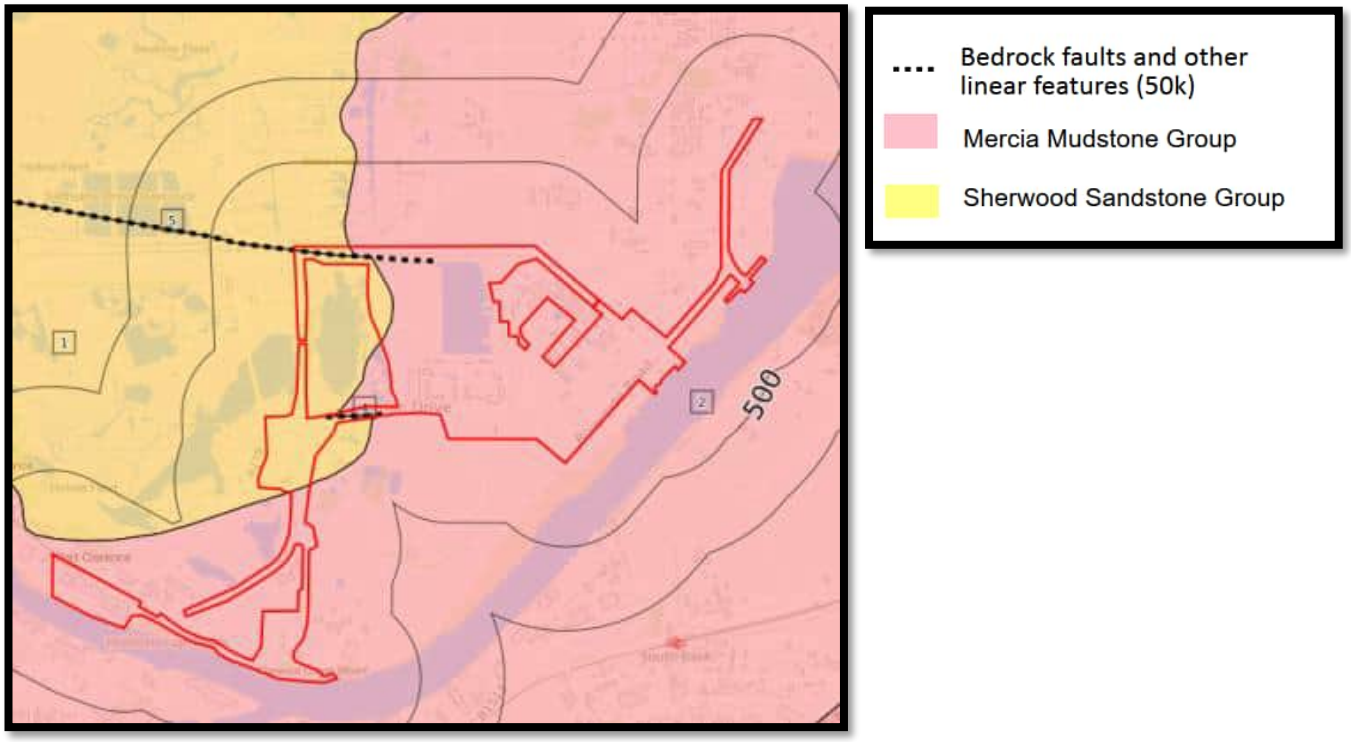
3.1.2. The MMG consists of brown and red-brown, calcareous clays and mudstones, with occasional beds of impersistent green siltstone and fine-grained sandstone. The SSG consists of sandstone, red, yellow and brown, part pebbly; conglomeratic in lower part. The Saltholme Fault runs along the northern boundary of the Site.

3.1.3. Extracts from the Groundsure Report are provided as **Insert 3-1** and **Insert 3-2**. **Insert 3-1** shows the extent of known Made Ground with selected BGS borehole record locations shown in orange (logs discussed below) and the extent of bedrock deposits and faulting is shown on **Insert 3-2**. Superficial deposits comprising Tidal Flat Deposits are shown to be present beneath the entire Site area.

Insert 3-1 –Extent of Known Made Ground *(Extract from Groundsure)*



Insert 3-2 - Extent of Bedrock Deposits *(Extract from Groundsure)*



3.1.4. BGS borehole records that are available online (BGS Onshore GeoIndex) have been reviewed. Three borehole records, as shown in **Insert 3-1** and provided in **Appendix B**, have been selected to represent the Site spatially and the strata recorded in these logs is detailed as follows:

- Log 1 (NZ52SW479) located adjacent to the proposed access road in the northwest of the Site. The borehole recorded 32m of superficial deposits comprising:
    - sand (3.0m thick), grey silt (11.3m thick) – interpretated as Tidal Flats
    - boulder clay (11.3m thick), boulders (0.6m thick) and boulder clay (6.7m thick) – interpretated as Glacial Till.

3.1.5. Directly underlying the Glacial Till, red sandstone interpreted as Sherwood Sandstone (formerly named Bunter Sandstone) was encountered at 32.9m bgl, this was proven for 89m, the borehole terminating at approximately 121.9m bgl. The presence or absence of groundwater was not recorded on the log.

- Log 2 (NZ52SW180/M) located in the southeast of the Site. This record includes 5 logs labelled No. 1100 – 1104. The logs record a similar geology across the area investigated, as summarised below:

- Ground level to between 3.81m and 6.17m bgl (all boreholes) – light brown (becoming black in two locations) laminated clayey silt with traces of sand (interpretated as Tidal Flats).
- From 3.81m to 6.17m bgl down to 10.13m to 10.97m (all boreholes) – medium dense brown fine to medium sand (interpretated as Tidal Flats).
- From 10.97m to 14.32m bgl (in three boreholes) brown silty clay (no. 1100), 10.66m to 12.34m brown laminated clay (no. 1101) and 10.13m to 11.88m laminated sandy clay with gravel (no. 1103) (interpretated as Tidal Flats).
- From 10.13m to 16.15m bgl (all boreholes) – boulder clay (interpretated as Glacial Till).

3.1.6. Bedrock was encountered between 12.49m and 13.15m bgl and described as a marl (interpretated as Mercia Mudstone Group). The presence or absence of groundwater was not recorded on the logs.

- Log 3 (NZ52SW243/B) also located in the southeast of the Site. The borehole recorded superficial deposits to 5.18m bgl (silt and sand to 2.29m bgl, over sand to 5.18m bgl) (interpretated as Tidal Flats). Underlain by bedrock to 7.09m bgl (maximum drilling depth) described as red becoming grey marl (interpretated as Mercia Mudstone Group). The presence or absence of groundwater was not recorded on the log.

3.2. MINING, GROUND WORKINGS AND NATURAL CAVITIES

3.2.1. A review of the Coal Authority Interactive map viewer available online indicates the Site does not lie within a Coal Mining Reporting Area. The risk from coal mining related features is therefore considered to be negligible.

3.2.2. The Groundsure report records the following mining related features on, or within 250m of, the Site.

- One Brine Well recorded 133m southwest, ceased operation;
- Surface ground working (multiple refuse heaps, unspecified pits, ponds and water bodies);
- Underground workings, two tunnels recorded on the Site;
- A historical mineral planning area for surface mineral working of salt on the Site;
- Non-coal mining related underground workings for brine. Multiple records on, and within 250m of, the Site; and
- Mining cavities comprising reported abandoned mineral workings and possible surface instability problems. One recorded on the Site and seven within 250m of the Site.

3.3. HYDROGEOLOGY

3.3.1. According to the Groundsure report the superficial Tidal Flats deposits are classified as a Secondary Undifferentiated Aquifer and the underlying bedrock is classified as a Secondary B Aquifer (MMG) and a Principal Aquifer (SSG).

3.3.2. The Groundsure report classifies the superficial and bedrock deposits as high vulnerability which are deposits that can easily transport pollution to groundwater. The Site does not lie in a groundwater source protection zone.

3.3.3. A summary of the active groundwater abstractions recorded on, or within 250m of, the Site is provided in **Table 3-1**:

Table 3-1 - Active Groundwater Abstractions

On-Site / Off-Site (distance m and direction)	Details	Source	Volume (per year in m3)
On-Site	General use relating to Secondary Category	Groundwaters – Triassic Mudstones	450,000
7m northwest	General use relating to Secondary Category	Groundwaters – Triassic Sandstones	1,800,000
206m northwest	General use relating to Secondary Category	Groundwaters – Triassic Sandstones	1,800,000

3.3.4. The nearest active potable abstraction borehole is recorded 647m southwest of the Port Clarence extent of the Site. This is for drinking water abstracted from the sandstone.

3.3.5. A Brine Field is situated to the northwest of the Site and influence from abstractions should be considered when assessing likely groundwater flow direction as large-scale abstractions can influence local groundwater flow directions.

3.3.6. The Water Framework Directive (WFD) classifies the SSG as having a good chemical and overall rating and the MMG as having a poor chemical and overall rating.

3.4. HYDROLOGY

3.4.1. Several unnamed lakes and inland rivers are recorded within and immediately adjacent to the Site boundary. The Site borders the River Tees to the southeast and south and includes jetties present within the river. According to the Groundsure report the River Tees is classified under the WFD as chemical rating (fail) and ecological rating (moderate) with an overall rating of moderate.

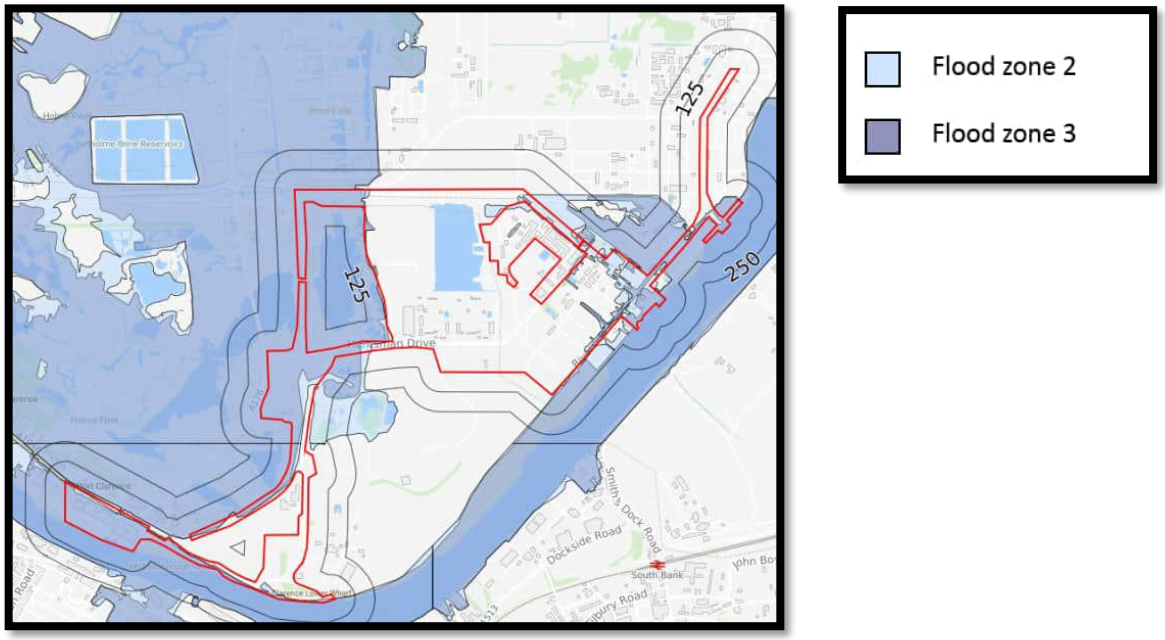
3.5. FLOODING

3.5.1. **Insert 3-3** indicates the recorded flood zones at the Site for rivers and coastal flooding and **Insert 3-4** shows the recorded extent of surface water flooding.

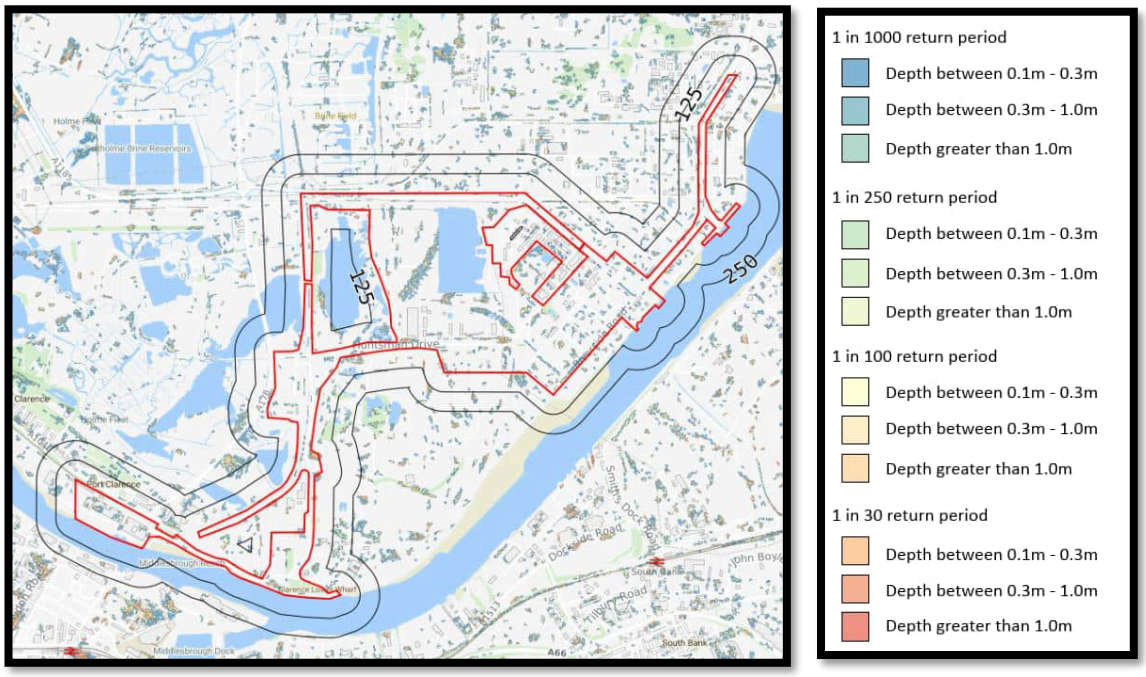
3.5.2. Land within flood zone 2 is defined as “Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding”.

3.5.3. Land within flood zone 3 is defined as “Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea” or “land where water from rivers or the sea has to flow or be stored in times of flood”.

Insert 3-3 – Extent of River and Coastal Flooding *(Extract from Groundsure)*



Insert 3-4 – Extent of Surface Water Flooding *(Extract from Groundsure)*



3.6. SENSITIVE LAND USES

The sensitive land uses recorded on, or within 250m of, the Site are presented in **Table 3-2**.

Table 3-2 - Sensitive Land Uses

On-Site/ Off-Site (direction and distance (m))	Land Use	Name	Details
On-Site	Sites of Special Scientific Interest	Teesmouth and Cleveland Coast.	-
24m west		Teesmouth and Cleveland Coast.	-
44m west		Teesmouth and Cleveland Coast.	-
On-Site	Conserved wetland site (Ramsar)	Teesmouth and Cleveland Coast.	Medium-large site encompassing a range of habitats (sand and mudflats, rocky shore, saltmarsh, freshwater marsh and sand dunes) on and around an estuary which has been much modified by human activities. Together these
23m southeast			
27m west			

			habitats support internationally important numbers of waterbirds
On-Site	Special Protection Areas	Teesmouth and Cleveland Coast	Marine areas, Sea inlets; Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins); Salt marshes, Salt pastures, Salt steppes; Coastal sand dunes, Sand beaches, Machair; Bogs, Marshes, Water fringed vegetation, Fens; Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites); Shingle, Sea cliffs, Islets
27m west			
228m north			

3.6.1. There are no other recorded Sites of Special Scientific Interest, Ramsar sites, Special Protection Areas, Special Areas of Conservation, National Nature Reserves, Local Nature Reserves, Designated Ancient Woodland, Biosphere Reserves, Forest Parks, Marine Conservation Areas or Green Belt recorded on, or within 250m of the Site.

3.6.2. As shown on DEFRA Magic Maps and within the Groundsure Report, the majority of the Site is classified as urban with a small area in the northwest classified as Grade 5 (very poor quality).

3.7. GROUND STABILITY

3.7.1. Ground stability hazards identified within the Groundsure report are summarised in **Table 3-3.**

Table 3-3 – Ground Stability Hazards

Stability Hazard	Risk Level (within 50m of the Site)
Potential for collapsible ground	Negligible
Potential for compressible ground	Moderate
Potential for dissolution	Negligible
Potential for landslides	Low
Potential for running sands	Moderate
Potential for shrink/ swell clays	Very Low

3.8. LANDFILLS AND WASTE MANAGEMENT SITES

LANDFILLS

3.8.1. The Groundsure report records the following active or recent landfills on, or within 250m of, the Site:

- Industrial Chemicals Ltd (on-Site, southern extent to the north of Clarence Wharf) for household, commercial and industrial waste – closed;
- Augean North Limited (to the immediate south of the main SFA facility, to the south of Huntsman Drive) for waste landfilling of inert waste – active;
- The Land Restoration Trust (51m southeast of the Internal Heavy Haul Road) for other landfill taking special waste – closed;
- Industrial Chemicals Ltd (103m southeast of the Internal Heavy Haul Road) for industrial waste landfill (factory curtilage) – closed; and
- The Land Restoration Trust (111m southwest of the Internal Heavy Haul Road access area at Port Clarence) for industrial waste landfill (factory curtilage) – closed.

3.8.2. The Groundsure report records the following historical landfills on, or within 250m of, the Site:

- A refuse tip (97m southeast) shown on 1968 mapping;
- Clarence Works, Fire Bund. Shown to be a linear landfill extending north from Clarence Wharf at the southern extent of the Site, running along the western boundary to Huntsman Drive, turning east to follow Huntsman Drive and then extending south to end at the shoreline of the River Tees. The landfill licence is recorded to have been held by British Steel Corporation for the acceptance of inert and industrial waste. Last recorded waste input indicated as occurring in 1990;
- South of the Seal Sands Road (adjacent to the north of Seal Sands Road to the north of the Site) for inert, industrial and commercial waste. Last recorded waste input indicated as occurring in 1978;
- BSC Chemical Works (176m southwest of the boundary with Huntsman Drive), licence recorded to be held by British Steel Corporation for industrial and liquid sludge. Last recorded waste input indicated as occurring in 1990; and
- TDC Landfill (236m southwest), licence held by Bitmac Limited for industrial and liquid sludge. First recorded 1912, date of last waste input not recorded.

WASTE MANAGEMENT SITES

3.8.3. The Groundsure Report records a total of 13 licenced waste sites on the Site and a further 21 within 250m of the Site:

- North Tees Waste Limited (on-Site, shown to be in the area of TV2) – household, commercial and industrial waste;

- North Tees Remediation Limited (on-Site, ‘Reclamation Pond’ shown to be in the area to the north of TV1) – deposition of waste to land as a recovery operation, stated to be a Physical Treatment Facility;
- FLIQDS Remediation Limited (on-Site, shown to be located along the Internal Heavy Haul Road – household, commercial and industrial waste;
- Impetus Waste Management Limited (on-Site, shown to the east of TV1) - physical treatment facility;
- North Tees Waste Management Limited (on-Site, shown to the east of TV1) - physical treatment facility; and
- Zero Waste Limited (listed within the Groundsure Report to be on-Site, however is to the south of Huntsman Drive) – Port Clarence Landfill and Port Clarence Hazardous Waste Landfill site. Operated under various different licence numbers. Licences held for the disposal and co-disposal of household, commercial, industrial and special waste.

3.9. RADON

3.9.1. The Groundsure report indicates that the Site lies within a lower probability radon area where less than 1% of properties are at or above action level. Radon protection measures are therefore not required in the construction of new buildings.

3.10. UNEXPLODED ORDNANCE (UXO)

3.10.1. A Zetica UXO Pre-Desk Study (dated 14 April 2023) recorded strategic World War I and World War II targets within the vicinity of the Site and records indicate several high explosive bombs fell in close proximity. Zetica recommended that a detailed desk study be commissioned to assess and potentially zone UXO hazard level at the Site, at the time of writing no further information in relation to UXO is available.

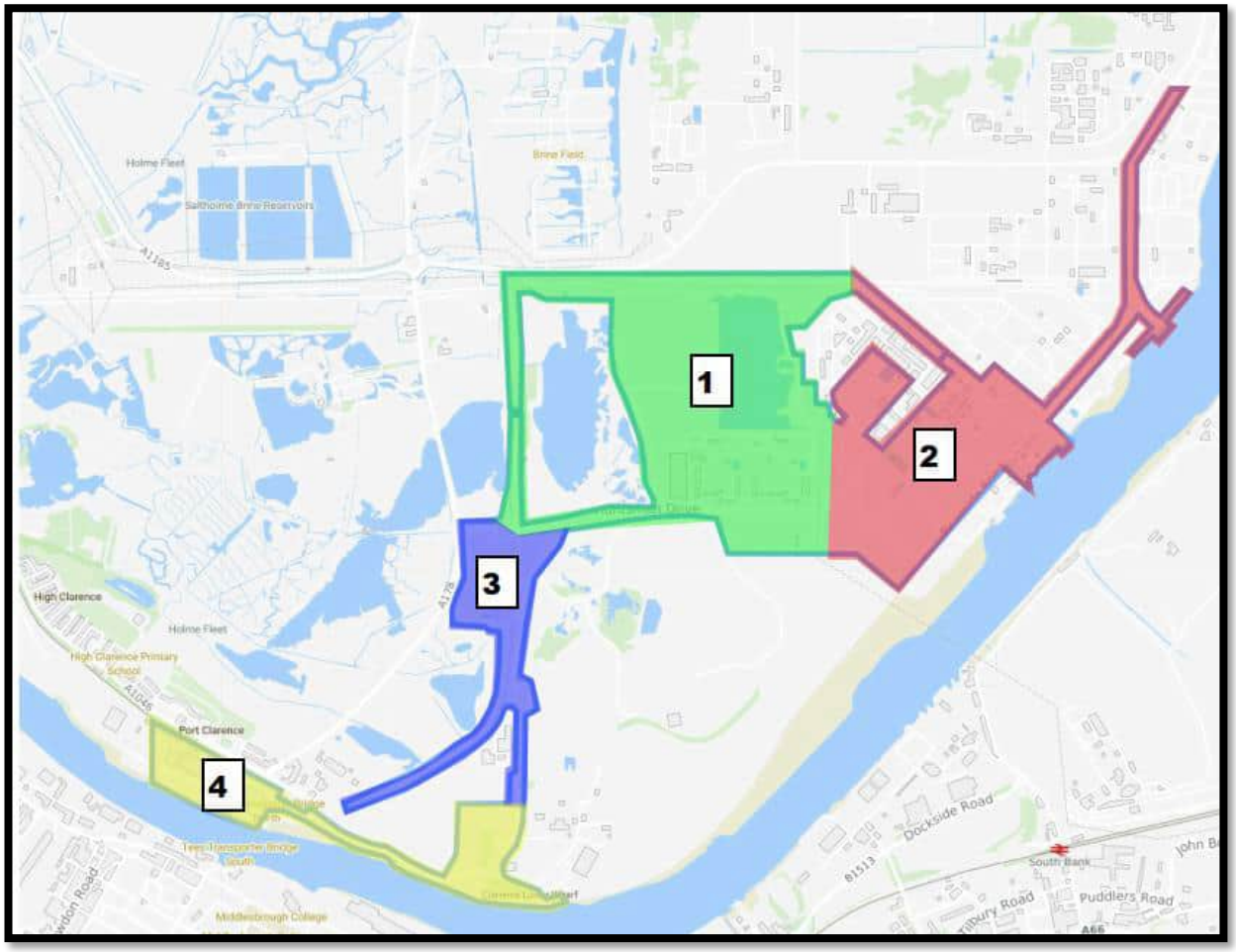
4. SITE HISTORY AND REGULATORY INFORMATION

4.1. HISTORICAL MAP REVIEW SUMMARY

4.1.1. A review of historical maps in the Groundsure report has been undertaken with a summary provided below. The historical maps are provided in the Groundsure Report.

4.1.2. Given the size and irregular shape of the Site it has been divided into four sections for ease of reference during the historical map review. These areas are shown on **Insert 4-1**.

Insert 4-1 - Division of Site for Historical Map Review



OVERVIEW

4.1.3. The Site is located in the Teesside area which has a long industrial history of heavy manufacturing, steel works, chemical works and waste disposal/treatment facilities.

4.1.4. The earliest available historical mapping (around the mid-1800's) shows the Site was largely undeveloped mud flats and began to be developed in the south (around Area 3 and Area 4) around the late 1800's with Salt and Iron Works and associated

infrastructure. These changed shape and size over time and were eventually demolished in the 1950s and replaced with unspecified works and warehousing. A terminal was constructed at the eastern extent (within Area 2) adjacent to the River Tees in the 1980s and remains today and TV1/TV2 were partially constructed (within Area 1) in the last 10 years and remain today. Associated infrastructure such as roads and pipework connect the various areas.

4.1.5. The surrounding land uses were predominantly mud flats until the late 1800s when a small Salt Works was established to the northwest and a large Salt Works and Irons Works were established to the east of Area 3 and Area 4 (partially on the Site). Several Brine Wells are noted in all directions from the Site from the late 1800s to the mid 1900s. The Salt Works and Iron Works were demolished in the 1950s and replaced with a Coal Distillation Plant (now a Chemical Works). The smaller Salt Works to the northwest is now a Brine Field.

Historical Summary - On-Site

4.1.6. A summary of on-Site land use is provided in **Table 4-1**.

Table 4-1 - Summary of on-Site land use

Date	Land Use			
	Area 1	**Area 2**	**Area 3**	**Area 4**
1855	Sand and Mud flats	-	-	
1856	No change	-	Undeveloped land labelled as liable to flooding	At the western end breakwater and coal staithes and at the eastern end railway infrastructure relating to the Port Clarence Iron Works (off-Site)
1896	No change	Sand and Mud flats	No change	No change
1897	No change	No change	A Brine well shown in the north with railway lines and embankments across the rest of Area 3 relating to the Clarence Iron Works and the Clarence Salt Works outside the area to the south.	Anderston Foundry with associated railway infrastructure and jetties at the western end and a Salt Works with associated reservoirs and railway infrastructure at the eastern end. The

Date	Land Use			
	Area 1	Area 2	Area 3	Area 4
				railways lines appear to link the two sites.
1913	No change	No change	Brine well is labelled as disused	No change
1950	No change	No change	No change	Salt works has been cleared in the east but reservoir and railway infrastructure still in place. There is no change in the west.
1984	No change	No change	No change	The Foundry in the west has been cleared and replaced with several buildings labelled as Works and Warehouses. The railway infrastructure has been removed.
1988	No change	North Tees Works (Oil Refinery)	Tanks are labelled at the northern end. Railway lines have mostly been removed and a path/road appears to have replaced it.	The eastern end is occupied by tanks labelled as disused and open land with paths/tracks shown. No change at the western end.
2001	No change	No change	No change	The tanks at the eastern end are no longer shown. No change at the western end.
2010	Small unknown buildings in the southeast	No change	No change	The western end shows several large warehouse buildings and eastern end appears to have been cleared.

Date	Land Use			
	Area 1	**Area 2**	**Area 3**	**Area 4**
2023	Unlabelled industrial buildings across the southern portion of Area 1 which are likely TV1 and TV2 (built between 2010 and 2023 mapping)	No change	No change	No change

Historical Summary - Surrounding Land Use

4.1.7. A summary of surrounding land use is as follows:

- Area 1: The land to the north, west and south of Area 1 (Area 2 is to the east) is shown as mudflats and land liable to flooding on early mapping from around the 1850's. By the 1890's Cowpen Salt Works with three brine wells is shown to the northwest and a Brine Well and gravel/sand pits or mounds are shown to the southwest. By 1913 the Cowpen Salt Works and the Brine Wells to the northwest and southwest are labelled as disused. By the 1950's several more Brine Wells are shown to the west of Area 1, the land to the south and north appear to be mud flats. By 1988 mapping the land to the northwest and west of Area 1 is shown to be a Brine Field with pumping station, electricity substations and associated infrastructure. The land immediately north and south is still shown as mud flats. Aerial imagery shows a landfill to the south of Area 1 and records in the Groundsure Report indicate this area has bene extensively landfilled.
- Area 2: The River is immediately east of Area 2 and Area 1 is to the west. From early mapping from the 1850's until the development of the terminal shown on mapping in the 1980's the land to the north and south is shown as mud flats. Beyond the 1980's the land to the north is occupied by terminal infrastructure (i.e., tanks, pipework, buildings and roads) and the area to the south has remained undeveloped.
- Area 3: With the exception of several Brine Wells the land to the west of Area 3 remains undeveloped from the earliest available mapping (circa. 1850s) to the present day. The land to the east of Area 3 is occupied by Clarence Iron Works and Salt Works (plus associated infrastructure) from the 1890s until circa. 1950s when the mapping shows the land has been cleared. It then remains unchanged to the present day.
- Area 4: The land to the north, east and west of Area 4 was undeveloped mud flats until circa 1890s when cottages and a school are shown to the north of the western end and at the eastern end. There is also infrastructure associated with

the Salt Works shown at the eastern end. The infrastructure expands at the eastern end and to the north of Area 4 by 1913 mapping. By the 1950s land adjacent to the eastern end appears to have been cleared and replaced with a Coal Distillation Works (later becoming Clarence Distillation Works and then Clarence Works) with associated buildings, tanks and reservoirs. The land adjacent to the north of the western end remains occupied by the Clarence Salt Works and newly constructed additional residential dwellings. By 1992 mapping the Clarence Salt Works is labelled as an unspecified works whilst the residential dwellings remain. The surrounding land uses remain largely unchanged to the present day.

4.2. REGULATORY INFORMATION REVIEW

4.2.1. Relevant environmental information from regulatory authorities is contained within the Groundsure Report and pertinent information within 250m of the Site is summarised in **Table 4-2**.

Table 4-2 - Relevant Regulatory Information

Land Use	On-Site	0 – 50m	50 – 250m
Recent Industrial Land Uses	140	115	418
Gas pipelines	2	-	-
Control of Major Accident Hazards (COMAH)	13	1	10
Hazardous substances used / stored	11	2	16
Historical licensed industrial activities (IPC)	1	38	20
Licensed industrial activities (Part A(1))	65	36	76
Licensed pollutant release (Part A(2)/B)	2	2	2
Radioactive Substance Authorisations	0	12	0
Licensed Discharges to controlled waters	29	8	71
Pollutant release to public sewer	0	0	1
Pollution Incidents (EA/NRW)	8	8	8

5. INITIAL CONCEPTUAL SITE MODEL

5.1. INTRODUCTION

5.1.1. The potential risks associated with potential contamination within soil and groundwater are assessed according to the environmental setting / ground model, likely presence of potential sources of contamination and the proposed use of the Site.

5.1.2. The source-pathway-receptor model forms the basis of the risk assessment; potential risks are only considered to exist if there is a credible source (e.g., a chemical substance capable of causing arm); a pathway for migration of the source to a receptor; and a sensitive receptor that could be affected (e.g., nearby river or future Site users). A source-pathway-receptor contaminant linkage assessment is termed a Conceptual Site Model (CSM). An initial CSM is produced prior to intrusive ground investigation and is refined following collection of site-specific data.

5.2. PRELIMINARY GROUND MODEL

5.2.1. The ground conditions across the Site are expected to comprise Made Ground relating to previous development. There is potential that Made Ground thickness could be significant in places given the existing TV1/TV2 investigation which recorded Made Ground to greater than 9m bgl (albeit in a small area of the Site), and the type of previous uses that are shown on historical maps e.g., reservoirs, stockpiles, mounds, embankments, and buildings (now demolished) with the potential for deep basements/below ground obstructions etc. Made Ground is likely underlain by superficial deposits comprising Tidal Flat Deposits, potentially overlying further superficial deposits of Glacial Till. The Superficial Deposits are shown to be underlain by bedrock of the Mercia Mudstone Group across the majority of the Site and the Sherwood Sandstone Group across the western extent.

5.2.2. Groundwater is potentially shallow (previously recorded in TV1/TV2 at 4.0 – 5.0m bgl) across the Site given the proximity of the River Tees (a tidal river with a fluctuation between 2.0m to 4.0m over the course of the tide). Therefore, perched water within Made Ground or groundwater within the superficial deposits is potentially in hydraulic connection with the river. It is likely that the bedrock aquifers drain into the river on a local or regional scale. The presence of a Brine Field (to be confirmed whether active or not) to the northwest of the Site could potentially impact on the piezometric surface across the wider local area if significant volumes of water are abstracted and this should be considered when designing any intrusive ground investigation to refine the conceptual model.

5.2.3. If contamination is present within the Made Ground, there is potential for migration via surface water infiltration and within the likely shallow groundwater towards the River

Tees. If Glacial Till extends across the entire Site area (below the Tidal Flats) this lower permeability layer may offer some protection to the underlying bedrock, however if absent vertical migration to the bedrock also has the potential to migrate towards the River Tees.

5.3. SOURCES, PATHWAYS AND RECEPTORS

5.3.1. The potential sources of contamination, receptors relevant to the Proposed Scheme and the potential exposure pathways have been identified and are presented below.

POTENTIAL CONTAMINATION SOURCES

5.3.2. Relevant potential contamination sources:

- Contaminants within Made Ground material associated with previous on-Site uses. potential chemical contaminants include; metals, polyaromatic hydrocarbons, petroleum hydrocarbons, volatile and semi-volatile organic compounds, and asbestos;
- Contaminants within shallow soils/ shallow bedrock related to previous Site uses of an industrial nature and relating to adjacent Site uses (the same potential chemical contaminants as above);
- Hazardous ground gas associated with potential Made Ground and infilling of basins/reservoirs;
- Hazardous ground gas associated with natural superficial (organic) deposits;
- Hazardous vapours associated with volatile contamination within soil and/or groundwater; and
- Landfill gases (off-Site source) associated with the neighbouring landfill to the south.

POTENTIAL RECEPTORS

5.3.3. Relevant potential receptors are considered to include the following:

- Construction workers during the redevelopment / future maintenance workers;
- Future Site users;
- Neighbouring Site users (particularly residents of Port Clarence) during the redevelopment;
- Third parties (e.g. members of the general public, Site visitors) during and after the development;
- Potable water supply pipes;
- Below ground structures e.g. foundations;
- Shallow groundwater within the superficial deposits (Secondary Undifferentiated);
- Groundwater in bedrock (Secondary B and Principal Aquifer); and
- Surface water in the River Tees.

POTENTIAL EXPOSURE PATHWAYS

5.3.4. Relevant potential pathways are considered to include the following:

- Direct contact, ingestion and inhalation of soil bound contaminants/dust;
- Migration of hazardous ground gas (relating to Made Ground or infilled basin/reservoirs) / vapours (relating to soil or groundwater contaminant sources) into any deeper excavations (if proposed i.e., to install deeper drainage manhole chambers) during redevelopment causing asphyxiation or explosion and migration into the future buildings if left untreated;
- Migration of mobile contaminants into bedrock aquifer/ River Tees; and
- Lateral migration of off-Site sources of landfill gas.

5.4. POTENTIALLY COMPLETE POLLUTANT LINKAGES

5.4.1. Given the above sources, pathways and receptors the pollutant linkages that are considered to be viable are presented in **Table 5-1**. A risk likelihood graded according to CIRIA C552 (included as **Appendix E**) is provided.

Table 5-1 - Potentially Complete Pollutant Linkages

Source	Pathway	Receptor	Severity	Probability	Pre-Mitigation Risk	Qualitative Comment	Post-Mitigation Risk
Contamination (including asbestos) associated with Made Ground materials from previous land use and infilling / raising. Contamination relating to former Site uses or adjacent industrial uses (e.g., spills, leaks).	Direct contact, ingestion and inhalation	Construction Workers during redevelopment	Severe (predominantly due to asbestos health risks)	Likely	HIGH RISK	There is potential for soil chemical contamination including asbestos relating to the Site previous uses. The potential for exposure can potentially be mitigated during redevelopment via good practice and the use of standard Personal Protective Equipment (PPE), Respiratory Protective Equipment (RPE) and good hygiene practices.	MODERATE / LOW RISK
		Maintenance workers post development	Medium	Low	MODERATE / LOW RISK	It is likely that the local planning authority (LPA) will require an intrusive investigation to assess for potential contamination and require remediation of any identified contamination. The potential for residual soil contamination post-remediation including asbestos should be recorded in the Site risk register so any maintenance workers or future Site users are aware. The potential for exposure can then be mitigated via good practice and the use of standard Personal Protective Equipment (PPE), Respiratory Protective Equipment (RPE) and good hygiene practices	VERY LOW RISK
		Future Site Users (Site Workers)	Medium	Low	MODERATE / LOW RISK		VERY LOW RISK
	Mobilisation of contamination into groundwater/ surface waters and potable water supply pipes.	Groundwater within bedrock/ Surface Water in River Tees	Severe	Likely	HIGH RISK	The intrusive investigation will assess groundwater quality. If contamination has impacted groundwater quality, then source removal would likely be required during any remediation. Given the long-term industrial nature of the Site and surrounding area there is potential for residual sources of groundwater/ surface water contamination within shallow Made Ground, superficial or bedrock deposits. A specific potable water supply pipe risk assessment will be required to ascertain whether barrier pipes (or alternative mitigations measures) are required.	MODERATE / LOW RISK
Hazardous Ground Gas related to Made Ground or organic material. Landfill gas from adjacent landfill Site. Volatile contamination in groundwater causing vapour migration	Migration into ground excavations / man-hole chambers or building infrastructure	Construction Workers during redevelopment	Severe	Low	HIGH RISK	Potential for soil/ groundwater gas/ vapour. Intrusive investigation will assess for the potential presence of ground gas concentrations and volatile groundwater contamination/ non-aqueous phase liquid (NAPL). Any identified ground gas or vapour risk will likely require mitigation in the form of source removal or implementation of gas protection measures within the building design.	LOW RISK
		Maintenance workers post development	Medium	Low	MODERATE RISK		VERY LOW RISK
		Future Site Users (Site Workers)	Medium	Low	MODERATE RISK		VERY LOW RISK

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CONCLUSIONS

6.1.1. The approximately 205.66 ha Site is situated within a heavily industrialised area and the Site itself has an industrial past. The irregularly shaped Site comprises a number of different land uses including existing power generation facilities with associated infrastructure, decommissioned currently non-operational facilities, access roads, vacant land and jetties. Made Ground is anticipated relating to previous Site uses and bases on existing ground investigation data is likely to be thick (up to c. 9m) in places. There is potential for Made Ground to contain contaminants of concern (such as asbestos, metals, polyaromatic hydrocarbons, petroleum hydrocarbons and volatile/ semi-volatile organic compounds) relating to previous known Site uses or adjacent industrial Site uses. There is the potential for contaminant sources in Made Ground to have impacted the underlying superficial deposits.

6.1.2. The Site is considered to have a moderate sensitivity with regards to controlled waters given the likely hydraulic connection to the River Tees and potentially the underlying aquifers (a Principal and a Secondary B Aquifer) and given the industrial nature of its proposed use, a low sensitivity with regards to human health.

6.1.3. At this stage it is anticipated that a Geoenvironmental Ground Investigation will be required in order to assess the nature and extent of contamination at the Site (with an associated interpretative report). It this identifies unacceptable risks from contamination, a Remediation Strategy will need to be developed to outline how the associated risk could be mitigated. Once necessary remediation works have been carried out, a Remediation Verification Report would be needed, to confirm that works had achieved the requirements of the Remediation Strategy.

6.1.4. If the above-noted Ground Investigation works are carried out is post-consent, a Requirement will be likely placed on the DCO which will be discharged prior to works commencing.

6.1.5. Given the history of the Site there is potential for in-ground obstructions and structures which would require removal.

WASTE DISPOSAL AND CLASSIFICATION

6.1.6 Dependent on the required finished Site levels there is potential for cut/fill requirement to create a stable development platform. It is expected there would be opportunities for re-use based on the size of the development. If soil arisings are considered suitable for on-Site re-use (following appropriate testing) then a Materials Management Plan will be required, together with supporting documents, in line with the Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice, Version 2 March 2011 (DoWCoP).

6.1.7 If surplus materials from the Site are to be disposed of at landfill, the material should be segregated (i.e., soil, asphalt, concrete) and the materials should be characterised with respect to chemical and asbestos content to determine the classification of the waste for landfilling purposes.

6.2. RECOMMENDATIONS

6.2.1. Based on the data presented in this report, a series of activities are recommended as part of the DCO application. In order to assess (and where necessary mitigate) the nature and extent of contamination and other geoenvironmental constraints that may be present the following is recommended:

- Completion of a detailed desk study to ascertain the UXO risk at the Site, and to potentially zone the Site prior to investigation delivered by way of Site-specific UXO report);
- An intrusive investigation to refine the CSM and geotechnical soil parameters, and to further understand the hydrogeological regime (described within an interpretative ground investigation report);
- Installation of gas / vapour and groundwater monitoring wells (described within an interpretative ground investigation report);
- Classification of waste soils, to satisfy the EA, land contamination officers and planners (described within an interpretative ground investigation report);
- Identification of remediation requirements, and likely timescales for remediation to aid development of the construction programme (described within a Remediation Strategy); and
- Identification of likely long term monitoring requirements that will be required as part of the environmental permit for the Proposed Scheme (likely described within a Remediation Strategy and / or Verification Report).

Appendix A
Figures

PINS Reference: **EN010150**

July 2023

Volume 2

N

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

PROPOSED DCO APPLICATION BOUNDARY

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

0 100 500 1000
SCALE (m)

DRAWING STATUS:	Final

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT:	Lighthouse Green Fuels Ltd
PROJECT:	Lighthouse Green Fuels
TITLE:	Figure 17.4 Proposed DCO Application Boundary

SCALE:		CHECKED: AR	APPROVED: JK
PROJECT No: 70102442	DESIGNED: SA	DRAWN: SA	DATE: 7/11/2023

DRAWING No: 70102442-WSP-RP-ES-1704	REV: 2

DO NOT SCALE

Information Classification:
PUBLIC
Information that is available to the general public and is intended for distrubution outside WSP.

Key

- PROPOSED DCO APPLICATION BOUNDARY
- LIGHTHOUSE GREEN FUELS SAF PLANT
- FEEDSTOCK STORAGE AREA
- PIPELINE CORRIDORS
- BULK LIQUID STORAGE (SAF/NAPHTHA)
- FEEDSTOCK PROCESSING
- AIR SEPARATION UNIT
- CONSTRUCTION LAYDOWN/ PERMANENT PARKING
- MOF / HEAVY HAUL ROAD
- CONVEYOR CORRIDOR
- RAIL TERMINAL
- JETTIES

It should be noted that the large surface water body contained within the Proposed DCO Application Boundary has been filled in.

DRAWING STATUS: Final

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Ltd

PROJECT: Lighthouse Green Fuels

TITLE: Figure 17.5
Proposed Scheme Layout

SCALE:	CHECKED:	APPROVED:
	AR	JK

PROJECT No:	DESIGNED:	DRAWN:	DATE:
70102442	SA	SA	7/11/2023

DRAWING No: 70102442-WSP-RP-ES-1705 REV: 2

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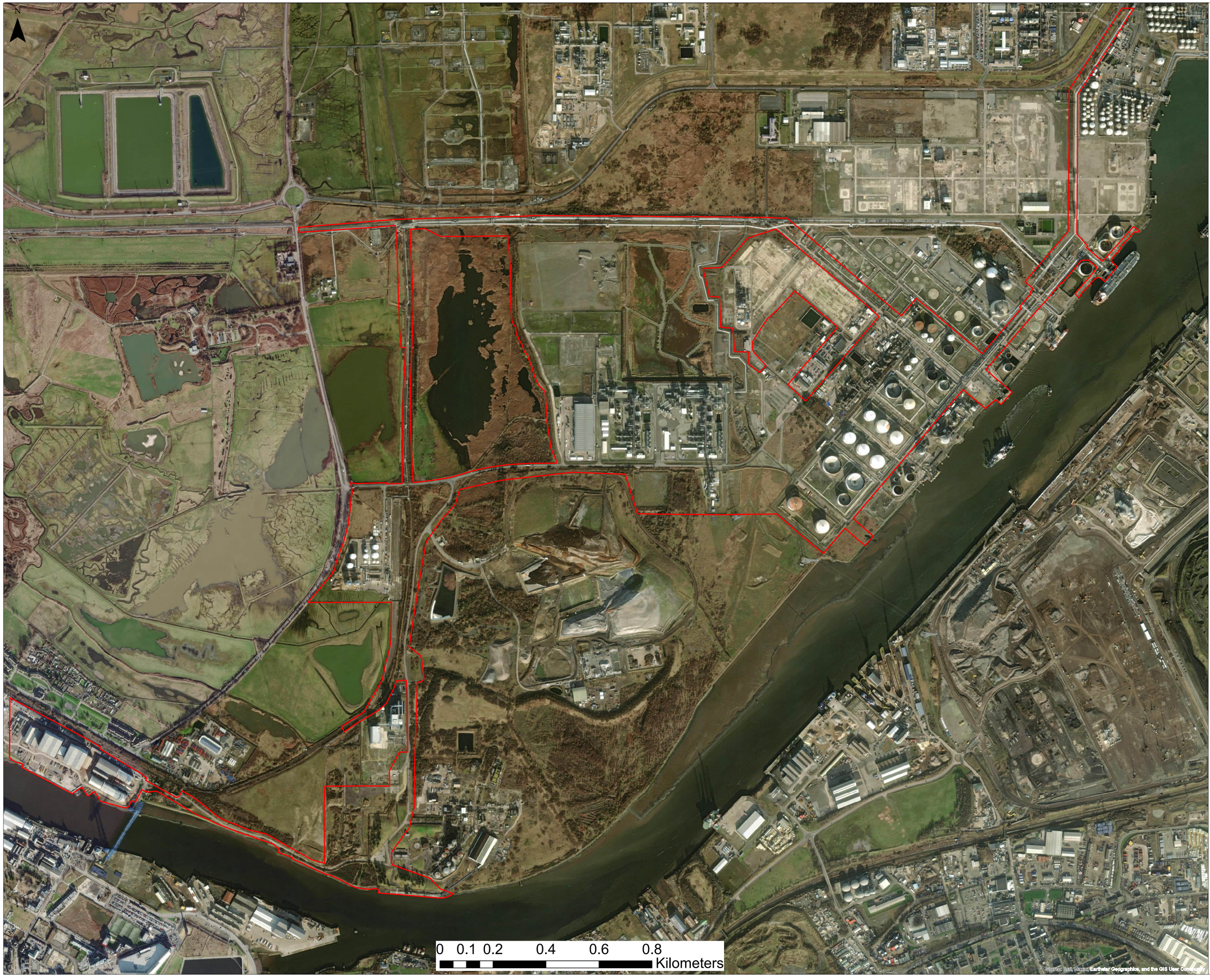


DO NOT SCALE

Information Classification:

PUBLIC

Information that is available to the general public and is intended for distrubution outside WSP.

Key

Proposed DCO Application Boundary

DRAWING STATUS: Final

Lighthouse Green Fuels

1 Cornhill, London, England, EC3V 3NR

APPLICANT: Lighthouse Green Fuels Limited Ltd

PROJECT: Lighthouse Green Fuels

TITLE: Figure 1 7 . 6
Site Layout Plan

SCALE @ A1:	CHECKED:		APPROVED:
1:6,500	AR		JK
PROJECT No:	**DESIGNED:**	**DRAWN:**	**DATE:**
70102442	AV	AV	7/3/2023

DRAWING No:	REV:
70102442-WSP-RP-ES-1706	2

Appendix B
BGS Logs

PINS Reference: **EN010150**

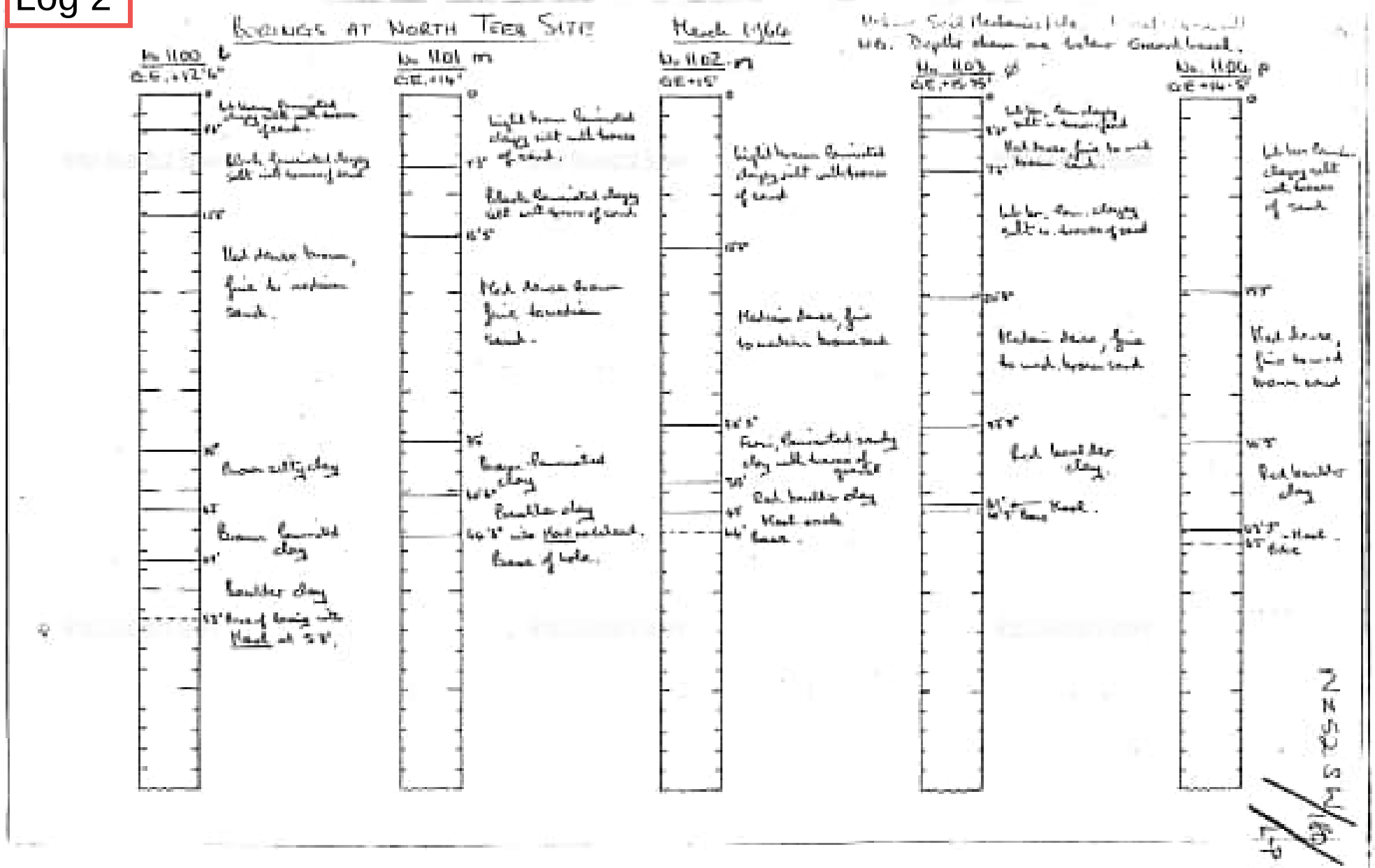
July 2023

Volume 2

Log 1

(For Survey use only) Geological Classification	Nature of Strata. If measurements start below ground surface, state how far ..	Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
	Sand	10	0	10	0
	Grey Silt	37	0	47	0
Drift	Brown Boulder Clay	37	0	84	0
	Boulders	2	0	86	0
	Brown Boulder Clay	22	0	108	0
Bunter Sandstone per Geologist N.E. Unit Dec 1976	Red Sandstone	292	0	400	0
				Total	depth

Log 2


Borings at North Tees Site
No. 11/03
No. 11/01
No. 11/02
No. 11/03
No. 11/04

Log 3

TEES & HARTLEPOOLS PORT AUTHORITY

BOREHOLE No T329

BOREHOLE LOG

BOREHOLE No. _____ LOCATION DORMAN LONG & Co. LTD.

POSITION SHOWN ON PLAN 89/212 (THPA) DATE MADE _____

CARRIED OUT BY _____ TYPE OF BORING _____

DIAMETER _____ GROUND LEVEL + 8·00' + A.O.D LINING _____

DESCRIPTION OF STRATA	SAMPLE	LEGEND	DEPTH GL	RELATED TO OD	INDEX TESTS			γ_M	C	ϕ	S_u kN/m^2	F^n	SPT BLOWS PER FT
					$M_{\%}$	$-L$	P_L						
SILT & SAND			7'-6"	+0.5'									
SAND			17'-0"	-9.0'									
RED MARL ON TOP													
RED CLAY			20'-0"	-12.0'									
RED MARL			22'-10"	-14.8'									
GREY MARL			23'-3"	-15.25'									

SCALE : 1" = 10FT.

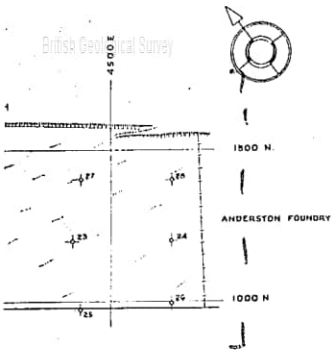
NOTES (OBSERVATIONS OF GROUND WATER ETC)

KEY TO TYPES OF SAMPLE

U (4") - 4" DIA UNDISTURBED SAMPLE
U (1½") - 1½" DIA " "
D - DISTURBED SAMPLE
B.D. - BULK DISTURBED SAMPLE
V - VANE TEST
S - STANDARD PENETRATION TEST
C - DYNAMIC CONE PENETRATION TEST

NZ42SE/255

a – V



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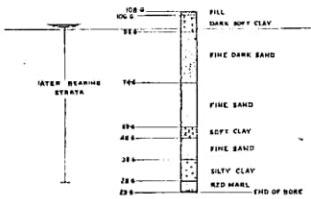

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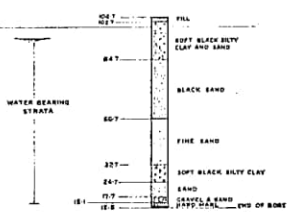

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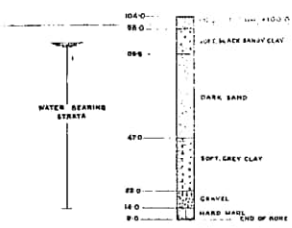

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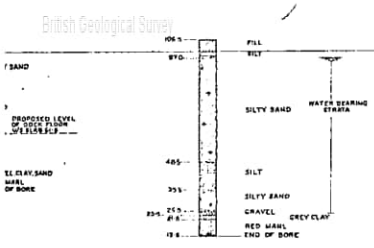

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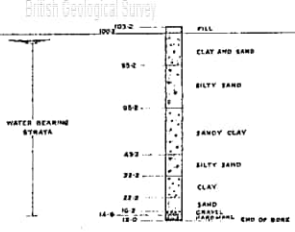

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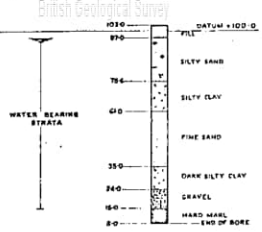

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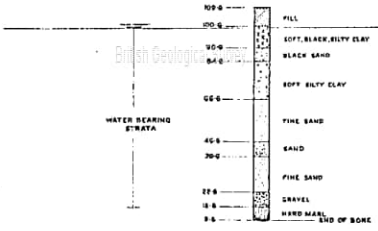

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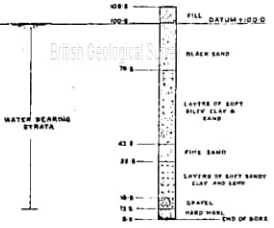
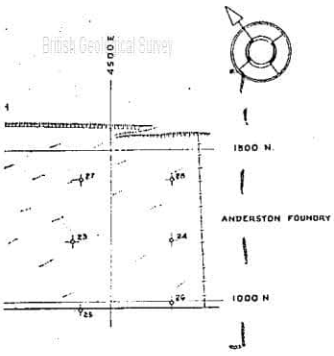


FEET

'A' REV – REDRAWN WITH ADDITIONAL BOREHOLES

NZ42SE/255

a – V



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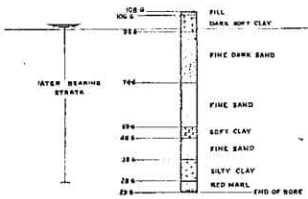

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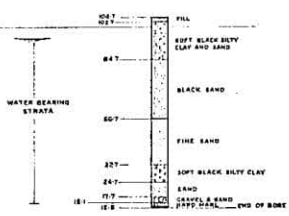

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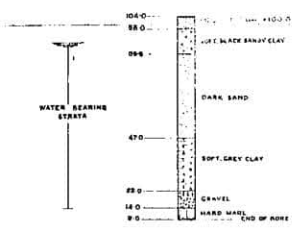

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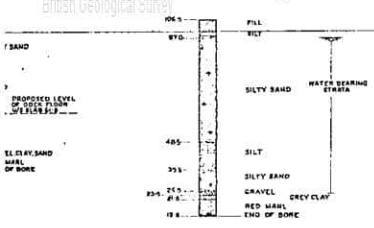

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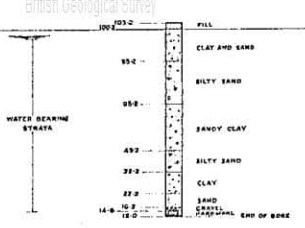

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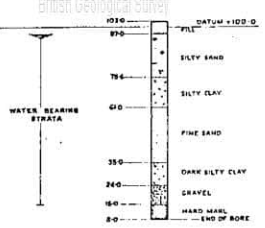

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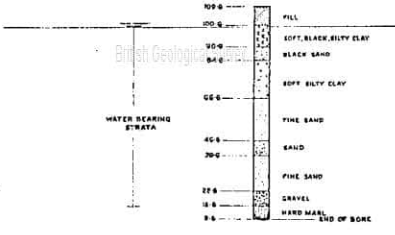

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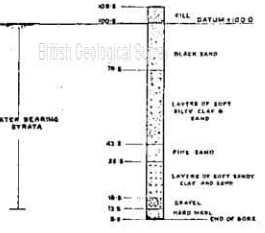
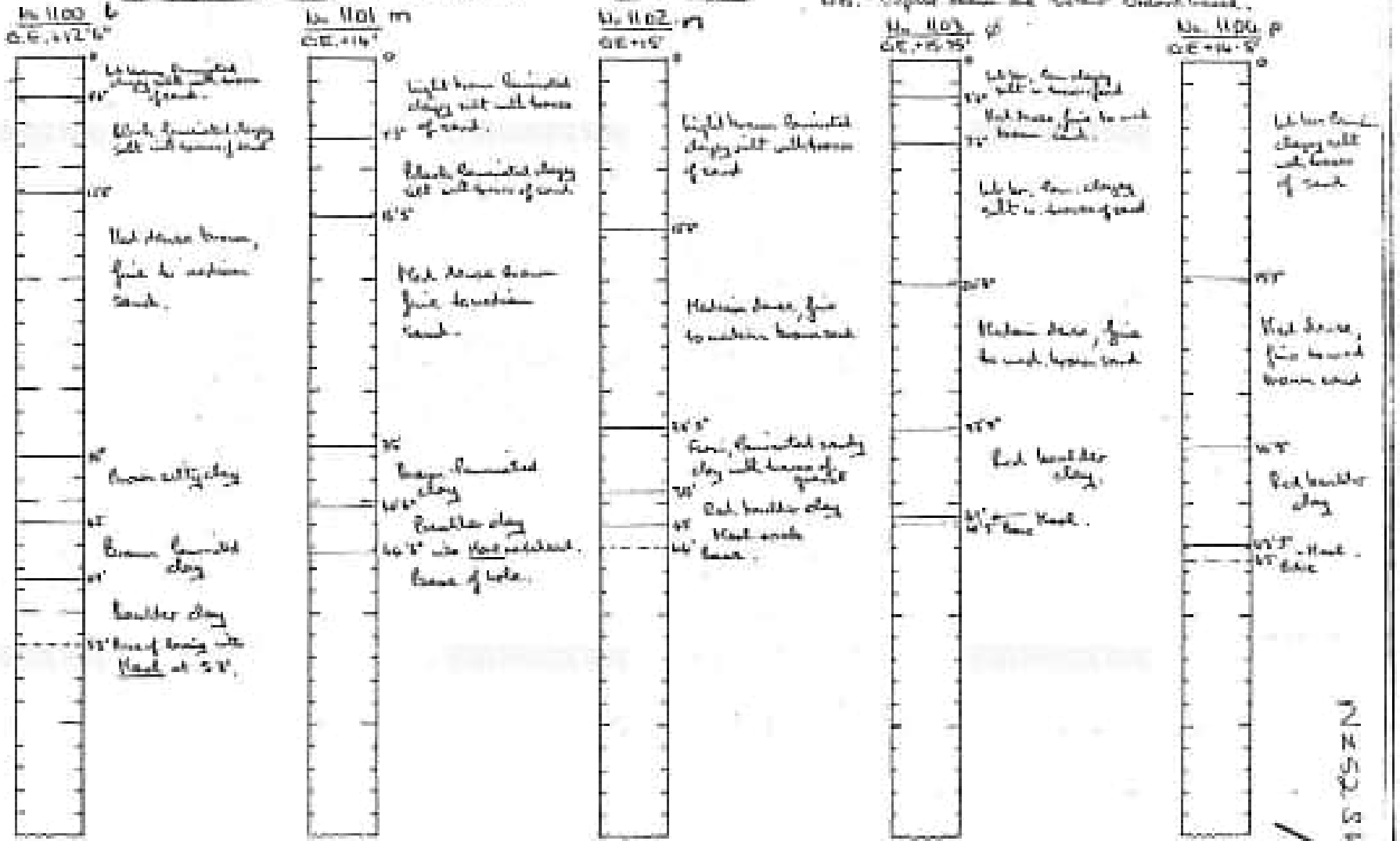


'A' REV – REDRAWN WITH ADDITIONAL BOREHOLES

Borings at North Tees Site

March 1964



NZ 42 SW / 24 / b

TEES & HARTLEPOOLS PORT AUTHORITY

BOREHOLE N° T329

BOREHOLE LOG

BOREHOLE N° _____ LOCATION DORMAN LONG & Co. LTD.

POSITION SHOWN ON PLAN 69/212 (THPA) DATE MADE _____

CARRIED OUT BY _____ TYPE OF BORING _____

DIAMETER _____ GROUND LEVEL + 8·00' + A.OD LINING _____

DESCRIPTION OF STRATA	SAMPLE	LEGEND	DEPTH GL	RELATED TO OD	INDEX TESTS M%	- L	P.L	γ_M	C	ϕ	Sol SO_3	F^m	SPT BLOWS PER FT
SILT & SAND													
			7'-6"	+0.5'									
SAND													
			17'-0"	-9.0'									
RED MARL ON TOP RED CLAY			20'-0"	-12.0'									
RED MARL			22'-10"	-14.8'									
GREY MARL			23'-3"	-15.25'									

SCALE : 1" = 10FT.

NOTES (OBSERVATIONS OF GROUND WATER ETC).

KEY TO TYPES OF SAMPLE

U (#) - #" DIA UNDISTURBED SAMPLE
U (1½) - 1½" DIA "
D - DISTURBED SAMPLE
B.D - BULK DISTURBED SAMPLE
V - VANE TEST
S - STANDARD PENETRATION TEST
C - DYNAMIC CONE PENETRATION TEST

(For Survey use only) GEOLOGICAL CLASSIFICATION	NATURE OF STRATA If measurements start below ground surface, state how far ..	THICKNESS Feet ..	THICKNESS Inches ..	DEPTH Feet	DEPTH Inches
	Sand	10	0	10	0
	Grey Silt	37	0	47	0
Drift	Brown Boulder Clay	37	0	84	0
	Boulders	2	0	86	0
	Brown Boulder Clay	22	0	108	0
Bunter Sandstone per Geologist N.E. Unit Dec 1976	Red Sandstone	292	0	400	0
				Total	depth

Appendix C
UXO Pre-desk Study Assessment

PINS Reference: **EN010150**

July 2023

Volume 2

Pre-Desk Study Assessment

Site:	Land at Seal Sands, Teesside, County Durham
Client:	WSP
Contact:	Emily Morgan
Date:	14th April 2023
Pre-WWI Military Activity on or Affecting the Site	By 1898 the Port Clarence Rifle Ranges, consisting of 8No. shooting galleries, were established adjacent to the Site.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Docks, quays and wharves located along the River Tees. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including metal and engineering works. ■ Royal Naval Air Service (RNAS) Seaton Carew. ■ Military training areas. ■ Anti-Aircraft (AA) guns.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	None identified.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ Docks, quays and wharves located along the River Tees. ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including metal, chemical and engineering works. ■ Royal Air Force (RAF) Greatham. ■ Military camps and training areas. ■ AA and anti-invasion defences.
WWII Bombing Decoys (within 5km of Site)	4No. The nearest was located approximately 1km north of the Site.
WWII Bombing	During WWII the Site was located in the Urban District (UD) of Billingham, which officially recorded 221No. High Explosive (HE) bombs with a bombing density of 28.1 bombs per 405 hectares (ha). Readily available records indicate that several HE bombs fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	None identified.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.

Further information	For information about Zetica's detailed UXO desk studies and other UXO services, please visit our website: www.zeticauxo.com. Details and downloadable resources covering the most common sources of UXO hazard affecting sites in the UK can be found here. If you have any further queries, please don't hesitate to get in contact with us at uxo@zetica.com or 01993 886 682.

This summary is based on a cursory review of readily available records. Caution is advised if you plan to action work based on this summary.

It should be noted that where a potentially significant source of UXO hazard has been identified on the Site, the requirement for a detailed desk study and risk assessment has been confirmed and no further research will be undertaken at this stage. It is possible that further in-depth research as part of a detailed UXO desk study and risk assessment may identify other potential sources of UXO hazard on the Site.

Appendix D
Limitations

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REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.

2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.

3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.

4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.

6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.

8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:

- **i.** The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
- **ii.** Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.

10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.

11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.

12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.

13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.

14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.

15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.

16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.

18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.

19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.

20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.

22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.

24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.

25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.

28. The data is presented and will be compared with assessment criteria.

Appendix E
CIRIA C552

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RISK APPRAISAL

RISK APPRAISAL METHODOLOGY

The identification of potential “contaminant linkages” is a key aspect of the evaluation of potentially contaminated land. An approach based on the UK CIRIA report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001) has been adopted within this report. For each of the contaminant linkages, an estimate is made of;

- The potential severity of the risk; and
- The likelihood of the risk occurring.

Table D.1 presents the classification of the severity of the risk:

TABLE D-1 SEVERITY OF RISK

Severe	Acute risks to human health; Major pollution of controlled waters (watercourses or groundwater)
Medium	Chronic (long-term) risk to human health; Pollution of sensitive controlled waters (surface waters or aquifers)
Mild	Pollution of non-sensitive water resources.
Minor	Requirement for protective equipment during site works to mitigate health effects; Damage to non-sensitive ecosystems or species

The probability of the risk occurring is classified by criteria given in Table D.2.

TABLE D-2 PROBABILITY OF RISK OCCURRING

High Likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low Likelihood	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability as presented in Table D.3.

TABLE D-3 COMPARISON OF SEVERITY AND PROBABILITY

	Severity

TABLE D-3 COMPARISON OF SEVERITY AND PROBABILITY

		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	Very low risk	Very low risk

Table D.4 then provides a description of the typical consequences and potential actions required following each risk definition.

TABLE D-4 QUALITATIVE RISK ASSESSMENT - CLASSIFICATION OF CONSEQUENCE

Classification	Definition
Very High Risk	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short-term, but likely to be required over the long-term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be mild. Some remedial works may be required in the long-term.
Moderate / Low Risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as mild. Limited further investigation may be required to clarify the risk. If necessary, remediation works are likely to be limited in extent.
Low Risk	Possible that harm could arise to a receptor. Such harm, at worst, would normally be mild.
Very Low Risk	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.

It should be noted that the identification of potential contaminant linkages does not indicate that they are significant. The risk to ground workers during any redevelopment has not been assessed as part of these works. It is recommended that a task specific risk assessment, which may include stipulations with regards to appropriate work control procedures and personal protective equipment (PPE), is completed prior to any future construction works.

Appendix 20-A Shipping and Navigation Scoping Report

PINS Reference: **EN010150**

July 2023

Volume 2

NASH MARITIME

LIGHTHOUSE GREEN FUELS

Shipping and Navigation Scoping Report

WSP

Document No: 23-NASH-0350 | R04-00

19-Jul-23

PROJECT INFORMATION

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REPORT TITLE	Shipping and Navigation Scoping Report
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CLIENT ADDRESS	70 Chancery Ln, London WC2A 1AF

DOCUMENT CONTROL

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R01-00	12-Jul-2023	Draft issue for review	MAS	SAB	EJR
R02-00	13-Jul-2023	Final Report	MAS	SAB	EJR
R03-00	14-Jul-2023	Minor typographical updates	EJR	EJR	EJR
R04-00	19-Jul-2023	Update following Legal review	SAB	SAB	SAB

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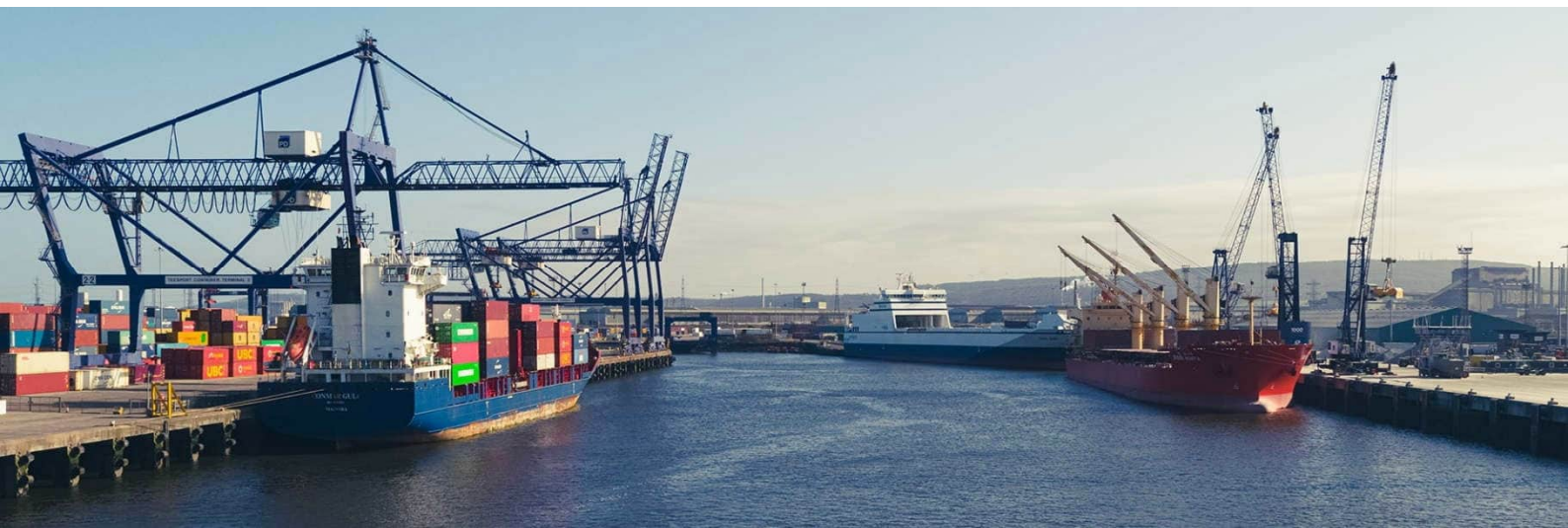

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FIGURES

TABLES

APPENDICES

1. INTRODUCTION

1.1 OVERVIEW

1.1.1 NASH Maritime Ltd have been contracted by WSP (as lead EIA consultant for Lighthouse Green Fuels Limited) to deliver a shipping and navigation scoping assessment for the marine operation associated with the construction of the Lighthouse Green Fuels (LGF) refinery site. This Technical Note will form the basis for the Marine Navigation Chapter of an EIA Scoping Report to be prepared by WSP.

1.1.2 The proposed marine operation is being progressed in order to support the offloading of sizable abnormal indivisible loads (modules) from ocean-going vessels, which will subsequently be transported to the LGF construction site (Alfanar site). This will involve the mooring of large ocean going vessels and/or barges for offloading as well as roll over operations to load barges with modules from ocean-going vessels.

1.1.3 This assessment considers the impacts of the proposed marine operation on shipping and navigation within the Navigational Study Area (referred to in this report as the Study Area).

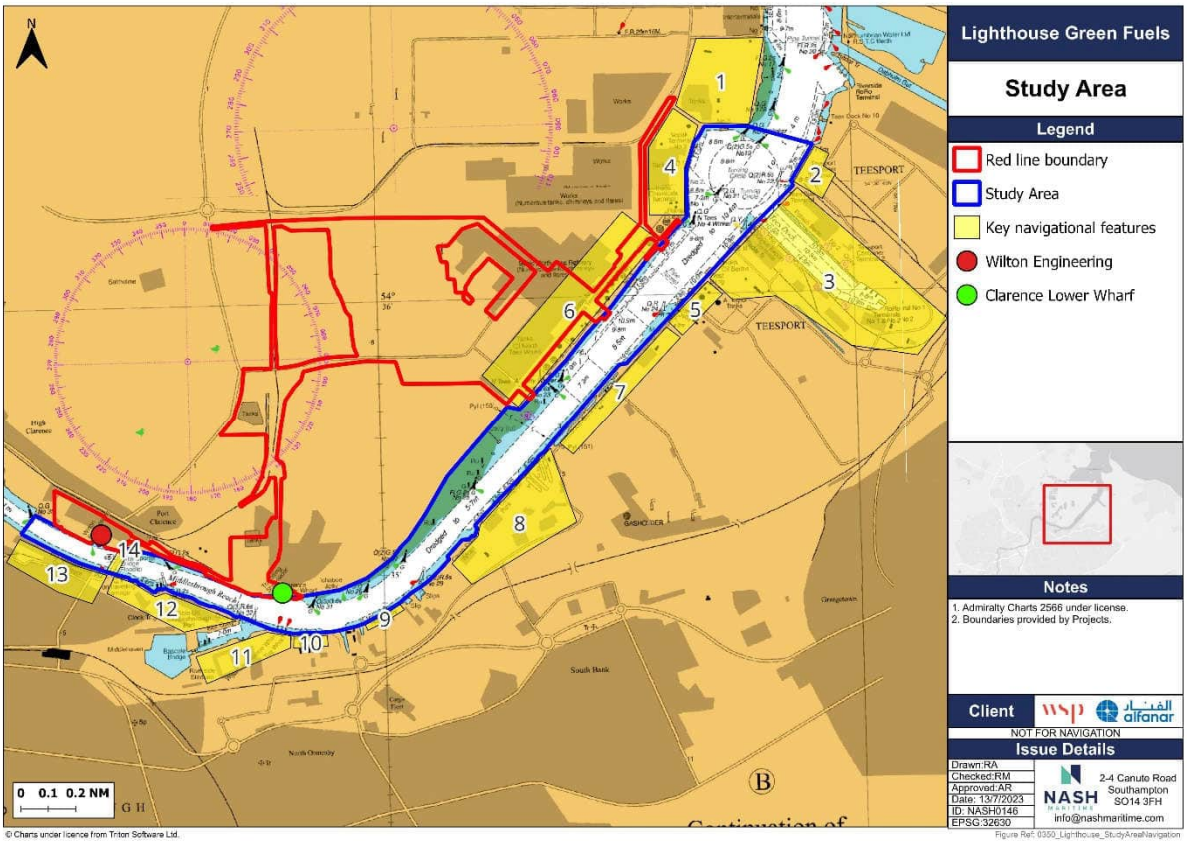

Figure 1: Study Area, LGF DCO boundary, offloading sites and other navigational points of interest.

1.1.4 **Figure 1** shows the Development Consent Order (DCO) boundary (referred to in this report as the red line boundary) for the LGF project, the location of two (2) offloading

sites currently under consideration (Wilton Engineering and Clarence Lower Wharf), and other navigational points of interest within the Study Area (illustrated by the unbroken blue boundary in **Figure 1**). **Table 1** summarises the key navigational features shown in **Figure 1.**

Table 1: Summary of key navigational features within the Study Area.

Figure Label	Key Navigational Feature	Description
1	Seal Sands Interterminals	2 jetties and 2 berths
2	PD Ports Container Terminal 1 & 2	4 berths, 10 RTG cranes, and 5 ship-to-shore cranes
3	Tees Dock	Cleveland Potash Bulk Terminal (3 general cargo berths), PD Ports RO/RO Berths (2 RO/RO berths), and Teesport Bulk Terminal (500 m quay)
4	Navigator Terminals	4 terminals and deep-water jetty
5	PD Ports Teesport Jetties	2 jetties
6	SABIC North Tees Logistics	2 terminals, 2 berths, and 3 jetties
7	South Bank Wharf	1,000 m quay
8	Teesport Commerce Park	4 dry docks, 2 berths, 5 cranes, and a 240 m quay
9	Normanby Wharf	100 m quay
10	Cochranes Wharf	3 berths
11	Svitzer Marine	Fleet of 4 tugs
12	ABLE Middlesborough	6 quays (1,000 m in total), 6 cranes
13	Port Middlesborough	1,000 m of quayside, load-out heavy lift quays, can accommodate ships with LOA 220 m.
14	Transporter Bridge	Air draft of 48.2 m at Highest Astronomical Tide (HAT)

1.2 PROPOSED MARINE OPERATION

1.2.1 The marine operations will involve the arrival and offloading of up to 200 modules during an 18-month period. The modules will be transported to Teesport via large ocean-going vessels, such as the heavy lift MC-Class vessel (e.g., *Biglift Baffin*; see **Figure 2**). MC-Class vessels are 173m Length Overall (LOA) with a beam of 43m.

Figure 2: ***Biglift Baffin.***

1.2.2 Two offloading options are being considered:

- A direct transfer of the modules to the shore from the MC Class vessel; or
- A transshipment of the modules (roll-over operation) onto barges, followed by subsequent offloading onto land.

1.2.3 **Figure 3** and **Figure 4** show the different mooring configurations (Mediterranean and Side-on) of a MC-Class vessel and a North Sea Barge (typically 90m LOA and 31m beam) at Wilton Engineering and Clarence Lower Wharf.

1.2.4 The Mediterranean mooring of the MC-Class vessel at both offloading sites will obstruct the majority of the Tees navigation channel, particularly at Clarence Lower Wharf, where most of the channel is blocked due to the orientation of the berth. Mediterranean mooring of the vessel requires the deployment of anchors to stabilise the vessel's bow, further contributing to the obstruction of the Tees navigation channel. Mediterranean mooring of the North Sea Barge partially blocks the channel and is less of an obstruction owing to its size. Side-on mooring of the ocean-going vessel also does not block the channel but will likely have an impact on the navigation of the third-party vessels. Side-on mooring of the barge will not impact navigation at both offloading sites.

1.2.5 Marine operations at both offloading sites are also tidally restricted, as the project vessel has a summer draught of 6.5 m. The minimum depth at berth is 4.7 m at Wilton Engineering and 3.1 m at Clarence Lower Wharf and the tidal range is about 4.5 meters at spring tides and 2.3 meters at neap tides. The project vessel will therefore have a narrow tidal window for offloading operations, especially at Clarence Lower Wharf. It will be possible to further define the tidal window once the project vessel specification, anticipated loaded draught and exact depth alongside are known. Similar operations have been successfully completed by a 150 m long cargo vessel with a draught of 5.6 m in Wilton Engineering. This vessel operated during a neap tide cycle so that it could stay moored during low water.

1.2.6 Wilton Engineering specialises in loading out large, complicated cargo structures for different industries and is the preferred offloading site for the modules. Clarence Lower Wharf, owned and operated by Koppers Inc., is the second offloading site option and would require structural reinforcement of the main quay and marine infrastructure works to support heavy loads. This might involve other marine

construction operations that should be considered within any future Navigation Risk Assessment undertaken to support an Environmental Statement.

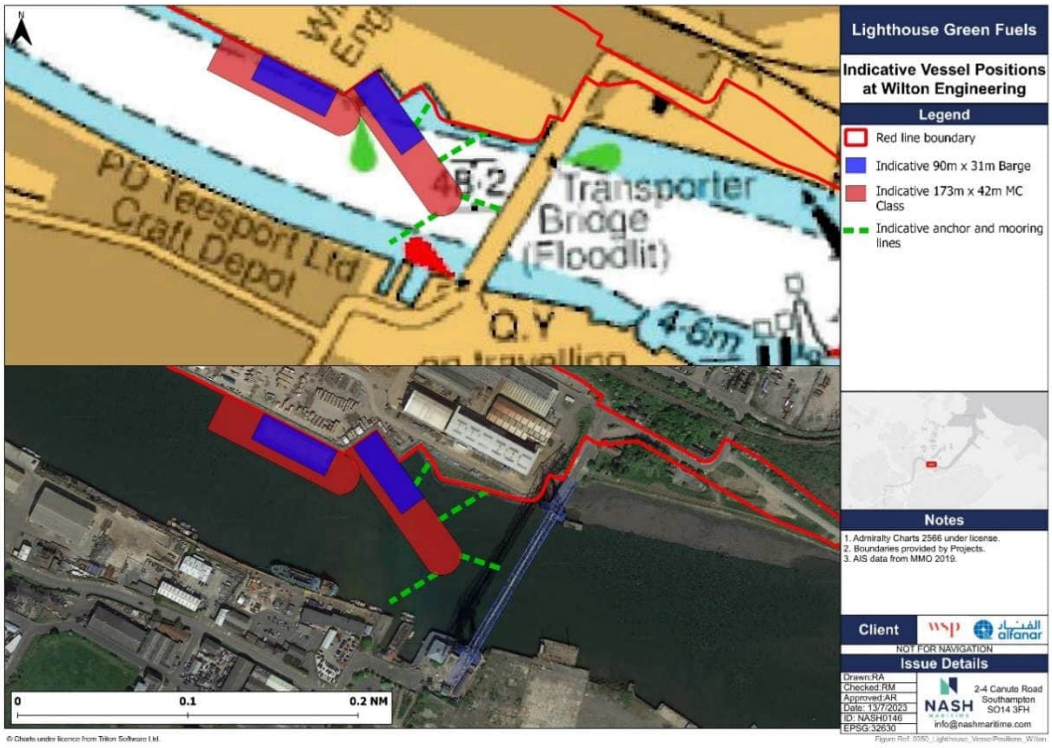

Figure 3: Indicative MC Class vessel and North Sea barge mooring configurations Wilton Engineering.

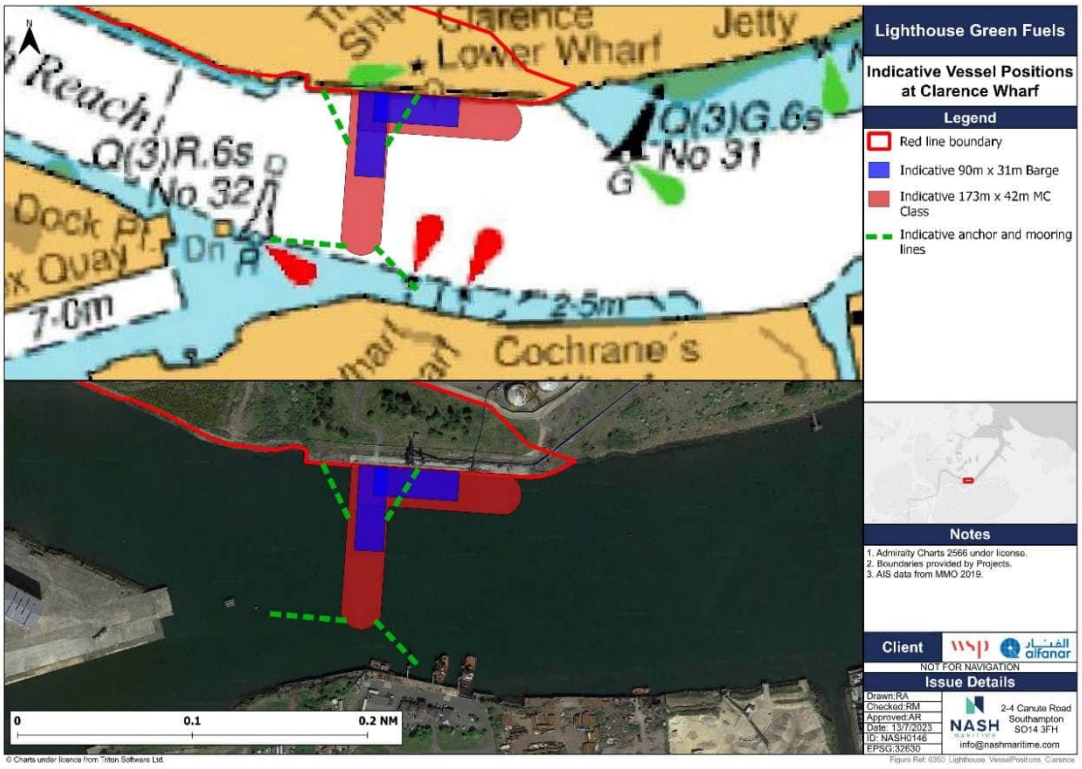

Figure 4: Indicative MC Class vessel and North Sea barge mooring configurations at Clarence Lower Wharf.

2. RELEVANT GUIDANCE

2.1 The following section provides details of the legislation, guidance, procedures and practices relevant to shipping and navigation within the Navigational Study Area.

2.1 LEGISLATION

2.1.1 The following list provides a summary of legislation identified as part of this scoping outline review:

- The Tees and Hartlepool Harbour Byelaws 1977 & 1985;
- General Directions for Safety of Navigation, Persons and Property in the Harbour;
- Harbours, Docks, & Piers Clauses Act 1847;
- Tees and Hartlepool's Port Authority Act 1966;
- Tees and Hartlepool Port Authority Act 1982; and
- International Port and Ship Security Code 2004.

2.2 GUIDANCE, PROCEDURES, PRACTICES

2.2.1 The following list provides a summary of the relevant guidance, procedures and practices identified as part of this scoping outline review:

- Port Marine Safety Code;
- Port Marine Safety Code – "Guide to Good Practice on Port Marine Operations";
- Marine Safety Plan 2021-2024 – PD Ports;
- River Tees Passage Plan – PD Ports; and
- Notices to Mariners – PD Ports.

3. BASELINE NAVIGATIONAL ENVIRONMENT

3.1 Definition of the baseline navigational environment requires analysis of existing data to facilitate identification and quantification of key navigational issues and impacts. The proposed marine operations can then be mapped over the top of the baseline vessel traffic activity to understand the magnitude of any navigation impact they may pose.

3.2 Teesport is amongst the largest and busiest ports in the UK and has a diverse mix of vessel traffic activity. The port is primarily known for its bulk cargo operations and container handling, with major trades of oil, coal, grain, potash and soda ash exports. Commercial vessels range from small port service crafts, up to large commercial tankers and can be draught restricted (can only transit channels during high tide).

3.3 Relevant information regarding usage of Teesport and the surrounding area has been collated in order to understand the baseline navigation environment within the Study Area.

3.1 NAVIGATIONAL FEATURES

3.1.1 The Teesport harbour has extensive marine infrastructure including terminals, quays, jetties, and berths, and is a hub of commercial vessel activity. Consequently, careful passage planning is crucial for ensuring safe navigation through this busy area.

3.1.1 Marine Infrastructure

3.1.1.1 The Navigational Study Area features a wide array of marine infrastructure. The key navigational features (terminals, quays, docks, berths, jetties, and bridges) located within the Study Area are shown in **Figure 1** and summarised in **Table 1.**

3.1.1.2 The main navigational obstacle for ocean-going vessels transiting to Wilton Engineering is the Tees Transporter Bridge, which has an air draft of 48.2m at Highest Astronomical Tide (HAT). The passage into Clarence Lower Wharf is located before the Transporter bridge and is therefore not affected by the restriction. Both offloading sites are restricted by the overhead power cables further down river with an air draft 87m at HAT.

3.1.1.3 Wilton Engineering utilises its Port Clarence base for all load-out facilities including three (3) separate quays. The two main quays (200m quay and 54 m angle quay) have barge Roll on Roll off (RO/RO) capability with capacity of 20,000 Tonne over each quay. These quays are adjacent to an extensively piled and reinforced concrete external construction apron, which has a floor load rating of 40 tonnes per square metre and is equipped with 8 no 30 Tonne overhead (60T e tandem) cranes.

3.1.1.4 Clarence Lower Wharf is a single 200m quay adjacent to the ABLE Clarence Port.

3.1.2 Aids to Navigation

3.1.2.1 Within the River Tees, the dredged channel is delimited by lateral marks, and some terminals, quays, and berths are marked by pilar shaped buoy with lights. The transporter bridge before Wilton Engineering is marked with flood lights.

3.1.3 Bathymetry and Charted Depths

3.1.3.1 The dredged depth of the Tees Approach Channel starts at 15.4m Chart Datum (CD) and reduces to 14.1m CD at the mouth of the River Tees. The dredged channel continues up the river decreasing to a depth of 5.1m CD in the vicinity of Wilton Engineering. The dredged channel depth at Clarence Lower Wharf is 5.7m CD, but according to PD Ports, the minimum expected depth on a berth in Clarence Lower Wharf is 3.1m CD.

3.1.4 Tidal information

3.1.4.1 Teesport Harbour, located in the River Tees, is subject to tidal variations due to several factors including gravitational pull, the shape of the river, the wind, and atmospheric pressure. As a result, the tides on the River Tees can be quite complex and vary throughout the day. The Tees Estuary tidal range is about 4.5 meters at spring tides and 2.3 meters at neap tides. The estuary experiences semi-diurnal tides, meaning it experiences two high tides and two low tides of approximately equal height within a 24-hour period. The tides can have significant impact on shipping, and thus, careful planning and consideration is required to ensure safe passage.

3.2 HARBOUR AUTHORITY

3.2.1 PD Ports operates as the designated Statutory Harbour Authority for the Port of Tees and Hartlepool, collectively known as Teesport. Their primary responsibility entails the oversight of a 12-mile segment of the River Tees, extending three miles into the North Sea. The Navigational Study Area is entirely contained with the Statutory Harbour Authority area.

3.2.2 PD Ports oversees all vessel traffic management, ensuring safe navigation and maintaining channel depths for the vessels that visit Teesport. Its powers are predominantly derived under the Tees and Hartlepool Port Authority Act 1966, but it also exercises various other powers under other legislation applicable to all Harbour Authorities.

3.2.3 PD Ports is also the Competent Harbour Authority for the purposes of pilotage within its jurisdiction.

3.2.4 Additionally, PD Ports fulfils the role of the Local Lighthouse Authority, assuming the responsibility for the provision and proper maintenance of aids to navigation as necessary and effective management of any danger to navigation from wrecks or obstructions, facilitating the safe passage of vessels.

3.2.5 Consultation was undertaken with PD Ports and is documented in **Section 4**

3.3 VESSEL TRAFFIC MANAGEMENT

3.3.1 A Vessel Traffic Service (VTS) is operated in the approaches to, and within the Statutory Harbour Authority area, of Teesport. The purpose of a VTS is to contribute to safety of life at sea, improve the safety and efficiency of navigation and support the protection of the environment within a VTS area by mitigating the development of unsafe navigation situations through:

- Providing timely and relevant information on factors that may influence ship movements and assist on-board decision making.
- Monitoring and managing ship traffic to ensure the safety and efficiency of ship movements.
- Responding to developing unsafe situations

3.3.2 PD Teesport, who manage the Tees and Hartlepool Port, have issued a set of byelaws and general directions for vessels navigating within the SHA area. The general directions define VTS controlled vessels as any vessel over 20m in length and requires them to seek permission from VTS before entry into the VTS area.

3.4 PILOTAGE REQUIREMENTS

3.4.1 PD Teesport is the Competent Harbour Authority (CHA) for the Study Area with respect to pilotage. The requirements for pilotage are contained within the PD Ports Pilotage Directions 2023. The areas where pilotage is considered to be mandatory in the Tees are:

- The navigable area of the Tees between the inner limit of the Seaton Turning Area and No.23 Buoy.
- The navigable area of the Tees between No.23 Buoy and the upper limit of PD Teesport's jurisdiction.

3.4.2 The Pilotage Directions also state that pilotage is compulsory for vessels navigating in the above areas when:

- The LOA exceeds 95m; or
- The summer deadweight exceeds 4,000 tonnes; or
- The gross tonnage exceeds 4,000 tonnes; or
- The LOA exceeds 20m and the cargo on board are dangerous goods or marine pollutants; or
- The vessel is in excess of 50m LOA and requires the services of a tug; or
- The vessel is less than 50m LOA and requires the services of a tug, where a risk assessment carried out by the Harbour Master and Tees Bay Pilots so dictates.

3.4.3 The proposed project ocean going vessel have a LOA of 173m, and so requires pilotage to transit to and from both wharfs. As North Sea Barges are greater than 50m LOA and will require a tug, they also require pilotage. Project vessels will therefore potentially be subject to delays whilst the services of an available pilot are awaited.

3.5 VESSEL TRAFFIC ANALYSIS

3.5.1 The Study Area in the vicinity of Wilton Engineering and Clarence Lower Wharf has a significant level of vessel traffic, (see **Figure 5** and see **Table 2**).

3.5.2 In order to determine the differing levels of vessel traffic between the two sites, analysis of vessel movements, by vessel type was undertaken (see **Table 2**).

3.5.3 The section of the river channel in front of Wilton Engineering has significantly less vessel activity than the channel at Clarence Lower Wharf (see **Table 2**).

3.5.4 This is predominately attributed to variances in port service vessel activity; there were 4,239 port service vessels adjacent to Clarence Lower Wharf in contrast to 797 at Wilton Engineering. The substantial difference in port service vessel transit numbers can be explained by the location of the tug moorings directly opposite Clarence Lower Wharf, as tug vessel frequently navigate on and off the moorings but would mostly navigate down river.

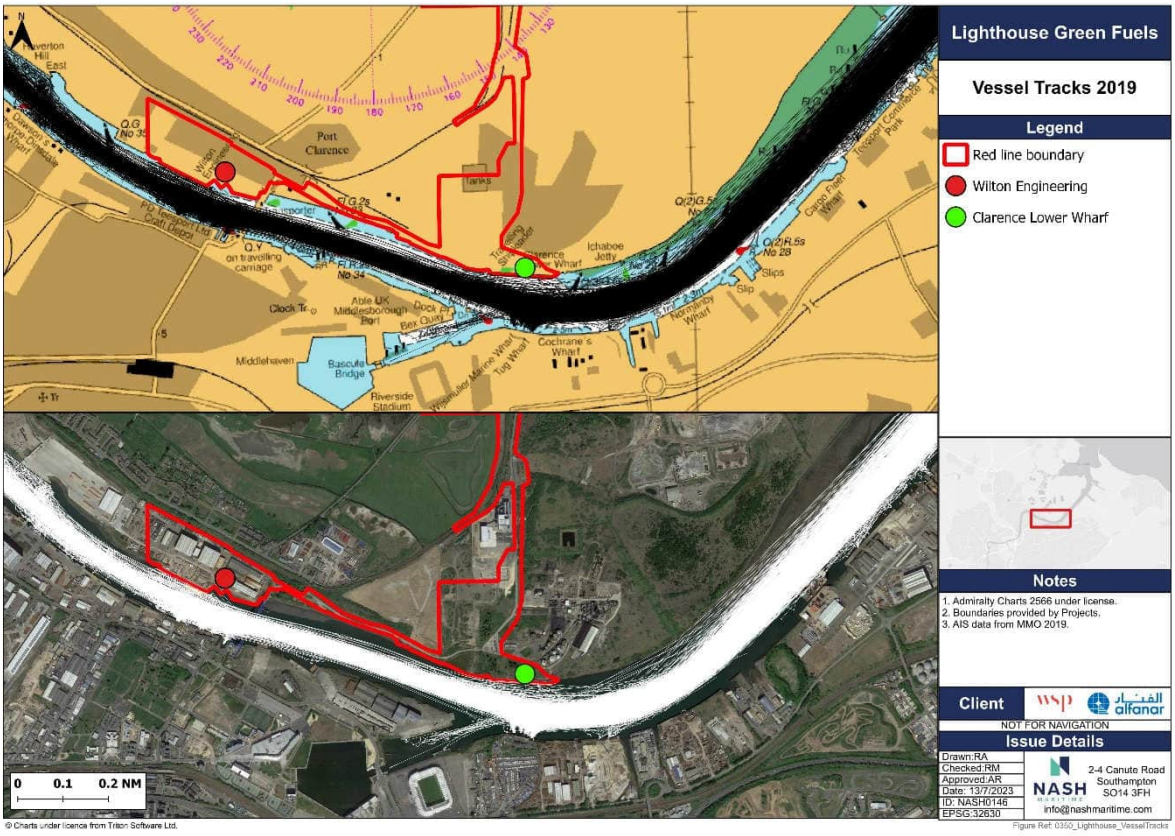

Figure 5: Initial vessel tracks from 2019 AIS data (MMO).

3.5.5 Vessel movements by other vessel types (excluding port service vessels and tankers) are approximately the same across both sites.

Table 2: Annual vessel traffic frequency by vessel type adjacent to Wilton Engineering (left) and Clarence Lower Wharf (right) derived from 2019 AIS data (MMO).

Wilton Engineering		
Vessel Type	**<75 m**	**>75 m**
Cargo	7	250
Tanker	4	135
Port Service	797	0
Dredging	552	9
Other	339	46
Total	1,699	439

Clarence Lower Wharf		
Vessel Type	**<75 m**	**>75 m**
Cargo	4	237
Tanker	28	150
Port Service	4,239	0
Dredging	528	9
Other	311	46
Total	5,110	456

3.6 MARITIME INCIDENTS

3.6.1 Relevant recorded incident data was extracted from the following sources and periods:

- Marine Accident Investigation Branch (MAIB) incidents (2010-2020); and
- Royal National Lifeboat Institute (RNLI) callouts (2008-2022).

3.6.2 Only 2 MAIB incidents and 22 relevant RNLI callouts were recorded in the Study Area. The relevant recorded incidents are summarised in **Table 3** below.

Table 3: Summarises the relevant incidents in the navigational study area reported by the MAIB (2010-2020) and the RNLI (2008-2022).

RNLI / MAIB	Date	Vessel Type	Description	Occurrence
MAIB	01/09/94	Cargo	Contact with shore object	Less serious
MAIB	01/02/96	Cargo	Loss of control due to ship crane failure	Marine incident
MAIB	01/12/97	Cargo/cargo	Collision between cargo vessels	Serious
MAIB	01/08/14	Cargo/tanker	Collision between cargo and oil tanker	Serious
MAIB	01/12/20	Cargo	Engine failure – required tow	Less serious
MAIB	01/03/21	Tug & service	Grounding during low tide	Less serious
MAIB	01/07/21	Passenger	Grounding/stranding due to personal conflict	Less serious
MAIB	01/09/21	Tanker	Contact with fendering	Marine incident
MAIB	01/10/21	Tanker	Grounding while manoeuvring astern to berth	Less serious

4. HARBOUR MASTER CONSULTATION

4.1 A consultation meeting was held with Teesport Deputy Harbour Master Chris Stock on 12-Jul-2023 between 15:00 and 16:00.

4.2 The purpose of the meeting was to elicit regulator feedback on the key navigational impacts that may result for the proposed marine operation.

4.3 The meeting was attended by:

- PD Ports
- Chris Stocks, Deputy Harbour Master (CS)
- NASH Maritime Ltd
- Sam Anderson-Brown, Principal Consultant (SAB)
- Marco Antonio Slerca, Maritime Consultant (MAS)

4.4 Note, the below key points are subject to formal approval by Chris Stocks. (full draft meeting minutes can be viewed in **Appendix A** and are also subject to approval by Chris Stocks)

4.5 The following key points were discussed**:**

- **Stakeholders and impacts on port services** – Mediterranean mooring of a Big Lift vessel at Wilton Engineering and Clarence Lower Wharf would block the channel. This can impact the port service activities, and other vessels that operate in a tidal window as well. Side-on mooring would not block channel and would have a smaller impact on the existing operations. Barge in Mediterranean mooring would partially obstruct the channel but still allow some vessel crossing. The biggest impact will be on Port Middlesborough, directly opposite to Wilton Engineering, which also operate similar-sized vessel in a tidal window.
- There is precedent for transhipment operations occurring between vessels and barges in Tees Dock.
- Mediterranean mooring of a 150m long vessel has already occurred at Wilton Engineering, which left part of the channel free for port service boats. However, this was a one-off operation.
- CS observed that Clarence Lower Wharf is not suitable for these marine operations – shallower depth at berth compared to Wilton and extremely narrow tidal window. Mediterranean mooring of barge will obstruct significant portion of Tees channel.
- Grounding is a high risk due to depths, draught, and tidal range.
- Side-on mooring is less challenging compared to Mediterranean mooring from a navigational risk assessment perspective.
- Important to consider how long the module discharging will take and how the ship will be ballasted during offloading.
- CS stated that the proposed marine operations have significant potential navigation impacts and therefore a project Navigation Risk Assessment would be required.

5. NAVIGATIONAL IMPACTS REVIEW

5.1 Following a review of the proposed marine operation, baseline navigational environment, high level vessel traffic analysis, and information elicited during consultation combined with the expert opinion of the project team, the following likely navigational impacts were identified:

- Obstruction of the navigation channel;
- Project vessel grounding;
- Project vessel contact;
- Project vessel breakout; and
- Collision with third party vessel.

5.1 OBSTRUCTION OF THE NAVIGATION CHANNEL

5.1.1 The review of the proposed marine operation indicates the potential for obstructing the Tees navigation channel. Mediterranean mooring of a heavy lift MC Class (LOA of 173m) would obstruct the majority of the channel at Wilton Engineering. Mediterranean mooring of the heavy lift MC Class at Clarence Lower Wharf would completely block the channel. The anchors of the vessels secured in a Mediterranean mooring configuration would further contribute to the obstruction of the channel and create a hazard for small passing vessels (such as attendant tugs). Side-on mooring of the project vessel at both offloading sites would have less of an impact on the navigational channel and passing vessels. Mediterranean mooring of the North Sea Barge would partially obstruct the channel, especially at Clarence Lower Wharf, but would probably allow the crossing of smaller vessels. Side-on mooring of the project barge at both sites would not affect the navigational channel.

5.1.2 Project vessels manoeuvring on and off the berth and turning, can also temporarily block the channel, which would impact the vessel traffic.

5.1.3 Partial or complete blocking of the channel could lead to contact between the moored project vessel and a passing vessel. In addition, a partial obstruction of the channel can also increase the likelihood of grounding of third-party vessels, as they will have to navigate closer to the shallower riverbank.

5.1.4 This obstruction can also have wider port and commercial consequences, including increased vessel traffic congestion, delays in time schedules, and potential impacts on the pilotage service. Blocking of the channel at Clarence Lower Wharf can present greater challenges due to the high vessel activity, especially in relation to tug & service vessels.

5.2 PROJECT VESSEL GROUDING

5.2.1 The assessment identifies a risk of project vessel grounding during the marine operations, attributed to factors such as shallow areas, uneven bed conditions, and navigational planning errors. The summer draught of the project vessel is 6.5 metres and the minimum depths at berth in Wilton Engineering and Clarence Lower Wharf

are 4.7 m and 3.1, respectively. This means that offloading operations at both sites are extremely tidally limited, especially in Clarence Lower Wharf. Contingencies during offloading operations can lead to grounding of the project vessel as the tide lowers. The state of the tide is also considered the most critical and limiting factor for barge RO/RO operations.

5.3 PROJECT VESSEL CONTACT

5.3.1 There is a potential for contact between the project vessel and fixed structures as it passes the Tees navigation channel, particularly when swinging to enable a stern on Mediterranean berthing. These structures can be moored third-party vessels, jetties, navigational aids, and the Transporter Bridge supports (for vessels navigating up to Wilton Engineering). The narrow Tees channel contributes to the likelihood of contact, especially during vessel manoeuvring.

5.4 PROJECT VESSEL BREAKOUT

5.4.1 The potential breakout of the project vessel in Mediterranean mooring is a navigational concern during the marine operation. A breakout refers to the unintentional release or loss of control of the vessel from its moorings. Breakout of the project vessel can lead to contact with other stationary third-party vessels or various fixed structures such as the Transporter Bridge supports, quays, jetties and navigation buoys.

5.5 COLLISION WITH THIRD PARTY VESSEL

5.5.1 The review identifies the possibility of collisions between the project vessel and third-party vessels due to the high vessel activity at Teesport (see **Figure 5**), reduced manoeuvring space, and potential deviations from the main channel. Marine operations taking place at Clarence Lower Wharf have a higher risk of collision due to the increased vessel traffic in that region (see **Table 2**)

5.6 SUMMARY

5.6.1 The impacts identified in **Section 5** could be significant and therefore should not be scoped out of the environmental assessment of shipping and navigation.

5.6.2 The impacts that have been scoped into the assessment are outlined in **Table 4** together with a description of any additional data collection and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the shipping and navigation impacts.

5.6.3 The potential impacts to marine processes that have been scoped out of the assessment are described in **Table 5.**

Table 4: Impacts to be Scoped into the Environmental Assessment of shipping and navigation.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach to Assessment
Increased risk of collision	The project will introduce a new source of vessel traffic to the port environment. This has the potential to increase the risk of collision between project vessels and third-party vessels. There is also a risk of collisions occurring between third party vessels as a result of action taken to avoid project vessels.	AIS vessel traffic data will be required to inform that baseline. Consultation with key stakeholders.	Review of project operations. Qualitative assessment to assess potential impact, informed by a Navigation Risk Assessment (NRA).
Increased risk of contact	Partial or complete blocking of the navigational channel can lead to contact between the moored project vessel and a passing vessel. There is a potential for contact between the project vessel and fixed structures as it passes the Tees navigation channel, particularly when swinging to enable a stern on Mediterranean berthing	AIS vessel traffic data and incident data will be required to inform that baseline. Analysis of metocean conditions. Consultation with key stakeholders.	Review of project operations. Qualitative assessment to assess potential impact, informed by an NRA.
Increased risk of grounding	The project vessels have a summer draught of 6.5 m and the minimum depth at berth at Wilton Engineering and Clarence Lower Wharf is 4.7 m and 3.1 m respectively. The vessels will have to operate over a narrow tidal window and contingencies during offloading operations can lead to grounding.	AIS vessel traffic data and incident data will be required to inform that baseline. Tidal height and stream analysis Consultation with key stakeholders.	Review of project operations. Qualitative assessment to assess potential impact, informed by an NRA.
Increased risk of breakout	Project vessels in Mediterranean mooring are at risk of breaking out, which could lead to contact of the vessel with fixed structures and cause significant damage to property and pose risks to the safety of personnel involved.	MetOcean data for the area including wind and tidal conditions will be required to inform the baseline. Consultation with key stakeholders	Review of project operations. Qualitative assessment to assess potential impact, informed by an NRA.
Impact on Port operations	Any potential increase in vessel traffic associated with the project could result in an increase in demand for port services such as anchorages and pilotage services, particularly during a restricted tidal window. This may affect availability of services leading to effects on port operations and subsequent increases in navigation risk.	AIS vessel traffic data will be required to inform that baseline. Consultation with key stakeholders.	Review of project operations. Qualitative assessment to assess potential impact, informed by an NRA.

Impact	Justification	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Proposed Approach to Assessment
Changes in navigation risk profile resulting from roll over operation	Depending on the location of the roll over operation there will likely be varying increases in navigational risk which will require assessment.	AIS vessel traffic data will be required to inform that baseline. Consultation with key stakeholders.	Review of project operations. Development of marine concept plan Qualitative assessment to assess potential impact, informed by an NRA.

Table 5: Impacts to be scoped out of the Environmental Assessment of shipping and navigation.

Impact	Justification
Normal alongside berthing operations at Wilton Engineering and Clarence Lower Wharf	Alongside berthing operations currently take place at Wilton Engineering and Clarence Lower Wharf. Providing the project vessel and barge utilised is of similar specification and moors in a similar manner to current operations, this activity is not a departure from normal baseline activity and would be covered by the Port baseline risk assessment.
Commercial impact on port / third party operations	Commercial impacts on the port / third party operations will not be considered as this is not an impact associated purely with navigation and shipping.

Appendix A
Draft Consultation Minutes

LIGHTHOUSE GREEN FUELS

Project Title	LIGHTHOUSE GREEN FUELS
Project Number	0350
Meeting subject / purpose	Harbour Master Consultation
Revision	R01-00
Date of meeting	12-Jul-2023
Start time	15:00 GMT
Finish time	16:00 GMT
Client	WSP + Alfanar
Location	Teams

DOCUMENT CONTROL

Revision	Date of Issue	Description	Approved
R01-00	12-Jul-2023	Issued to attendees for comment	SAB

ATTENDEES

Organisation	Attendee	Role	Initial
NASH Maritime	Sam Anderson-Brown Marco Antonio Slerca	Principal Consultant Maritime Consultant Intern	SAB MAS
PD Ports	Chris Stocks	Deputy Harbour Master at PD Ports	CS

APOLOGIES

Organisation	Attendee	Role	Initial
NASH Maritime	Ed Rogers	Director	EJR

NOTES OF MEETING

1	Introductions	Action
1.1	All 3 participants introduced themselves and SAB outlined the proposed marine operations for the construction of the LGF site. This involves arrival of 200 modules via heavy lift vessels over an 18-month period. Two offloading options are possible: (1) A direct transfer of the modules to the shore from the MC Class vessel; or (2) a transshipment of the modules (roll-over operation) onto barges, followed by subsequent offloading onto land. Offloading site options are: (1) Wilton Engineering, and (2) Clarence Lower Wharf. Albeit that Clarence Lower Wharf would require infrastructure works in order to support the heavy modules.	
2	**Key Impacts to Consider:**	
2.1	**Grounding** – High risk due to the shallow depths of the channel/berths and the draught of the Big Lift vessel (summer draught = 6.5 m). Navigation and operations are tidally limited; vessels will have to operate within a defined tidal window. Minimum depth at berth 4.7 m at Wilton Engineering and around 3 m at Clarence Lower Wharf. Offloading operations in Clarence Lower Wharf will have very narrow tidal windows. The navigational plan should account for contingencies. Less risk of grounding if transhipment of modules onto barges occurs (usually this happens at Tees Dock).	
2.2	**Contact** – Risk of contact as project vessels navigating up to Wilton Engineering will have to pass under the Transporter bridge, with an air draft of 48.2 m. Other obstacles include moored third-party vessels, buoys, and fixed port infrastructure. Breakout of vessel whilst moored can also lead to contact with quay or other riverbank structures.	
2.3	**Stakeholders and impacts on port services** – Mediterranean mooring of Big Lift vessel at Wilton Engineering and Clarence Lower Wharf would block the channel. This can impact the port service activities, and other vessels that operate in a tidal window as well. Side-on mooring would not block channel and would have a smaller footprint on the existing operations. Barge in Mediterranean mooring would partially obstruct the channel but still allow some vessel crossing. The biggest impact will be on Port Middlesborough, directly opposite to Wilton Engineering, which also operate similar-sized vessel in a tidal window.	
2.4	**Collision** – Study area is highly trafficked, especially in front of Clarence Lower Wharf due to Svitzer Marine (located directly in front of Clarence Lower Wharf). High risk of collision of project vessel and third-party vessels, especially as there will likely be other large vessels operating the same tidal window.	
2.5	**Third-party vessel impacts** – Partial or complete obstruction of the channel can lead to deviations by third-party vessels, vessel traffic congestion, and disruptions. This can increase the likelihood of contact, grounding, or collision, of third-party vessels.	
3	**Precedents for similar operations**	
3.1	Vessels above 100 m heading upriver tend to swing at Tees Dock.	
3.2	There is precedent for transhipment operations occurring between vessels and barges in Tees Dock.	
3.3	Mediterranean mooring of a 150 m long vessel has already occurred at Wilton Engineering, which left part of the channel free for port service boats. However, this was a one-off operation.	

3.4	Mediterranean mooring at Wilton Engineering has been undertaken with a bow anchor, 2 side lines on the portside attached to the shore, and 2 tugs on the starboard side.	
3.5	Transhipment of cargo from ocean-going vessels onto barges usually takes place at Tees Dock for vessels over 100 m long.	
4.0	**Concluding thoughts**	
4.1	CS observed that Clarence Lower Wharf is not suitable for these marine operations – shallower depth at berth compared to Wilton and extremely narrow tidal window. Mediterranean mooring of barge will obstruct significant portion of Tees channel.	
4.2	Grounding is a high risk due to the depths, draught, and tidal range.	
4.3	Side-on mooring is less challenging compared to Mediterranean mooring from a navigational risk assessment perspective	
4.4	Important to consider how long the module discharging will take and how the ship will be ballasted during offloading.	
4.5	CS stated that the proposed marine operations have significant potential navigation impacts and therefore a project Navigation Risk Assessment would be required.	

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