

b. the lateral extension of mineral workings.

- 18.8 Minerals are vital to the economy of the United Kingdom and to Flintshire. It is important that the planning system facilitates the minerals extraction and processing industries to ensure the continued supply of minerals to the marketplace whilst safeguarding high quality mineral resources from use as lower grade material. The Minerals Planning Authority will seek to ensure that mineral resources are extracted and utilised in a sustainable way in order to make an appropriate contribution to the needs of society.
- 18.9 Given the extensive landbank for aggregates, further extensions to existing sites or new extraction sites will not be permitted save in rare and exceptional circumstances. Such a situation could arise where, for example, the supply of an aggregate of a particular specification is clearly demonstrated or where operators are prepared to unilaterally surrender the consents relating to existing permitted reserves through planning agreements or Prohibition Orders. To ensure minerals are used appropriately it will be necessary for proposals to demonstrate that there is a need for the mineral to be extracted. This is a key consideration and proposals which fail to demonstrate need will be refused. To demonstrate need developers should consider the local, regional and national economies, the existing supply of minerals, and the ability of existing supplies to meet current and projected market demand. Where a demand is identified it will be necessary for developers to demonstrate the need for land-won materials instead of secondary and recycled resources. There are limitations to the use of recycled waste materials and the Council recognises that it will not be appropriate for all proposals to consider this potential, for example in those proposals where a high quality mineral is required.
- 18.10 Because of the long term nature of mineral workings it is sometimes more sustainable and environmentally acceptable to permit the deepening or lateral extension of an existing mineral working than to permit a new mineral development. The UDP takes a sequential approach to proposals for new mineral development with preference being given firstly to the use of secondary and recycled materials; secondly to the deepening of existing workings, provided it does not have an unacceptable adverse impact on groundwater or other environmental interests; thirdly to the lateral extension to existing workings, provided the extension does not have an unacceptable adverse impact on existing communities and on other landscape, historic and environmental interests; and lastly to the development of new mineral workings.
- 18.11 In using the sequential approach it will be necessary to assess the impact of each of the preferred options in accordance with the entire minerals policy suite (particularly MIN 2) and the rest of the development plan to ensure the development is of an acceptable standard, the development is appropriately located, and the adverse impacts of the development are mitigated and minimised.

#### Other key Policies:

- GEN5 Environmental Assessment

#### MIN2 Minerals Development

Proposals for the winning, working, processing and/or recovery of minerals will be assessed with regard to the following criteria:

- a. the development will not have a significant adverse impact upon the following interests of importance:
- i. the River Dee Estuary;
  - ii. Holywell Common and Halkyn Mountain;
  - iii. sites of international, national, regional or local environmental, nature conservation, landscape and/or heritage importance.
- b. Minerals development should not take place in the Clwydian Range AONB save in exceptional circumstances, subject to the most rigorous examination and demonstrated to be in the public interest;
- c. the amenity of local people is not significantly affected;
- d. the economic viability of the area is not compromised;
- e. visual intrusion arising from site working, creation of overburden mounds or the presence of plant and machinery;
- f. the impact of mineral operations on land stability;
- g. satisfactory management and disposal of mineral waste; and

- h. the cumulative effects of mineral operations, involving operational or consented sites, in the locality.
- 18.12 This policy seeks to locate minerals development away from sensitive locations to protect the community and the environment. Minerals development should not take place in the AONB save in exceptional circumstances. All minerals development proposals must be subject to the most rigorous examination and demonstrated to be in the public interest before being allowed to proceed. Consideration will be given to the factors outlined in para 21 of MPPW in assessing proposals. Minerals proposals adjacent to or close to the AONB that might affect its setting will be carefully assessed to determine whether the environmental and amenity impact is acceptable. In exceptional instances where permission is granted the Planning Authority will seek to ensure the highest standards of development and operations are abided to by the operator.
- 18.13 The visual intrusion of minerals development will be assessed in terms of the effects arising from site working, amendments to landform and any associated plant and machinery. Where ground instability is likely to be an issue, a land stability report will be required, setting out the issues relevant to the locality and how they will be overcome. Developers will be required to establish how mineral waste arising from extraction will be managed and disposed of. An assessment of the cumulative impacts of additional proposals will be required having regard to both operational and consented sites in the vicinity. This should seek to identify whether the proposed mitigation measures are sufficient to address the identified impacts and whether additional measures are required. Minerals development will be expected to meet all of the policy requirements as laid out above. If this is done then it will be necessary for the detail of the application to meet the requirements of MIN3.

#### Other key policies:

- GEN5 Environmental Assessment
- L1 Landscape Character
- L2 Area of Outstanding Natural Beauty
- WB2 Sites of International Importance
- WB3 Statutory Sites of National Importance
- WB4 Local Sites of Wildlife and Geological Importance
- WB5 Undesignated Wildlife Habitats

#### MIN3 Controlling Minerals Operations

Provided the criteria of Policies MIN1 and MIN2 are met, then mineral workings will be permitted where:

- a. the additional traffic burden can be accommodated by the existing highway network without significant adverse impact;
  - b. the movements of vehicles to and from the site do not cause unacceptable harm to the living conditions of nearby residents;
  - c. blasting operations do not cause unacceptable harm to the surrounding area by reason of vibration;
  - d. noise from the winning, working, processing and/or recovery of minerals will not cause significant disturbance to noise sensitive locations;
  - e. dust, smoke and fumes from processing operations and handling operations will not have an adverse impact on sensitive locations and on the surrounding vegetation; and
  - f. it would not result in significant adverse impact on land drainage, groundwater resources or water supplies.
- 18.14 The Mineral Planning Authority is charged with the task of monitoring mineral permissions in the County to ensure the operations of the mineral working are compliant with conditional permissions; conditions are drafted to ensure that the impact of minerals operators is minimised as far as possible. It is important therefore that developers ensure that proposals meet the above operations criteria. To assess the impact of the traffic generated by the development the Minerals Planning Authority will expect developers to submit details of the anticipated number of vehicle movements and the proposed routes of these vehicles. Noise sensitive locations include residential dwellings and gardens, places of worship, educational establishments, hospitals or similar institutions and livestock farms. Sensitive locations are defined in the Town & Country Planning (EIA) (England and Wales) Regs 1991 and include amongst others, areas of special scientific interest, scheduled ancient monuments, AONB's and European Sites.

#### Other key policies:

- GEN5 Environmental Assessment

- AC13 Access and Traffic Impact
- MIN10 Mineral Buffer Zones
- EWP12 Pollution
- EWP13 Nuisance

#### **MIN4 Restoration and Aftercare**

The Minerals Planning Authority requires that all minerals development proposals be accompanied by a scheme of restoration and aftercare. Such a scheme will set out the short and long term maintenance and improvement of the site. The scheme should address and make full reference to the following criteria:

- a. the undertaking of works which will limit the impact of the mineral workings operations on the surrounding environment;
- b. a timetable detailing the progressive restoration of the site to the highest most practicable standards;
- c. the proposed afteruse and;
- d. the final landform design taking into consideration the surrounding topography and landscape character.

- 18.15 The restoration of a mineral workings site is a key consideration for the Minerals Planning Authority and applications which lack the necessary detail (as specified in the policy above) will not receive planning permission. Applicants will be encouraged to restore sites with the intention of maximising their use for nature conservation and for informal recreation purposes (i.e. boating lakes, footpaths etc).

#### **Other Key Policy**

- IMP1 Planning Conditions and Obligations

#### **MIN5 Dormant, Inactive and Interim Development Order Sites**

The Minerals Planning Authority will seek to ensure that all dormant, inactive and interim development order minerals sites meet modern planning standards both in their operations and in the restoration of a site.

- 18.16 Within Flintshire there are many sites which currently hold permission for the extraction of minerals. Some of these permissions date back prior to World War Two (pre-1939). For the Minerals Planning Authority, historic permissions pose a significant problem since they contain grossly inadequate conditions to control their development. Historic permissions may well omit conditions relating to, for example, blasting; the movement of vehicles servicing the site; the restoration of the site; and/or the reuse of the site. Where modern standards are omitted the Minerals Planning Authority will seek to achieve a better standard of development which meets the aims and objectives of this Plan and which complies with its policies. The Council has confirmed prohibition orders on 18 dormant sites and there are only two dormant sites remaining at Grange, Pantasaph and Mount Pool, Buckley.

#### **MIN6 Review of Mineral Permissions**

The Minerals Planning Authority will undertake an annual assessment of all dormant mineral sites and sites that have not been worked for 10 years to identify their potential contribution to the landbank and the likelihood of their reopening. Where appropriate, prohibition orders will be served under s.102 of the Town and Country Planning Act 1990.

- 18.17 Unfortunately in the past the MPA has granted permission for minerals extraction but the expansion of settlements, the growth of new settlements and the recognised importance of other interests, forces the MPA to reconsider some of those permissions. Minerals Planning Authorities have the authority to review existing planning permissions and to modify or revoke planning consent. In such instances where the MPA prejudices the asset value of a minerals site it will be liable to pay compensation to the sites owners. While this route is a costly one it may be necessary to undertake these proceedings where the reopening and resumption of operations presents a real threat to the communities of Flintshire.

#### **MIN7 Exploration for Minerals**

The Minerals Planning Authority will permit exploration works for a temporary period as long as they do not have a significant adverse impact on the environment and the site is fully restored to its former state.

- 18.18 Proposals for trial excavations, boreholes or any other exploratory development will normally be permitted for a temporary period provided the development does not pose a threat to the environment. Where the pollution of water courses, groundwater or other water resources is a possibility it will be necessary for the Minerals Planning Authority to consult with the Environment Agency prior to permitting the development. Normally it will be expected that permission will be granted for a temporary period of three months, and extensions beyond this period must be negotiated with the Minerals Planning Authority and fully justified by the developer.

### MIN8 Protection of Mineral Interests

To ensure that known mineral resources are safeguarded for future use, Mineral Safeguarding Areas (MSA's) have been identified and are shown on the proposals map.

Any non-mineral development within a MSA will require evidence as to what extent it may sterilise or restrict the working of mineral resources. Where the evidence is not forthcoming or demonstrates that there will be an unacceptable impact on mineral resources the application will be refused. However, where it is considered that the proposed development is of overriding importance, consideration will be given to the principle of pre-extraction of the minerals.

- 18.19 Within the County there are significant deposits of important mineral resources. It is important that these mineral resources are safeguarded to ensure their availability in the future. Developments proposed within identified Mineral Safeguarding Areas will be assessed to ensure they do not sterilise mineral resources either by developing over identified deposits or by restricting future mineral extraction. Within the Minerals Safeguarding Area consultation between the Minerals Planning Authority, the minerals industry and others will be undertaken before certain non-mineral planning applications made within the area are determined.
- 18.20 Policy MIN8 seeks to ensure that all mineral interests are adequately safeguarded from unnecessary sterilisation and loss. Whilst the Proposals Map only identifies Minerals Safeguarding Areas for hard rock and sand and gravel deposits, this policy will also apply to the protection of energy minerals. The exploitation of energy minerals such as coal is unlikely to be a significant issue for this Plan period but may have considerable future importance for Flintshire. Areas such as Point of Ayr and the site of the Point of Ayr Colliery are perhaps the best examples of where it will be necessary to consider the protection of deep coal seams from unnecessary development and subsequent sterilisation.

### Other Key Policies:

- WB2 Sites of International Importance

### MIN9 Borrow Pits

Proposals for the development of borrow pits will be permitted provided that:

- there are demonstrable environmental benefits to be gained; and
- they can be developed in accordance with mineral planning policies.

- 18.21 Borrow Pits are temporary mineral workings developed to supply a particular construction project. Borrow pits can offer significant environmental benefits over mineral supply from existing reserves. They should be located near to the project and preferably supply material direct without the use of public roads. There need to be clear environmental benefits from the use of a borrow pit and restoration should be to a high standard.

### MIN10 Mineral Buffer Zones

Mineral Buffer Zones are identified on the Proposals Maps based on a minimum distance of 100m for sand and gravel workings (and others where no blasting is permitted) and 200m for hard rock quarries. Development within Minerals Buffer Zones for new mineral extraction or sensitive development will not be permitted.

- 18.22 The principle of Buffer Zones was established in Minerals Planning Policy Wales in order to protect land uses or developments that are most sensitive to the impact of mineral operations by establishing a separation distance between potentially conflicting land uses. Sensitive development is any building occupied by people on a regular basis and includes housing areas, hostels, meeting places schools and

hospitals, where an acceptable standard of amenity should be expected. Buffer zones will also help to prevent the sterilisation of mineral resources. As such, developments proposed within the Buffer Zones are also likely to be assessed under Policy MIN8 if they fall within the Mineral Safeguarding Area.

- 18.23 The extent of the Buffer Zones has been defined based on the minimum distances specified in MTAN1. They provide a clear indication of the areas within which there is likely to be conflict between minerals and other forms of development. Within the Buffer Zone, there should be no new mineral extraction or sensitive development. However other developments which are less sensitive to impact from mineral operations, for example industry, offices and some ancillary development related to the mineral working, may be acceptable within the Buffer Zone.

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# Annex C

## **SECTION 1 MRA**

## SECTION 1 MRA

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### 1.1. SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 1 of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the development is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (shown in **Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 1 of the Newbuild Infrastructure Boundary is presented in **Table C-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits are presented on **Figure 11.3.2 (Sheet 1)** in **Annex A**.

**Table C-1 – Anticipated geological sequence for Section 1**

Type	Geological unit and typical description	Distribution
<b>Superficial</b>	Alluvium: Variable sediment of mud, sand, and gravel, with some peat in places.	Limited exposure in the western most limits of Section 1.
	Tidal Flat Deposits: Mud and sand.	Eastern / north-eastern parts of Section 1.
	Glacial Till: Diamicton (unsorted sediment with gravel in a fine mud matrix).	Central and western parts of Section 1.
<b>Bedrock</b>	Kinnerton Sandstone Formation: Sandstone	East side of Section 1.
	Chester Formation: Pebbly gravelly sandstone	Western side of Section 1

## BGS MINERAL RESOURCES MAP

A review of the BGS 1:50,000 scale Mineral Resources Map does not highlight any potential mineral resources. However, based on a review of the Mineral Safeguarding Areas (see **Section 5.1** of the main report), the Alluvium located within Section 1 is considered to be a potential resource and therefore exploratory hole records have been reviewed for this area.

**Table C-2 – Summary of mineral thickness and overburden for Section 1 of the Newbuild Infrastructure Boundary**

Borehole Ref:	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
LB_21_02_BH (App. I.1)	344537 , 374786	Sand & Gravel	1.5	1.85	20m

## HYDROGEOLOGY

Hydrogeological units for Section 1 of the Newbuild Infrastructure Boundary are summarised in **Table C-3**. The superficial deposits are classified as Secondary aquifers by the Environment Agency (EA). As a Secondary A aquifer, the Alluvium is more likely to contain extractable quantities of groundwater in permeable layers. Both bedrock formations are classified as Principal Aquifers, and contain a high potential yield of extractable groundwater through high intergranular and / or fracture permeability. Section 1 of the Newbuild Infrastructure Boundary is not within a groundwater protection zone.

**Table C-3 – Aquifer statuses of geological units within Section 1 of the Newbuild Infrastructure Boundary**

Type	Geological Unit	Aquifer Status
Superficial	Alluvium	Secondary A
	Glacial Till	Secondary (undifferentiated)
	Tidal Flat Deposits	Secondary (undifferentiated)
Bedrock	Kinnerton Sandstone Formation	Principal Aquifer
	Chester Formation	Principal Aquifer



## HYDROLOGY

Section 1 of the Newbuild Infrastructure Boundary encroaches on two catchment areas. The eastern parts of Section 1 cross the 'Peckmill Brook, Hoolpool Gutter at Ince Marshes' water body, assessed by the EA as having a 'Moderate' ecological status, and a 'Fail' for chemical status<sup>1</sup>. The catchment is also protected under the Nitrates Directive. West Central Drain, East Central Drain, and Hornsmill Brook are all intersected by the Newbuild Carbon Dioxide Pipeline route within this catchment.

The western parts of Section 1 cross the 'Gowy (Milton Brook to Mersey)' water body, which is also by the EA as having a 'Moderate' ecological status, and a 'Fail' for chemical status<sup>2</sup>. The catchment is also protected under the Nitrates Directive. This section of the Newbuild Infrastructure Boundary intersects Gale Brook 0.3km east of Thornton le Moors within this catchment.

Review of flood risk mapping for Section 1 reveals that the eastern parts of the Newbuild Infrastructure Boundary east of Elton are within a Flood Zone 3 area, as are the western most limits. These areas have a high probability of flooding and require flood risk assessments. The central parts of Section 1 are within a Flood Zone 1 and have a low probability of flooding.

## SENSITIVE LAND USES

No sensitive land uses are recorded within 50m of the Newbuild Carbon Dioxide Pipeline in Section 1.

## 1.2. MINERALS RESOURCES ASSESSMENT

### POTENTIAL MINERALS RESOURCES

Potential mineral resources identified throughout Section 1 of the Newbuild Infrastructure Boundary are detailed herein. Where the Newbuild Carbon Dioxide Pipeline route intersects an MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

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<sup>1</sup> Chemical 'Fail' status attributed to mercury and its compounds, and polybrominated diphenyl ethers.

<sup>2</sup> Chemical 'Fail' status attributed to mercury and its compounds, Perfluorooctane sulphonate, and polybrominated diphenyl ethers

Safeguarded mineral resources identified in Section 1 are limited to the western-most limits of the section in the small area identified as Alluvium (**Figure 11.3.3 Sheet 1, Annex A**). Mineral resources here are described as Sand & Gravel in the Cheshire West and Chester Local Plan Part 1 (**Ref. 7**). The Newbuild Carbon Dioxide Pipeline route intersects this MSA adjacent the southern side of Hill View Way. For the purposes of this assessment, this is termed 'Intersection 1a'.

### **POTENTIAL OPPORTUNITIES FOR MINERAL EXTRACTION, RESOURCE VIABILITY, AND STERILISATION**

The MSA associated with Intersection 1a is already partially sterilised by existing development and overhead power lines (**Figure 11.3.3 Sheet 1, Annex A**), leaving ~0.43ha of extractable mineral resources which the DCO Proposed Development may influence.

Exploratory hole records associated with this MSA are limited. However, from the geological log available (**Annex J** log LB\_21\_02BH), mineral resources do not appear to be of a desirable quality. With a mineral resource thickness of only 1.85m, the characteristics for Category A / B deposits are not met. The deposits that would be considered a mineral resource are described as 'slightly clayey SAND', for which the sand is fine and medium.

Without particle size data to further distinguish the proportion of fines, the depositional environment can be consulted to give a general indication as to what properties the mineral resource may possess. The deposits are highlighted as glacial till in the geological logs. Glacial till can comprise a wide variety of particle sizes and can also be spatially variable (**Ref-19**). Based on this, it cannot be said with any certainty that the mineral resources will reflect what is shown in the geological log, and there may be a higher proportion of fines than anticipated.

### **CONCLUSIONS**

Based on **Figure 11.3.3 Sheet 1 Annex A**, the MSA is already partially sterilised by existing development and overhead cables in the areas where the DCO Proposed Development will cross the MSA. Only a small area within the MSA may be sterilised as a result of the DCO Proposed Development. The remaining area is not considered viable for extraction and would likely not be viewed as a mineral prospect. Additionally, the mineral resource does not meet the requirements of what would be considered a quality mineral resource. As a result, it is considered that the remaining mineral resources are not viable for prior extraction and in-line

with policy M2 of Cheshire West and Chester County Council Local Plan Part 2 (**Ref. 8**), no further assessment here is deemed necessary.

# Annex D

## **SECTION 2 MRA**

## SECTION 2 MRA

### 1.1.

#### SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 2 of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the development is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (shown in **Appendix 11.1, Volume III**). Information from exploratory hole records from the BGS (**Ref. 12**) and the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

#### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 2 of the Newbuild Infrastructure Boundary is presented in **Table D-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits is presented in **Figure 11.3.3, Sheet 2 in Annex A**.

**Table D-1 – Anticipated Geological Sequence for Section 2**

Type	Geological unit and typical description	Distribution
<b>Superficial</b>	Alluvium: Variable sediment of mud, sand, and gravel, with some peat in places.	Limited exposure in the central parts of Section 2
	Tidal Flat Deposits: Mud and sand.	Limited exposure in the western parts of Section 2
	Glaciofluvial Deposits: Sand and gravel	Limited exposure in the central and western parts of Section 2
	Alluvial Fan Deposits: Sand and gravel	Very limited exposure in the central part of Section 2
	Blown Sand	Eastern side of Section 2
	Peat*	Eastern side of Section 2
	Glacial Till: Diamicton (unsorted sediment with gravel in a fine mud matrix).	Throughout Section 2
<b>Bedrock</b>	Wilmslow Sandstone Formation: Sandstone	Limited intersection with north-eastern parts of Section 2
	Chester Formation: Pebbly gravelly sandstone	Throughout Section 2

*\*an Outline Peat Management Plan (Document Reference: D.6.5.4.4) has been prepared which highlights how peat intersected by the proposed development could be best managed by the contractor responsible for installation of the Newbuild Carbon Dioxide Pipeline.*

## **BGS MINERAL RESOURCES MAPPING**

A review of the BGS 1:50,000 scale Mineral Resources Map shows the blown sand, peat, and Glaciofluvial Deposits within Section 2 are all considered as potential resources, therefore exploratory hole records produced as part of the ground investigation for the Newbuild Carbon Dioxide Pipeline, as well as BGS borehole records in these geological units have been reviewed to provide details on approximate mineral and overburden thicknesses (**Table D-2**).

**Table D-2 -Summary of mineral and overburden thickness for Section 2 of the Newbuild Infrastructure Boundary**

<b>Borehole Ref:</b>	<b>NGR</b>	<b>Mineral resources of interest</b>	<b>Approximate overburden thickness (m)</b>	<b>Mineral resource thickness (m)</b>	<b>Groundwater strike</b>
<b>SJ47SW1 34 (App. I.2)</b>	344550E , 373445N	Sand & Gravel	7.3	1.2	8.3m
<b>SJ47SW1 6 (App. I.3)</b>	344490E , 373280N	Sand & Gravel	6.25	10.01	3.96m
<b>SJ47SW1 33 (App. I.4)</b>	343832E , 373060N	Sand & Gravel	2.7	10.9	3.6m
<b>LB_21_07_BH (App. I5)</b>	344737E , 373406N	Sand & Gravel	0.8	0.85	None
<b>LB_21_08_BH (App. I.7)</b>	344378E , 373205N	Sand & Gravel	0.6	6.8	None
<b>LB_21_09_CPT (App. I.8)</b>	344056E , 373056N	Sand & Gravel	0.6	0.5	None

Borehole Ref:	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
LB_21_114_BH (App. I.9)	344521E , 373302N	Sand & Gravel	0	1.5	1.1
LB_21_115_TP (App. I.10)	344631E , 373338N	Sand & Gravel	0.65	0.5	1.2
LB_21_19_BH (App. I.11)	341454E , 371095N	Sand & Gravel	0.3	9.8	0.9m
SJ47SW144 (App. I12)	341810E , 371830N	Sand & Gravel	2.2	3.7	3.3m
SJ47SW143 (App. I13)	341830E , 371820N	Sand & Gravel	1.8	>6.3	1.6m
SJ47SW146 (App. I14)	341730E , 371850N	Sand & Gravel	0.95	3.95	3m

## HYDROGEOLOGY

Hydrogeological units for Section 2 of the Newbuild Infrastructure Boundary are summarised in **Table D-3**. The superficial deposits are classified as Secondary aquifers by the Environment Agency (EA). The units classified as Secondary A aquifers are more likely to contain extractable quantities of groundwater in permeable layers. Both bedrock formations are classified as Principal Aquifers and contain a high potential yield of extractable groundwater through high intergranular and / or fracture permeability. Section 2 of the Newbuild Infrastructure Boundary is not within a groundwater protection zone.

**Table D-3 - Aquifer statuses of geological units within Section 2 of the Newbuild Infrastructure Boundary**

Type	Geological unit	Aquifer Status
Superficial	Alluvium	Secondary A
	Tidal Flat Deposits	Secondary (undifferentiated)
	Glaciofluvial Deposits	Secondary A
	Alluvial Fan Deposits	Secondary A
	Blown Sand	Secondary A
	Peat	Secondary (undifferentiated)
	Glacial Till	Secondary (undifferentiated)
Bedrock	Wilmslow Sandstone Formation	Principal Aquifer
	Chester Formation	Principal Aquifer

## HYDROLOGY

Section 2 of the Newbuild Infrastructure Boundary intersects two operational catchment areas – the Gowy catchment, and the Dee catchment.

The eastern and central parts of Section 2 cross the Milton Brook to Mersey reach, and Stanney Mill Brook areas of the Gowy catchment. Moving from east to west, Section 2 first intersects the Milton Brook to Mersey reach, which has achieved ‘Moderate’ ecological status, but ‘Fail’ on chemical status. This is due to pollution of mercury and its compounds, perfluorooctane sulphonate, and polybrominated diphenyl ethers. The Stanney Mill Brook water body is then crossed, which also achieved ‘Moderate’ ecological status, but a ‘Fail’ for chemical status. This is due to pollution of benzo(g-h-i)perylene, mercury and its compounds, and polybrominated diphenyl ethers. The Gowy operational catchment is also protected under the Nitrates Directive. Several abstraction licences are also noted along the River Gowy approximately 200m north of the M56.

The western-most limits of Section 2 encroach on the Dee operational catchment, specifically the Finchetts Gutter water body. This achieved a ‘Poor’ ecological status, as well as a ‘Fail’ on chemical status. ‘Poor’ ecological status is owed to a ‘Poor’ classification of invertebrates and phosphate. Chemical status was classified as ‘Fail’ due to pollution of mercury and its compounds, and polybrominated diphenyl ethers.



Section 2 of the Newbuild Infrastructure Boundary intersects an area of peat in the east moving from east to west, before crossing the River Gowy adjacent the southern side of the M56 motorway. ~500m southwest of this, Mill Brook is then crossed. An unnamed stream is then crossed in the central parts of Section 2, before the Shropshire Grand Union Canal is intersected in the western parts of Section 2. Two more unnamed streams are also intersected in the western-most parts of Section 2.

Section 2 of the Newbuild Infrastructure Boundary is primarily within a Flood Zone 1, with the exception of the area surrounding the River Gowy in the east of the section, which is a Flood Zone 3 and requires a flood risk assessment.

### **SENSITIVE LAND USES**

The following sensitive land uses are recorded within Section 2:

- Several listed buildings in Thornton le Moors, greater than 50m from the Newbuild Carbon Dioxide Pipeline.

## **1.2.**

### **MINERALS RESOURCES ASSESSMENT**

#### **POTENTIAL MINERALS RESOURCES**

Potential mineral resources identified throughout Section 2 of the Newbuild Infrastructure Boundary are detailed herein. Where the Newbuild Carbon Dioxide Pipeline route intersects an MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

Safeguarded mineral resources in Section 2 identified within the Cheshire West and Chester Local Plan Part 1 (**Ref. 7**) include:

- An area of Sand & Gravel in the east of the section intersected by the M56 southwest of Thornton le Moors (Intersection 2a; **Figure 11.3.3 Sheet 2, Annex A**) and,
- An area of Sand & Gravel in central area of the section, west of Wervin (Intersection 2b; **Figure 11.3.3 Sheet 3, Annex A**).

The MSA associated with Intersection 2a is already partially sterilised by the existing M56 motorway, as well as residential development within the MSA (**Figure 11.3.3 Sheet 2, Annex A**). The area south of the M56 which the Newbuild Carbon Dioxide Pipeline route passes through is approximately 10.2ha in area and is not sterilised by existing development.

Intersection 2b is partially sterilised by the Shropshire Grand Union Canal, existing development, and overhead high voltage electrical cables (**Figure 11.3.3 Sheet 3, Annex A**). Despite this, a 3ha area within the MSA remains unsterilised which the Newbuild Carbon Dioxide Pipeline route would intersect.

## **POTENTIAL OPPORTUNITIES FOR MINERAL EXTRACTION, RESOURCE VIABILITY, AND STERILISATION**

### **Intersection 2a**

The 10.2ha area south of the M56 associated with Intersection 2a (**Figure 11.3.3 Sheet 2, Annex A**) would be partially sterilised by the Newbuild Carbon Dioxide Pipeline route, leaving 5.8ha of unsterilised mineral resources.

The proximity of Intersection 2a to the M56 may be unsuitable for prior mineral extraction in-line with Policy M3 of Cheshire West and Chester County Council Local Plan Part 2 (**Ref. 8**), as deep earthworks associated with quarrying may destabilise the road, as well as tarnish the landscape observable from the motorway itself.

Exploratory hole records from within this MSA indicate that mineral resources here may not present a quality prospect due to spatial heterogeneity (**Annex J** logs BH03, unnamed 'Nature of Strata', BH02, LB\_21\_07\_BH, LB\_21\_08\_BH, LB\_21\_09\_CPT, LB\_21\_114\_BH, LB\_21\_115\_TP). Geological logs show that mineral resource thickness is highly variable, with thicknesses ranging from 0.5m to 10.01m with 5 of the 8 records showing mineral resource thickness <2m. Moreover, variability is also observed in the overburden thickness, which ranges from 0m to 6.25m. Record 'SJ47SW134' (**Annex J** log BH03) displays an overburden thickness much greater than that of the mineral resource, whilst record 'SJ47SW16' (**Annex J**, log unnamed 'Nature of Strata') is >5m beneath the surface. Groundwater has been encountered as shallow as 1.1m below ground level (bgl). As a result, dewatering of the site and associated discharge would also likely be required should prior extraction be deemed necessary. No particle size distribution data has been provided from Fugro Ltd to further deduce the quality of this sand and gravel resource.

With only a small overburden recorded in places (**Table D-2**), incidental extraction of mineral resources will likely occur with open-trench installation of the Newbuild Carbon Dioxide Pipeline. Should this be the case, the mineral resources should be sustainably reused as part of a Materials Management Plan (MMP), which the Construction Contractor should implement (**Chapter 14 – Materials and Waste, Volume II**).

### **Intersection 2b**

The approximately 3ha area of the MSA which the DCO Proposed Development intersects lies between two sets of overhead electrical cables and is constrained by Shropshire Grand Union Canal to the west (**Figure 11.3.3 sheet 3, Annex A**). It is considered that this area would be unlikely to present a viable mineral prospect due to these surrounding sterilisation and constraints, which could potentially be destabilised by the installation of a mineral extraction site. Should mineral extraction occur, it would likely be north of the overhead electrical cables where these constraints are lessened, and mineral resources are unsterilised. The capability for mineral resource infrastructure at surface level however would remain unsterilised after completion of the DCO Proposed Development, and vehicular access of plant could likely be supported through reinforced crossing and similar.

Exploratory hole records are not available where the DCO Proposed Development intersects the MSA associated with Intersection 2b, and so records in the central and northern area of the MSA are utilised to assess potential mineral resource quality (**Annex J** logs LB\_21\_19\_BH, borehole 18, borehole 17, borehole 20). Mineral resources here appear to be of good quality, with shallow overburden and moderately thick mineral resource (generally loose brown fine to coarse SAND). No particle size distribution data is available within these mineral resources to further deduce the quality of the mineral resource. Groundwater strike is as shallow as 0.9m, suggesting that dewatering would likely be required for extraction of mineral resources.

Incidental extraction may occur at this location where open-trench installation of the Newbuild Carbon Dioxide Pipeline is utilised. However, to cross the canal, a trenchless crossing will be used. This method of installation would not result in incidental extraction of mineral resource. Should incidental extraction occur, the mineral resources should be sustainably reused as part of an MMP, which the Construction Contractor should implement (see **Chapter 14 - Materials and Waste, Volume II**).

## **1.3. CONCLUSIONS**

Based on the information above, neither the MSA associated with Intersection 2a or the MSA associated with Intersection 2b are deemed suitable for prior extraction of mineral resources.

## **INTERSECTION 2A**

The MSA associated with Intersection 2a is already partially sterilised and truncated by the M56 Motorway, and only the resources in the southwest of the MSA will be affected by the proposed development. This area hosts what is considered only a small quantity of mineral resources, which are spatially variable in thickness. Their proximity to the M56 motorway would also likely require a substantial development stand-off for mineral extraction. Using the criteria detailed in Policy M2 of Cheshire West and Chester Local Plan (**Ref. 8**), it is considered that these factors combined make the remaining mineral resources that may be influenced by the DCO Proposed Development unsuitable for prior extraction.

Should mineral resources be incidentally extracted during construction of the DCO Proposed Development at this location, these should be reused sustainably as part of an MMP which the contractor should implement.

## **INTERSECTION 2B**

The area of the MSA associated with Intersection 2b is partially sterilised and truncated by the Shropshire Grand Union Canal and overhead electrical cables. It is considered that these constraints make the approximately 3ha area of mineral resource potentially unviable for extraction, as the installation of minerals extraction site could have adverse impacts, including the destabilisation of the canal and the overhead electrical cable infrastructure. Mineral resources to the north of the overhead electrical cables would remain unsterilised after completion of the proposed development. If not permitted on this basis, the overriding need for the proposed development (discussed in **Section 5.5**) should allow development to proceed here, in-line with Policy M2 of Cheshire West and Chester Local Plan (**Ref. 8**).

Should mineral resources be incidentally extracted during construction of the DCO Proposed Development at this location where open-trench methods are utilised, these should be reused sustainably as part of an MMP which the Construction Contractor should implement. Mineral recovery where trenchless crossing installation methods are utilised is thought to be unlikely.

# Annex E

## **SECTION 3 MRA**

# 1. SECTION 3 MRA

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## 1.1. SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 3 of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the development is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (see **Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11.5, Volume III**).

### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 3 of the DCO Proposed Development is presented in **Table E-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits are presented on **Figure 11.3.2, Sheet 3** in **Annex A**.

**Table E-1 - Anticipated Geological Sequence for Section 3**

Type	Geological unit and typical description	Distribution
Superficial	Glaciofluvial deposits: Sand and gravel	Limited exposure in the eastern most limits of Section 3
	Tidal Flat Deposits: Mud and sand.	Limited exposure in eastern parts of Section 3. Good exposure in the west of Section 3
	Glacial Till: Diamicton (unsorted sediment with gravel in a fine mud matrix).	Present throughout eastern and central parts of Section 3
Bedrock	Kinnerton Sandstone Formation: Sandstone	Western side of Section 3
	Chester Formation: Pebbly gravelly sandstone	Eastern side of Section 3

## BGS MINERAL RESOURCES MAPPING

A review of the BGS 1:50,000 scale Mineral Resources Map shows the small area of Glaciofluvial Deposits within the far east of Section 3 to be a potential resource, therefore borehole records produced as part of the ground investigation for the DCO Proposed Development, as well as BGS borehole records (**Ref. 12**) in these geological units have been reviewed to provide details on approximate mineral and overburden thicknesses (**Table E-2**).

**Table E-2 – Summary of mineral resources and overburden thickness for Section 3 of the DCO Proposed Development**

Borehole Ref:	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
<b>SJ37SE2 8 (App. I.15)</b>	339024E, 371899N	Sand & Gravel	3	8	-
<b>SJ37SE2 9 (App. I.16)</b>	339226E, 371593N	Sand & Gravel	0.3	5.8	-
<b>SJ37SE3 0 (App. I.17)</b>	339369E, 371451N	Sand & Gravel	0.3	5.8	-
<b>SJ37SE3 1 (App. I.18)</b>	339589E, 371239N	Sand & Gravel	0.6	7.3	-
<b>SJ37SE3 2 (App. I.19)</b>	339897E, 371163N	Sand & Gravel	0.3	9.1	-
<b>SJ37SE3 3 (App. I.20)</b>	339954E, 371122N	Sand & Gravel	1.3	6.7	-
<b>SJ37SE3 6 (App. I.21)</b>	339810E, 371174N	Sand & Gravel	11.9	1.8	-
<b>SJ37SE3 7 (App. I.22)</b>	339858E, 371166N	Sand & Gravel	6.3	-	-

## HYDROGEOLOGY

Hydrogeological units for Section 3 of the DCO Proposed Development design are summarised in **Table E-3**. The superficial deposits are classified as Secondary aquifers by the Environment Agency (EA). The units classified as Secondary A aquifers are more likely to contain extractable quantities of groundwater in permeable layers. Both bedrock formations are classified as Principal Aquifers and contain a high potential yield of extractable groundwater through high intergranular and / or fracture permeability. Section 3 of the DCO Proposed Development is not within a groundwater protection zone. An agricultural abstraction point exists in the central area of Section 3, approximately 1.3km east of central Saughall.

**Table E-3 - Aquifer statuses of geological units within Section 3 of the DCO Proposed Development design**

Type	Geological unit	Aquifer Status
Superficial	Tidal Flat Deposits	Secondary (undifferentiated)
	Glaciofluvial Deposits	Secondary A
	Glacial Till	Secondary (undifferentiated)
Bedrock	Kinnerton Sandstone Formation	Principal Aquifer
	Chester Formation	Principal Aquifer

## HYDROLOGY

Section 3 of the DCO Proposed Development intersects the Dee Estuary operational catchment. The eastern side of Section 3 is located within the Finchetts Gutter water body, previously discussed for the western-most limits of Section 2. The west of Section 3 lies within the Garden City Drain water body, which has achieved 'Moderate' ecological status, and a 'Fail' for chemical classification. This is due to pollution of mercury and its compounds, and polybrominated diphenyl ethers. The Garden City Drain water body is protected under the Nitrates Directive, and the Shellfish Water Directive.

The eastern-most limits of Section 3 run adjacent to the Shropshire Union Canal, whilst also intersecting the Backford Brook water body. An unnamed stream is intersected in the central area of Section 3. Another unnamed stream is intersected in the western-most limits of Section 3, which runs parallel to the England/Wales border.

Section 3 is primarily within a Flood Zone 1, with a low probability of flooding. A small area in the eastern-most parts of the section adjacent the



Shropshire Union Canal is classified as a Flood Zone 3, as are the western-most parts of Section 3 associated with the River Dee. These areas have a high probability of flooding and require flood risk assessments.

### **SENSITIVE LAND USES**

No sensitive land uses are evident within 50m of the Newbuild Carbon Dioxide Pipeline within Section 3. The nearest listed building is located ~120m northwest of the Newbuild Carbon Dioxide Pipeline on Hermitage Road south of Saughall.

## **1.2. MINERALS RESOURCES ASSESSMENT**

### **POTENTIAL MINERALS RESOURCES**

Potential mineral resources identified throughout the Section 3 of the DCO Proposed Development are detailed herein. Where the Newbuild Carbon Dioxide Pipeline route intersects a MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

Safeguarded mineral resources in Section 3 identified within the Cheshire West and Chester Local Plan Part 1 are limited to an area of Sand & Gravel in the eastern-most parts of the Section south of Backford. The Newbuild Infrastructure Boundary slightly encroaches on an MSA in its southernmost limits, termed 'Intersection 3a' (**Figure 11.3.3, Sheet 4 Annex A**). Existing development has sterilised the majority of the southern area of this MSA, and mineral resources here are no longer viable for extraction. The MSA is unsterilised in its central and northern parts and will not be affected by the DCO Proposed Development in these areas.

- 1.2.1.** With only a small overburden recorded in places ( **Table E-2**), incidental extraction of mineral resources could potentially occur with open-trench installation of the Newbuild Carbon Dioxide Pipeline. Should this be the case, the mineral resources should be sustainably reused as part of a Materials Management Plan (MMP), which the Construction Contractor should implement (**Chapter 14 – Materials and Waste, Volume II**).

## **1.3. CONCLUSIONS**

The safeguarded mineral resources identified within Section 3 of the DCO Proposed Development will be minimally affected by the construction of the Newbuild Carbon Dioxide Pipeline (**Figure 11.3.3, Sheet 4 Annex A**). The southernmost area of the MSA associated with Intersection 3a is sterilised by existing development, leaving the remaining mineral resources in the

vicinity of the DCO Proposed Development unsuitable for prior extraction. In accordance with Policy M2 of Cheshire West and Chester County Council Local Plan Part 2 (**Ref. 8**), no further assessment is deemed necessary here as the area within the MSA that may be affected by the DCO Proposed Development is no longer viable for extraction.

Should mineral resources be incidentally extracted during construction of the DCO Proposed Development, mineral resources should be sustainably reused as part of an MMP, which the Construction Contractor should implement.

# Annex F

## **SECTION 4 MRA**

## SECTION 4 MRA

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### 1.1.

#### SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 4 of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the Newbuild Carbon Dioxide Pipeline is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (see **Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

#### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 4 of the Newbuild Infrastructure Boundary is presented in **Table F-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits is presented in **Figure 11.3.2 Sheet 4, Annex A**.

**Table F-1 - Anticipated Geological Sequence for Section 4**

Type	Geological unit and typical description	Distribution
<b>Superficial</b>	Tidal Flat Deposits: Mud and sand.	Throughout eastern and central parts of Section 4
	Glacial Till: Diamicton (unsorted sediment with gravel in a fine mud matrix).	Present throughout western parts of Section 4
<b>Bedrock</b>	Kinnerton Sandstone Formation: Sandstone	Eastern side of Section 4
	Etruria Formation: Mudstone, sandstone, and conglomerate	Exposure in central and western parts of Section 4
	Pennine Middle Coal Measure Formation: Mudstone, siltstone, and sandstone	Exposure in western side of Section 4
	Pennine Lower Coal Measure Formation: Mudstone, siltstone, and sandstone	Limited exposure in western side of Section 4

## BGS MINERAL RESOURCES MAPPING

The BGS 1:50,000 scale geological mapping shows the eastern half of Section 4 is underlain by Glacial Till deposits that may be considered a resource, therefore borehole records produced as part of the ground investigation for the Newbuild Carbon Dioxide Pipeline, as well as BGS borehole records (**Ref. 12**) in these geological units have been reviewed to provide details on approximate mineral and overburden thicknesses (**Table F-2**).

**Table F-2 - Summary of mineral resources and overburden thickness for Section 4 of the DCO Proposed Development**

Borehole Ref:	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
<b>SJ36NW3 1 (App. I.23)</b>	333140E , 365400N	Brick Clay	0.8	39	-
<b>LB_21_49_BH (App. I.24)</b>	333804E , 366175N	Brick Clay	3.81	>5.64	-
<b>LB_21_50_TP (App. I.25)</b>	333500E , 366269N	Brick Clay	0.3	2.6	3.4m
<b>LB_21_51_BH (App. I.26)</b>	333226E , 366612N	Brick Clay	1.55	>8.5	-

## HYDROGEOLOGY

Hydrogeological units for Section 4 of the DCO Proposed Development design are summarised in **Table F-3**. The superficial deposits are classified as Secondary aquifers by the Environment Agency (EA) and Natural Resources Wales. The Kinnerton Sandstone Formation is classified as a Principal Aquifer and may contain a high potential yield of extractable groundwater through high intergranular and / or fracture permeability. The units classified as Secondary A aquifers are more likely to contain extractable quantities of groundwater in permeable layers.

Section 4 of the DCO Proposed Development is not within a groundwater source protection zone, although a groundwater protection zone is located 0.7km southeast of from central parts of Section 4.

**Table F-3 - Aquifer statuses of geological units within Section 4 of the DCO Proposed Development design**

Type	Geological unit	Aquifer Status
<b>Superficial</b>	Tidal Flat Deposits	Secondary (undifferentiated)
	Glacial Till	Secondary (undifferentiated)
<b>Bedrock</b>	Kinnerton Sandstone Formation	Principal Aquifer
	Eturia Formation	Secondary A
	Pennine Middle Coal Measure Formation	Secondary A
	Pennine Lower Coal Measure Formation	Principal Aquifer

## HYDROLOGY

The eastern side of Section 4 is located within the Garden City Drain water body catchment, previously discussed for Section 4. The western side of Section 4 lies within the Sandycroft Drain water body catchment, part of the Dee Estuary operational catchment. Natural Resources Wales classifies this water body as having a 'Moderate' ecological status, and a 'Good' chemical status.

Section 4 of the Newbuild Carbon Dioxide Pipeline intersects the following surface water features:

- Afon Dyfrdwy;
- Broughton Brook; and,
- Two unnamed water features in towards within the west of the section

Much of Section 4 is located within a Flood Zone 3 area due to its proximity to the River Dee, and requires a flood risk assessment. This area spans from the eastern boundary to Deeside, leaving only the western-most limits in a Flood Zone 1.

## SENSITIVE LAND USES

Section 4 intersects the Afon Dyfrdwy Site of Special Scientific Interest ~800m north of Hawarden Airport. No other sensitive land uses are recorded within 50m of the Newbuild Infrastructure Boundary in Section 4.

## 1.2.

# MINERALS RESOURCES ASSESSMENT

## POTENTIAL MINERALS RESOURCES

Potential mineral resources identified throughout Section 4 of the Newbuild Carbon Dioxide Pipeline route are detailed herein. Where the Newbuild Carbon Dioxide Pipeline route intersects an MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

An area of Brick Clay, classified as a safeguarded mineral under the Flintshire UDP, has been identified within Section 4 of the development and is intersected by the Newbuild Carbon Dioxide Pipeline route (Intersection 4a; **Figure 11.3.3, Sheet 5, Annex A**). This mineral resource is largely sterilised by existing development, however approximately 26ha in the west of the area remains unsterilised and is intersected by the Newbuild Carbon Dioxide Pipeline route.

Another small area of Brick Clay is intersected by the Newbuild Carbon Dioxide Pipeline route within Section 4; however, this mineral resource is sterilised by existing development (Intersection 4b; **Figure 11.3.3, Sheet 5, Annex A**).

## POTENTIAL OPPORTUNITIES FOR MINERAL EXTRACTION, RESOURCE VIABILITY, AND STERILISATION

### Intersection 4a

The safeguarded brick clay associated with Intersection 4a is already largely sterilised by existing development (**Figure 11.3.3 Sheet 5, Annex A**). The 26ha area of unsterilised mineral resources identified southeast of Sandycroft would be partially sterilised by the Newbuild Carbon Dioxide Pipeline route, leaving 21ha of unsterilised workable mineral resources.

Geological data from this location is limited, but available exploratory hole records (**Annex J** logs SJ36NW/31, LB\_21\_49\_BH, LB\_21\_50\_TP, LB\_21\_51\_BH) indicate that the overburden here ranges from 0.8-3.81m, whilst the mineral resource thickness may be at least 39m with no recordings of groundwater. The quality of the mineral resource is difficult to confirm from the geological log shown in **Annex J** log SJ36NW/31 due to poor detail. However, geological logs shown in **Annex J** logs LB\_21\_49\_BH, LB\_21\_50\_TP, LB\_21\_51\_BH indicate the presence of well sorted clays (tidal flat deposits), and sandy gravelly clays (glacial till deposits).

Due to the 39m thickness of the mineral resources, deep earthworks may be required to enable extraction. For such depths, stepping would be required. To extract the minerals intersected by the Newbuild Carbon Dioxide Pipeline route, stepping would encroach on the adjacent road located to the east, compromising local infrastructure. Policy EN23 of Flintshire LDP (**Ref. 3**) states that minerals should only be extracted if it can be done so without affecting existing infrastructure.

Additionally, the proximity of Intersection 4a to the adjacent residential developments in Sandycroft, as well as Hawarden airport may make the site unsuitable for prior mineral extraction in-line with Policy MIN2 of Flintshire UDP (**Ref. 2**) and Policy EN23 of Flintshire LDP (**Ref. 3**). Deep earthworks associated with quarrying may have adverse environmental impacts to residents including noise, dust, and visual pollution, as well as an increase in congestion associated with mineral workings. Restoration of the quarry here may also result in an increased risk of bird strikes associated with the airport.

Some incidental extraction of mineral resources may occur during development, due to the shallow overburden (0.8m) (**Table F-2**). Should this be the case, the mineral resources should be sustainably reused as part of an MMP, which the Construction Contractor should implement (**Chapter 14 – Materials and Waste, Volume II**).

#### **Intersection 4b**

The other small area of Brick Clay intersected by the Newbuild Carbon Dioxide Pipeline route within Section 4 (Intersection 4b) is sterilised by existing development (**Figure 11.3.3 Sheet 5, Annex A**). As such, no further assessment here is deemed necessary.

### **1.3. CONCLUSIONS**

Based on the information above, neither the mineral resources associated with intersection 4a or 4b are deemed suitable for prior extraction.

Deep earthworks associated with the extraction of minerals at Intersection 4a may cause an adverse environmental impact to surrounding residents, whilst quarry restoration may increase the risk of bird strikes at Hawarden Airport (Policy MIN2 of Flintshire UDP (**Ref. 2**) and Policy EN23 of Flintshire LDP (**Ref. 3**)).

Mineral resources associated with Intersection 4b are sterilised by existing development, and thus unsuitable for extraction.



Should incidental extraction of mineral resources at either location occur, mineral resources should be sustainably reused as part of an MMP, which the Construction Contractor should implement.

# Annex G

## **SECTION 5 MRA**

## SECTION 5 MRA

### 1.1.

#### SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 5 of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the DCO Proposed Development is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (**Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

#### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 5 of the Newbuild Infrastructure Boundary is presented in **Table G-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits is presented in **Figure 11.3.2, Sheet 5 Annex A**.

**Table G-1 - Anticipated Geological Sequence for Section 5**

Type	Geological unit and typical description	Distribution
<b>Superficial</b>	Glaciofluvial deposits: Sand and gravel	Eastern and central parts of Section 5
	Peat*	Limited exposure in east of section
	Head deposits: Clay, silt, sand and gravel	Limited exposure in central parts of Section 5
	Glacial Till: Diamicton (unsorted sediment with gravel in a fine mud matrix).	Present throughout Section 5
<b>Bedrock</b>	Gwespyr Sandstone: Sandstone and argillaceous rocks, interbedded	Intermittent throughout section
	Etruria Formation: Mudstone, sandstone, and conglomerate	Limited in west of section
	Etruria Formation: Sandstone	Limited in central part of section
	Hollin Rock: Sandstone	Intermittent throughout section
	Bowland Shale Formation: Mudstone	Limited in east of section

Type	Geological unit and typical description	Distribution
	Pennine Middle Coal Measure Formation: Mudstone, siltstone, and sandstone	Limited in central and north western parts of section
	Pennine Middle Coal Measure Formation: Sandstone	Limited in central parts of section
	Pennine Lower Coal Measure Formation: Mudstone, siltstone, and sandstone	Intermittent throughout section

*\*an Outline Peat Management Plan (Document Reference D.6.5.5.4) has been prepared which highlights how peat intersected by the proposed development could be best managed by the Construction Contractor responsible for installation of the pipeline.*

### **BGS MINERAL RESOURCES MAPPING**

A review of the BGS 1:50,000 scale Mineral Resources Map shows the Glaciofluvial Deposits in the eastern half of Section 5 as a potential mineral resource. As a result, borehole records produced as part of the ground investigation for the DCO Proposed Development, as well as BGS borehole records (**Ref. 12**) in these geological units have been reviewed to provide details on approximate mineral and overburden thicknesses (**Table G-2**).

**Table G-2 - Summary of mineral resources and overburden thickness for Section 5 of the Newbuild Infrastructure Boundary**

Borehole Ref (see Annex J:	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
<b>LB_21_59_BH</b>	330935E , 366796N	Sand & Gravel	2.15	0.71	-
<b>LB_21_60_BH</b>	330671E , 366877N	Sand & Gravel	0.5	10	-
<b>LB_21_63_BH</b>	330228E , 366904N	Sand & Gravel	2.8	9.4	-
<b>LB_21_65_BH</b>	329901E , 367059N	Sand & Gravel	2.8	13.35	10.2

## HYDROGEOLOGY

Hydrogeological units for Section 5 of the Newbuild Carbon Dioxide Pipeline design are summarised in **Table G-3**. All units are classified as Secondary aquifers by Natural Resources Wales. The units classified as Secondary A aquifers are more likely to contain extractable quantities of groundwater in permeable layers. Section 5 of the Newbuild Carbon Dioxide Pipeline is not within a groundwater protection zone.

**Table G-3 - Aquifer statuses of geological units within Section 5 of the Newbuild Carbon Dioxide Pipeline design**

Type	Geological unit	Aquifer Status
<b>Superficial</b>	Glaciofluvial deposits	Secondary A
	Glacial Till	Secondary Undifferentiated
	Peat	Secondary Undifferentiated
	Head deposits	Secondary Undifferentiated
<b>Bedrock</b>	Gwespvr Sandstone	Secondary A
	Etruria Formation	Secondary A
	Hollin Rock	Secondary A
	Bowland Shale Formation	Secondary Undifferentiated
	Pennine Middle Coal Measure Formation	Secondary A
	Pennine Lower Coal Measure Formation	Secondary A

## HYDROLOGY

The eastern parts of Section 5 are located within the Sandycroft Drain water body, previously discussed for Section 4 in **Annex F**. The western parts of Section 5 are located within the Wepre Brook water body assessment area, belonging to the Dee Estuary operational catchment. This received a 'Moderate' overall classification, with ecological classification as 'Moderate' and chemical classification as 'Good'.

Section 5 of the Newbuild Carbon Dioxide Pipeline intersects the following surface water features:

- An unnamed water body 0.23km west of Ewloe Green which joins the Nant Gwepra;
- Alltami Brook 0.9km southeast of Northop Hall County Primary School;

- An unnamed water body 0.45km southwest of Northop Hall County Primary School which joins the Nant Gwepra; and,
- An unnamed surface water feature towards the western-most limits of Section 5.

1.1.1. Almost the entirety of Section 5 is within a Flood Zone 1 and has a low probability of flooding. The Newbuild Carbon Dioxide Pipeline intersects water features listed above, where it is classified as a Flood Zone 3. However, this is likely in reference to the water features, and not the surrounding areas.

### **SENSITIVE LAND USES**

1.1.2. Section 5 of the Newbuild Infrastructure Boundary runs adjacent the Connah's Quay Ponds and Woodlands SSSI approximately 1km northwest of Ewloe. An area of Ancient Woodland occupies the same area and extends south to Ewloe Green. Areas of Ancient Woodland also surround the Newbuild Carbon Dioxide Pipeline in the vicinity of Northop Hall, and one area is intersected by the Newbuild Carbon Dioxide Pipeline approximately 830m southwest of the Northop Hall. The nearest listed building to Section 5 of the Newbuild Carbon Dioxide Pipeline is located approximately 80m north of the pipeline, north of Church Lane, Ewloe.

## **1.2. MINERALS RESOURCES ASSESSMENT**

### **POTENTIAL MINERALS RESOURCES**

Potential mineral resources identified throughout Section 5 of the Newbuild Carbon Dioxide Pipeline are detailed herein. Where the Newbuild Carbon Dioxide Pipeline route intersects an MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

Safeguarded mineral resources in Section 5 identified within the Flintshire UDP and LDP include the area of Sand & Gravel which spans from Hawarden to the north of Ewloe Green and is intersected by the Newbuild Carbon Dioxide Pipeline route (Intersection 5a; **Figure 11.3.3 Sheet 6 Annex A**). This is largely sterilised by existing development, however a 15.3ha area of unsterilised mineral resources is present to the north of Ewloe Green which the Newbuild Carbon Dioxide Pipeline route intersects. A SSSI associated with Connah's Quay Ponds and Woodland is located immediately west of this area.

An area of Brick Clay is also intersected by the Newbuild Carbon Dioxide Pipeline route within Section 5 (Intersection 5b; **Figure 11.3.3 Sheet 7 Annex A**). Only the northernmost parts of this area are intersected by the Newbuild Carbon Dioxide Pipeline route, where existing development has already sterilised the mineral resource.

## **POTENTIAL OPPORTUNITIES FOR MINERAL EXTRACTION, RESOURCE VIABILITY, AND STERILISATION**

### **Intersection 5a**

The MSA associated with Intersection 5a is largely sterilised by existing development. As previously stated however, the Newbuild Carbon Dioxide Pipeline route intersects a 15.3ha area of potential mineral resources north of Ewloe Green, which may be up to 20m in thickness (**Annex J** log Borehole 17). This 15.3ha area (termed 'Intersection 5a') however is constrained by its proximity to the SSSI adjacent west, and the overhead power cables which intersect the MSA. The area would be partially sterilised by the Newbuild Carbon Dioxide Pipeline route, leaving 8.9ha of unsterilised mineral resources.

The proximity of the MSA associated with Intersection 5a to the adjacent SSSI to the west may make the area unsuitable for prior extraction of mineral resources under policy MIN2 of Flintshire UDP (**Ref.2**), which seeks to protect areas such as SSSI's from adverse effects of development. Its location within a Green Barrier area reinforces this, as mineral workings would invade the open character and appearance of this area of countryside. The two sets of overhead power cables which constrain the area would present further constraints to minerals working. Additionally, the surrounding settlements of Ewloe and Ewloe Green may incur increased congestion because of minerals workings, as well as the potential for air and noise pollution. The proximity of Hawarden Airport must also be considered, as quarry restoration may increase the risk of bird strikes associated with the airport.

Geological logs from within Intersection 5a are limited, however logs from nearby locations within the MSA (**Annex J** logs: LB\_21\_59\_BH, LB\_21\_60\_BH, LB\_21\_63\_BH, LB\_21\_65\_BH) indicate that mineral resources are of a moderate quality, with the exception of those shown in **Annex J** log LB\_21\_63\_BH, which appear to represent good quality sand & gravel resources. Information from the ground investigation undertaken by Fugro Ltd broadly identified deposits elsewhere within the MSA as 'sandy clay with gravel', 'slightly gravelly silty sand', and 'sand and gravel'. Coal fragments are also indicated within these geological logs (**Annex J** logs: LB\_21\_59\_BH, LB\_21\_60\_BH, LB\_21\_63\_BH, LB\_21\_65\_BH) which

would also have an adverse impact on the workability and economic viability of the potential resource.

The moderate quantities of silt and clay that may exist within the mineral resources, as well as the presence of coal fragments (**Annex J** logs: LB\_21\_59\_BH, LB\_21\_60\_BH, LB\_21\_65\_BH App. I.27, 28, 30), could make the mineral resources less economically viable for prior extraction. Particle size distribution data associated with the geological logs displayed in **Annex J** logs: LB\_21\_59\_BH, LB\_21\_60\_BH, suggests that mineral resources here could vary in quality throughout the sequence, although still of good quality (passable as Category B). **Annex J** logs: LB\_21\_60\_BH, displays 93% sand and only 6.9% silt and clay at 1.2m, whilst **Annex J** logs: LB\_21\_59\_BH, displays 80% sand & gravel and 20% silt and clay at 2.15m.

An informal consultation with Hanson Aggregate (**Annex K**), for which they were provided all relevant exploratory hole data, revealed that the mineral resources here were perceived as a poor-quality deposit which would not be worth the planning difficulties. Some of the main constraints that were highlighted include: the lack of suitable infrastructure; the proximity to Hawarden airport; the adjacent SSSI; and the network of power lines. In summary, it was stated that significant design, operational, amenity, and environmental challenges would be faced if the mineral resource were to be extracted, and a significant mineral reserve would be required to justify further consideration.

Due to the significant constraints that would be faced as part of mineral extraction at Intersection 5a, as well as the apparent lack of a high quality mineral resource, prior extraction here is not deemed suitable, in-line with Policy EN23 of Flintshire LDP (**Ref. 3**).

Should prior extraction of mineral resources here be deemed necessary, the overburden recorded elsewhere within the MSA is 0.3m, whilst the groundwater was encountered as shallow as 10.2m bgl. Resultantly, much of the mineral resource could potentially be extracted without dewatering of the area.

Incidental extraction would likely occur during construction of the proposed development (**Table G-2**). Should this be the case, the mineral resources should be sustainably reused as part of a Materials Management Plan (MMP), which the Construction Contractor should implement (**Chapter 14 – Materials and Waste (Volume II)**).



### **Intersection 5b**

The area of the safeguarded Brick Clay mineral resource associated with Intersection 5b which is influenced by the DCO Proposed Development is already sterilised by existing development (**Figure 11.3.3 Sheet 7 Annex A**). As a result, this mineral resource is not considered workable, and no further assessment is deemed necessary in this area.

## **1.3.**

### **CONCLUSIONS**

Based on the assessment above, prior extraction of the mineral resources located within Section 5 of the DCO Proposed Development is considered unsuitable.

The potentially poor quality of mineral resources (Policy EN23 of Flintshire LDP (**Ref. 3**)) as well as the sensitive land uses (SSSI, Green Barrier, Hawarden Airport) which constrain the area of the MSA influenced by the DCO Proposed Development (Policy MIN2 of Flintshire UDP (**Ref. 2**)) make the mineral resources at Intersection 5a an unattractive prospect for extraction. This was confirmed by consultation with the local operator, Hanson Aggregate.

Existing development already sterilises the mineral resources that would be influenced by the DCO Proposed Development at Intersection 5b, and mineral resources here are not considered workable.

Should mineral resources be incidentally extracted during construction of the DCO Proposed Development at these locations where open-trench methods are utilised, these should be reused sustainably as part of an MMP which the Construction Contractor should implement.

# Annex H

## **SECTION 6 MRA**

## SECTION 6 MRA

### 1.1.

### SITE CONTEXT

Information deemed pertinent to the Minerals Resource Assessment of Section 6 of the Newbuild Carbon Dioxide Pipeline is reviewed here. Detailed information of the entire length of the Newbuild Carbon Dioxide Pipeline is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (**Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

### GEOLOGICAL MAPPING

A summary of the anticipated geology for Section 6 of the Newbuild Carbon Dioxide Pipeline is presented in **Table H-1**. Extracts from BGS 1:50,000 scale geological mapping displaying bedrock and superficial deposits is presented in **Figure 11.3.2 Sheet 6, Annex A**.

**Table H-1 - Anticipated Geological Sequence for Section 6**

Type	Geological unit and typical description	Distribution
Superficial	<b>Glaciofluvial deposits:</b> Sand and gravel	East of northern extent of Newbuild Infrastructure Boundary
	<b>Head deposits:</b> Clay, silt, sand and gravel	East of northern extent of Newbuild Infrastructure Boundary
	<b>Glacial Till:</b> Diamicton (unsorted sediment with gravel in a fine mud matrix).	Present throughout Section 6
Bedrock	<b>Gwespyr Sandstone:</b> Sandstone and argillaceous rocks, interbedded	Limited presence at northern-most limits of Newbuild Infrastructure Boundary in Section 6
	<b>Pennine Middle Coal Measure Formation:</b> Mudstone, siltstone, and sandstone	Adjacent southern boundary between Sections 5 and 6.
	<b>Pennine Lower Coal Measure Formation:</b> Mudstone, siltstone, and sandstone	Throughout central parts of Section 6

## BGS MINERAL RESOURCES MAPPING

A review of the BGS 1:50,000 scale Mineral Resources Map shows Section 6 to be underlain by glaciofluvial sand & gravels in the northern reaches. As a result, borehole records produced as part of the ground investigation for the Newbuild Carbon Dioxide Pipeline, as well as BGS borehole records (**Ref. 12**) in these geological units have been reviewed to provide details on approximate mineral and overburden thicknesses (**Table H-2**).

**Table H-2 - Summary of mineral resources and overburden thickness for Section 6 of the Newbuild Carbon Dioxide Pipeline**

Exploratory hole Ref (Annex J):	NGR	Mineral resources of interest	Approximate overburden thickness (m)	Mineral resource thickness (m)	Groundwater strike
<b>SJ27SE177</b>	325450E , 370720N	Sand & Gravel	5	12.1	-
<b>SJ27SW249</b>	324950E , 370570N	Sand & Gravel	5.4	5.8	-
<b>LB_21_82_TP</b>	325271E , 370042N	Sand & Gravel	0.7	>1.3	-
<b>LB_21_83B_TP</b>	325080E , 370414N	Sand & Gravel	4.5	-	4.5m
<b>LB_21_88_BH</b>	325203E , 370857N	Sand & Gravel	14.0	-	-
<b>LB_21_89_TP</b>	325232E , 370876N	Sand & Gravel	2.8	-	-

## HYDROGEOLOGY

Hydrogeological units for Section 6 of the Newbuild Carbon Dioxide Pipeline design are summarised in **Table H-3**. All units are classified as Secondary aquifers by Natural Resources Wales. The units classified as Secondary A aquifers are more likely to contain extractable quantities of groundwater in permeable layers. Section 6 of the Newbuild Infrastructure Boundary is not within a groundwater protection zone.

**Table H-3 - Aquifer status of geological units within Section 6 of the Newbuild Carbon Dioxide Pipeline design**

Type	Geological unit	Aquifer Status
<b>Superficial</b>	Glaciofluvial deposits	Secondary A
	Glacial Till	Secondary Undifferentiated
	Head deposits	Secondary Undifferentiated
<b>Bedrock</b>	Gwespyr Sandstone	Secondary A
	Pennine Middle Coal Measure Formation	Secondary A
	Pennine Lower Coal Measure Formation	Secondary A

## **HYDROLOGY**

The southern-most part of Section 6 is located within the Wepre Brook water body assessment area, previously discussed for Section 5 (**Annex G**). The remainder of Section 6 is not located within a water body assessment area.

Section 6 of the Newbuild Carbon Dioxide Pipeline intersects the following surface water features:

- Northop Brook 1km northeast of Northop; and,
- An unnamed stream 1.6km northeast of Northop which joins Lead Brook.

Section 6 is located within a Flood Zone 1, with the exception of its intersection with Northop Brook which is classified as a Flood Zone 3.

## **SENSITIVE LAND USES**

No sensitive land uses are evident within 50m of Section 6 of the Newbuild Carbon Dioxide Pipeline.

## **1.2. MINERALS RESOURCES ASSESSMENT**

### **POTENTIAL MINERALS RESOURCES**

Potential mineral resources identified throughout Section 6 of the Newbuild Carbon Dioxide Pipeline route are detailed herein. Where the proposed pipeline route intersects an MSA, the immediate area is assessed to see whether existing development has already sterilised the mineral resources, or if extraction is viable.

Safeguarded minerals resources in Section 6 identified within the Flintshire UDP and LDP include two areas of Sand & Gravel west and east of the northern-most limits of the proposed pipeline route. The order limits of the proposed development intersect the eastern MSA (Intersection 6a; **Figure 11.3.3 Sheet 8 Annex A**). This MSA comprises an approximately 75ha of unsterilised mineral resource. The MSA to the west of the DCO Proposed Development will not be influenced, and so is not assessed any further.

## **POTENTIAL OPPORTUNITIES FOR MINERAL EXTRACTION, RESOURCE VIABILITY, AND STERILISATION**

### **Intersection 6a**

The 75ha MSA associated with Intersection 6a (**Figure 11.3.3 Sheet 8, Annex A**) is largely unsterilised. As previously stated, the Newbuild Carbon Dioxide Pipeline route intersects with this MSA and would partially sterilise the underlying resources, leaving 72ha of unsterilised mineral resources. It is worth noting that the Newbuild Carbon Dioxide Pipeline route does not intersect with the MSA outlined within the Flintshire UDP, but only the Flintshire LDP, which appears to apply a buffer to the MSA. Moreover, within the area of unsterilised resources, several surface water features exist (a stream, ponds / lakes).

Geological logs (**Annex J** logs: SJ27SE/177, SJ27SW/249, LB\_21\_82\_TP, LB\_21\_83B\_TP, LB\_21\_88\_BH, LB\_21\_89\_TP) indicate that mineral resources here may not be homogenous nor of desirable quality based on their depositional environment (Glacial Till / Glaciofluvial). Associated PSD information (**Annex J** logs: LB\_21\_82\_TP, LB\_21\_83B\_TP, LB\_21\_88\_BH, LB\_21\_89\_TP) supports this. **Annex J** log LB\_21\_82\_TP displays that the proportion of fines within the mineral resource is 20.3%, satisfying the requirements for a Category B deposit, whilst the proportion of fines in PSDs from **Annex J** logs: LB\_21\_83B\_TP, LB\_21\_88\_BH, LB\_21\_89\_TP all exceed 40%. This suggests a lack of spatial homogeneity within this mineral resource, and a strong indication that mineral resources are of a poor quality due to the amount of processing that may be required. In-line with Policy EN23 of FCC LDP (**Ref. 3**), deposits here would not warrant prior extraction, particularly given the size of the area that will be sterilised by the proposed pipeline route at Intersection 6a.

Should prior extraction of mineral resources here be deemed necessary, the overburden recorded within the MSA ranges from 0.2-5m, whilst groundwater was not encountered. Resultantly, much of the mineral resource could potentially be extracted without dewatering of the area.

Incidental extraction would likely occur during development with an overburden of potentially only 0.2m within this MSA (**Table H-2**). Should mineral resources be incidentally extracted during construction of the DCO Proposed Development at this location where open-trench methods are utilised, these should be reused sustainably as part of a Materials Management Plan (MMP) which the Construction Contractor should implement (**Chapter 14 – Materials and Waste (Volume II)**).

### 1.3. CONCLUSIONS

The assessment of mineral resources associated with Intersection 6a presented above indicates that extraction here would not be suitable prior to the DCO Proposed Development.

The mineral resources surrounding Intersection 6a are of a potentially poor quality (Policy EN23 of Flintshire LDP (**Ref. 3**)), whilst groundwater may be shallower than indicated by geological logs reviewed. The need for the DCO Proposed Development is also considered to outweigh the need to protect the 3ha of mineral resource that may be sterilised as a result of development, as the HyNet Northwest Project is a nationally significant infrastructure project (discussed in **Needs Case (Document Reference D5.5)**).

Should mineral resources be incidentally extracted during construction of the DCO Proposed Development at this location where open-trench methods are utilised, these should be reused sustainably as part of an MMP which the Construction Contractor should implement.

# Annex I

## **BLOCK VALVE STATIONS MRA**



# BLOCK VALVE STATIONS MRA

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## 1.1.

### SITE DETAILS

Information deemed pertinent to the Minerals Resource Assessment of the three Block Valve Station (BVS) sites along the existing Flint connection of the DCO Proposed Development is reviewed here. Detailed information of the entire length of the DCO Proposed Development is included in the Phase 1 Land and Soil (Contaminated Land) Baseline report (**Appendix 11.1, Volume III**). Information from the ground investigation conducted throughout the length of the Newbuild Carbon Dioxide Pipeline route by Fugro Ltd. on behalf of the Applicant has also been utilised herein (**Appendix 11-5, Volume III**).

### GEOLOGICAL MAPPING

#### **Babell BVS (or BVS1)**

Bedrock is Cefn Mawr Limestone Formation which comprises thinly interbedded dark argillaceous limestones and mudstones with units of pale shelly limestone, see **Insert 1** below. The limestone dips approximately 12 degrees east.

Superficial Deposits comprise Glacial Till (boulder clay) in the northwest, Glaciofluvial Ice Contact Deposits (sand and gravel) in the centre, and Head (gravelly and sandy clay) in the southeast. See **Insert 2** below.

There is potential for Made Ground beneath the lane that runs through the area.

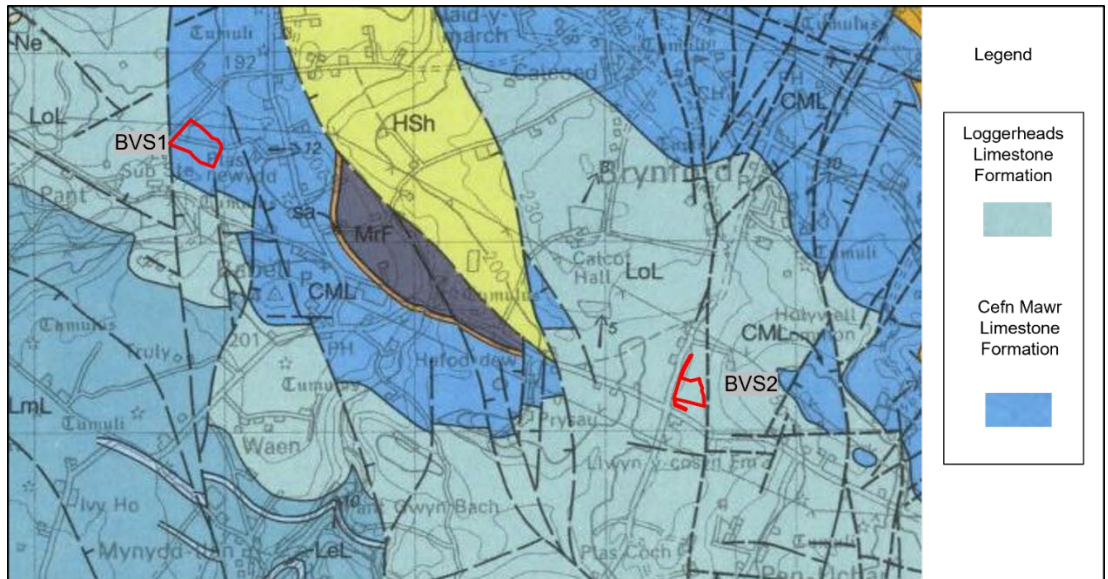
#### **Pentre Halkyn BVS (or BVS2)**

Bedrock is the Loggerheads Limestone Formation which comprises pale thick bedded massive rubbly pseudo brecciated and mottled limestones. A fault traverses the east of the site in a north south orientation. The limestone dips approximately 5 degrees to the north. See **Insert 1** below.

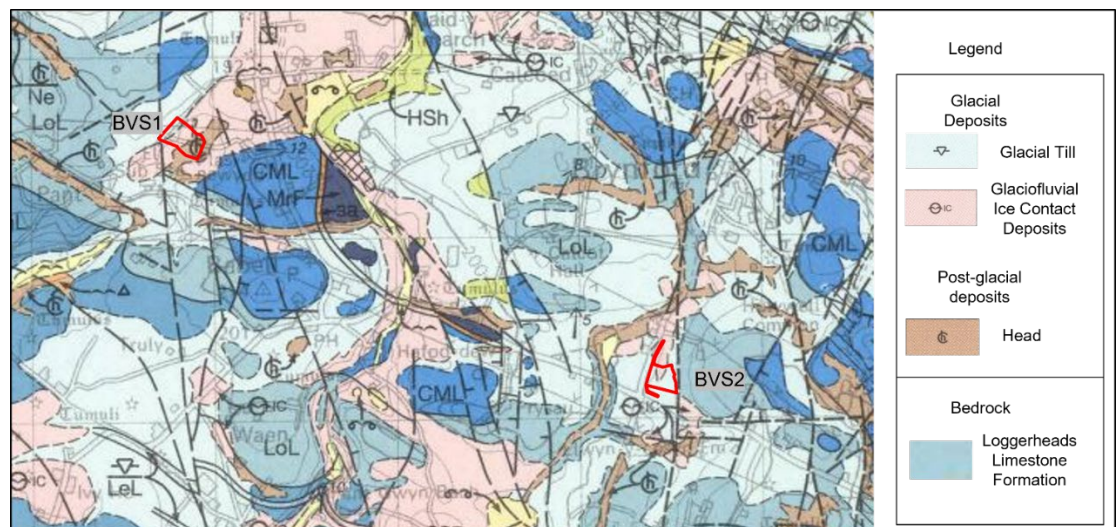
Superficial Deposits comprise Glacial Till (boulder clay) across site and Glaciofluvial Ice Contact Deposits are present in part of the north, see **Insert 2** below.

Made Ground relating to the roadway or surrounding farm activities may be underlying the site, however significant thicknesses of Made Ground are not expected.

**Insert 1 - Babell BVS and Pentre Halkyn BVS bedrock geology (extract of BGS 1:50k sheet 108)**



**Insert 2 - Babell BVS and Pentre Halkyn BVS bedrock and superficial geology (extract of BGS 1:50k sheet 108)**

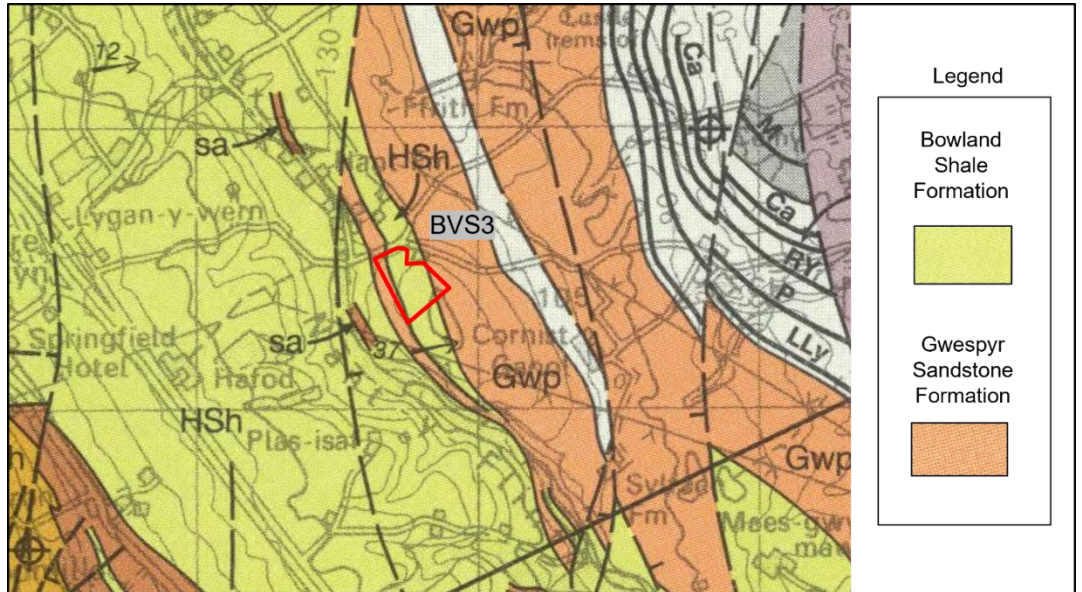


**Cornist Lane BVS (or BVS3)**

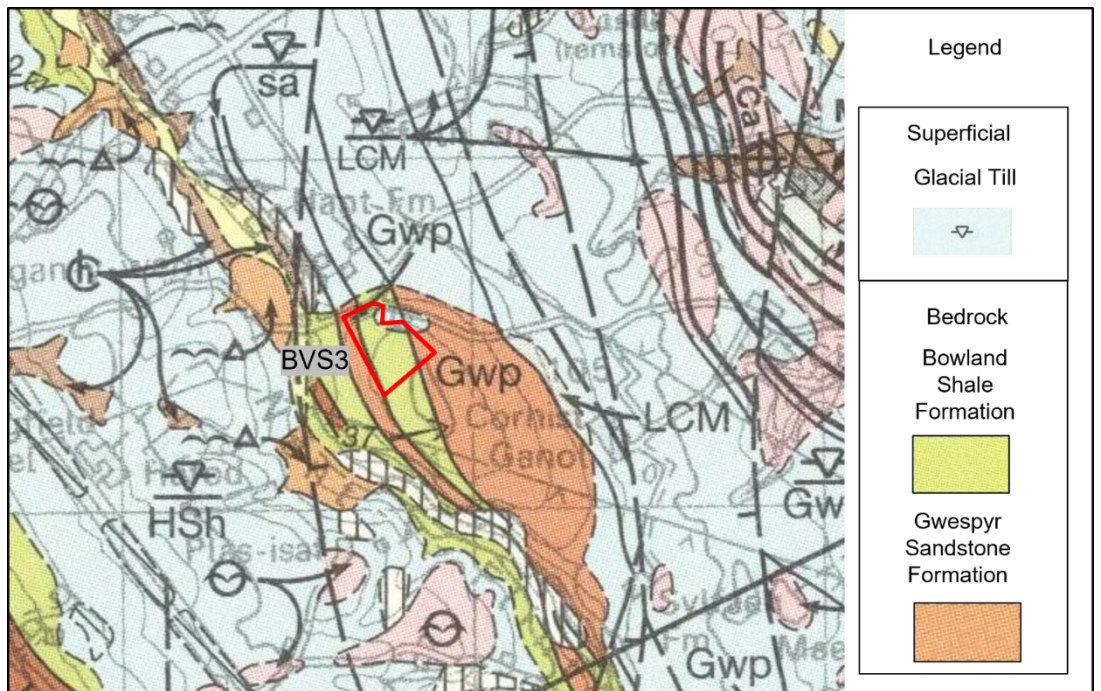
Bedrock is the Bowland Shale Formation (Formerly Holywell Shale Formation) (Craven Group) in the centre of site comprising dark grey fissile mudstone. The Gwespys Sandstone Formation (Millstone Grit Group) is present in the east and west of site comprising feldspathic sandstones, see **Insert 3** below. Superficial Deposits comprise Glacial Till (boulder clay) in the northeast, see **Insert 4** below; superficial deposits are absent across the rest of site.

Made Ground relating to the nearby farm may potentially be present, however significant thicknesses of Made Ground are unlikely.

**Insert 3 - Cornist Lane BVS bedrock geology (extract of BGS 1:50k sheet 108)**



**Insert 4 - Cornist Lane BVS bedrock and superficial geology (extract of BGS 1:50k sheet 108)**



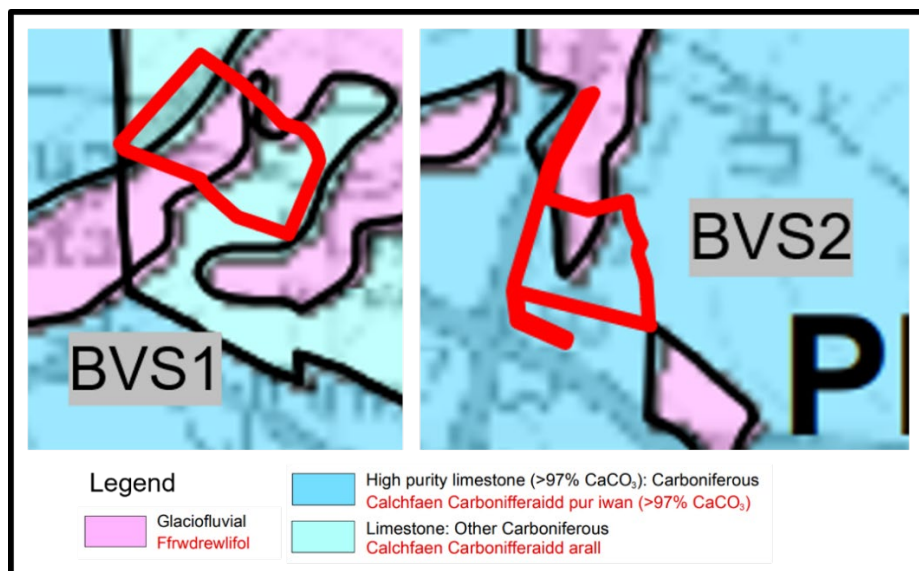
## BGS MINERAL RESOURCES MAP

A summary of mineral resources for Babel BVS to Cornist Lane BVS is presented in Error! Reference source not found. below and extracts from the Mineral Resource Map are provided below (**Inserts 5 and 6**).

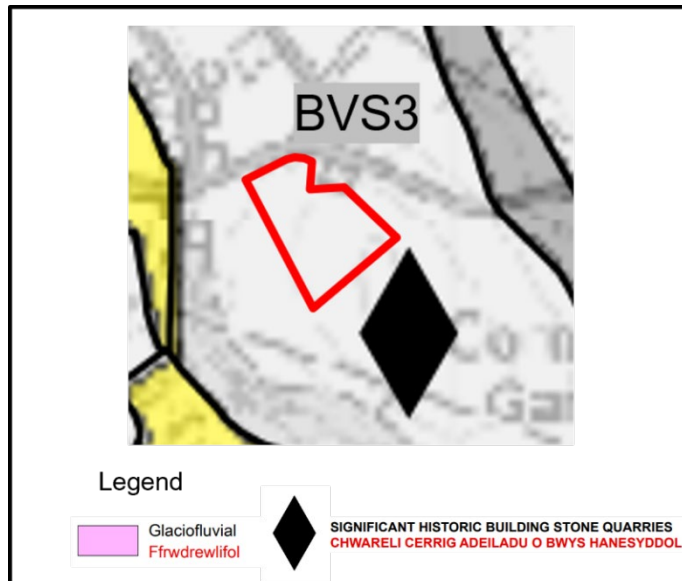
**Table 1 BGS Mineral Resource Map Summary Babel BVS-Cornist Lane BVS**

Location	Mineral Resource
Babel BVS	Superficial: glaciofluvial deposits: sand and gravels Bedrock: Limestone (Cefn Mawr Limestone Formation)
Pentre Halkyn BVS	Superficial: glaciofluvial deposits: sand and gravels Bedrock: High Purity Limestone (Loggerheads Limestone Formation)
Cornist Lane BVS	None identified

**Insert 5 – BGS North East Wales Mineral Resources Map Extract (Babel BVS and Pentre Halkyn BVS)**



## Insert 6 – BGS North East Wales Mineral Resources Map Extract (Cornist Lane BVS)



### BOREHOLE LOGS

There are no BGS borehole records available for the Block Valve Sites. Intrusive ground investigation was carried out at each site by Fugro Ltd on behalf of the Applicant in February 2022 (**Appendix 11-5, Volume III**). Borehole logs have been provided to WSP and are summarised in **Table 22** below. The exploratory hole locations are shown on **Figure 11.3.6, Sheets 1-3**, presented in **Annex A**.

**Table 2 – Babell BVS-Cornist Lane BVS summary of trial pit logs**

<b>BVS</b>	<b>Trial pit locations</b>	<b>Base of hole (m bgl)</b>	<b>Summary</b>	<b>Pertinent details</b>
Babell BVS	LB_21_309_TP	2.30	Topsoil to 0.30m bgl Clay to 2.30m bgl	N/A
	LB_21_310_TP	1.80	Topsoil to 0.30m bgl Clay top 1.80m bgl	N/A
	LB_21_311_TP	2.00	Topsoil to 0.30m bgl Sand to 2.00m bgl	Sand from 0.30 – 2.00 (unproven final depth) represent glaciofluvial deposits which are identified as a mineral resource.
Pentre Halkyn BVS	LB_21_306_TP	1.90	Topsoil to 0.10m bgl Cobbles to 0.30m bgl Sand to 1.90m bgl	Sand from 0.30 – 1.90 (unproven final depth) represent glaciofluvial deposits which are identified as a mineral resource.
	LB_21_307_TP	2.10	Topsoil to 0.30m bgl A mixture of clay, sand, gravel and silt to 2.10m bgl	N/A
	LB_21_308_TP	1.60	Topsoil to 0.30m bgl Clay to 1.60m bgl	N/A

<b>BVS</b>	<b>Trial pit locations</b>	<b>Base of hole (m bgl)</b>	<b>Summary</b>	<b>Pertinent details</b>
Cornist Lane BVS	LB_21_303_TP	2.70	Topsoil to 0.40m bgl Sand to 1.20m bgl Clay to 2.70m bgl	N/A
	LB_21_304_TP	1.70	Topsoil to 0.40m bgl Sand to 0.90m bgl Clay to 1.70m bgl	N/A
	LB_21_305_TP	2.70	Topsoil to 0.40m bgl Sand to 0.80m bgl Clay to 2.00m bgl Gravel to 2.70m bgl	N/A

## **HYDROGEOLOGY**

The Environment Agency classifies aquifer status as summarised in **Table 33** below.

**Table 3 – Babell BVS to Cornist Lane BVS hydrogeology units and aquifer designations**

<b>BVS</b>	<b>Type</b>	<b>Geological unit</b>	<b>Aquifer status</b>
Babell BVS	Superficial	Glacial Till	Secondary Undifferentiated Aquifer
		Glaciofluvial Ice Contact Deposits	Secondary A Aquifer
		Head	Secondary Undifferentiated Aquifer
	Bedrock	Cefn Mawr Limestone	Principal Aquifer
Pentre Halkyn BVS	Superficial	Glacial Till	Secondary Undifferentiated Aquifer
		Glaciofluvial Ice Contact Deposits	Secondary A Aquifer
	Bedrock	The Loggerhead Limestone	Principal Aquifer
Cornist Lane BVS	Superficial	Glacial Till	Secondary Undifferentiated Aquifer
	Bedrock	The Bowland Shale	Secondary Undifferentiated Aquifer
		The Gwespyr Sandstone	Secondary A Aquifer

The BVS do not lie within, or within 250m of, SPZs.

There was a historical groundwater abstraction 170m northeast of Pentre Halkyn BVS for farming. There are no other records of groundwater abstractions on site or within 500m of the block valve sites.

Groundwater was not encountered in any of the trial pits.

## **HYDROLOGY**

A summary of the hydrology information for Babell BVS-Cornist Lane BVS is presented in **Table 4** below.



**Table 4 – Babell BVS – Cornist Lane BVS Hydrology summary**

<b>BVS</b>	<b>Nearest surface water feature</b>
Babell BVS	The Afon Wys river is located 380m south. Unnamed Land Drain situated approximately 660m east.
Pentre Halkyn BVS	No features within 1km.
Cornist Lane BVS	Small unnamed drain located approximately 110m northeast. Afon Nant-y-Fflint stream is located approximately 150m west, with several small unnamed drains located to the further west. Unnamed pond located approximately 385m to the north.

There are no surface water abstractions within 500m of the block valve sites.

### **QUARRYING AND MINERAL EXTRACTION**

A review of the Coal Authority Interactive mapping online (**Ref. 20**) indicates Babell BVS - Cornist Lane BVS are outside the Coal Mining Reporting Area.

A summary of quarrying and mineral extraction is presented in **Table 5** below.

**Table 5 – Quarrying and mineral extraction Babell BVS-Cornist Lane BVS Summary**

<b>Feature</b>	<b>On-site</b>	<b>Within 250m</b>
Brit Pits	None recorded within Newbuild Infrastructure Boundaries of any of the BVS sites.	Babell BVS - Ceased underground lead working at Bryn-Ilwyn approximately 250m southeast of Babell BVS.  Pentre Halkyn BVS – <ul style="list-style-type: none"> <li>• Gelli-ffowler former lead shaft approximately 25m north</li> <li>• Groesffordd Farm former lead shaft approximately 95m south</li> <li>• Glanllyn-chaf former lead shaft approximately 230m northwest of Pentre Halkyn BVS.</li> </ul>

Feature	On-site	Within 250m
		Cornist Lane BVS - Two pits associated with sandstone extraction from the Windmill site approximately 165m southwest and Cornist Ganol site located approximately 190m southwest of Cornist Lane BVS.
Surface Ground Workings	<p>Babell BVS - 'Old quarry' shown in southwest of site on earliest historical mapping from 1870, after 1870 mapping it is no longer labelled.</p> <p>No other surface ground workings recorded within Newbuild Infrastructure Boundary of any of the other BVS sites.</p>	<p>One unspecified quarry identified approximately 160m southeast of the Babell BVS and numerous unspecified pits/heaps identified within 250m. Former quarry 348m northwest.</p> <p>Numerous ponds, clay pots and unspecified pits, workings and heaps identified within 250m of Pentre Halkyn BVS. There is an unnamed quarry operated by CCP aggregates located 1.1km east, Halkyn Quarry operated by Cemex is 1.4km southeast.</p> <p>Cuttings, ponds and unspecified quarries/pits have also been identified within 250m of Cornist Lane BVS.</p>
Underground Workings	None recorded within Newbuild Infrastructure Boundary of any of the BVS sites.	<p>Two unspecified old shafts identified within 250m of Babell BVS, the closest of which is approximately 230m northwest. The Groundsure report indicates the northwest part of Babell BVS is within an area where localised small scale underground mining is possibly related to a former limestone quarry 348m northwest.</p> <p>Numerous old/disused unspecified and lead shafts identified within 250m of Pentre Halkyn BVS site. Closest recorded is the former lead working located 25m north (Brit Pit Section). Pentre Halkyn BVS is within an area where underground mining is known or likely within close proximity related to the Brit Pits mentioned above.</p>

Feature	On-site	Within 250m
		None recorded within 250m of Cornist Lane BVS. Cornist Lane BVS is within an area where sporadic underground mining of a restricted extent is possible.
Mining Cavities	None recorded within Newbuild Infrastructure Boundary of any of the BVS sites.	<p>Bryn-Llwyn lead mine located approximately 190m southeast of Babell BVS has been identified as a mining cavity within 250m.</p> <p>Two cavities have been identified within 250m of Pentre Halkyn BVS (approximately 110m north and 190m northeast associated with the Gelli Fowler lead workings).</p> <p>None have been recorded within 250m of Cornist Lane BVS.</p>

## SENSITIVE LAND USES

The sites are not within an SSSI.

All sites are located within a SSSI Impact Risk Zone (**Appendix 11-1, Volume III**). These define zones around SSSIs which reflect the particular sensitivities of the features for which it is notified and indicate the types of development proposal which could have potentially adverse impacts. Certain types of development proposals including airports, farming units and incineration units require consultation however the development proposals for Babell BVS – Cornist Lane BVS do not fall under this requirement.

## BGS AGGREGATE SAFEGUARDING MAPS

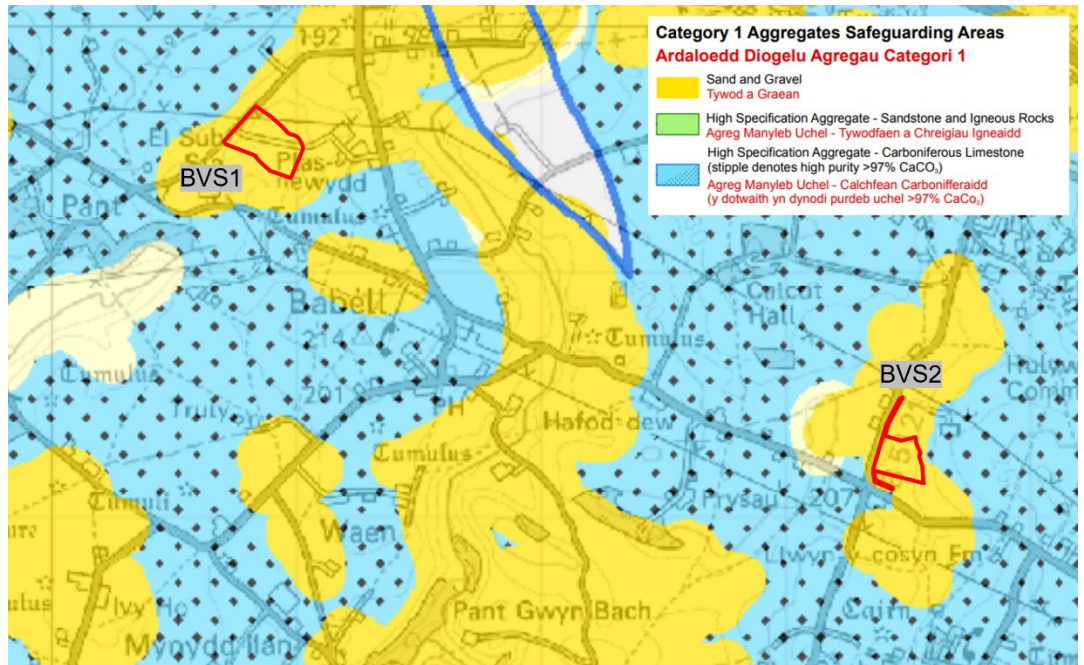
Extracts from BGS Aggregate Safeguarding Map are presented below (**Inserts 7 and 8**). Category 1 refers to resources considered nationally important, Category 2 refers to resources which are important for serving regional and local markets.

In summary:

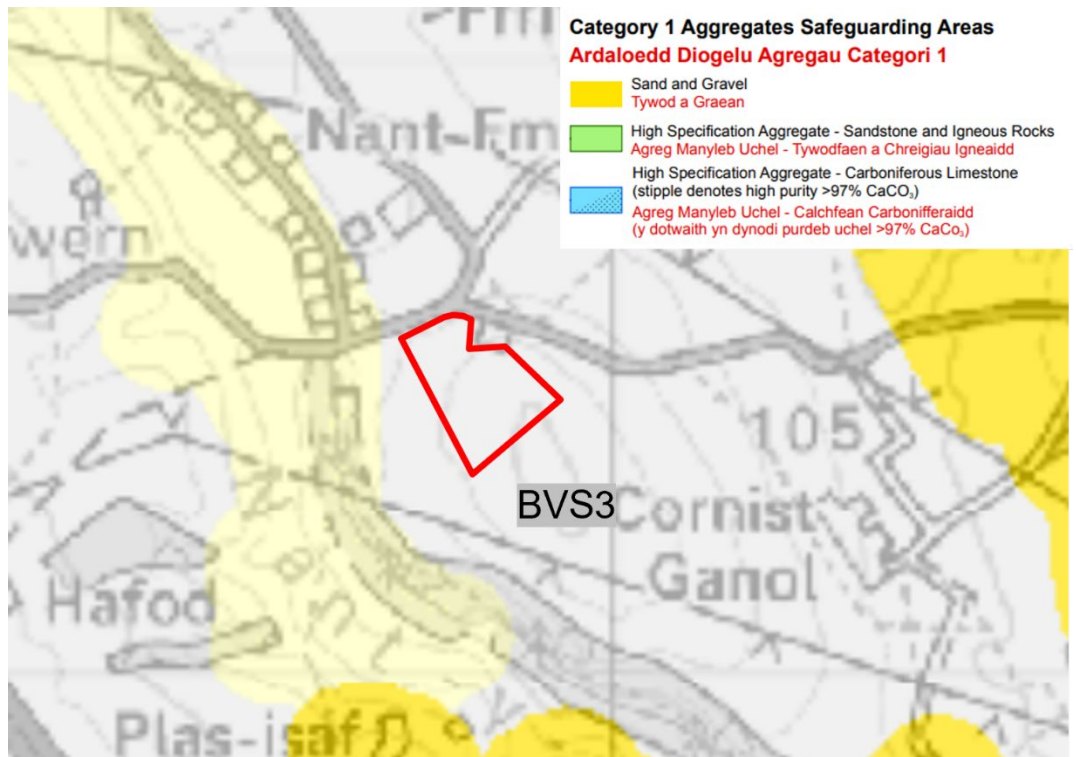
- Babell BVS is within a BGS Category 1 sand and gravel safeguarding area and high specification aggregate carboniferous limestone safeguarding area.
- Pentre Halkyn BVS is within BGS Category 1 sand and gravel safeguarding area and high specification aggregate carboniferous limestone safeguarding area.

- Cornist Lane BVS is not within a BGS aggregate safeguarding area.

**Insert 7 - Extract from BGS aggregate safeguarding map (Babell BVS and Pentre Halkyn BVS)**



**Insert 8 - Extract from BGS aggregate safeguarding map (Cornist Lane BVS)**



## MINERAL SAFEGUARDING AREAS (MSA)

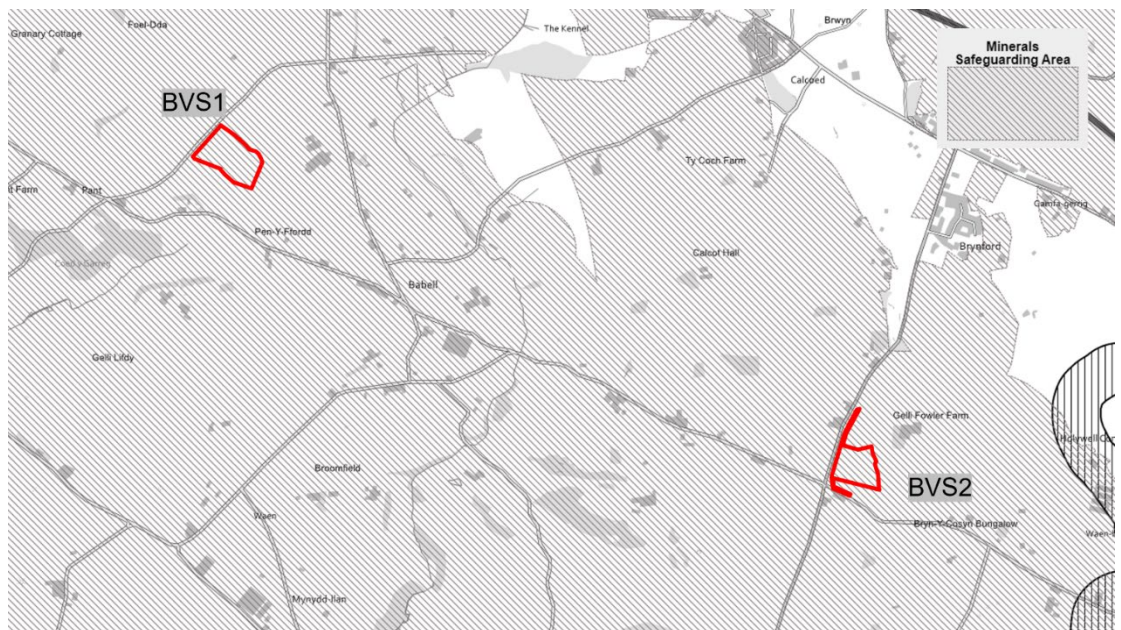
Extracts from the Flintshire LDP proposals map showing the MSA are included below (**Inserts 9 and 10**) and a summary of MSA mapping is presented in **Table 6** below.

**Table 6 – Summary of MSA mapping**

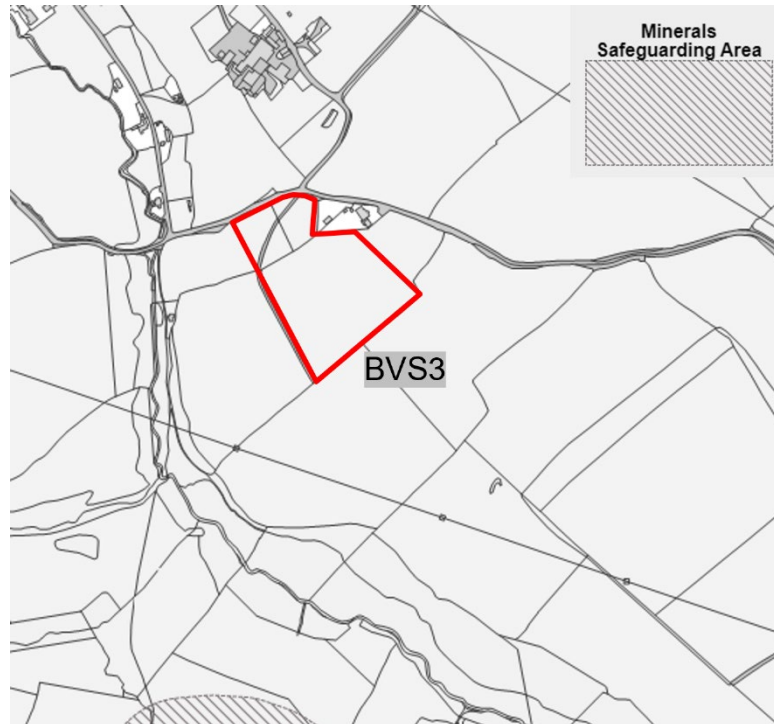
BVS	Adopted UDP (2011)	Emerging LDP (2019)
Babell BVS	Entire site within an MSA for glaciofluvial sand and gravel deposits and limestone bedrock on site.	Entire site within an MSA for glaciofluvial sand and gravel deposits and limestone bedrock on site.
Pentre Halkyn BVS	Entire site within an MSA for glaciofluvial sand and gravel deposits and limestone bedrock on site.	Entire site within an MSA for glaciofluvial sand and gravel deposits and limestone bedrock on site.
Cornist Lane BVS	Not within an MSA.	Not within an MSA.

It should be noted that as Cornist Lane BVS is not within an MSA and no mineral resources are identified on site, it has not been considered further in the Mineral Resource Assessment sections of this report.

### Insert 9 - Extract from LDP proposals map (Babell BVS and Pentre Halkyn BVS)



## Insert 10 - Extract from Flintshire LDP proposals map (Cornist Lane BVS)



### 1.2. MINERAL RESOURCE ASSESSMENT – BABELL BVS

#### MINERAL RESOURCES IDENTIFIED

The mineral resources identified are Glaciofluvial Deposits (sand and gravels) in part of the northwest half of site, and Limestone (Cefn Mawr Limestone Formation) underlying the entire site. The whole site is within a MSA.

#### COMMERCIAL VIABILITY

##### Resource requirement

The LDP states that a minimum 10 year land bank of crushed rock and minimum 7 year land bank of sand and gravel to be maintained throughout the LDP period (**Ref. 3**). Where a land bank can provide for over 20 years of extraction, new allocations will not be necessary and proposals for further extractions should not be permitted apart from in exceptional circumstances (MTAN 1: Aggregates (**Ref. 5**)).

The Flintshire existing land bank for crushed rock is 14.3 years, and for land-won sand and gravel aggregates is 6.1 years (**Ref. 18**).

### **Extent and viability of resource on site**

The sands and gravels are only present in the northwest half of the site (approximately 40% of the total site area, 1.2ha), as indicated on geological mapping and mineral resource maps.

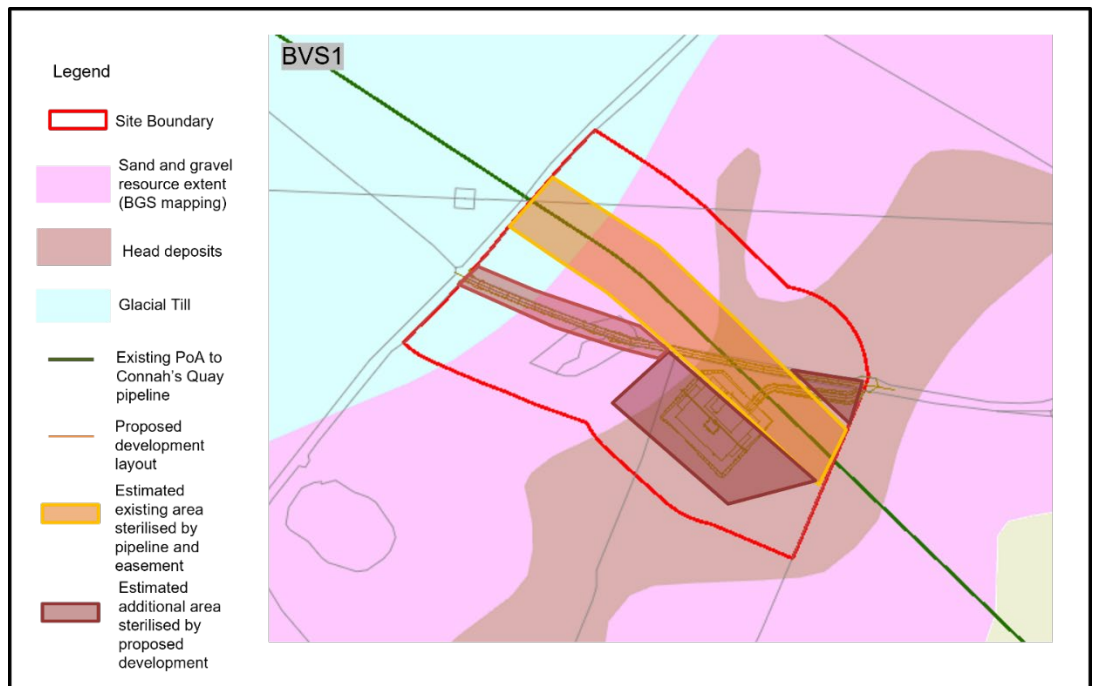
Ground investigation data (**Appendix 11-5, Volume III**) recorded sand and gravels in the northwest half of site from (location LB\_21\_311\_TP) from 0.30 – 2.00 (maximum depth unproven), no other ground investigation data is available within the sand and gravels. Investigation in the southeast half of site did not record sand and gravels.

The depth of superficial overburden is unknown overlying the limestone (greater than 2.3m thickness, bedrock unproven in trial pits).

The existing pipeline already cuts across the site and the maintenance strip easement of the existing pipeline is 30m in width embracing the pipeline, as marked up on **Insert 11** below. Once the Block Valves are installed, the Newbuild Carbon Dioxide Pipeline (and assumed Block Valves) are assumed to have a similar easement. In addition, access improvement works will take place to the farm track cutting across site.

**Insert 11** below shows the area of site already sterilised by the Newbuild Carbon Dioxide Pipeline and easement, and additional area that would be sterilised by the DCO Proposed Development.

### **Insert 11 Babell BVS estimated existing and additional area sterilised**



1.2.1.

Error! Reference source not found.7 shows the calculations of; area of mineral resource on site, area of mineral resource already sterilised by pipeline and easement, and additional area of mineral resource that would be sterilised by DCO Proposed Development, based on **Insert 11** above.

**Table 7 Babel BVS areas sterilised**

<b>Mineral Resource</b>	<b>Total area of mineral resource on site</b>	<b>Area already sterilised by pipeline and easement</b>	<b>Total existing unsterilised area of mineral resource</b>	<b>Additional area that would be sterilised by proposed development</b>
Sand and gravel	1.2ha (40% of site area)	0.29ha (24% of total resource area)	0.91ha (30% of total site area)	0.16ha (13% of total resource area)
Limestone	3.0ha (100% of site area)	0.8ha (26% of total resource area)	2.2ha (74% of total site area)	0.63ha (21% of total resource area)

No particle size distribution data for Babel BVS has been provided as part of the Geoenvironmental Ground Investigation (**Appendix 11-5, Volume III**) to allow assessment of the quality of the sand and gravel resource.

## **GROUNDWATER**

Groundwater was not encountered within the trial pits on site (**Appendix 11-5, Volume III**).

## **PRIOR AND INCIDENTAL EXTRACTION**

### **Prior extraction**

The LDP policy EN23 (**Ref. 3**) states that proposals for non-mineral development on sites of 4ha or more in size underlain by Category 1 sand and gravel deposits shall be supported by a prior extraction assessment. The site is 3.0ha in size and therefore would not warrant a prior extraction assessment. Furthermore, due to the limited size of existing unsterilised sand and gravel (0.91ha, or 30% of site area) and limestone (2.2ha, or 74%) mineral deposits on site, prior extraction would not be feasible.



## Incidental Extraction

The DCO Proposed Development as indicated on **Figure 11.3.5, Annex A** and **Insert 11** above shows the Block Valve Station would be located in the east of the site with road improvement to the existing road cutting across site. This means that excavation within the sand and gravel resource would only take place in the northwest part of site for construction of the road. Incidental extraction would be feasible and materials reused in the DCO Proposed Development if possible. If sand and gravel deposits are encountered during excavation of the Block Valve, then stockpiling and reuse would be feasible.

## **POLICY SUMMARY**

A summary assessing the relevant mineral planning policy in relation to Babell BVS is presented in **Table 8** below.

**Table 8 – Babell BVS summary with mineral policy**

<b>Policy</b>	<b>Policy detail</b>		<b>Comments</b>
<b>EN23: Minerals Safeguarding (LDP)</b>	Non-mineral development within Mineral Safeguarding Areas as defined on the proposals map will only be permitted where it can be demonstrated that:	a) The mineral underlying the site does not merit extraction	<p>The current land-won sand and gravel land bank for Flintshire is 6.1 years (a 7 year land bank is to be maintained throughout the LDP period).</p> <p>The site is within an MSA. No data on the quality of mineral resource is available.</p> <p>Due to the small size of the site (3.0ha) and distribution of sand and gravel across parts of the site only (unsterilised sand and gravel across 30% of the total site area only), the mineral resource is unlikely to merit extraction.</p> <p>In terms of the crushed rock aggregate mineral resource, there is a sufficient land bank of crushed rock across Flintshire. Furthermore there is already sterilisation of 26% of the limestone resource on site, therefore the resource is unlikely to merit extraction.</p>
		b) The need for the non-mineral development outweighs the need to protect the resource	The HyNet Northwest Project is a nationally significant infrastructure project.

Policy	Policy detail		Comments
		c) The mineral can be satisfactorily extracted prior to non-mineral development	Due to existing infrastructure sterilising of much of the mineral resources, along with the small size of the site, and distribution of sand and gravels parts of the site only, prior extraction is unlikely to be feasible.  Incidental extraction of small amounts of sand and gravel deposits for use in the proposed development would be feasible.
		d) The development is of temporary nature or can be removed within the timescales within which the mineral is likely to be needed	Not applicable, development not temporary.
		e) essential infrastructure that supports the supply of minerals would not be compromised or would be provided elsewhere	Essential infrastructure related to the supply of minerals would not be compromised by the development.
<b>MIN8 Protection of Mineral Interests (UDP)</b>	Any non-mineral development within a MSA will be required to demonstrate reasonable justification for sterilisation or restriction of mineral resources.		Justification outlined in this section of report.

### 1.3.

## MINERAL RESOURCE ASSESSMENT - PENTRE HALKYN BVS

### MINERAL RESOURCES IDENTIFIED

There are Glaciofluvial Deposits (sand and gravels) in the north of the Newbuild Infrastructure Boundary, and High Purity Limestone (Loggerheads Limestone Formation) underlying the entire site. The whole site is within an MSA.

## COMMERCIAL VIABILITY

### Resource requirement

The LDP states that a minimum 10 year land bank of crushed rock and minimum 7 year land bank of sand and gravel to be maintained throughout the LDP period (**Ref. 3**). Where a land bank can provide for over 20 years of extraction, new allocations will not be necessary and proposals for further extractions should not be permitted apart from in exceptional circumstances (MTAN 1: Aggregates (**Ref. 5**)).

The Flintshire existing land bank for crushed rock is 14.3 years, and for land-won sand and gravel aggregates is 6.1 years (**Ref. 18**).

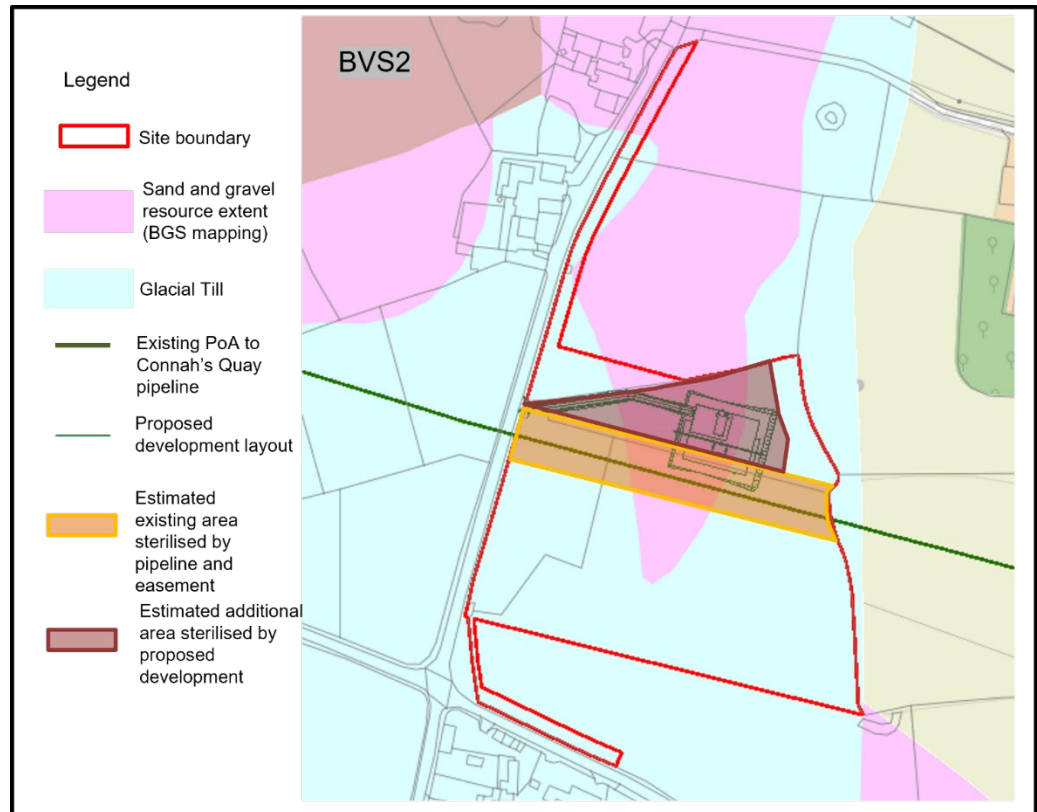
### EXTENT AND VIABILITY OF RESOURCE ON SITE

The sands and gravels are present in the northwest of the site and southeast corner, as indicated by geological mapping and mineral resource maps. Ground investigation data (**Appendix 11-5, Volume III**) in the northwest of site recorded sand from 0.30 to 1.90 (maximum depth unproven), no other ground investigation data is available within the sand and gravels. No ground investigation was completed in the south of site. The depth of superficial overburden is unknown overlying the limestone (greater than 2.1m thickness, bedrock unproven in trial pits).

The existing pipeline already cuts across the site and the maintenance strip easement of the existing pipeline is 30m in width embracing the pipeline, as marked up on **Insert 12** below. Once the Block Valves are installed, the pipeline (and assumed Block Valves) are assumed to have a similar easement.

**Insert 12** below shows the area of site already sterilised by the pipeline and easement, and additional area that would be sterilised by the DCO Proposed Development.

**Insert 12 – Pentre Halkyn BVS estimated existing and additional area sterilised**



**Table 9** below shows the calculations of; area of mineral resource on site, area of mineral resource already sterilised by pipeline and easement, and additional area of mineral resource that would be sterilised by DCO Proposed Development, based on **Insert 12** above.

**Table 9 – Pentre Halkyn BVS areas sterilised**

<b>Mineral Resource</b>	<b>Total area of mineral resource on site</b>	<b>Area already sterilised by pipeline and easement</b>	<b>Total existing unsterilised area of mineral resource</b>	<b>Additional area that would be sterilised by DCO Proposed Development</b>
Sand and gravel	0.61ha (20% of site area)	0.14ha (22% of total resource area)	0.47ha (14% of total site area)	0.27ha (44% of total resource area)
Limestone	3.18ha (100% of site area)	0.56ha (17% of total resource area)	2.62 (82% of total site area)	0.42ha (13% of total resource area)

## QUALITY OF RESOURCE

Data from the borehole log (**Annex J** log LB\_21\_306\_TP) within the sand and gravel has been assessed regarding the quality of the mineral resource.

A particle size distribution test has been carried out at 1.3m bgl, the test is included in Error! Reference source not found.. The mineral component proportion of Fines <0.063mm is 9.3%. The depth of overburden (topsoil) is 0.3m thickness. The proven thickness of deposit is a minimum of 1.6m thickness, however the trial pit was terminated therefore the deposit thickness was not proven.

The following BGS technical paper (**Ref. 14**) on classification of mineral deposits includes suggested categorisation according to a number of key features including thickness of deposit and ratio of deposit to overburden thickness. Two categories have been devised: Category A which is more favourable, and Category B which includes deposits which are more difficult to work and / or may be less economically viable.

**Table 10 – Comparison to Category A and B deposit characteristics**

	Category A deposit key characteristics		Category B deposit key characteristics	
<b>Pentre Halkyn BVS</b> <b>Location:</b> <b>LB_21_306_TP</b> <b>Depth:</b> <b>1.3m bgl</b>	Minimum average 2m deposit thickness	✓	Minimum average 2m deposit thickness	✓
	<i>Unproven, but likely</i>		<i>Unproven, but likely</i>	
	Ratio of overburden to mineral should not exceed 1:1	✓	Ratio of overburden to mineral should not exceed 2:1	✓
	Proportion of fines should be <20%	✓	Proportion of fines should be <40%	✓
	Deposit should lie within 5m of the surface	✓	Deposit should lie within 10m of the surface	✓

**Table 10** above indicates that the superficial sand and gravels may be a Category A deposit, however the minimum deposit thickness is unproven

## GROUNDWATER

Groundwater was not encountered within the trial pits on site (**Appendix 11-5, Volume III**).

## PRIOR AND INCIDENTAL EXTRACTION

### Prior extraction

The LDP policy EN23 (**Ref. 3**) states that proposals for non-mineral development on sites of 4ha or more in size underlain by Category 1 sand and gravel deposits shall be supported by a prior extraction assessment. The site is 3.18ha in size and therefore would not warrant a prior extraction assessment. Furthermore, due to the limited size of existing unsterilised sand and gravel (0.47ha, or 14% of the total site area) and limestone (2.62ha, or 82% of the total site area) mineral deposits on site, prior extraction is unlikely to be feasible.

### Incidental Extraction

- 1.3.1. The DCO Proposed Development as indicated on **Figure 11.3.5 Sheet 3, Annex A** shows the Block Valve Station would be in the north of site, and access road in the northwest. This means that excavation for the access road, and potentially the block valve, may take place within the glaciofluvial sand and gravel deposits, therefore incidental extraction would be feasible. This material could be stockpiled on site and reused in the proposed development where suitable.

## SUMMARY

- 1.3.2. A summary assessing the relevant mineral planning policy in relation to Pentre Halkyn BVS is presented in below.

**Table 11 – Pentre Halkyn BVS summary with mineral policy**

Policy	Policy detail	Comments
	a) The mineral underlying the site does not merit extraction	The current land-won sand and gravel land bank for Flintshire is 6.1 years (a 7 year land bank is to be maintained throughout the LDP period).  The site is within an MSA. Based on the available PSD data the material would be classified as a Category A deposits which

Policy	Policy detail		Comments
EN23: Minerals Safeguarding (LDP)	Non-mineral development within Mineral Safeguarding Areas as defined on the proposals map will only be permitted where it can be demonstrated that:		<p>are more favourable for mineral working.</p> <p>However, due to the small size of the site (3.18ha) and distribution of sand and gravel across parts of the site only and existing sterilisation (unsterilised sand and gravel deposits only cover 0.47ha, or 14% of total site area), the mineral resource is unlikely to merit extraction.</p> <p>In terms of the limestone crushed rock mineral resource, there is a sufficient land bank of crushed rock across Flintshire. Furthermore there is existing sterilisation of 17% of the limestone resource, therefore the resource on site is unlikely to merit extraction.</p>
		b) The need for the non-mineral development outweighs the need to protect the resource	The HyNet Northwest Project is a nationally significant infrastructure project.
		c) The mineral can be satisfactorily extracted prior to non-mineral development	Due to existing infrastructure sterilising much of the mineral resources, the small size of the site, and distribution of sand and gravels in a small part of the site only, prior extraction is unlikely to be feasible.

Policy	Policy detail		Comments
			Incidental extraction of small amounts of sand and gravel deposits for use in the proposed development would be feasible.
		d) The development is of temporary nature or can be removed within the timescales within which the mineral is likely to be needed	Not applicable, development not temporary.
		e) essential infrastructure that supports the supply of minerals would not be compromised or would be provided elsewhere	Essential infrastructure related to the supply of minerals would not be compromised.
MIN8 Protection of Mineral Interests (UDP)	Any non-mineral development within a MSA will be required to demonstrate reasonable justification for sterilisation or restriction of mineral resources.		Justification outlined in this section of report.

## 1.4. CONCLUSIONS

The conclusions of the mineral resource assessment are outlined in **Table 12**.



**Table 12 - Conclusions**

Site	Summary of mineral resources	Conclusions
Babell BVS	Sand and gravel resource across part of site and limestone mineral resources identified across entire site; and the site is within an MSA. Thicknesses of sand and gravel is unproven.	<p>The potential for working the sand and gravel mineral resource is limited by the presence of sand and gravel across a small part of the site only and sterilisation from existing pipeline (existing unsterilised sand and gravel deposits only cover 0.91ha, or 30% of total site area), and significance of non-mineral development.</p> <p>Incidental extraction of sand and gravel and reuse within the Newbuild Infrastructure Boundary is considered feasible during groundworks.</p> <p>The potential for working the limestone mineral resource is limited by the existing pipeline which sterilises 26% of the site area; combined with the small size of site, and sufficient land bank of crushed rock resource in Flintshire.</p>
Pentre Halkyn BVS	Sand and gravel resource across part of site and limestone mineral resources identified across entire site; and the site is within an MSA. Thicknesses of sand and gravel is unproven.	<p>The potential for working the sand and gravel mineral resource is limited by the presence of sand and gravel across a small part of the site only and sterilisation from existing pipeline (existing unsterilised sand and gravel deposits only cover 0.47ha, or 14% of total site area), and significance of non-mineral development.</p> <p>Incidental extraction of sand and gravel and reuse within the Newbuild Infrastructure Boundary is considered feasible during groundworks.</p> <p>The potential for working the limestone mineral resource is limited by the existing pipeline which sterilises 17% of the site area; combined with the small size of site, and sufficient land bank of crushed rock resource in Flintshire.</p>
Cornist Lane BVS	No mineral resource identified and not within an MSA.	Not considered further.

# Annex J

## **EXPLORATORY HOLE LOG**

	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			<b>LB_21_02_BH</b>
	Fugro Reference	F190089			
	Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90	Sheet 1 of 1
	Hole Type	Sonic Core Drilling to Rotary Coring			Status <span style="float:right">Draft</span>

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	08/12/2021	08/12/2021	Hand excavated		PCD	LT, LD	LT	
1.20	3.00	SNC	09/12/2021	09/12/2021	Eijelkamp CRS XL MAX			LM, LD	LT, KR	
3.00	20.00	RC	09/12/2021	09/12/2021	Eijelkamp CRS XL MAX	Geobor-S	PCD	LM, LD	LT, KR	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
08/12/2021	14:15	0.00			Dry	1.20	1.50	Water	100	Red	00:02	1.20	1.50	101
08/12/2021	15:15	1.20			Dry	1.50	3.00	Water	100	Red	00:04	1.50	3.00	101
09/12/2021	07:00	1.50	1.50	0.70	Raining Showers	3.00	3.50	Water	100	Red	00:05	3.00	3.50	101
09/12/2021	17:30	20.00	4.30	0.70		3.50	5.00	Water	100	Red	00:07	3.50	5.00	101
						5.00	6.50	Water	100	Red	00:10	5.00	6.50	101
						6.50	8.00	Water	100	Red	00:10	6.50	8.00	101
						8.00	9.50	Water	100	Red	00:10	8.00	9.50	101
						9.50	11.00	Water	100	Red	00:10	9.50	11.00	101
						11.00	12.50	Water	100	Red	00:10	11.00	12.50	101
						12.50	14.00	Water	100	Red	00:10	12.50	14.00	101
						14.00	15.50	Water	100	Red	00:10	14.00	15.50	101
						15.50	17.00	Water	100	Red	00:10	15.50	17.00	101
						17.00	18.50	Water	100	Red	00:10	17.00	18.50	101
						18.50	20.00	Water	100	Red	00:10	18.50	20.00	101

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
3.00	175	3.00	175
20.00	146	20.00	146

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Approximately 10mm of water in base of inspection pit.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
GMP	10.00	7.50	10.50	10/12/2021	1	0.50	8.00	50	Plain	-0.50	0.00	Upstanding Cover	10/12/2021
					1	8.00	10.00	50	Slotted	0.00	0.50	Concrete	10/12/2021
										0.50	7.50	Bentonite	10/12/2021
										7.50	10.50	Gravel	10/12/2021
										10.50	20.00	Bentonite	10/12/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID
Client	Eni UK Limited		<b>LB_21_02_BH</b>
Fugro Reference	F190089		
Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90
Hole Type	Sonic Core Drilling to Rotary Coring		Status
			Draft

**LB\_21\_02\_BH**

Sheet 1 of 3

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
0.10 - 0.30	B	1							TOPSOIL. Soft dark brown sandy CLAY. Sand is fine and medium.	(0.30)			
0.20 - 0.30	D	2							[TOPSOIL] [CLAY]	0.30	9.60		
0.50 - 0.90	B	3	1.71 W/m.K						Stiff light brown mottled orange sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	(0.90)			
0.50	TCon		1.82 W/m.K						[GLACIAL TILL DEPOSITS] [CLAY]				
0.80 - 0.90	ES	4	0.1 ppm						Stiff light brown mottled orange sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	1.20	8.70		
1.10 - 1.20	D	5							[GLACIAL TILL DEPOSITS] [CLAY]	(0.30)			
1.20 - 1.50	B	7							Stiff light brown mottled orange sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	1.50	8.40		
1.20 - 1.65	D	6							[GLACIAL TILL DEPOSITS] [CLAY]				
1.20 - 1.65	SPT		N = 23 (S)	100	N/A	N/A			Light brownish red slightly clayey SAND. Sand is fine and medium.	(1.85)			
1.50 - 2.20	B	8	0.76 W/m.K						[GLACIAL TILL DEPOSITS] [SAND]				
1.50	TCon		3.65 W/m.K										
2.20 - 2.25	D	9											
2.25 - 3.00	B	10											
1.50 - 3.00				100	N/A	N/A							
3.00 - 3.45	D	11							3.00m to 3.35m; very dense. Assumed zone of core loss.				
3.00 - 3.40	SPT		50/245 mm (S)	30	N/A	N/A							
3.00 - 3.50	B	12							Firm reddish brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is subangular and subrounded fine and medium of sandstone.	3.35	6.55		
3.35 - 3.50									[GLACIAL TILL DEPOSITS] [CLAY]	(0.15)	6.40		
3.50 - 4.35							NR		ASSUMED ZONE OF CORE LOSS. [NO RECOVERY]	(0.85)			
3.50 - 5.00				43	17	17							
4.35 - 4.50							NI						
4.50 - 4.57							-						
4.57 - 4.76	C	13					70		Very weak reddish brown fine and medium grained micaceous SANDSTONE. Bedding fractures are 0 degrees, possibly very closely spaced (15/40/430), planar, rough, tight with black speckling, locally open infilled (<1mm) with very soft sandy clay. Partially weathered.	(1.40)			
4.76 - 5.40	C	14					15		[CHESTER FORMATION]				
5.19 - 5.28							430		4.35m to 4.50m; non intact. Recovered as angular to subrounded fragments (<10mm x 30mm x 50mm) of very weak reddish brown sandstone.				
5.40 - 5.51							NI		4.57m to 4.76m; non intact. Recovered as angular to subrounded fragments (<5mm x 25mm x 35mm) of very weak reddish brown sandstone.	5.75	4.15		
5.51 - 5.75							25		5.29m to 5.36m; yellowish light grey.	(0.75)			
5.00 - 6.50				50	37	24	30		5.29m to 5.40m; joint 90 degrees planar, rough, open, infilled (<1mm) with very soft reddish brown clay.				
5.75 - 6.50							55		5.40m to 5.51m; non intact. Recovered as slightly clayey sandy gravel. Sand is fine and medium. Gravel is angular to subrounded fine and medium of extremely weak reddish brown sandstone. Possibly moderately weathered.	6.50	3.40		
6.71 - 6.84	C	15					60		5.51m to 5.62m; joint 90 degrees planar, rough, open, infilled (<1mm) with very soft reddish brown sandy clay.	(1.12)			
6.50 - 7.11							75		Sand is fine.				
7.20 - 7.62	B	16					NA		5.66m to 5.75m; non intact. Recovered as angular and subangular fragments (<10mm x 25mm x 40mm) of very weak reddish brown sandstone with occasional soft clay.	7.62	2.28		
6.50 - 8.00									ASSUMED ZONE OF CORE LOSS. [NO RECOVERY]	(0.53)			
7.11 - 7.62									Very weak reddish brown fine and medium grained micaceous SANDSTONE. Bedding fractures are 0 degrees, closely spaced (60/75/265), planar, rough, tight with black speckling. Partially weathered.	8.15	1.75		
7.62 - 8.15							NR		[CHESTER FORMATION]				
8.15 - 8.53							NI		6.84m to 7.11m; joint 90 degrees, planar, rough, tight with black speckling.	(1.05)			
8.00 - 9.50				90	65	48			6.95m to 7.10m; light grey.				
8.78 - 8.98	C	17					60		7.11m to 7.62m; medium bed of gravelly sand. Sand is fine and medium. Gravel is angular to subrounded fine and medium of extremely weak reddish brown sandstone. Possibly moderately weathered.	9.20	0.70		
8.53 - 9.20							70		ASSUMED ZONE OF CORE LOSS. [NO RECOVERY]				
9.55 - 9.77	C	18							Very weak reddish brown fine and medium grained micaceous SANDSTONE. Bedding fractures are 0-5				
9.20 - 10.56							30						
							110						
							425						

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b> <b>LB_21_02_BH</b>
	Eni UK Limited		
	F190089		
	E344513.07 N374742.05	Ground Elevation (m Datum) 9.90	Sheet 2 of 3
	Sonic Core Drilling to Rotary Coring		Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Backfill / Installation
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	
9.50 - 11.00				71	67	56			degrees, closely spaced (60/70/205), planar, rough, tight with black speckling or micaceous on fracture surface. Partially weathered. [CHESTER FORMATION] 8.15m to 8.53m; non intact. Recovered as angular and subangular fragments (<10mm x 25mm x 60mm) of very weak and weak sandstone. 8.60m to 9.10m; rare light grey reduction spots (<10mm x 25mm).				
10.56 - 11.00							NR	11	Very weak and weak reddish brown fine and medium grained micaceous SANDSTONE with rare voids (<2mm). Bedding fractures are 0-20 degrees, predominantly closely spaced (40/130/290), planar and undulating, rough, very tight and clean. Partially weathered. [CHESTER FORMATION] 9.75m to 9.78m; joint 45 degrees, undulating, rough, very tight and clean. 9.77m to 9.83m; non intact. Recovered as angular fragments (<5mm x 10mm x 15mm) of very weak sandstone. 9.78m to 9.83m; joint 45 degrees, undulating, rough, very tight and clean. 10.31m to 10.33m; joint 45 degrees, undulating, rough, very tight and clean. 11.95m to 12.10m; extremely weak to very weak. 12.14m to 12.20m; light grey. 12.19m to 12.22m; non intact. Recovered as angular fragments (<10mm x 10mm x 80mm) of very weak sandstone. 12.35m to 12.50m; non intact. Recovered as angular and subangular fragments (<10mm x 30mm x 80mm) of very weak sandstone. 12.50m to 12.70m; assumed zone of core loss.	(3.50)			
11.61 - 11.79 11.00 - 12.35 11.00 - 12.50	C	19		100	88	73	40 130 290	12					
12.35 - 12.50 12.50 - 12.70							NI NR	13			12.70	-2.80	
12.50 - 14.00 13.48 - 13.61	C	20		87	87	79		14					
12.70 - 15.45 14.00 - 15.50 14.87 - 15.13	C	21		97	97	94	45 255 505	15	Very weak and weak, locally extremely weak reddish brown fine and medium grained micaceous SANDSTONE with rare voids (<2mm). Bedding fractures are 0-20 degrees, closely and medium spaced (25/230/605), planar, rarely undulating, rough, very tight and clean or tight and micaceous, locally moderately wide infilled (<3mm) with soft reddish brown clay. Partially weathered. [CHESTER FORMATION] 12.70m to 12.78m; non intact (assumed drilling induced). Recovered as angular to subrounded fragments (<20mm x 35mm x 55mm) of weak sandstone. 13.58m to 13.61m; very thin bed of light grey weak sandstone. 14.00m to 14.30m; rare lenses (<10mm x 80mm) of light grey weak sandstone. 14.50m to 14.65m; thinly laminated. Laminae are extremely closely spaced of dark reddish brown mudstone. 15.45m to 15.80m; assumed zone of core loss. 15.97m to 16.15m; 4 No. very closely spaced thin laminae of grey sandstone. 16.25m to 16.60m; thinly laminated. Laminae are extremely closely and very closely spaced of very weak dark reddish brown mudstone. At 16.51m; subangular nodule (10mm x 20mm) of very weak reddish brown mudstone. At 17.12m; subangular nodule (10mm x 25mm) of very weak reddish brown mudstone. 17.18m to 17.21m; light grey. 17.30m to 17.45m; extremely weak to very weak. At 17.46m; 3 No. nodules (<10mm x 10mm) of very weak dark reddish brown mudstone. 17.56m to 17.62m; non intact. Recovered sandy gravel. Sand is fine and medium. Gravel is angular fine to coarse of extremely weak sandstone. 17.65m to 17.90m; thinly laminated. Laminae are black and dark reddish brown extremely closely and very closely spaced. 17.87m to 17.90m; very thin bed of light grey weak sandstone. 17.90m to 17.97m; non intact. Recovered as angular fragments (<2mm x 10mm x 10mm) of extremely weak dark reddish brown mudstone and sandstone with occasional very soft clay. 17.90m to 18.17m; interbedded very weak grey sandstone and extremely weak dark reddish brown mudstone.	(5.58)			
15.45 - 15.80 15.50 - 17.00 16.65 - 16.94	C	22		80	80	69		16					
15.80 - 18.28 17.21 - 17.37	C	23					65 175 605	17					
17.00 - 18.50 18.17 - 18.31	C	24		97	88	74		18			18.28	-8.38	
18.28 - 18.85 19.05 - 19.23 18.50 - 20.00 18.85 - 20.00	C	25					10 70 200	19			(0.57)	-8.95	
				100	96	79	10 50 360				(1.15)		
											20.00	-10.10	

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_02_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90	Sheet 3 of 3
Hole Type	Sonic Core Drilling to Rotary Coring			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
									<p>Extremely weak and very weak yellowish grey fine and medium grained SANDSTONE. Bedding fractures are 5 degrees, predominantly closely spaced (10/70/200), planar, rough, tight with black speckling, locally open infilled (&lt;1mm) with very soft clay. Partially weathered.</p> <p>[CHESTER FORMATION]</p> <p>18.45m to 18.50m; assumed zone of core loss.</p> <p>18.75m to 18.78m; non intact. Recovered as angular fragments (&lt;10mm x 10mm x 20mm) of very weak and extremely weak sandstone.</p> <p>18.81m to 18.84m; non intact. Recovered as angular fragments (&lt;10mm x 10mm x 20mm) of very weak and extremely weak sandstone.</p> <p>Very weak reddish brown fine and medium grained micaceous SANDSTONE. Bedding fractures are 0-5 degrees, predominantly very closely spaced (10/50/360), planar, rough, very tight and clean. Partially weathered.</p> <p>[CHESTER FORMATION]</p> <p>19.00m to 19.11m; joint 45 degrees, planar, rough, tight with clay veneer.</p> <p style="text-align:center">End of Borehole at 20.00 m</p>				
21													
22													
23													
24													
25													
26													
27													
28													
29													

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_02_BH
Fugro Reference	F190089			
Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90	Sheet 1 of 3
Hole Type	Discontinuity Log			Status: Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
3.50 - 4.35	NR							Assumed zone of core loss.			
4.35 - 4.50	NI							Non intact.			
4.57 - 4.76	NI							Non intact.			
5.19	BF	0		T	PI	Ro		Micaceous.			
5.29 - 5.40	J	90		O	PI	Ro		Infilled (<1mm) with very soft clay.			
5.36	BF	0		T	PI	Ro		Black speckling.			
5.40	BF	0		T	PI	Ro		Black speckling.			
5.40 - 5.51	NI							Non intact, possibly moderately weathered.			
5.51 - 5.62	J	90		O	PI	Ro		Infilled (<1mm) with very soft sandy clay.			
5.59	BF	0		T	PI	Ro		Black speckling.			
5.62	BF	0		T	PI	Ro		Black speckling.			
5.64	BF	0		T	PI	Ro		Black speckling.			
5.66 - 5.75	NI							Non intact.			
5.75 - 6.50	NR							Assumed zone of core loss.			
6.71	BF	0		T	PI	Ro		Black speckling.			
6.84 - 7.11	J	90		T	PI	Ro		Black speckling.			
7.05	BF	0		T	PI	Ro		Black speckling.			
7.11	BF	0		T	PI	Ro		Black speckling.			
7.11 - 7.62	NI							NA, gravelly sand.			
7.62 - 8.15	NR							Assumed zone of core loss.			
8.15 - 8.53	NI							Non intact.			
8.60	BF	0		T	PI	Ro		Black speckling.			
8.78	BF	0		T	PI	Ro		Micaceous.			
8.98 - 8.99	BF	5		T	PI	Ro		Micaceous.			
9.04 - 9.05	BF	5		T	PI	Ro		Micaceous.			
9.20	BF	0		T	PI	Ro		Black speckling.			
9.25 - 9.26	BF	5		VT	PI	Ro		Clean.			
9.30 - 9.32	BF	15		T	PI	Ro		Black speckling.			
9.34	BF	0		VT	PI	Ro		Clean.			
9.75 - 9.78	J	45		VT	Un	Ro		Clean.			
9.77 - 9.83	NI							Non intact.			
9.83 - 10.26	J	90		T	PI	Ro		Black speckling.			
9.91	BF	0		T	PI	Ro		Black speckling.			

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			LB_21_02_BH
	Fugro Reference	F190089			
	Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90	Sheet 2 of 3
Hole Type	Discontinuity Log			Status	Draft

Discontinuity Details										Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend	
10.12	BF	0		VT	PI	Ro		Clean.		0°		
10.31 - 10.33	J	45		VT	Un	Ro		Clean.		45°		
10.36 - 10.37	BF	5		VT	PI	Ro		Clean.		5°		
10.56 - 11.00	NR							Assumed zone of core loss.				
11.27 - 11.31	BF	20		VT	PI	Ro		Clean.		20°		
11.41 - 11.43	BF	20		VT	PI	Ro		Clean.		20°		
11.61	BF	0		VT	PI	Ro		Clean.		0°		
11.83	BF	0		VT	Un	Ro		Clean.		0°		
11.87 - 11.88	BF	5		VT	PI	Ro		Clean.		5°		
11.96 - 11.97	BF	5		VT	Un	Ro		Clean.		5°		
12.00 - 12.01	BF	5		VT	Un	Ro		Clean.		5°		
12.06 - 12.07	BF	10		VT	Un	Ro		Clean.		10°		
12.11 - 12.14	BF	20		VT	Un	Ro		Clean.		20°		
12.19 - 12.22	NI							Non intact.				
12.35 - 12.50	NI							Non intact.				
12.50 - 12.70	NR							Assumed zone of core loss.				
13.16	BF	0		VT	PI	Ro		Clean.		0°		
13.23 - 13.24	BF	5		VT	PI	Ro		Clean.		5°		
13.37 - 13.38	BF	10		VT	Un	Ro		Clean.		10°		
13.48	BF	0		VT	PI	Ro		Clean.		0°		
13.61	BF	0		VT	PI	Ro		Clean.		0°		
13.94 - 13.95	BF	5		MW	PI	Ro		Infilled (<3mm) with soft reddish brown clay.		5°		
14.32 - 14.33	BF	5		VT	PI	Ro		Clean.		5°		
14.83	BF	0		VT	PI	Ro		Clean.		0°		
14.87 - 14.88	BF	5		VT	Un	Ro		Clean.		5°		
15.13	BF	0		VT	PI	Ro		Clean.		0°		
15.45 - 15.80	NR							Assumed zone of core loss.				
15.97 - 15.98	BF	15		VT	PI	Ro		Clean.		15°		
16.20 - 16.21	BF	5		T	PI	Ro		Micaceous.		5°		
16.26 - 16.28	BF	20		T	PI	Ro		Micaceous.		20°		
16.33 - 16.35	BF	20		T	PI	Ro		Micaceous.		20°		
16.94 - 16.95	BF	5		VT	Un	Ro		Clean.		5°		
17.46 - 17.47	BF	5		VT	PI	Ro		Clean.		5°		
17.56 - 17.62	NI							Non intact.				
17.73 - 17.74	BF	5		O	PI	Ro		Infilled (<1mm) with clayey sand.		5°		
17.90 - 17.97	NI							Non intact.				
18.31 - 18.32	BF	5		T	PI	Ro		Black speckling.		5°		
18.40 - 18.41	BF	5		T	PI	Ro		Black speckling.		5°		
18.45 - 18.50	NR							Assumed zone of core loss.				
18.56 - 18.57	BF	5		O	PI	Ro		Infilled (<1mm) with very soft clay.		5°		
18.75 - 18.78	NI							Non intact.				
18.81 - 18.84	NI							Non intact.				
18.93	BF	0		VT	PI	Ro		Clean.		0°		
18.94	BF	0		VT	PI	Ro		Clean.		0°		
18.95	BF	0		VT	PI	Ro		Clean.		0°		
19.00	BF	0		VT	PI	Ro		Clean.		0°		
19.00 - 19.11	J	45		T	PI	Ro		Clay veneer.		45°		
19.05	BF	0		VT	PI	Ro		Clean.		0°		
19.07	BF	0		VT	PI	Ro		Clean.		0°		
19.23 - 19.24	BF	5		VT	PI	Ro		Clean.		5°		
19.59 - 19.60	BF	5		VT	PI	Ro		Clean.		5°		
19.59 - 19.60	BF	5		VT	PI	Ro		Clean.		5°		
19.70	BF	0		VT	PI	Ro		Clean.		0°		
19.74	BF	0		VT	PI	Ro		Clean.		0°		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'





Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_02_BH
Fugro Reference	F190089			
Coordinates (m)	E344513.07 N374742.05	Ground Elevation (m Datum)	9.90	Sheet 3 of 3
Hole Type	Discontinuity Log			Status      Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
19.77	BF	0		VT	PI	Ro		Clean.	21 22 23 24 25 26 27 28 29		
19.82	BF	0		VT	PI	Ro		Clean.			
19.87 - 19.88	BF	5		VT	PI	Ro		Clean.			

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



# ALLIED EXPLORATION & GEOTECHNICS LTD

## BOREHOLE RECORD

Status:-  
**FINAL**  
Date:- **07/03/96**

Project: <b>NMCS2 Communications System In Cheshire - MS2 Cantilever Sites - M56</b>		BOREHOLE No <b>BH-03</b>	
Client: <b>The Highways Agency</b>	Location: <b>SJ 4650 7345 53/7 +60B</b>	<b>SJ 47 SW / 1A</b>	
Method & Equipment: <b>Cable Percussion using a Pilcon Wayfarer 1500</b>	Ground Level(m(AOD)): <b>7.64</b>	Date: <b>18-12-95</b>	Sheet: <b>1 of 2</b>

SAMPLES & TESTS			STRATA			
Depth	Type No	Test Result	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
0.80-1.20	B1		7.34		(0.30) (1.20)	(1) TOPSOIL.  MADE GROUND (Yellow brown and grey brown silty fine to medium sand. Occasional rootlets).
1.50-1.95	SJ2	N5	6.14		(0.50) (1.50)	Soft occasionally thinly laminated brown CLAY with occasional lenses of orange brown coarse sand. (Glacio-lacustrine)
1.51-1.90	B3		5.64		(2.00)	
2.50-2.95	U4	(67)			(5.30)	Firm to stiff brown sandy CLAY with some gravel. Gravel is fine to medium subangular to subrounded and consists of sandstone and basalt. (Glacial Till)
3.00	J5					
3.01-3.40	B6					
3.50-3.95	U7	(55)				
4.00	J8					
4.01-4.40	B9					
4.50-4.95	U10	(60)				
5.00	J11					
5.10-5.50	B12					
5.50-5.95	U13	(70)				
6.00	J14					
6.40-6.80	B15					
7.00-7.45	U16	(100)	0.34		7.30 (0.20)	
7.30-7.60	B18		0.14		7.50	Red brown slightly clayey fine to medium SAND with occasional pockets and bands of soft thinly laminated clay. (Fluvio-glacial)
7.50	J17					
7.60-7.90	SJ19					
7.61-7.90	B20	50 for 56mm			(1.00)	(As sheet 2 of 2)

Boring Progress and Water Observations					Chiselling			Water Added		GENERAL REMARKS
Date	Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
18.12.95	0.00	0.00			7.90	8.20	0.75	7.30	9.00	1) Description derived from driller's daily report.
18.12.95	2.00	1.65	150mm	dry	8.30	8.50	0.50			
19.12.95	2.00	1.65	150mm	dry	8.50	8.80	1.00			
19.12.95	9.00	9.00	150mm	8.30						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Drawn By:	Logged By: A. Latimer	Contract No. <b>1568</b>
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# ALLIED EXPLORATION & GEOTECHNICS LTD

## BOREHOLE RECORD

Status:- **FINAL**  
Date:- **07/03/96**

Project: <b>NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56</b>		BOREHOLE No <b>BH-03</b>	
Client: <b>The Highways Agency</b>		Location: <b>53/7 +60B</b> <span style="float: right; font-family: cursive;">5347SW</span>	
Method & Equipment: <b>Cable Percussion using a Pilcon Wayfarer 1500</b>		Ground Level(m(AOD)): <b>7.64</b>	Date: <b>18-12-95</b>
		Sheet: <b>2 of 2</b>	

SAMPLES & TESTS			STRATA			
Depth	Type No	Test Result	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
8.50-8.70	SJ21	50 for	-0.86		8.50	Very dense slightly medium to coarse sandy fine to coarse subangular GRAVEL with some cobbles. Gravel and cobbles consist of sandstone and basalt. (Fluvio-glacial)
8.70-8.90	B22	53mm			(0.50)	
8.90-9.00	C23	50 for 47mm	-1.36		9.00	Grey and red brown medium grained poorly cemented slightly weathered SANDSTONE weak. (Bunter Sandstone) Borehole complete at 9.00m BGL.

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Depth	Casing	Casing Dia	Water Depth		From	To	Hours	From	To	
18.12.95	0.00	0.00				7.90	8.20	0.75	7.30	9.00	
18.12.95	2.00	1.65	150mm	dry		8.30	8.50	0.50			
19.12.95	2.00	1.65	150mm	dry		8.50	8.80	1.00			
19.12.95	9.00	9.00	150mm	8.30							

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Checked By: <span style="background-color: black; color: black;">XXXXXXXXXX</span>	Logged By: A. Latimer	Contract No. <b>1568</b>
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For Survey use only)  
GEOLOGICAL  
CLASSIFICATION

NATURE OF STRATA

If measurements start below  
ground surface, state how far ...

THICKNESS

DEPTH

Feet Inches  
... ..

Feet Inches

METRES

op.

Sandy Top Soil

1

6

1

6

0-46 0-46

Brown Sand

2

0

3

6

0-61 1-07

Boulder Clay

2

0

5

6

0-61 1-62

Brown Clay

7

0

12

6

2-13 3-81

Brown Sandy Clay & Pebbles

20

6

33

0

6-25 10-01

Sandstone

32

0

65

0

9-75 19-81

Sandstone with Bands of Sandy Clay

110

0

175

0

33-53 53-3

Red Marl

4

0

179

0

1-22 54-56

Sandstone

50

0

229

0

15-24 61-80

Sandstone with Bands of Sandy Clay

35

0

261

0

10-67 30-47

Sandstone & Pebbles with Bands

of Sandy Clay

31

0

298

0

10-36 40-83

Sandstone with Bands of Sandy Clay

21

0

322

0

7-32 48-15

Sandstone & Pebbles with Bands of

Sandy Clay

53

0

375

0

16-15 114-20

Sandstone with Bands of Sandy

Clay

23

0

398

0

7-01 121-31

Hard Red Marl

12

0

410

0

3-66 124-9



# ALLIED EXPLORATION & GEOTECHNICS LTD

5478W/133

## BOREHOLE RECORD

Status:- **FINAL**  
Date:- 07/03/96

Project: <b>NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56</b>		BOREHOLE No	
Client: <b>The Highways Agency</b>	Location: <b>54/6 +70B SJ4832 Y3060 SJ475W</b>	<b>BH-02</b> 133	
Method & Equipment: <b>Cable Percussion using a Pilcon Wayfarer 1500</b>		Ground Level(m(AOD)): <b>7.18</b>	Date: <b>15-12-95</b>
		Sheet: <b>1 of 2</b>	

SAMPLES & TESTS			STRATA				
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
							(1) MADE GROUND (Topsoil and hardcore fill).
1.10-1.50	B1			6.08		(1.10) 1.10	
1.50-1.95	CB2	N7				(1.60)	MADE GROUND (Loose grey brown gravelly medium to coarse sand with some to many pockets of firm grey and red brown sandy clay with occasional gravel. Gravel is fine to medium occasionally coarse angular to subrounded and consists of sandstone, limestone and basalt. Occasional rootlets).
2.00-2.40	B3						
2.50-2.95	CB4	N25		4.48		2.70	
3.50-3.95	CB5	N11				(1.40)	Medium dense orange brown gravelly coarse SAND with occasional pockets of firm thinly laminated clay. Gravel is fine to medium subangular to rounded and consists of sandstone, basalt and quartzite. (Fluvio-glacial)
4.10-4.50	B6			3.08		4.10	
4.50-4.95	U7	(45)				(0.90)	Stiff occasionally thinly laminated red brown sandy CLAY with occasional to some gravel and occasional lenses of orange brown coarse sand. Gravel is fine to medium subangular to subrounded and consists of sandstone and basalt. (Glacial Till)
5.00	J8			2.18		5.00	
5.50-5.95	SJ9	50 for 275mm		1.68		(0.50)	Firm thinly laminated brown CLAY with occasional thin laminae of brown fine sand and silt. (Glacio-lacustrine)
6.30-6.70	B10						Very dense red brown silty fine SAND. (Fluvio-glacial)
7.00-7.45	SJ11	50 for 210mm				(3.00)	
7.80-8.10	B12						

Boring Progress and Water Observations					Chiselling			Water Added		GENERAL REMARKS
Date	Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
15/12/95	0.00	0.00						5.00	8.50	1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.2m).
15/12/95	8.50	8.50	150mm	5.10						
18/12/95	8.50	8.50	150mm	4.30						
18/12/95	15.00	15.00	150mm	3.60						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Logged By: A. Latimer	Contract No. 1568
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# ALLIED EXPLORATION & GEOTECHNICS LTD

## BOREHOLE RECORD


Status:-  
**FINAL**  
Date:- **07/03/96**

Project: <b>NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56</b>		BOREHOLE No <b>BH-02</b> <span style="float: right;">133</span>	
Client: <b>The Highways Agency</b>	Location: <b>54/6 +70B</b>	<b>SJ47SW</b>	
Method & Equipment: <b>Cable Percussion using a Pilcon Wayfarer 1500</b>		Ground Level(m(AOD)): <b>7.18</b>	Date: <b>15-12-95</b> Sheet: <b>2 of 2</b>

SAMPLES & TESTS			STRATA				
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
8.50-8.95	SJ13	50 for 216mm		-1.33	x x	8.50	(As sheet 1 of 2) Very dense red brown fine to medium SAND. (Fluvio-glacial)
9.40-9.80	B14						
10.00-10.45	SJ15	50 for 177mm					
10.90-11.20	B16					(5.20)	
11.50-11.95	SJ17	50 for 164mm					below c.11.50m BGL ... becoming medium to coarse.
12.40-12.80	B18						
13.00-13.45	SJ19	50 for 150mm					
13.70-14.00	B20			-6.53	o	13.70	Very dense red brown very gravelly coarse SAND. Gravel is fine to coarse subangular to subrounded and consists of sandstone, basalt and quartzite. (Fluvio-glacial)
14.00-14.45	CB21	50 for 107mm				(1.30)	
14.60-15.00	B22			-7.83	o	15.00	below c.14.60m BGL ... becoming sandy gravel with occasional basalt cobbles.
Borehole complete at 15.00m BGL							

Boring Progress and Water Observations					Chiselling			Water Added		GENERAL REMARKS
Date	Depth	Casing	Casing Dia	Water Depth	From	To	Hours	From	To	
15/12/95	0.00	0.00						5.00	8.50	1) Description derived from driller's daily report. 2) Inspection pit dug prior to drilling (1.0 x 1.0 x 1.2m).
15/12/95	8.50	8.50	150mm	5.10						
18/12/95	8.50	8.50	150mm	4.30						
18/12/95	15.00	15.00	150mm	3.60						

All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets		By: <span style="background-color: black; color: black;">XXXXXXXXXX</span>	Logged By: A. Latimer	Contract No. <b>1568</b>
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	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_07_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344734.73 N373406.32	Ground Elevation (m Datum)	11.90	Sheet 1 of 1	
	Hole Type		Sonic Core Drilling			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00 1.20	1.20 9.29	IP SNC	30/11/2021 30/11/2021	30/11/2021 01/12/2021	Hand excavated Eijelkamp CRS XL MAX		PCD	LT, LM LM, DM, LD	LT LT	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
30/11/2021	07:00	0.00	0.00	0.00	Cloudy	1.20	1.50	Water	100	Brown	00:05	1.20	1.50	100
30/11/2021	17:30	6.00	6.00	1.60	Dry	1.50	3.00	Water	100	Brown	00:05	1.50	3.00	100
01/12/2021	07:00	6.00	7.50	1.80	Showers	3.00	4.50	Water	100	Brown	00:05	3.00	4.50	100
01/12/2021	17:30	9.29	7.50	1.80		4.50	6.00	Water	100	Brown	00:05	4.50	6.00	100
						6.00	7.50	Water	100	Brown	00:05	6.00	7.50	100
						7.50	9.00	Water	100	Red	00:05	7.50	9.00	100
						9.00	9.29	Water	100	Red	00:05	9.00	9.29	100

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
9.29	150	9.29	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	9.29	Bentonite	01/12/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_07_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E344734.73 N373406.32	Ground Elevation (m Datum)	11.90	Sheet 1 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	
0.10 - 0.30	B	1							MADE GROUND. Dark brown slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is angular fine and medium of sandstone and flint, occasional fragments of medium gravel sized brick and concrete. [MADE GROUND] [CLAY]	(0.80)	11.10	
0.20 - 0.30	D	2										
0.50 - 0.80	B	3	1.34 W/m.K						Light reddish brown slightly clayey SAND. Sand is fine and medium. [WIND BLOWN DEPOSITS] [SAND]	0.80	11.10	
0.50	TCon		1.89 W/m.K									
0.60 - 0.70	D	4							Medium dense light reddish brown slightly clayey SAND. Sand is fine and medium. [WIND BLOWN DEPOSITS] [SAND]	(0.45)	10.70	
0.70 - 0.80	ES	5	< 0.1 ppm									
0.80 - 0.90	PID								Stiff light brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subrounded and subangular fine and medium of mixed lithologies including sandstone, mudstone and flint. [GLACIAL TILL DEPOSITS] [CLAY]	1.65	10.25	
0.90 - 1.10	B	6										
1.10 - 1.20	D	7							100	N/A	N/A	
1.20 - 1.65	B	8	N = 11 (S)									
1.20 - 1.65	SPT								1.22 W/m.K	1.44 W/m.K		
1.20 - 1.50												
1.50	TCon		1.16 W/m.K						0/450 mm			
1.50	TCon		1.40 W/m.K									
1.65 - 2.20	B	9							100	N/A	N/A	
2.20 - 2.25	D	10										
2.25 - 3.00	B	11							1.17 W/m.K	1.63 W/m.K		
1.50 - 3.00												
2.50	TCon		1.22 W/m.K						100	N/A	N/A	
2.50	TCon		1.44 W/m.K									
3.00 - 3.45	U	12	0/450 mm						100	N/A	N/A	
3.45 - 3.60	B	13										
3.50	TCon		1.17 W/m.K						100	N/A	N/A	
3.50	TCon		1.63 W/m.K									
3.60 - 4.00	B	14							100	N/A	N/A	
3.00 - 4.50												
4.00 - 4.05	D	15							100	N/A	N/A	
4.05 - 4.50	B	16										
4.50 - 4.95	D	17							100	N/A	N/A	
4.50 - 5.20	B	18										
4.50 - 4.95	SPT		N = 21 (S)						1.19 W/m.K	1.39 W/m.K		
4.50	TCon		1.19 W/m.K									
4.50	TCon		1.39 W/m.K						Continued next page			

**Notes**

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'






Contract Name		LBA CCS Transport and Storage Project Ground Investigations		Location ID	
Client		Eni UK Limited		<b>LB_21_07_BH</b>	
Fugro Reference		F190089			
Coordinates (m)		E344734.73 N373406.32	Ground Elevation (m Datum)	11.90	Sheet 2 of 2
Hole Type		Sonic Core Drilling		Status	Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
5.20 - 5.25 5.25 - 6.00 4.50 - 6.00	D B	19 20		100	N/A	N/A							
6.00 - 6.45 6.00 - 6.70	U B	21 23	0/450 mm					6					
6.45 - 6.60	B	22											
6.70 - 6.75 6.75 - 7.50 6.00 - 7.50	D B	24 25		100	N/A	N/A		7					
7.50 - 7.80 7.50 - 7.95 7.50 - 7.87	B D SPT	27 26	50/220 mm (S)										
7.80 - 8.20	B	28						8	Very dense light reddish brown mottled grey slightly clayey SAND. Sand is fine and medium. [CHESTER FORMATION] [SAND]	7.80	4.10		
8.20 - 8.25 8.25 - 9.00 7.50 - 9.00	D B	29 30		100	N/A	N/A				(1.49)			
9.00 - 9.29 9.00 - 9.29 9.00 - 9.29	D SPT	31	50/140 mm (S)					9					
									End of Borehole at 9.29 m	9.29	2.61		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_08_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344330.96 N373056.52	Ground Elevation (m Datum)	8.41	Sheet 1 of 1	
	Hole Type		Cable Percussion			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	10/12/2021	10/12/2021	Hand excavated			EA, KM, SD	EA	
1.20	7.81	CP	10/12/2021	14/12/2021	Dando 3000			KM, SD	EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
10/12/2021	07:30	0.00	0.00	0.00	Dry									
10/12/2021	17:00	1.65	1.20	1.20	Dry									
13/12/2021	06:00	1.65	1.20	1.20	Dry									
13/12/2021	16:30	5.48	5.00	5.00	Dry									
14/12/2021	07:30	5.48	5.00	3.60	Dry									
14/12/2021	16:30	7.81	5.00	5.00	Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
7.81	250	7.81	250

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	7.81	Bentonite	14/12/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'


Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_08_BH</b>
	Eni UK Limited		
	F190089		<b>Sheet 1 of 1</b>  <b>Status</b> <b>Draft</b>
	E344330.96 N373056.52	Ground Elevation (m Datum) 8.41	
	Cable Percussion		

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10	D	1			TOPSOIL. Firm dark brown slightly sandy slightly gravelly CLAY.					
0.10 - 0.35	B	2			Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of flint.	(0.35)	8.06			
0.10	TCon		0.97 W/m.K		[TOPSOIL] [CLAY]	0.35				
0.10	TCon		1.36 W/m.K			(0.25)				
0.40	D	3			Brown slightly gravelly very clayey SAND. Sand is fine and medium. Gravel is fine.	0.60	7.81			
0.40 - 0.60	B	4			[WIND BLOWN DEPOSITS] [SAND]					
0.65	D	5			Light brown and brown SAND. Sand is fine and medium.	(0.60)				
0.65	ES	6			[WIND BLOWN DEPOSITS] [SAND]					
0.65 - 0.95	B	7		1						
0.65	PID		< 0.1 ppm		Medium dense brown SAND. Sand is fine and medium.					
0.65	TCon		0.97 W/m.K		[WIND BLOWN DEPOSITS] [SAND]	1.20	7.21			
0.65	TCon		0.99 W/m.K		1.10m to 1.20m; becomes brown.					
1.00	D	8			Medium dense brown SAND. Sand is fine and medium.	(0.60)				
1.15	D	9			[WIND BLOWN DEPOSITS] [SAND]					
1.20 - 1.65	D	10				1.80	6.61			
1.20 - 1.65	SPT		N = 18 (S)		Medium dense reddish brown silty SAND. Sand is fine and medium becoming fine to coarse. Completely weathered.					
1.80	D	11		2	[CHESTER FORMATION] [SAND]					
1.80 - 2.20	B	12			1.80m to 2.20m; with rare fine gravel.					
2.20 - 2.65	B	13								
2.20 - 2.65	SPT		N = 11 (S)							
2.70	D	14								
2.70 - 3.20	B	15		3						
3.20 - 3.65	D	16								
3.20 - 3.65	SPT		N = 13 (S)							
3.70	D	17								
3.70 - 4.20	B	18		4						
4.20 - 4.65	D	19								
4.20 - 4.65	SPT		N = 12 (S)							
4.70	D	20				(5.60)				
4.70 - 5.00	B	21								
5.00 - 5.48	D	22		5						
5.00 - 5.45	SPT		N = 14 (S)							
5.70	D	23								
5.80 - 6.30	B	24		6						
6.50 - 6.95	D	25			6.50m to 6.95m; dense.					
6.50 - 6.95	SPT		N = 31 (S)		6.80m to 7.40m; becoming fine to coarse.					
7.00 - 7.40	B	26		7						
7.40	D	27			Extremely weak to very weak reddish brown SANDSTONE.	7.40	1.01			
7.40 - 7.81	D	28			Recovered as reddish brown sandy gravel. Sand is fine to coarse.	(0.41)				
7.40 - 7.80	SPT		50/255 mm (S)		Gravel is angular and subangular fine to coarse of sandstone. Partially to moderately weathered.	7.81	0.60			
				8	[CHESTER FORMATION]					
					End of Borehole at 7.81 m					
				9						

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_08_CPT</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344329.23 N373059.11	Ground Elevation (m Datum)	8.32	Sheet 1 of 1	
	Hole Type		Inspection Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	08/12/2021	08/12/2021	Hand excavated			MR, MW, CG	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
08/12/2021	10:20	0.00			Rain									
08/12/2021	11:00	1.20			Dry Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

**Water Strike Remarks**  
Groundwater not encountered during excavation.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	1.20	Arisings	08/12/2021

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'


Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_08_CPT</b>
Fugro Reference	F190089			
Coordinates (m)	E344329.23 N373059.11	Ground Elevation (m Datum)	8.32	Sheet 1 of 1
Hole Type	Inspection Pit			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.20 - 0.30	B	3			TOPSOIL. Cut crops over soft dark grey sandy CLAY. Sand is fine to coarse. [TOPSOIL] [CLAY]	(0.30)				
0.20 - 0.30	D	2								
0.20 - 0.30	ES	1								
0.20 - 0.30	PID		< 0.1 ppm							
0.40 - 0.60	B	5			Light brown clayey SAND. Sand is fine to coarse. [WIND BLOWN DEPOSITS] [SAND]		8.02			
0.50 - 0.60	D	4								
0.50 - 0.60	ES	6								
0.50 - 0.60	PID		0.2 ppm			(0.70)				
1.00 - 1.10	D	7		1	Brown clayey SAND. Sand is fine to coarse. [WIND BLOWN DEPOSITS] [SAND]	1.00	7.32			
1.00 - 1.20	B	8				(0.20)				
					End of Inspection Pit at 1.20 m	1.20	7.12			
				2						
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	0.30 m 

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_09_CPT</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344056.52 N373056.48	Ground Elevation (m Datum)		7.35	Sheet 1 of 1
	Hole Type		Inspection Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	08/12/2021	08/12/2021	Hand excavated			MR, CG, MW	MR	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
08/12/2021	11:15	0.00			Rain									
08/12/2021	12:00	1.20		Dry	Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	1.20	Arisings	08/12/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'


Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_09_CPT</b>
Fugro Reference	F190089			
Coordinates (m)	E344056.52 N373056.48	Ground Elevation (m Datum)	7.35	Sheet 1 of 1
Hole Type	Inspection Pit			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.30 - 0.50	B	3	0.5 ppm	1	TOPSOIL. Cut crops over soft dark grey sandy CLAY. Sand is fine to coarse. [TOPSOIL] [CLAY]	(0.60)	6.75			
0.40 - 0.50	D	2			Brown clayey SAND. Sand is fine to coarse. [WIND BLOWN DEPOSITS] [SAND]	0.60				
0.40 - 0.50 0.40	ES PID	1				(0.50)				
0.70 - 0.90	B	6	0.2 ppm	1	Firm reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse subrounded and rounded of quartzite. [WIND BLOWN DEPOSITS] [CLAY]	1.10	6.25			
0.80 - 0.90	D	5				(0.10)				
0.80 - 0.90 0.80	ES PID	4			1.20	6.15				
1.10 - 1.20	B	8			End of Inspection Pit at 1.20 m					
1.10 - 1.20	D	7								
				2						
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	0.30 m 

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			LB_21_114_BH	
	Fugro Reference		F190089				
	Coordinates (m)		E344521.86 N373302.51	Ground Elevation (m Datum)	6.43	Sheet 1 of 1	
	Hole Type		Sonic Core Drilling			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	25/11/2021	25/11/2021	Hand excavated		PCD	LT, LM	LT	
1.20	9.00	SNC	25/11/2021	26/11/2021	Eijelkamp CRS XL MAX			LM, LD	LT	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
25/11/2021	07:00	0.00	0.00	0.00	Sunny	1.20	1.50	Water	100	Brown	00:05	1.20	1.50	101
25/11/2021	17:30	7.50	7.50	1.20	Dry	1.50	3.00	Water	100	Brown	00:05	1.50	3.00	101
26/11/2021	07:00	7.50	7.50	0.30		3.00	4.50	Water	100	Brown	00:05	3.00	4.50	101
26/11/2021	17:30	9.00	7.50	0.30		4.50	6.00	Water	100	Brown	00:05	4.50	6.00	101
						6.00	7.50	Water	100	Red	00:05	6.00	7.50	101
						7.50	9.00	Water	100	Red	00:05	7.50	9.00	101

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
9.00	175	9.00	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
1.10	0.86	20				

**Water Strike Remarks**  
At 1.10m; water seepage was observed.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
GMP	9.00	5.50	8.50	26/11/2021	1	0.50	6.00	50	Plain	-0.30	0.00	Upstanding Cover	26/11/2021
					1	6.00	8.00	50	Slotted	0.00	0.30	Concrete	26/11/2021
										0.30	5.50	Bentonite	26/11/2021
										5.50	8.50	Gravel	26/11/2021
										8.50	9.00	Bentonite	26/11/2021

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022





Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_114_BH
Fugro Reference	F190089			
Coordinates (m)	E344521.86 N373302.51	Ground Elevation (m Datum)	6.43	Sheet 1 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
0.10 - 0.30	B	1							Dark brown clayey SAND. Sand is fine and medium. [WIND BLOWN DEPOSITS] [SAND]	(0.30)			
0.20 - 0.30	D	2								0.30	6.13		
0.50 - 0.80	B	3							Light brown slightly clayey SAND. Sand is fine and medium. [WIND BLOWN DEPOSITS] [SAND]	(0.90)			
0.80 - 0.90 0.80	ES PID	4	< 0.1 ppm					1					
1.10 - 1.20	D	5											
1.20 - 1.65	D	7											
1.20 - 1.65	D	6							Loose light brown slightly clayey SAND. Sand is fine and medium. [WIND BLOWN DEPOSITS] [SAND]	1.20	5.23		
1.20 - 1.50	SPT		N = 5 (S)	100	N/A	N/A				(0.30)			
1.65 - 2.00	B	8							Stiff and very stiff light reddish brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint. [GLACIAL TILL DEPOSITS] [CLAY]	1.50	4.93		
2.00 - 2.20 2.00	ES PID	9	< 0.1 ppm					2					
2.20 - 2.25	D	10											
2.25 - 3.00	B	11		100	N/A	N/A							
1.50 - 3.00													
3.00 - 3.45	UT	12	1/450 mm					3					
3.45 - 3.60	B	13											
3.45 - 3.60	D	2											
3.60 - 4.00	B	14											
3.00 - 4.50				100	N/A	N/A				(4.50)			
4.00 - 4.05	D	15						4					
4.05 - 4.50	B	16											
4.50 - 4.95	D	17											
4.50 - 5.20	B	18											
4.50 - 4.95	SPT		N = 10 (S)										

Continued next page


Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_114_BH
Fugro Reference	F190089			
Coordinates (m)	E344521.86 N373302.51	Ground Elevation (m Datum)	6.43	Sheet 2 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
5.20 - 5.25 5.25 - 6.00 4.50 - 6.00	D B	19 20		100	N/A	N/A							
6.00 - 6.50 6.00 - 6.70	UT# B	21 22	1/0 mm					6	Dense light brown slightly gravelly SAND. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint. [GLACIAL TILL DEPOSITS] [SAND]	6.00	0.43		
6.70 - 6.75 6.75 - 7.50 6.00 - 7.50	D B	23 24		100	N/A	N/A		7					
7.50 - 7.95 7.50 - 8.20 7.50 - 7.95	D B SPT	25 26	N = 37 (S)					8		(3.00)			
8.20 - 8.25 8.25 - 9.00 7.50 - 9.00	D B	27 28		100	N/A	N/A		9					
								9	End of Borehole at 9.00 m	9.00	-2.57		G

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_114_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344520.20 N373308.51	Ground Elevation (m Datum)		6.35	Sheet 1 of 1
	Hole Type		Trial Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	2.50	TP	22/11/2021	22/11/2021	Machine excavated : JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
22/11/2021	11:15	0.00		1.20	Sunny									
22/11/2021	12:45	2.50		1.20										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
1.20	1.20	20				







**Water Strike Remarks**  
At 1.20m; water seepage was observed.


**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool [CAT] survey was carried out. Services were not located.  
2. Trial pit remained unstable during excavation.  
3. Trial pit terminated at 2.50m due to the collapse of pit sides.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	2.50	Arisings	22/11/2021

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR/SAF	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_114_TP	
		Fugro Reference				F190089					
		Coordinates (m)		E344520.20 N373308.51		Ground Elevation (m Datum)		6.35		Sheet 1 of 1	
		Hole Type				Trial Pit / Trench				Status	Draft
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.30 - 0.50	B	3			TOPSOIL. Soft dark grey sandy CLAY. Sand is fine to coarse. [TOPSOIL] [CLAY]	(0.50)					
0.40 - 0.50	D	2									
0.40 - 0.50	ES	1	< 0.1 ppm								
0.40	PID										
0.50 - 0.70	B	5			Light brown clayey SAND. Sand is fine to coarse. [WIND BLOWN DEPOSITS] [SAND]	0.50	5.85				
0.50	Tcon		0.04 W/m.K		0.50m to 0.70m; slightly clayey.						
0.50	Tcon		0.05 W/m.K								
0.50	Tcon		0.16 W/m.K								
0.60 - 0.70	D	4				(0.70)					
1.20 - 1.30	B	7			Spongy black pseudo-fibrous gravelly PEAT. Gravel is angular to rounded fine to coarse of mudstone and sandstone. Organic odour. [TIDAL FLAT DEPOSITS]	1.20	5.15				
1.20 - 1.30	D	6				(0.10)	5.05				
1.40 - 1.60	B	9			Soft bluish grey sandy CLAY. Sand is fine to coarse. [TIDAL FLAT DEPOSITS] [CLAY]	1.30					
1.50 - 1.60	D	8									
1.60	HVane		30 kPa (10 kPa)								
1.60	HVane		30 kPa (6 kPa)								
1.60	HVane		35 kPa (11 kPa)								
1.60	Tcon		0.04 W/m.K								
1.60	Tcon		0.06 W/m.K								
1.60	Tcon		0.09 W/m.K								
2.00 - 2.20	B	11			Soft and firm reddish brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded of mixed lithologies including mudstone, flint and sandstone. [GLACIAL TILL DEPOSITS] [CLAY]	2.00	4.35				
2.10 - 2.20	D	10									
2.20	HVane		35 kPa (10 kPa)								
2.20	HVane		48 kPa (16 kPa)								
2.20	HVane		50 kPa (10 kPa)								
2.50	HVane		52 kPa (18 kPa)								
2.50	HVane		62 kPa (18 kPa)								
2.50	HVane		63 kPa (18 kPa)								
2.50	Tcon		0.03 W/m.K								
2.50	Tcon		0.07 W/m.K								
2.50	Tcon		0.08 W/m.K								
					End of Trial Pit / Trench at 2.50 m	2.50	3.85				
Notes					Pit Stability		Plan				
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'					Pit sides collapsed on excavation below 2.50m.		<div style="text-align: center;">3.70 m</div> <div style="display: flex; align-items: center; justify-content: center;"> <span>0.60 m</span>  <span>135°</span> </div>				
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW							Print Date	29/04/2022			

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_115_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E344631.55 N373338.14	Ground Elevation (m Datum)	9.56	Sheet 1 of 1	
	Hole Type		Trial Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	4.50	TP	19/11/2021	19/11/2021	Machine excavated : JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
19/11/2021	08:50	0.00		1.20	Sunny									
19/11/2021	11:30	4.50		1.20										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
1.20	1.20	20				

**Water Strike Remarks**  
At 1.20m; water seepage was observed.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. Services were not located.  
2. Trial pit remained stable during excavation.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	4.50	Arisings	19/11/2021

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_115_TP</b>
	Eni UK Limited		
	F190089		Sheet 1 of 1 Status <span style="float:right">Draft</span>
	E344631.55 N373338.14	Ground Elevation (m Datum) 9.56	

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.30 - 0.40	ES	1			TOPSOIL. Grass over dark grey clayey SAND. Sand is fine to coarse. [TOPSOIL] [SAND]	(0.50)				
0.30 - 0.50	B	3								
0.30	PID		< 0.1 ppm							
0.40 - 0.50	D	2								
0.50 - 0.70	B	6			Light brown clayey SAND. Sand is fine to coarse. [TIDAL FLAT DEPOSITS] [SAND] 0.50m to 0.70m; with rare fine gravel.	0.50	9.06			
0.50	Tcon		0.01 W/m.K							
0.50	Tcon		0.03 W/m.K							
0.50	Tcon		0.09 W/m.K			(0.50)				
0.60 - 0.70	D	5								
0.60 - 0.70	ES	4								
0.60	PID		0.1 ppm							
1.00 - 1.20	B	8		1	Soft bluish grey slightly gravelly sandy CLAY with rare pockets (<5mm x 25mm) of plastic amorphous dark brown peat. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of flint and mudstone. Slight organic odour. [TIDAL FLAT DEPOSITS] [CLAY]	1.00	8.56			
1.10 - 1.20	D	7								
1.10 - 1.20	ES	9								
1.10	PID		< 0.1 ppm							
1.20	HVane		30 kPa (10 kPa)							
1.20	HVane		35 kPa (15 kPa)							
1.20	HVane		35 kPa (9 kPa)							
1.50 - 1.70	B	12				(1.00)				
1.60 - 1.70	D	10								
1.70	HVane		45 kPa (10 kPa)							
1.70	HVane		47 kPa (16 kPa)							
1.70	HVane		48 kPa (18 kPa)							
1.70	Tcon		0.05 W/m.K							
1.70	Tcon		0.19 W/m.K							
1.70	Tcon		0.22 W/m.K							
2.00 - 2.20	B	14		2	Firm and stiff grey gravelly CLAY with rare shell fragments (<2mm x 2mm). Gravel is angular to rounded fine to coarse of flint and mudstone. [TIDAL FLAT DEPOSITS] [CLAY]	2.00	7.56			
2.10 - 2.20	D	13								
2.20	HVane		45 kPa (18 kPa)							
2.20	HVane		55 kPa (18 kPa)							
2.20	HVane		58 kPa (20 kPa)							
2.50 - 2.70	B	16								
2.60 - 2.70	D	15								
2.70	HVane		58 kPa (20 kPa)							
2.70	HVane		66 kPa (18 kPa)							
2.70	HVane		68 kPa (23 kPa)							
2.70	Tcon		0.02 W/m.K							
2.70	Tcon		0.04 W/m.K							
2.70	Tcon		0.04 W/m.K							
3.00 - 3.20	B	18		3	3.00m to 3.20m; slightly gravelly sandy clay. Sand is fine to coarse.					
3.10 - 3.20	D	17								
3.20	HVane		106 kPa (28 kPa)							
3.20	HVane		76 kPa (22 kPa)							
3.20	HVane		88 kPa (27 kPa)							
3.50 - 3.70	B	20			Stiff and very stiff reddish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mudstone. [GLACIAL TILL DEPOSITS] [CLAY]	3.40	6.16			
3.60 - 3.70	D	19								
3.70	HVane		102 kPa (22 kPa)							
3.70	HVane		112 kPa (32 kPa)							
3.70	HVane		120 kPa (28 kPa)							
3.70	Tcon		0.02 W/m.K							
3.70	Tcon		0.03 W/m.K							
3.70	Tcon		0.03 W/m.K							
4.00 - 4.20	B	22		4		(1.10)				
4.10 - 4.20	D	21								
4.20	HVane		100 kPa (25 kPa)							
4.20	HVane		105 kPa (23 kPa)							
4.20	HVane		120 kPa (30 kPa)							
End of Trial Pit / Trench at 4.50 m						4.50	5.06			

<b>Notes</b> - Abbreviations and results data defined on 'Notes on Exploratory Position Records'	<b>Pit Stability</b> Localised collapse of FACE B between 1.20m and 2.20m.	<b>Plan</b> <div style="text-align:center"> </div>
	Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW	
Print Date		29/04/2022

<b>FUGRO</b>	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			<b>LB_21_19_BH</b>
	Fugro Reference	F190089			
	Coordinates (m)	E341454.37 N371095.10	Ground Elevation (m Datum)	11.98	Sheet 1 of 1
	Hole Type	Sonic Core Drilling to Rotary Coring			Status <span style="float:right">Draft</span>

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	15/03/2022	15/03/2022	Hand excavated			JB, AF, MW	JB	
1.20	9.20	SNC	16/03/2022	17/03/2022	Eijelkamp CRS XL MAX			TS, AF	MC	
9.20	17.60	RC	17/03/2022	17/03/2022	Eijelkamp CRS XL MAX	Geobor-S	PCD	TS, AF	MC	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
15/03/2022	09:15	0.00		0.90	Clear	1.20	3.00	Water	95	Brown	00:15	1.20	3.00	101
15/03/2022	09:28	1.20		0.90		3.00	4.50	Water	95	Brown	00:20	3.00	4.50	101
16/03/2022	07:30	1.20	0.00	0.60	Rain	4.50	6.00	Water	95	Brown	00:15	4.50	6.00	101
16/03/2022	18:00	4.50	3.00	0.60		6.00	7.50	Water	95	Brown	00:15	6.00	7.50	101
17/03/2022	07:30	4.50	4.50	0.60	Fair	7.50	9.00	Water	95	Brown	00:15	7.50	9.00	101
17/03/2022	18:00	17.60	9.00	0.60		9.00	9.20	Water	95	Brown	00:15	9.00	9.20	101
						9.20	10.10	Water	95	Brown	00:15	9.20	10.10	101
						10.10	10.60	Water	95	Brown	00:15	10.10	10.60	101
						10.60	11.60	Water	95	Brown	00:30	10.60	11.60	101
						11.60	13.10	Water	95	Red	00:30	11.60	13.10	101
						13.10	14.60	Water	95	Red	00:30	13.10	14.60	101
						14.60	16.10	Water	95	Red	00:30	14.60	16.10	101
						16.10	17.60	Water	95	Red	00:30	16.10	17.60	101

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
17.60	146	17.60	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
0.90	0.90	20				

Water Strike Remarks	General Remarks
At 0.90m; water ingress.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
GMP	9.00	2.00	8.00	17/03/2022	1	0.00	2.00	50	Plain	-0.50	0.00	Upstanding Cover	17/03/2022
					1	2.00	8.00	50	Slotted	0.00	0.50	Concrete	17/03/2022
					1	8.00	9.00	50	Plain	0.50	1.50	Bentonite	17/03/2022
										1.50	8.00	Gravel	17/03/2022
										8.00	17.60	Bentonite	17/03/2022

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	28/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_19_BH</b>  Sheet 1 of 4  <b>Status</b> <b>Draft</b>
	Eni UK Limited		
	F190089		
	E341454.37 N371095.10	Ground Elevation (m Datum) 11.98	
Sonic Core Drilling to Rotary Coring			

Depth (m)	Sampling and In Situ Testing		Core Recovery				Strata Details				Backfill / Installation			
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)		Level (m Datum)	Legend	
0.10 - 0.30	B	2	0.2 ppm						TOPSOIL. Grass over dark brown silty SAND with frequent rootlets (<1mm x 8mm). Sand is fine to coarse. [TOPSOIL] [SAND]	(0.30)	11.68			
0.20 - 0.25	D	1							Light orangish brown very clayey SAND with occasional rootlets (<1mm x 5mm). Sand is fine and medium. [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	0.30				
0.25	ES	3									(0.30)			
0.30 - 0.60	B	5								Yellowish light brown silty SAND with occasional rootlets (<3mm x 100mm). Sand is fine and medium. [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	0.60	11.38		
0.40 - 0.45	D	4									(0.60)			
0.60 - 0.90	B	7												
0.65 - 0.70	D	6												
0.90 - 1.20	B	9						1		(0.60)				
1.00 - 1.05	D	8												
1.20 - 1.65	D	10	N = 8 (S)						Loose light brown mottled orangish brown SAND with rare rootlets (<1mm x 25mm). [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND] 1.20m to 1.50m; assumed zone of core loss.	1.20	10.78			
1.20 - 1.65	SPT													(0.60)
1.50 - 1.70	D	16												
2.00 - 2.10	D	17		100	N/A	N/A		2	Loose brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of sandstone and mudstone. [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	1.80	10.18			
1.20 - 3.00										(1.20)				
2.50 - 3.00	B	18												
3.00 - 3.45	D	11	N = 5 (S)					3	Loose brown SAND. Sand is fine to coarse. [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	3.00	8.98			
3.00 - 3.45	SPT													
3.20 - 3.30	D	19												
3.50 - 4.40	B	20												
3.00 - 4.50				87	N/A	N/A		4		(1.50)				
4.40 - 4.50	D	21												
4.50 - 4.95	D#	12	N = 4 (S)						ASSUMED ZONE OF CORE LOSS. [NO RECOVERY] 4.50m to 6.00m; drillers description: extremely loose sand.	4.50	7.48			
4.50 - 4.95	SPT													
Continued next page														

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'





<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_19_BH</b>
	Eni UK Limited		
	F190089		
	E341454.37 N371095.10	Ground Elevation (m Datum) 11.98	<b>Sheet 2 of 4</b>
Sonic Core Drilling to Rotary Coring		<b>Status</b>	<b>Draft</b>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
4.50 - 6.00				0	N/A	N/A				(1.50)			
6.00 - 6.20 6.00 - 6.45 6.00 - 6.45	D D# SPT	22 13	N = 1 (S)					6	Very loose reddish brown becoming loose brown SAND with rare gravel. Sand is fine and medium. Gravel is angular to subrounded fine to coarse of sandstone and mudstone. [OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	6.00	5.98		
6.50 - 7.40	B	23											
6.00 - 7.50				100	N/A	N/A		7					
7.40 - 7.50 7.50 - 7.95 7.50 - 7.95	D D# SPT	24 14	N = 7 (S)						From 7.50m; loose.	(2.80)			
7.80 - 8.00	D	25											
8.00 - 8.80	B	26						8					
7.50 - 9.00				100	N/A	N/A							
8.80 - 9.00	D	27							Reddish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of sandstone. Residual soil. [CHESTER FORMATION] [SAND]	8.80	3.18		
9.00 - 9.20 9.00 - 9.25 9.00 - 9.24 9.00 - 9.20	D D SPT	28 15	100/105 mm (S)	100	N/A	N/A		9		(0.40)			
9.20 - 9.65							NA		Reddish brown GRAVEL and COBBLES of very weak reddish brown fine to medium grained sandstone. Gravel is angular and subangular fine to coarse. Cobbles (100mm x 100mm x 50mm) are subangular. Destructured. [CHESTER FORMATION] [GRAVEL]	(0.45)	2.78		
9.65 - 9.95 9.20 - 10.10 9.65 - 9.95	D	29		100	N/A	N/A			Reddish brown slightly gravelly SAND. Sand is fine. Gravel is subangular and subrounded fine and medium of sandstone. Residual soil. [CHESTER FORMATION] [SAND]	9.65	2.33		
9.95 - 10.10	D	30					NA			(0.30)			
Continued next page													

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_19_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E341454.37 N371095.10	Ground Elevation (m Datum)	11.98	Sheet 3 of 4
Hole Type	Sonic Core Drilling to Rotary Coring			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details					Backfill / Installation
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	
9.95 - 10.10							NA		Reddish brown gravelly SAND with low cobble content. Sand is fine to medium. Gravel is angular to subrounded fine to coarse of greenish grey sandstone. Cobbles (15mm x 70mm x 85mm) are subrounded of greenish grey sandstone. Residual soil. [CHESTER FORMATION] [SAND]	(0.15) 10.10	1.88		
10.10 - 10.60				90	76	32			Moderately weak to medium strong locally very weak very thinly and thinly bedded reddish brown fine and medium grained micaceous SANDSTONE. Bedding fractures are inclined 10 to 30 degrees, very closely and closely spaced, planar, smooth and rough partially open and open, clean with occasional fine sand and clay infill. Distinctly weathered becoming partially weathered. [CHESTER FORMATION]				
10.85 - 10.99	C	31						11					
10.60 - 11.60 11.11 - 11.26	C	32		100	95	42			10.10m to 10.23m; very weak greenish grey fine grained sandstone. Distinctly weathered. 10.60m to 10.65m; assumed zone of core loss.				
10.10 - 13.18 11.71 - 11.82	C	33					20 90 190		11.68m to 11.70m; 1 No. subrounded clast (10mm x 20mm x 50mm) of green mudstone.	(3.08)			
12.17 - 12.31	C	34						12	11.96m to 12.03m; very weak with honeycomb weathering.				
11.60 - 13.10				100	100	65			12.58m to 13.15m; joint 80 degrees, planar, smooth, open with fine sandy clay infill (<1mm).				
13.18 - 13.61	C	35						13	13.15m to 13.18m; greenish grey sandstone. Moderately weak to medium strong thickly laminated and cross-laminated to thinly bedded reddish brown fine to coarse grained micaceous SANDSTONE with widely spaced thin greenish grey laminations. Bedding fractures are inclined 10 to 30 degrees, very closely to widely spaced, planar, smooth and rough, partially open and open, clean with occasional fine sand and clay infill. Joints are inclined 80 to 85 degrees, planar, smooth, open to moderately wide with clay infill (<10mm). Partially weathered. [CHESTER FORMATION]	13.18	-1.20		
13.70 - 13.88	C	36							13.85m to 14.95m; 2 No. joints 80 to 85 degrees spaced 40mm to 20mm apart.				
13.10 - 14.60				100	100	81		14	14.37m to 14.40m; soft brown mottled black clay.  14.78m to 14.87m; greenish grey sandstone.				
Continued next page													

**Notes**

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_19_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E341454.37 N371095.10	Ground Elevation (m Datum)	11.98	Sheet 4 of 4
Hole Type	Sonic Core Drilling to Rotary Coring			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
15.16 - 15.35	C	37											
14.60 - 16.10 13.18 - 17.60				100	98	93	40 185 740			(4.42)			
15.72 - 16.10	C	38						16	16.10m to 16.37m; joint inclined 80 degrees.  16.35m to 16.46m; greenish grey.				
16.83 - 17.15 16.10 - 17.60	C	39		100	100	69		17					
17.40 - 17.50	C	40											
									End of Borehole at 17.60 m	17.60	-5.62		
								18					
								19					

Notes  
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Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_19_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E341454.37	N371095.10	Ground Elevation (m Datum)	11.98
Hole Type	Discontinuity Log			Sheet 1 of 4
				Status
				Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									0		
									1		
									2		
									3		
									4		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_19_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E341454.37	N371095.10	Ground Elevation (m Datum)	11.98
Hole Type	Discontinuity Log			Sheet 2 of 4
				Status
				Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									6		
									7		
									8		
									9		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_19_BH
Fugro Reference	F190089			
Coordinates (m)	E341454.37 N371095.10	Ground Elevation (m Datum)	11.98	Sheet 3 of 4
Hole Type	Discontinuity Log			Status <span style="float:right">Draft</span>

Discontinuity Details										Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend	
10.10 - 10.44	J	90			PI	Sm		Black staining on surface	11	90°	[Pattern]	
10.12	BF	0		PO	PI	Sm				0°		
10.14	BF	0		PO	PI	Sm				0°		
10.23	BF	0		O	PI	Sm				0°		
10.30	BF	0		O	Un	Ro		Incipient		0°		
10.44 - 10.45	BF	10		O	PI	Sm			10°			
10.68 - 10.70	BF	20			PI	Sm			11	20°	[Pattern]	
10.75 - 10.77	BF	20		O	PI	Ro				20°		
10.84 - 10.86	BF	20		O	PI	Ro				20°		
10.98 - 11.00	BF	20		O	PI	Ro			11	20°	[Pattern]	
11.03	BF	0		O	PI	Ro				0°		
11.09 - 11.11	BF	20		O	PI	Ro				20°		
11.24 - 11.27	BF	30		O	PI	Ro			11	30°	[Pattern]	
11.30 - 11.32	BF	20		O	PI	Sm				20°		
11.37 - 11.39	BF	20		O	PI	Ro				20°		
11.45 - 11.47	BF	20		PO	PI	Sm				20°		
11.64 - 11.65	BF	10		O	Un	Ro			11	10°	[Pattern]	
11.71 - 11.73	BF	20		O	Un	Ro				20°		
11.82 - 11.83	BF	10		O	PI	Ro			11	10°	[Pattern]	
										10°		
12.01 - 12.03	BF	10		PO	PI	Ro			12	10°	[Pattern]	
12.14	BF	10		O	PI	Sm		Incipient		10°		
12.17 - 12.18	BF	10		O	PI	Sm			10°			
12.31 - 12.34	BF	30		PO	PI	Sm			12	30°	[Pattern]	
12.40 - 12.42	BF	20		O	PI	Sm				20°		
12.48 - 13.15	J	80		O	PI	Sm				80°		
12.66	BF	0		O	PI	Sm				0°		
12.78 - 12.79	BF	10		O	PI	Ro		Terminating on subvertical joint	12	10°	[Pattern]	
12.88 - 12.89	BF	10		O	Un	Sm				10°		
12.99 - 13.00	BF	10		O	PI	Ro			13	10°	[Pattern]	
13.03	BF	0		O	PI	Ro				0°		
13.05 - 13.07	BF	20		O	PI	Sm				20°		
13.17 - 13.18	BF	10		PO	PI	Sm				10°		
13.85 - 14.60	J	80		MW	PI	Sm			14	80°	[Pattern]	
13.87 - 13.89	BF	20			PI	Ro				20°		
14.13 - 14.15	BF	20		O	PI	Ro			14	20°	[Pattern]	
14.24 - 14.25	BF	10		O	PI	Sm				10°		
14.32 - 14.33	BF	10		O	PI	Sm			14	10°	[Pattern]	
14.32 - 14.96	J	80		MW	PI	Sm				80°		
14.47 - 14.49	BF	20		O	PI	Sm			14	20°	[Pattern]	
14.56	BF	10		O	PI					10°		
14.78 - 14.79	BF	10		O	PI	Ro			14	10°	[Pattern]	
14.95 - 14.97	BF	10		PO	PI	Sm				10°		
15.00	BF	0		O	PI	Sm			0°			

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_19_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E341454.37 N371095.10	Ground Elevation (m Datum)	11.98	Sheet 4 of 4
Hole Type	Discontinuity Log			Status      Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
15.05 - 15.06 15.06 - 15.09	BF J	15 30		PO O	PI PI	Sm Sm				15° 30°	
15.38 - 15.41	BF	30		O	PI	Sm			30°		
16.10 - 16.40 16.12 - 16.14 16.19 - 16.21	J BF BF	90 20 20		O O PO	PI PI PI	Ro Sm Sm			90° 20°		
16.37 - 16.38 16.39 - 16.41 16.48 - 16.49 16.52	BF BF BF BF	10 10 10 0		PO PO O O	PI PI PI PI	Sm Sm Ro Ro			10° 10° 10° 0°		
16.68 - 16.71 16.77	BF BF	30 10		O O	PI PI	Ro Ro			30° 10°		
17.39 - 17.41 17.52 - 17.53	BF BF	20 10		O O	PI PI	Sm Ro			20° 10°		
										16	
										17	
										18	
										19	

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



# Norwest Holst Soil Engineering Ltd. SJ47SW

**BOREHOLE LOG**

Borehole No. **18**

Contract No. F9826

Method Cable Percussion

Location 750mm Mickle Trafford to

Sheet 1 of 1 SJ47SW / 144

Deeside Pipeline

Borehole Diam (mm) 150

Coords

Client British Gas

4197 7183

Consultant

Date 08/10/92 08/10/92

Ground Level

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Sampling & Insitu Testing (T & N)		Ground Water	Piezometer/ Standpipe
				Depth (m)	TCR SCR RQP		
TOPSOIL		0.30					
Firm black brown slightly silty CLAY with some rootlets.		0.30 - 1.10		B 0.50 U 1.00	1.00 1.60		
Firm brown slightly sandy silty CLAY with some rootlets.		1.10 - 1.60		J 1.60 J 1.80			
Soft to firm brownish grey sandy very silty CLAY		1.60 - 2.20		U 2.00	2.50		
Loose brown very silty fine SAND.		2.20 - 3.80		J 2.60 J 2.80 S 3.00 W 3.30 B 3.50			
---below 3.00m becoming slightly silty					3.45		
Loose brown silty fine SAND.		3.80 - 4.80		S 4.00	4.45		1 →
Soft brown very sandy silty CLAY.		4.80 - 5.80		J 4.80 S 5.00	5.45		
Loose brown silty fine SAND.		5.80 - 6.80		B 5.80	6.30		
Soft brown sandy SILT.		6.80 - 6.80		S 6.80	6.95		
Brown very silty sandy fine to coarse subangular GRAVEL.		6.80 - 7.40		B 6.80	7.40		
Brownish brown moderately weathered fine to medium gravel of SANDSTONE very weak.		7.40 - 8.20		S 7.40 S 8.00	7.70 8.20	78/50mm 50/40mm	
Borehole Complete at 8.20m.		8.20					

Daily Progress			Hard Strata		Comments	Logged by:
Date	Final Depth (m) of:		Depth (m)	Time		
08/10/92	Borehole 8.20	Water 3.30	Casing 7.50	7.70-8.00	1 hr	Borehole moist and 2.00m.
Casing maintained just above base of borehole unless stated						

**Sample and Test Key**

- J Small Disturbed Sample
- B (B.R.) Disturbed Sample
- U Undisturbed U100 Sample
- W Water Sample
- N.R. No Recovery
- S Standard Penetration Test
- C Cone Penetration Test
- V Vane Vane Test
- PR Pressuremeter Test
- K Permeability Test
- D Drive to drive U100
- S.P.T. at C.P.T. 300mm penetration
- ..200 For given penetration
- ..25" Sealing 100mm only
- R.P. No Penetration
- Rotary Core Run
- Ground Water
- 1 → First Water Strike
- B → Subsequent Water Strikes
- an/m Standing Level
- Level 20mm after strike
- Casing Depth
- Piezometer
- Upper Seal
- Sand Cell
- Piezometer Tip
- Lower Seal
- Grout





Contract No. F9626

Method Cable Percussion

Location 750mm Mickle Trafford to

Sheet 1 of 1 ST47SW / 143

Deeside Pipeline

Borehole Diam (mm) 150

Coords

Client British Gas

4183 7182.

Consultant

Date 09/10/92 09/10/92

Ground Level

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Sampling & In situ		Testing (I) & N SCR ROD	Ground Water	Piezometer/ Standpipe
				Depth(m)	TCR			
TOPSOIL.		0.20						
Soft brown organic CLAY with abundant rootlets.				B 0.60	1.00			
Firm grey very silty CLAY with some rootlets.		1.20		U 1.00	1.80	(7)		
Loose brown silty fine to medium SAND.		1.80		J 1.80				
				S 2.00	2.45	"6"		
				B 2.50	3.00			
Loose reddish brown silty fine to medium SAND.		2.80		S 3.00	3.45	"8"		
				W 3.50				
				J 3.80				
				S 4.00	4.45	"10"		
				B 4.50	5.00			
				S 5.00	5.45	"11"		
				B 6.80	6.30			
Soft to firm brown thinly laminated silty CLAY with some fine sand partings.		6.50		SB 6.50	6.95	"23"		
Brown silty sandy fine to coarse subangular GRAVEL.		6.90						
Reddish brown moderately weathered SANDSTONE very weak.		7.20		S 7.20	7.50	83/45mm		
				J 7.70				
				S 7.80	8.10	60/40mm N.R.		
Borehole Complete at 8.10m.		8.10						

Daily Progress			Hard Strata		Comments	Logged by:
----------------	--	--	-------------	--	----------	------------

Date	Final Depth (m) of:			Depth(m)	Time
	Borehole	Water	Casing		
09/10/92	6.10	1.50	7.20	7.50-7.90	1 hr

Casing maintained just above base of borehole unless stated

Sample and Test Key	Rotary Core Run		Ground Water		Piezometer
	J Small Disturbed Sample B Bulk Disturbed Sample U Undisturbed U100 Sample W Water Sample N.R. No Recovery	S Standard Penetration Test C Core Penetration Test V Van Nostrand PII Permeability Test K Permeability Test II Blow to drive 11700	S.P.T. "N for full C.P.T. 300mm penetration .../200 For given penetration .../25" Soiling Masses only N.P. No Penetration	T.C.R. Total Core Recovery (%) S.C.R. Solid Core Recovery (%) R.Q.D. Rock Quality Designation (%)	1-3 Clean Water Sinks 2-3 Subsequent Water Sinks and/or Standing Level 3-3 Level 30mins after strike () Casing Depth



# LOG for BOREHOLE No. 534

Fig. 34

Location No. T. 4940 MID - WIRRAL ROAD. SJ 3TSE 28

Sheet 1 of 1

Carried out for M.O.T. (G. Mounsell & Partners). 39024 71899

Date 25<sup>th</sup>, 26<sup>th</sup> and 27<sup>th</sup> April. 1967.

Diameter 8" Casing to 36'-6"

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of Blooms	KEY to lab test
						Depth and Penetration ft. in.	No. of Blows (N)		
Ground Level (Ft. above N.D.)	+74.3			0 0				U4	
Brown Silty CLAY topsoil with a little fine sand and some roots.	73.4		1	0 - 10	0 - 10				
			2						
			3					19	MA } Comp. C.B.R.
Firm to stiff brown silty CLAY with a trace of sand and a trace of fine to med. gravel.	b <sub>1</sub>		4		9-8				Comp. C.B.R.
			5					24	MACX
	63.7		6	10-6					
			7					40	M
			8						
			9			19-6	(38)		
Medium dense to dense brown fine to medium SAND with a trace of fine to medium gravel. Grey traces above 15'.	b <sub>2</sub>		10			21-0	(43)		
Becoming very dense below 32'-6"			11			22-0	(49)		
			12			23-6	(38)		
			13			26-0	(15)		Comp + C.B.R.
			14			27-6	(19)		
			15			29-0	(51)		M.
Weakly cemented red fine and medium SANDSTONE.	37'-7"		15	36-6	1-0	30-0	(38)		
	36'-7"			37-6	Penetrated	37-6	35-6		
Water Level Observations.									
END OF BOREHOLE.									
Date	Time	B.H. Depth	Casing Depth	Depth to Water					
25 APR	18.00	7-6	NIL	DRY					
26 APR	08.00	7-6	NIL	DRY					
26 APR	18.00	36-0	34-6	35-0					
27 APR	08.00	36-0	34-6	35-0					
27 APR	09.00	37-6	36-6	DRY					

Scale 1 in. = 5 ft.

● Disturbed Sample

⬇ Bulk Sample

⬇ S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample

LOG for BOREHOLE No. 535

Fig. 35

Location No. T. 4940 MID-WIRRAL ROAD. SJ 37 SE 29

Sheet 1 of 1

Carried out for M.O.T. (G. Maunsell and Partners). 39226 71593

Date 25<sup>th</sup> and 26<sup>th</sup> April, 1967.

Diameter 8" Casing to 10'-0"

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to lab tests		
						Depth and Penetration ft. in.	No. of Blows (N)				
Ground Level (Ft. above N.D.) Brown silty CLAY TOPSOIL, with a little fine to medium sand and some roots          Stiff to very stiff brown silty CLAY with a trace of fine to medium sand and a trace of fine to medium gravel. Grey mottled about 5 ft.	+102.9		• 1	0 0	1-0			04			
	or 101.9		• 2	1-0							
	61			• 3		19-0	Penetrated			38	M.A. Comp CBR.
				• 4							
				• 5							
				• 6							
				• 7							
				• 8							
				• 9							
82.9				20-0			48				
<u>Borehole Dry throughout</u>		END OF BOREHOLE									

Scale 1 in. = 5 ft.

● Disturbed Sample

⊕ Bulk Sample

⊕ S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample

LOG for BOREHOLE No. 536 Fig. 36

Location No. T. 4940 MID-WIRRAL ROAD.

Carried out for M.O.T. (G. Maunsell and Partners) SJ 3756 30 Sheet 1 of 1

Date 25th April, 1967

Diameter 8" No. Casings.

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No. of blows	Key to lab tes							
						Depth and Penetration ft. in.	No. of Blows (N)									
Ground Level (Ft. above N.D.) Brown silty CLAY TOPSOIL, with a trace of sand and some roots.	+104.8 103.8		1 2 3 4 5 6 7 8 9 10	0 0 1 - 0	1 - 0			U4								
Stiff very stiff brown and grey mottled silty CLAY with a trace of fine to medium sand and a trace of fine to medium gravel very stiff at 10ft. medium dense SAND at 18-19.	b1		1 2 3 4 5 6 7 8 9 10	19-0	19-0	Penetrated.		40	M, A,							
								55	M, A, C, S.							
								63								
								65								
								18-0	19-0 (19)							
								84.8		20-0						
								BOREHOLE DRY THROUGHOUT.		END	OF	BOREHOLE.				

Scale 1 in. = 5 ft.

● Disturbed Sample

† Bulk Sample

♣ S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample

# LOG for BOREHOLE No. 537

Fig. 37

Location No. T.4940. MID - WIRRAL ROAD. SJ 37 SE 31

Sheet 1 of 1

Carried out for M.O.T. (G. Maunsell and Partners). 39589 71239

Date 22<sup>nd</sup> and 24<sup>th</sup> April. 1967.

Diameter 8" Casing to 25'-0"

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to lab tests
						Depth and Penetration ft. in.	No. of Blows (N)		
Ground Level (Ft. above N.D.)	+63.3			0 0				04	
Brown clayey SILT TOPSOIL with a trace of fine to medium Sand and some roots.	61.3		• 1	2-0	2-0				
Loose brown fine to medium silty SAND.	59.2		• 2	2-0	3-6			25	M
	57.8		• 3			5-0			
Dense brown silty fine sand with a trace of fine to medium gravel and some sub-rounded cobbles becoming clayey at base.	b2		• 4	5-6	2-6	6-6 (9)			M, A.
	55.3		• 5			7-0		31/8	
Loose pale brown fine to med. SAND.	b2		• 6	8-0		8-6			
			• 7		5-0	9-0		8	M.
Stiff-very stiff brown silty Sandy CLAY with a trace of fine to medium gravel. Occasional sandstone gravel.	50.3		• 8			11-6		11	
			• 9	13-0		13-0			
Dense brown silty SAND.	b1		• 10		6-0			48	M, A, F, S
	44.3		• 11	19-0					
Stiff red brown silty CLAY with a trace of fine to medium sand and gravel.	b2		• 12		4-6	19-6		43	
	39.8		• 13			21-0			
Weak to medium hard red fine grained SANDSTONE.	b1		• 14	23-6		22-0		44	
	36.8		• 15		3-0	23-6			
Borehole Dry throughout.			• 16	26-6		24-0		40	
	34.8		• 17		2-0	25-6			147
			• 18	28-6	Penetrates	27-0	21/8		
						27-9	1/8		
						28-0	57/6		
						28-6	6		
END OF BOREHOLE.									

Scale 1 in. = 5 ft.

● Disturbed Sample

† Bulk Sample

♣ S.P.T.

▣ Tube or Core Sample (Length to scale)

△ Water Sample

# LOG for BOREHOLE No.539

Fig. 39

Location No. T.4940 MID - WIRRAL ROAD. SJ 375 E 32 Sheet 1 of 1

Carried out for M.O.T. (G. Maunsell and Partners) 39897 71163

Date 25<sup>th</sup> and 26<sup>th</sup> April, 1967 Diameter 8" Casing to 25'-0"

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to lab. tests
						Depth and Penetration ft. in.	No. of Blows (N)		
Ground Level (ft. above N.D.)	+69.4			0 0	1 - 0			4	
Brown Silty CLAY TOP SOIL with little fine to med. SAND & some ro...	68.4		● 1	1 - 0					M
			● 2						
			● 3				3-6	(8)	
			● 4				6-0	(13)	
			● 5				7-6	(20)	
			● 6				9-0	(13)	
Loose to medium dense brown fine to medium SAND with a trace of silt and occasional clay pieces above 5ft. and a trace of coarse sand and a trace of fine to medium gravel below 2ft.			● 7		24 - 0		10-0	(12)	M
			● 8				11-6	(13)	Comp
			● 9				12-6	(12)	CB
			● 10				14-0	(9)	
			● 11				15-0	(13)	
			● 12		25-0		16-6	(15)	
Weak to medium hard red brown weakly cemented fine grained SANDSTONE.	44.4		● 12				18-0	(13)	
			● 13		3-6 penetrates		19-0	(9)	
	40.9		● 13		28-6		20-6	(8)	
							22-0	(15)	82
END OF BOREHOLE							25-6	57%	
							20-6	80%	
							27-6	80%	
							28-6	16%	
Water in borehole after withdrawing casing. Overnight water level dry.									

Scale 1 in. = 5 ft.

● Disturbed Sample

▲ Bulk Sample

† S.P.T.

■ Tube or Core Sample (length to scale)

△ Water Sample

LOG for BOREHOLE No. 540

Fig. 40

Location No. T. 4940 MID-WIRRAL ROAD. SJ 375E 33

Sheet 1 of 1

Carried out for M.O.T. (G. Maunsell and Partners) 39954 71122

Date 24<sup>th</sup> and 25<sup>th</sup> April. 1967.

Diameter 8" Casing to 20'

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to lab. test
						Depth and Penetration ft. in.	No. of Blows (N)		
Ground Level (ft. above N.D.)	+72.6			0 0				U4	
Dark brown Silty CLAY with a little sand & some roots. (TOPSOIL)	71.6		1	1-0	1-0				
Firm to stiff brown silty Sandy CLAY with some fine coarse sand and trace of fine to medium gravel.	b1		2						
	68.4		3	4-3	3-3			33	M, A.
Medium dense to dense brown fine to medium SAND.	b2		4						
			5					43	p.s.d. Comp CBR.
			6				11-0		
			7				12-6 (12)		
			8				12-6 (19)		
			9				14-0 (19)		
			10				15-0 (12)		
			11				16-6 (12)		
			12				16-6 (28)		M
							18-0 (28)		
Borehole Dry throughout.	40.6			26-0			20-0 (33)		M
							21-6 (58)		
							21-6 (58)		
							23-0 (58)		
						25-0 9 1/6			
						26-0 9 1/6			
END OF BOREHOLE.									

Scale 1 in. = 5 ft.

● Disturbed Sample

▲ Bulk Sample

† S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample



LOG for BOREHOLE No. 548

Fig. 48

Location No. T. 4940 MID-WIRRAL ROAD SJ 37SE 36

Sheet 1 of 1

Carried out for M.O.T. (G. Maunsell and Partners). 39810 71174

Date 30<sup>th</sup> May 1967: 1<sup>st</sup> June 1967

Diameter 8" Casing to 43'-0"

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to test	
						Depth and Penetration ft. in.	No. of Blows (N)			
Ground Level (Ft. above N.D.) MADE GROUND, ASH, BRICKS, CLAY	84.1			0 0				U4		
Ash bricks and clay. (MADE GROUND)	a <sub>1</sub>	[Cross-hatched pattern]	• 1							Sns M, A, B, R, & Comp.
			• 2							
			• 3							
			• 4			35-0				
			• 5							
			• 6				27-0 28-0 (11)			
			• 7							
Brown clay with fine to medium sand & medium gravel.	49.1	[Cross-hatched pattern]	• 8			4-0			M, A.	
			• 9							
Medium dense to dense brown fine to medium sand with a trace of fine to medium gravel at the top.	45.1	[Dotted pattern]	• 10			6-0				
			• 11			Penetrated				
			• 12			43-6 45-0 (24)				
Borehole Dry throughout.	39.1	[Dotted pattern]	• 13							
			• 14							
END OF BOREHOLE.										

Scale 1 in. = 5 ft.

● Disturbed Sample

† Bulk Sample

‡ S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample

LOG for BOREHOLE No. 549 Fig. 49

Location No. T. 4940 MID - WIRRAL ROAD. S33756 37 Sheet 1 of 1  
 Carried out for M.O.T. (G. Maunsell and Partners). 39858 71166  
 Date 2<sup>nd</sup> June 1967. Diameter 8" Casing to 14ft.

Description	Reduced Level: ft.	Legend	Sample	Depth ft. in.	Thickness ft. in.	Standard Penetration test		No of blows	Key to lab tests
						Depth and Penetration ft. in.	No. of Blows (N)		
Ground Level (Ft. above N.D.)	84.20			0 0				14	
Firm red, yellow grey and brown sandy Silty CLAY with some angular gravel.	a <sub>1</sub>		1, 2, 3, 4		10-0				27 } M.A. Comp. C.B.
(MADE GROUND)									
ORIGINAL Brown TOPSOIL.	74.2		5	10-0	1-0				43 } Sns. M, A
	73.2			11-0					
Very stiff red brown sandy CLAY with layers of fine and medium SAND and some fine and medium gravel.	b <sub>1</sub>		6, 7, 8			13-6 15-0 9-6 (Penetrated) 19-0 20-6	(6) (6)		
	62.7			20-6					
END OF BOREHOLE.									
Borehole Dry throughout									

Scale 1 in. = 5 ft.

● Disturbed Sample

◆ Bulk Sample

† S.P.T.

▬ Tube or Core Sample (Length to scale)

△ Water Sample

THE INSTITUTE OF GEOLOGICAL SCIENCES  
RECORD OF SHAFT, BOREHOLE OR SECTION

NAME OF SECTION		REGISTRATION NUMBER			
HAWARDEN CASTLE COLLIERY No. 1 BOREHOLE		SJ 36 NW/31			
Communicated by Hawarden Estate Office		NATIONAL GRID REFERENCE			
Date of sinking 1862(?)		SJ 3314 6540			
		SURFACE OR STARTING LEVEL			
		m A.O.D.			
		1:50 000 MAP	CONFIDENTIALITY		
		108			
GEOLOGICAL CLASSIFICATION BY:	DESCRIPTION OF STRATA	THICKNESS OF STRATA (m)	REDUCED LEVEL (m. A.O.D.)	DEPTH (m)	SCALE:
1				0.36	1
2	Clay	0.91		1.22	2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
10					10
1	Strong Marl Blue - Shale + particles of coal	2.16 0.66		10.36 10.92	1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9	Strong Marl Loam and Sand	8.23 0.61		19.05 19.66	9
20					20
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9	Strong Marl Gravel	2.92 0.34		22.58 22.92	9
30					30
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
40					40
1	Strong Marl Soapy Metal Coal	10.06 1.22		32.40 33.62	1
2	Warren Coal	0.61 0.20		46.22 46.42	2
3	Light Metal	2.64		43.78	3
4	Blue Metal Linstay	2.64 0.16		45.95 46.11	4
5					5
6					6
7					7
8	Linn and Wool Grey Soapy Rock	2.13 0.31		48.18 48.50	8
9	Blue Metal	1.22		49.72	9
50	Soft Metal	1.07		50.79	50
1					1
2					2
3	Light Blue Metal	1.83		52.62	3
4					4
5					5
6					6
7					7
8					8
9					9
60					60
1	Strong Blue Metal	5.03		57.65	1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
70					70
1	Linn and Wool	2.36		60.01	1
2	Light Blue Metal Strong Black Bass	1.32 0.10		61.33 61.43	2
3	COAL	1.02		62.35	3
4	Warren	0.36		62.71	4
5					5
6	Dark Metal	1.68		64.39	6
7	COAL Warren	0.31 0.36		64.70 65.06	7
8	COAL Strong Warren	1.24 0.61		66.30 66.91	8
9	Linn and Wool Blue Metal	1.32 0.13		68.23 68.36	9
70	Mild Rock	0.26		68.62	70
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
80					80
1	Strong Rock	8.23		76.89	1
2					2
3	Linstay Dark Metal	2.29 0.61		79.18 79.79	3
4	COAL Warren	1.40 0.33		81.19 81.52	4
5	Dark Metal Warren	1.32 0.13		82.84 82.97	5
6	Strong Warren	1.62		84.59	6
7					7
8					8
9					9
90					90
1	Linstay	2.59		87.18	1
2					2
3	Strong Linstay	2.13		89.31	3
4	Strong Rock	1.32		90.63	4
5	Strong Linstay	0.91		91.54	5
6					6
7	Dark Metal	3.20		94.74	7
8					8
9					9
100					100
1	Blue Metal Dark Metal Warren	2.29 0.61 0.36		97.03 97.64 98.00	1
2					2
3					3
4	Blue Metal Black Bass	3.05 0.23		101.05 101.28	4
5	Blue Metal	0.84		102.12	5
6					6
7					7
8					8
9					9
110					110
1	Strong Linstay Strong Rock	2.95 0.37		105.07 105.44	1
2	Linn and Wool	1.32		106.76	2
3					3
4					4
5	Strong Rock Linstay	3.86 0.36		110.62 110.98	5
6	Dark Metal	1.14		112.12	6
7					7
8					8
9	Strong Rock Strong Burr	2.09 0.10		114.21 114.31	9
120					120
1	Strong Rock Dark Metal	1.19 1.22		115.50 116.72	1
2					2
3	Blue Bass Warren	1.82 0.84		118.54 119.38	3
4	Black Bass	0.61		120.00	4
5					5
6					6
7					7
8					8
9					9
130					130
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
140					140
1					1
2					2
3					3
4					4
5					5
6					6
7					7
8					8
9					9
150					150

	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			<b>LB_21_49_BH</b>
	Fugro Reference	F190089			
	Coordinates (m)	E333804.50 N366175.52	Ground Elevation (m Datum)	5.16	Sheet 1 of 1
	Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00 1.20	1.20 9.45	IP SNC	11/04/2022 12/04/2022	11/04/2022 12/04/2022	Hand excavated Eijelkamp CRS XL MAX		PCD	AD TS, AF	AD MC	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
11/04/2022	13:45	0.00			Overcast, light wind	1.20	3.00	Water	95	Brown	00:15	1.20	3.00	100
11/04/2022	15:30	1.20			Dry	3.00	4.50	Water	95	Brown	00:15	3.00	4.50	100
12/04/2022	07:30	1.20	0.00		Rain	4.50	6.00	Water	95	Brown	00:15	4.50	6.00	100
12/04/2022	18:00	9.45	9.00	0.50		6.00	7.50	Water	95	Brown	00:15	6.00	7.50	100
						7.50	9.00	Water	95	Brown	00:15	7.50	9.00	100

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
9.00 9.45	175 51	9.00	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	9.45	Bentonite	12/04/2022

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	PG	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	27/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_49_BH</b>  Sheet 1 of 2  Status      Draft
	Eni UK Limited		
	F190089		
	E333804.50 N366175.52	Ground Elevation (m Datum) 5.16	
Sonic Core Drilling			

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	
0.00 - 0.10	D	1							(Possible) MADE GROUND. Dark brown slightly gravelly silty SAND. Sand is fine. Gravel is angular to subrounded fine to coarse of limestone. [MADE GROUND] [SAND]			
0.00 - 0.20	B	2										
0.20 - 0.60	B	5										
0.30	D	3										
0.30	ES	4	< 0.1 ppm							(0.80)		
0.30	PID											
0.60	D	6										
0.60 - 0.80	B	7										
0.80	D	8								0.80	4.36	
0.80 - 1.20	B	9	2.60 W/m.K						Firm and stiff grey mottled orange silty CLAY. [TIDAL FLAT DEPOSITS] [CLAY]			
0.90	TCon		2.10 W/m.K					1		(0.40)		
1.00	TCon											
1.10	ES	10	< 0.1 ppm									
1.10	PID		3.30 W/m.K							1.20	3.96	
1.10	TCon											
1.20	D	11							Soft light grey mottled orangish brown slightly sandy silty CLAY. Sand is fine. [TIDAL FLAT DEPOSITS] [CLAY]			
1.20 - 1.65	D	12	N = 7 (S)						1.20m to 1.50m; assumed zone of core loss.			
1.20 - 1.65	SPT									(0.82)		
1.70 - 1.80	D	18										
1.20 - 3.00				83	N/A	N/A		2	Plastic dark brown moderately strongly decomposed (H6) pseudofibrous PEAT with low fine fibres, no coarse fibres and low wood fragments (F1, R0, W1). [TIDAL FLAT DEPOSITS]	2.02	3.14	
2.15 - 2.25	D	19							2.13m to 2.28m; soft light grey clay.	(0.66)		
2.50 - 2.60	D	20										
2.85 - 3.00	D	21							Soft light grey silty CLAY with pockets of peat (<30mm x 40mm x 40mm). [TIDAL FLAT DEPOSITS] [CLAY]	2.68	2.48	
3.00 - 3.45	D	13								(0.32)		
3.00 - 3.50	B	22						3	Plastic dark brown moderately decomposed (H5) pseudofibrous PEAT with low fine fibres, low coarse fibres and low wood fragments (F1, R1, W1). [TIDAL FLAT DEPOSITS]	3.00	2.16	
3.00 - 3.45	SPT		0/450 (S)									
3.20 - 3.30	D	23								(0.81)		
3.00 - 4.50				100	N/A	N/A			3.56m to 3.68m; soft light grey clay.			
3.90 - 4.00	D	24						4	Very soft and soft slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mudstone and quartz. [TIDAL FLAT DEPOSITS] [CLAY]	3.81	1.35	
4.35 - 4.50	D	25								(0.49)		
4.50 - 4.95	D	14							Stiff brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of mudstone, sandstone and quartz. [GLACIAL TILL DEPOSITS] [CLAY]	4.30	0.86	
4.50 - 5.00	B	26										
4.50 - 4.95	SPT		N = 12 (S)							(1.12)		
5.00 - 5.30	C	27							Continued next page			


**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_49_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E333804.50 N366175.52	Ground Elevation (m Datum)	5.16	Sheet 2 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
4.50 - 6.00 5.30 - 5.40	D	28		100	N/A	N/A							
5.50 - 5.65	D	29							Orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular and subangular fine to coarse of sandstone, mudstone, quartz and coal. [GLACIAL TILL DEPOSITS] [CLAY]	5.42 (0.42)	-0.26		
6.00 - 6.45 6.00 - 6.45	D SPT	15	N = 11 (S)					6	Firm brown slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of mudstone, sandstone and quartz. [GLACIAL TILL DEPOSITS] [CLAY]	5.84	-0.68		
6.20 - 7.00	B	30											
6.00 - 7.50				100	N/A	N/A							
7.00 - 7.30	C	31						7					
7.30 - 7.45	D	32											
7.50 - 7.95 7.50 - 7.95	D SPT	16	N = 11 (S)							(3.61)			
7.70 - 8.45	B	33											
7.50 - 9.00				100	N/A	N/A							
8.45 - 8.75	C	34											
8.75 - 8.80	D	35											
9.00 - 9.45 9.00 - 9.45	D SPT	17	N = 17 (S)					9					
End of Borehole at 9.45 m										9.45	-4.29		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_50_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E333500.79 N366269.93	Ground Elevation (m Datum)		4.85	Sheet 1 of 1
	Hole Type		Trial Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	3.60	TP	29/10/2021	29/10/2021	Machine excavated: JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
29/10/2021	11:00	0.00		3.40	Showers									
29/10/2021	13:15	3.60		3.40										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
3.40	3.20	20				

Water Strike Remarks	General Remarks
At 3.40m; groundwater strike.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. Services were not located. 2. Trial pit terminated following collapse of pit sides on excavation below 3.60m.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	3.60	Arisings	29/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'


Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022

<b>FUGRO</b>	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			<b>LB_21_50_TP</b>
	Fugro Reference	F190089			
	Coordinates (m)	E333500.79 N366269.93	Ground Elevation (m Datum)	4.85	Sheet 1 of 1
	Hole Type	Trial Pit / Trench			Status
					Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.20 - 0.30	B	3			TOPSOIL. Light grey friable CLAY. [TOPSOIL] [CLAY]	(0.30)				
0.20 - 0.30	D	2								
0.20 - 0.30	ES	1								
0.20 - 0.30	PJD		< 0.1 ppm							
0.30 - 0.50	B	5			Soft light brown slightly sandy CLAY. Sand is fine to coarse. [TIDAL FLAT DEPOSITS] [CLAY]	0.30	4.55			
0.40 - 0.50	D	4								
0.80 - 1.00	B	7				(1.00)				
0.90 - 1.00	D	6								
1.00	HVane		18 kPa (3 kPa)	1						
1.00	HVane		19 kPa (5 kPa)							
1.00	HVane		19 kPa (5 kPa)							
1.30 - 1.50	B	9				1.30	3.55			
1.40 - 1.50	D	8			Soft blueish grey CLAY. [TIDAL FLAT DEPOSITS] [CLAY]	(0.30)				
1.50	HVane		22 kPa (6 kPa)							
1.50	HVane		22 kPa (6 kPa)							
1.50	HVane		22 kPa (6 kPa)							
1.80 - 2.00	B	11			Black moderately decomposed pseudo-fibrous PEAT. Organic odour. [TIDAL FLAT DEPOSITS]	1.60	3.25			
1.90 - 2.00	D	10				(0.50)				
				2						
					Soft and firm blueish grey CLAY. [TIDAL FLAT DEPOSITS] [CLAY]	2.10	2.75			
2.30 - 2.50	B	13								
2.40 - 2.50	D	12				(0.60)				
2.50	HVane		36 kPa (10 kPa)							
2.50	HVane		40 kPa (14 kPa)							
2.50	HVane		40 kPa (14 kPa)							
2.80 - 3.00	B	15			Stiff blueish grey gravelly CLAY. Gravel is angular to subrounded fine to coarse of mudstone. [TIDAL FLAT DEPOSITS] [CLAY]	2.70	2.15			
2.90 - 3.00	D	14				(0.70)				
				3						
3.40 - 3.50	D	16			Multicoloured sandy GRAVEL. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed lithologies including mudstone, quartzite, flint and granite. [TIDAL FLAT DEPOSITS] [GRAVEL]	3.40	1.45			
3.40 - 3.60	B	17				(0.20)				
						3.60	1.25			
					End of Trial Pit / Trench at 3.60 m					
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Pit sides collapsing at base on excavation below 3.60mbgl.	3.60 m 0.60 m  135°
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW	Print Date	21/04/2022



	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_51_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E333226.34 N366612.20	Ground Elevation (m Datum)		5.08	Sheet 1 of 1
	Hole Type		Cable Percussion			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	24/11/2021	24/11/2021	Hand excavated			EA, KM, SD	EA	
1.20	10.05	CP	24/11/2021	25/11/2021	Dando 3000			KM, SD	EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
24/11/2021	07:30	0.00	0.00	0.00	Cloudy									
24/11/2021	16:30	3.65	1.50	1.50	Dry									
25/11/2021	07:30	3.65	1.50	1.50	Fine									
25/11/2021	16:30	10.05	1.50	1.50	Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
10.05	250	10.05	250

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

**Water Strike Remarks**  
 Groundwater not encountered during excavation.

**General Remarks**  
 1. Prior to excavation, a Cable Avoidance Tool [CAT] survey was carried out. An inspection pit was hand-dug to 1.20m and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	10.05	Bentonite	25/11/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		Location ID	
	Eni UK Limited		<b>LB_21_51_BH</b>	
	F190089			
	E333226.34 N366612.20	Ground Elevation (m Datum)	5.08	Sheet 1 of 2
	Cable Percussion	Status	Draft	

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10	D	1			TOPSOIL. Grass over dark brown slightly sandy silty CLAY with frequent rootlets (<2mm). Sand is fine to coarse.	(0.20)				
0.10 - 0.20	B	2			[TOPSOIL] [CLAY]	0.20	4.88			
0.25	D	3			Brown very clayey SAND. Sand is fine and medium.	(0.30)				
0.25 - 0.50	B	4			[TIDAL FLAT DEPOSITS] [SAND]	0.50	4.58			
0.55	D	5			Light brown slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mixed lithologies including flint, sandstone, mudstone and quartzite.	(0.35)				
0.55	ES	6			[TIDAL FLAT DEPOSITS] [SAND]	0.85	4.23			
0.55 - 0.80	B	7			Light brown mottled brownish grey slightly gravelly clayey SAND. Sand is fine and medium. Gravel is fine.	(0.35)				
0.55	PID	8	< 0.1 ppm	1	[TIDAL FLAT DEPOSITS] [SAND]	1.20	3.88			
0.90	D	9			Loose light brown slightly clayey SAND. Sand is fine and medium.	(0.35)				
0.90 - 1.20	B	10			[TIDAL FLAT DEPOSITS] [SAND]	1.55	3.53			
1.20	D	11			Firm light grey sandy CLAY with frequent pockets (<5mm x 5mm) of dark grey organic material. Sand is fine. Strong organic odour.	(1.15)				
1.20 - 1.65	D	12	N = 9 (S)		[TIDAL FLAT DEPOSITS] [CLAY]	2.70	2.38			
1.20 - 1.65	SPT	13			Plastic dark brownish grey clayey amorphous PEAT. Organic odour.	(0.40)				
1.70	D	14		2	[TIDAL FLAT DEPOSITS]	3.10	1.98			
1.70 - 2.20	B	15			Firm brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone and coal.	(1.10)				
2.20 - 2.65	U	16	15/200 mm		[GLACIAL TILL DEPOSITS] [CLAY]	4.20	0.88			
2.70	D	17			Firm and stiff brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint and mudstone.	(1.50)				
2.70 - 3.10	B	18			5.20m to 5.70m; firm and stiff brown clay.	5.70	-0.62			
3.20 - 3.65	D	19			Firm brown slightly sandy, becoming sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone, quartz and coal.	(4.35)				
3.20 - 3.65	SPT	20	N = 15 (S)		[GLACIAL TILL DEPOSITS] [CLAY]					
3.70	D	21								
3.70 - 4.20	B	22								
4.20 - 4.65	U#B	23	30/450 mm							
4.70	D	24								
4.70 - 5.20	B	25								
5.20 - 5.65	D	26								
5.20 - 5.65	SPT	27	N = 22 (S)							
5.70	D	28								
5.80 - 6.30	B	29								
6.50 - 6.95	U#B	30	25/450 mm							
7.20	D	31								
7.40 - 7.90	B	32								
8.00 - 8.45	D	33								
8.00 - 8.45	SPT	34	N = 16 (S)							
8.60	D	35								
8.80 - 9.30	B	36								
9.65 - 10.05	U#B	37	35/450 mm							


Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_51_BH
Fugro Reference	F190089			
Coordinates (m)	E333226.34 N366612.20	Ground Elevation (m Datum)	5.08	Sheet 2 of 2
Hole Type	Cable Percussion			Status
				Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
					End of Borehole at 10.05 m	10.05	-4.97			
				11						
				12						
				13						
				14						
				15						
				16						
				17						
				18						
				19						

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_59_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E330930.60 N366780.00	Ground Elevation (m Datum)	47.01	Sheet 1 of 1	
	Hole Type		Sonic Core Drilling			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00 1.20	1.20 9.45	IP SNC	26/10/2021 26/10/2021	26/10/2021 27/10/2021	Hand excavated Eijelkamp CRS XL MAX		PCD	LT, JS, LM LM, JS	LT LT/EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
26/10/2021	13:00	0.00			Cloudy	1.20	1.50	Water	0	Brown	00:05	1.20	1.50	101
26/10/2021	18:01	1.20	6.00		Mild	1.50	3.00	Water	0	Brown	00:05	1.50	3.00	101
27/10/2021	07:30	6.00	6.00	1.70	Dry	3.00	4.50	Water	0	Brown	00:05	3.00	4.50	101
27/10/2021	13:30	9.45	6.00		Dry	4.50	6.00	Water	0	Brown	00:05	4.50	6.00	101
						6.00	7.50	Water	0	Brown	00:05	6.00	7.50	101
						7.50	9.00	Water	0	Brown	00:05	7.50	9.00	101

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
9.45	175	9.45	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. 2. Inspection pit remained stable during excavation.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	9.45	Bentonite	27/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK/JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_59_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330930.60 N366780.00	Ground Elevation (m Datum)	47.01	Sheet 1 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
0.10 - 0.30	B	1							TOPSOIL. Soft dark brown sandy CLAY. Sand is fine and medium.	(0.30)			
0.20 - 0.30	D	2							[TOPSOIL] [CLAY]				
0.20	HVane		53 kPa (19 kPa)								46.71		
0.20	HVane		55 kPa (20 kPa)						Stiff light brown mottled orange slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	0.30			
0.20	HVane		58 kPa (22 kPa)						[GLACIAL TILL DEPOSITS] [CLAY]	(0.50)			
0.40 - 0.70	B	3							Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	0.80	46.21		
0.40	HVane		68 kPa (18 kPa)						[GLACIAL TILL DEPOSITS] [CLAY]	(0.40)			
0.40	HVane		71 kPa (22 kPa)						Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	0.80	46.21		
0.40	HVane		74 kPa (25 kPa)						[GLACIAL TILL DEPOSITS] [CLAY]	(0.40)			
0.40	TCon		0.99 W/m.K					1	Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	1.20	45.81		
0.40	TCon		1.15 W/m.K						[GLACIAL TILL DEPOSITS] [CLAY]				
0.40	TCon		1.22 W/m.K						Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	1.20	45.81		
0.50 - 0.60	D	4							[GLACIAL TILL DEPOSITS] [CLAY]				
0.60 - 0.70	ES	5							Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.				
0.60	PID		< 0.1 ppm	100	N/A	N/A			[GLACIAL TILL DEPOSITS] [CLAY]				
0.90 - 1.10	B	6							Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.				
1.10 - 1.20	D	7							[GLACIAL TILL DEPOSITS] [CLAY]				
1.20 - 2.10	B	8							Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.				
1.20 - 1.65	SPT		N = 7 (S)						[GLACIAL TILL DEPOSITS] [CLAY]				
1.20 - 1.50	TCon		0.61 W/m.K							(0.95)			
1.50	TCon		0.79 W/m.K										
1.50	TCon		0.81 W/m.K										
2.10 - 2.15	D	9						2	Loose light brown gravelly clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	2.15	44.86		
2.15 - 2.80	B	10							[GLACIAL TILL DEPOSITS] [SAND]				
1.50 - 3.00	TCon		1.84 W/m.K	100	N/A	N/A				(0.71)			
2.50	TCon		1.95 W/m.K										
2.50	TCon		2.07 W/m.K										
2.80 - 2.86	D	11							Stiff light brown mottled grey and orange slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine and medium of mixed lithologies including sandstone, mudstone and flint.	2.86	44.15		
2.86 - 3.75	B	12							[GLACIAL TILL DEPOSITS] [CLAY]				
3.00 - 3.45	D	16						3	3.25m to 3.30m; light brown gravelly sand. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of sandstone and mudstone.				
3.00 - 3.45	SPT		N = 33 (S)										
3.50	TCon		1.32 W/m.K							(1.64)			
3.50	TCon		1.43 W/m.K										
3.50	TCon		1.71 W/m.K										
3.75 - 3.80	D	13		100	N/A	N/A			3.62m to 3.67m; light brown gravelly sand. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of sandstone and mudstone.				
3.00 - 4.50	B	14						4					
3.80 - 4.45													
4.45 - 4.50	D	15							Firm brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, sandstone and mudstone.	4.50	42.51		
4.50 - 4.95	D	17							[GLACIAL TILL DEPOSITS] [CLAY]				
4.50 - 5.20	B	20											
4.50 - 4.95	SPT		N = 18 (S)										
4.50	TCon		1.17 W/m.K										
4.50	TCon		1.56 W/m.K										
4.50	TCon		1.78 W/m.K										

Continued next page


Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_59_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330930.60 N366780.00	Ground Elevation (m Datum)	47.01	Sheet 2 of 2
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
5.20 - 5.30 4.50 - 6.00 5.30 - 6.00	D B	21 23		100	N/A	N/A							
6.00 - 6.45 6.00 - 6.70 6.00 - 6.45	D B SPT	18 24	N = 11 (S)					6	6.40m to 9.00m; rare angular fragments (<5mm x 5mm x 10mm) of coal.				
6.70 - 6.80 6.00 - 7.50 6.80 - 7.50	D B	25 26		100	N/A	N/A		7		(4.95)			
7.50 - 8.20 7.50 - 7.95	B SPT	27	N = 13 (S)					8	7.50m to 8.00m; soft (drilling disturbed by SPT).				
8.20 - 8.30 7.50 - 9.00 8.30 - 9.00	D B	28 29		100	N/A	N/A							
9.00 - 9.45 9.00 - 9.45	D SPT	30	N = 16 (S)					9					
End of Borehole at 9.45 m										9.45	37.56		

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_59_CPT</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E330934.96 N366792.25	Ground Elevation (m Datum)	46.33	Sheet 1 of 1	
	Hole Type		Inspection Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	26/10/2021	26/10/2021	Hand excavated			EA, CS, MW	EA	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
26/10/2021	09:30	0.00			Cloudy									
26/10/2021	10:30	1.20		Dry Dry										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	1.20	Arisings	26/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_59_CPT</b>
Fugro Reference	F190089			
Coordinates (m)	E330934.96 N366792.25	Ground Elevation (m Datum)	46.33	Sheet 1 of 1
Hole Type	Inspection Pit			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10	D	1			TOPSOIL. Grass over firm dark brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of flint and quartzite. [TOPSOIL] [CLAY]	(0.25)	46.08			
0.30	D	2	68 kPa (22 kPa)		Firm orangish brown sandy CLAY. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [CLAY]	0.25				
0.35	HVane		72 kPa (24 kPa)			(0.30)				
0.35	HVane		76 kPa (16 kPa)							
0.60	D	3			Light brown SAND. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [SAND]	0.55	45.78			
				1		(0.65)				
					End of Inspection Pit at 1.20 m	1.20	45.13			

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	0.40 m 0.42 m  290°
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW	Print Date	21/04/2022



# LABORATORY TEST CERTIFICATE

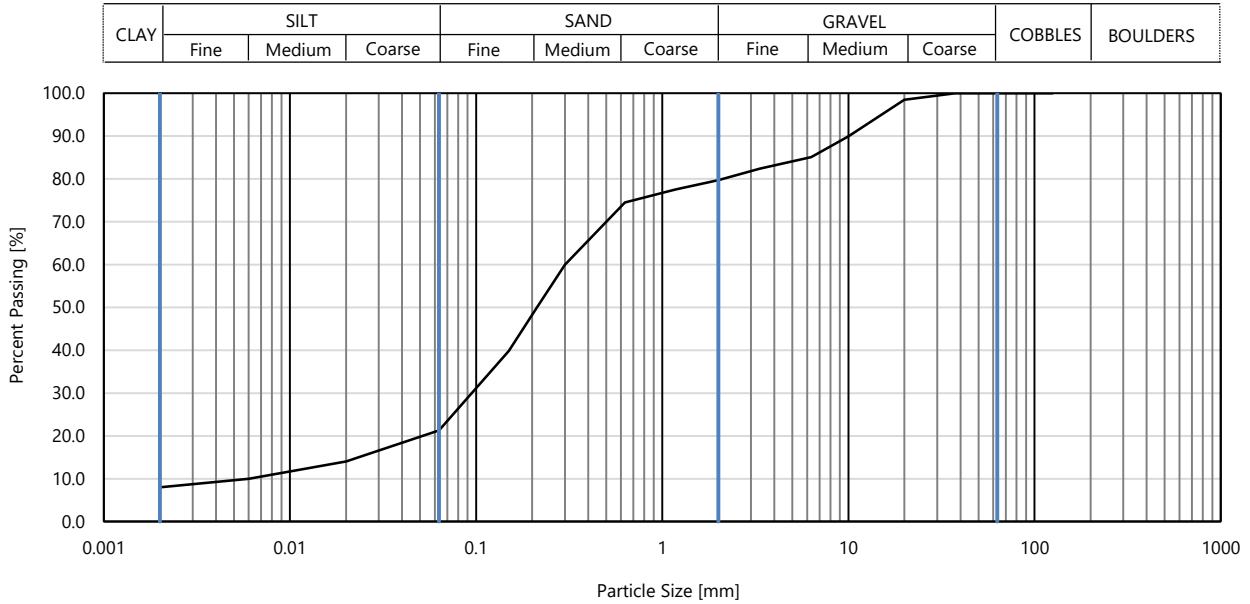
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_59_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	2.15
Specimen Description	Brown very gravelly very clayey SAND	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	10



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	14
90.0	100	0.00600	10
75.0	100	0.00200	8
63.0	100		
37.5	100		
20.0	99		
10.0	90		
6.30	85		
3.35	82		
2.00	80		
1.18	78		
0.630	75		
0.300	60		
0.212	50		
0.150	40		
0.0630	21		

Dry Mass of Sample [g]	12012
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	20.3
Sand	58.4
Silt	13.6
Clay	7.7

Grading Analysis	
D100 [mm]	37.5
D60 [mm]	0.3
D30 [mm]	0.0948
D10 [mm]	0.00504
Coefficient of Uniformity	59
Coefficient of Curvature	5.9

Issue Date	21/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	21/01/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW  Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.	
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	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_60_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E330683.47	N366880.47	Ground Elevation (m Datum)	51.68	Sheet 1 of 1
	Hole Type		Sonic Core Drilling			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00 1.20	1.20 25.50	IP SNC	20/10/2021 21/10/2021	20/10/2021 25/10/2021	Hand excavated Eijelkamp CRS XL MAX		PCD	LT, JS, LM LM, JS	LT LT/KR	

Progress						Rotary Details						Core Details		
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
20/10/2021	13:30	0.00			Dry	1.20	3.00	Water	0	Brown	00:02	1.20	3.00	101
20/10/2021	14:15	1.20			Dry	3.00	4.50	Water	0	Brown	00:05	3.00	4.50	101
21/10/2021	07:30	1.20	0.00		Dry	4.50	6.00	Water	0	Brown	00:05	4.50	6.00	101
21/10/2021	18:01	15.45	13.50	3.60		6.00	7.50	Water	0	Brown	00:05	6.00	7.50	101
22/10/2021	08:05	15.00	15.00	3.80		7.50	9.00	Water	0	Brown	00:05	7.50	9.00	101
22/10/2021	12:00	18.00	15.00	3.80		9.00	10.50	Water	0	Brown	00:05	9.00	10.50	101
25/10/2021	05:00	18.00	15.00	1.70		10.50	12.00	Water	0	Brown	00:05	10.50	12.00	101
25/10/2021	18:00	25.50	18.00	1.70		12.00	13.50	Water	0	Brown	00:05	12.00	13.50	101
						13.50	15.00	Water	0	Brown	00:05	13.50	15.00	101
						15.00	16.50	Water	0	Brown	00:10	15.00	16.50	101
						16.50	18.00	Water	0	Brown	00:10	16.50	18.00	101
						18.00	19.50	Water	0	Brown	00:05	18.00	19.50	101
						19.50	21.00	Water	0	Brown	00:05	19.50	21.00	101
						21.00	22.50	Water	0	Brown	00:05	21.00	22.50	101
						22.50	24.00	Water	0	Brown	00:05	22.50	24.00	101
						24.00	25.50	Water	0	Brown	00:05	24.00	25.50	101

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
25.50	175	25.50	175

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. 2. Inspection pit remained stable during excavation.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	25.50	Bentonite	26/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB
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Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47 N366880.47	Ground Elevation (m Datum)	51.68	Sheet 1 of 6
Hole Type	Sonic Core Drilling			Status <span style="float:right">Draft</span>

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)		Legend
0.00 - 0.30	B	1							TOPSOIL. Soft light brown sandy CLAY. Sand is fine and medium.				
0.20 - 0.30	D	2							[TOPSOIL] [CLAY]	(0.30)			
0.50 - 0.60	ES	3							Soft and firm light brown sandy CLAY. Sand is fine and medium.	0.30	51.38		
0.50 - 0.80	B	4							[OUTWASH GLACIO-FLUVIAL DEPOSITS] [CLAY]	(0.20)			
0.50	PID		0.1 ppm						Orangish light brown clayey SAND. Sand is fine to coarse.	0.50	51.18		
0.50	TCon		1.19 W/m.K						[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]				
0.50	TCon		1.49 W/m.K										
0.50	TCon		1.74 W/m.K										
0.60 - 0.70	D	5								(0.70)			
0.80 - 1.20	B	7											
1.10 - 1.20	D	6						1					
1.20 - 1.50	B	10											
1.20 - 1.65	D	8							Loose locally medium dense light brown mottled orange slightly clayey SAND with rare subangular fine coal fragments. Sand is fine and medium.	1.20	50.48		
1.20 - 1.65	SPT		N = 6 (S)						[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]				
2.00 - 2.50	B	11						2					
1.20 - 3.00				100	N/A	N/A							
2.50 - 2.55	D	12											
3.00 - 3.45	D	9						3					
3.00 - 3.45	SPT		N = 16 (S)						3.00m to 3.45m; medium dense.				
3.50 - 4.00	B	13											
3.00 - 4.50				100	N/A	N/A							
4.00 - 4.05	D	14						4					
4.50 - 4.95	SPT		N = 5 (S)										
5.00 - 5.50	B	16											

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Sonic Core Drilling			Sheet 2 of 6
Status				Draft

Depth (m)	Sampling and In Situ Testing		Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)		Level (m Datum)
4.50 - 6.00				100	N/A	N/A						
5.50 - 5.55	D	17										
6.00 - 6.45	D	18	N = 8 (S)					6		(9.30)		
6.00 - 6.45	SPT											
6.50 - 7.00	B	19										
6.00 - 7.50				100	N/A	N/A						
7.00 - 7.05	D	20						7				
7.50 - 7.95	D	21	N = 7 (S)						7.50m to 7.68m; assumed zone of core loss			
7.50 - 7.95	SPT											
8.00 - 8.50	B	22						8				
7.50 - 9.00				88	N/A	N/A						
8.50 - 8.55	D	23										
9.00 - 9.45	D	24	N = 27 (S)						9.00m to 9.45m; medium dense.			
9.00 - 9.45	SPT											
9.50 - 10.00	B	25										
9.00 - 10.50				100	N/A	N/A						
10.00 - 10.05	D	26										
Continued next page												

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Sonic Core Drilling			Status: Draft

Depth (m)	Sampling and In Situ Testing			Core Recovery				Strata Details				Backfill / Installation
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	
10.50 - 10.84	SPT		50/195 mm (S)						Stiff and very stiff greyish light brown slightly sandy gravelly CLAY. Sand fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, mudstone, flint and coal. [PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	10.50	41.18	
11.00 - 11.50	B	28					11					
10.50 - 12.00				100	N/A	N/A						
11.50 - 11.55	D	29										
12.00 - 12.45	D	27	N = 23 (S)					12				
12.00 - 12.45	SPT											
12.50 - 13.00	B	30										
12.00 - 13.50				100	N/A	N/A						
13.00 - 13.05	D	31						13				
13.50 - 13.95	D	35	N = 36 (S)							(5.60)		
13.50 - 13.95	SPT											
14.00 - 14.50	B	32						14				
13.50 - 15.00				100	N/A	N/A						
14.50 - 14.55	D	33										
15.00 - 15.45	SPT		N = 33 (S)									

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_60_BH</b>
	Eni UK Limited		
	F190089		
	E330683.47 N366880.47	Ground Elevation (m Datum) 51.68	<b>Sheet 4 of 6</b>
Sonic Core Drilling		<b>Status</b>	<b>Draft</b>

Depth (m)	Sampling and In Situ Testing		Core Recovery				Strata Details				Backfill / Installation		
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)		Level (m Datum)	Legend
15.00 - 16.50				87	N/A	N/A		16	15.00m to 15.20m; assumed zone of core loss.				
16.10 - 16.40	B	36	50/260 mm (S)						Stiff dark grey gravelly CLAY. Gravel is, subangular of dark grey mudstone lithorelicts and occasional subangular black coal fragments (<5mm x 5mm x 10mm). Highly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	16.10	35.58		
16.40 - 16.50	D	37					NA		At 16.10m; 1 No. fragment (20mm x 30mm x 50mm) of subangular strong brown ironstone.	(0.80)			
16.50 - 16.95	D	34							16.32m to 16.35m; thin bed of stiff brown clay.				
16.50 - 16.91	SPT								16.50m to 16.90m; soft (drilling disturbed by SPT).				
16.90 - 17.20	B	38						17	Very weak and weak black COAL. Recovered as non intact angular and subangular fragments (<10mm x 20mm x 20mm). Slightly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION]	16.90	34.78		
16.90 - 17.52				100	N/A	N/A				(0.62)			
16.50 - 18.00							NI						
17.60 - 17.85	C	39							Firm and stiff grey and light grey gravelly CLAY. Gravel is angular to subrounded of extremely weak fragments (<10mm x 10mm x 25mm) of light grey mudstone. Highly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	17.52	34.16		
17.52 - 18.17	D	40					NA			(0.65)			
17.85 - 17.95													
18.17 - 18.60									Strong black carbonaceous SHALE. Recovered as non intact angular to subrounded fragments (<5mm x 25mm x 40mm) with frequent very soft grey clay. Slightly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION] [MUDSTONE]	18.17	33.51		
18.17 - 18.60							NI			(0.43)			
18.00 - 19.50				100	N/A	N/A			Firm light grey gravelly CLAY. Gravel is subangular of extremely weak and very weak fragments (<5mm x 5mm x 10mm) of light grey mudstone. Highly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	18.60	33.08		
18.92 - 19.26	C	41											
18.60 - 19.50							NA			(1.20)			
19.26 - 19.30	D	42											
19.26 - 19.30													
19.50 - 19.80									19.50m to 19.80m; assumed zone of core loss.				
19.50 - 19.80							NR						
19.50 - 19.80									Extremely weak and very weak light grey MUDSTONE. Highly fractured producing non intact	19.80	31.88		
Continued next page													

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_60_BH</b>  Sheet 5 of 6 Status      Draft
	Eni UK Limited		
	F190089		
	E330683.47 N366880.47	Ground Elevation (m Datum) 51.68	

Depth (m)	Sampling and In Situ Testing		Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	RQD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)		Level (m Datum)
19.80 - 20.60 19.50 - 21.00 20.26 - 20.35	C	45		80	N/A	N/A	NI	21	core. Recovered as angular and subangular fragments (<10mm x 10mm x 25mm) of extremely weak and very weak light grey mudstone with occasional subangular fragments (<15mm x 20mm x 20mm) of strong brown ironstone with frequent firm grey clay. Fractures undetermined. Fracture spacing undetermined. <b>[PENNINE MIDDLE COAL MEASURES FORMATION] [MUDSTONE]</b> 19.80m to 19.90m; rare fragments (<20mm x 30mm x 30mm) of subangular strong black shale. 20.26m to 20.35m; 1 No. subangular cobble (60mm x 75mm x 90mm) of strong brown ironstone. 20.35m to 20.60m; fractures are possibly inclined 0-30 degrees, possibly very closely spaced, planar, smooth, tight to partially open (<0.50mm) of firm grey clay.	(0.80)		
20.60 - 20.70 20.70 - 20.89 20.60 - 21.10	D C	43 44				NA					20.60	31.08
21.10 - 21.28 21.28 - 21.33 21.10 - 21.63	C D	46 47				- 530		21	Firm and stiff light grey gravelly CLAY. Gravel is angular and subangular fine to coarse of extremely and very weak fragments (<10mm x 15mm x 30mm) of light grey mudstone. Highly weathered. <b>[PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]</b> Very weak light grey brecciated fine grained SANDSTONE within a matrix of soft to firm light grey clay with occasional quartz veins, with occasional black coal veins. Partially weathered. Fractures undetermined. Fracture spacing undetermined. <b>[PENNINE MIDDLE COAL MEASURES FORMATION]</b>	21.10	30.58	
21.63 - 21.80 21.00 - 22.50 21.80 - 21.88 21.88 - 22.05				70	41	35	NA - 80 NA				21.63	30.05
22.05 - 22.50 22.50 - 22.88 22.88 - 22.94 22.88 - 22.94 23.00 - 23.40							NR NI - 60	23	Grey extremely weak to very weak MUDSTONE. Recovered as clayey GRAVEL. Gravel is angular and subangular fine to coarse of very weak grey fine grained sandstone and extremely weak to very weak grey mudstone fragments (<10mm x 20mm x 20mm). Highly weathered. Possible breccia fault zone. <b>[PENNINE MIDDLE COAL MEASURES FORMATION] [MUDSTONE]</b> 21.80m to 21.88m; thin bed of very weak grey fine grained sandstone. 22.05m to 22.50m; assumed zone of core loss.  22.88m to 22.94m; thin bed of very weak grey fine grained sandstone.			
22.50 - 24.00 22.94 - 24.16				97	4	0	NI				(3.14)	
24.18 - 24.28 24.16 - 24.40 24.40 - 24.77 24.00 - 25.50	C	50					60 - 110 NI	24	23.95m to 24.00m; assumed zone of core loss.  24.16m to 24.18m; micro faulting (<15mm) displacement of quartz vein. 24.16m to 24.40m; medium bed of grey fine grained sandstone with occasional 45-70 degree quartz veins.	24.77	26.91	
				100	16	16						

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Sonic Core Drilling			Status
				Draft

Depth (m)	Sampling and In Situ Testing		Core Recovery				Strata Details				Backfill / Installation	
	Type	No.	Test Results	TCR (%)	SCR (%)	ROD (%)	If (mm)	Depth (m)	Strata Descriptions	Depth (Thickness) (m)		Level (m Datum)
24.77 - 25.50 25.18 - 25.44	C	51					NA		grey mudstone . Highly weathered. [PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	(0.73)		
25.44 - 25.50	D	52							End of Borehole at 25.50 m	25.50	26.18	
								26				
								27				
								28				
								29				

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'





Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID	
Client	Eni UK Limited			<b>LB_21_60_BH</b>	
Fugro Reference	F190089				
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68	Sheet 1 of 6
Hole Type	Discontinuity Log			Status	Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									1		
									2		
									3		
									4		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID	<b>LB_21_60_BH</b>	
Client	Eni UK Limited					
Fugro Reference	F190089					
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68	Sheet 2 of 6	
Hole Type	Discontinuity Log				Status	Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									6		
									7		
									8		
									9		

Notes  
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID	
Client	Eni UK Limited			<b>LB_21_60_BH</b>	
Fugro Reference	F190089				
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68	Sheet 3 of 6
Hole Type	Discontinuity Log			Status	Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									11		
									12		
									13		
									14		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Discontinuity Log			Status: Draft

Discontinuity Details										Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend	
16.90 - 17.52	NI							Non intact.	16			
18.17 - 18.60	NI							Non intact.	17			
19.50 - 19.80	NR							Assumed zone of core loss.	18			
19.80 - 20.60	NI							Non intact.	19			

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Discontinuity Log			Sheet 5 of 6
				Status
				Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
22.05 - 22.50	NR							Assumed zone of core loss.	21		
22.50 - 22.88	NI							Non intact.	22		
23.95 - 24.00	NR							Assumed zone of core loss.	23		
24.16 - 24.21	J	30		VT	PI	Ro		Clean.	24		
24.28 - 24.31	BF	20		VT	PI	Ro		Clean.			
24.31 - 24.40	J	60		VT	PI	Ro		Clean.			


Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_60_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E330683.47	N366880.47	Ground Elevation (m Datum)	51.68
Hole Type	Discontinuity Log			Sheet 6 of 6
				Status
				Draft

Discontinuity Details									Discontinuity Information		
Depth (m)	Type	Dip (°)	Aperture (mm)	Aperture Observation	Medium Scale Roughness	Small Scale Roughness	Set Reference	Remarks	Depth (m)	Discontinuity Log	Legend
									26		
									27		
									28		
									29		

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_60_CPT</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E330689.72 N366872.38	Ground Elevation (m Datum)	51.40	Sheet 1 of 1	
	Hole Type		Inspection Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	25/10/2021	25/10/2021	Hand excavated			EA, CS, MW	EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
25/10/2021	13:45	0.00			Cloudy									
25/10/2021	15:00	1.20		Dry Dry										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	1.20	Arisings	25/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022

<b>FUGRO</b>	Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
	Client	Eni UK Limited			<b>LB_21_60_CPT</b>
	Fugro Reference	F190089			
	Coordinates (m)	E330689.72 N366872.38	Ground Elevation (m Datum)	51.40	Sheet 1 of 1
	Hole Type	Inspection Pit			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
				0.20	TOPSOIL. Grass over firm dark brown sandy slightly gravelly SILT. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of quartzite and flint. [TOPSOIL] [SILT]	0.20	51.20			
				1.00	Light brown SAND. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [SAND] 0.20m to 0.30m; brown silty sand. Sand is fine and medium.	(1.00)				
				1.20	End of Inspection Pit at 1.20 m	1.20	50.20			
				2						
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Fairly stable	0.40 m  0.25 m  30°



# LABORATORY TEST CERTIFICATE

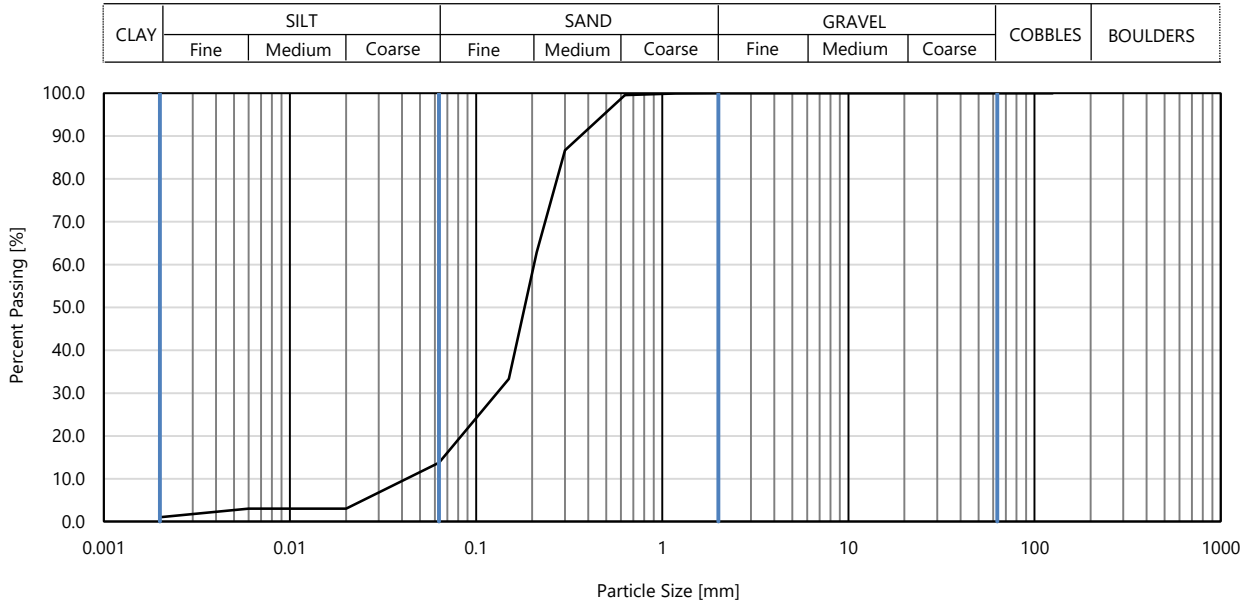
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_60_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	0.50
Specimen Description	Brown silty SAND	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	4



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	3
90.0	100	0.00600	3
75.0	100	0.00200	1
63.0	100		
37.5	100		
20.0	100		
10.0	100		
6.30	100		
3.35	100		
2.00	100		
1.18	100		
0.630	100		
0.300	87		
0.212	63		
0.150	33		
0.0630	14		

Dry Mass of Sample [g]	1417
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	0.0
Sand	86.3
Silt	12.4
Clay	1.3

Grading Analysis	
D100 [mm]	3.35
D60 [mm]	0.205
D30 [mm]	0.13
D10 [mm]	0.0419
Coefficient of Uniformity	4.9
Coefficient of Curvature	2

Issue Date	25/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	25/01/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW

Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.



# LABORATORY TEST CERTIFICATE

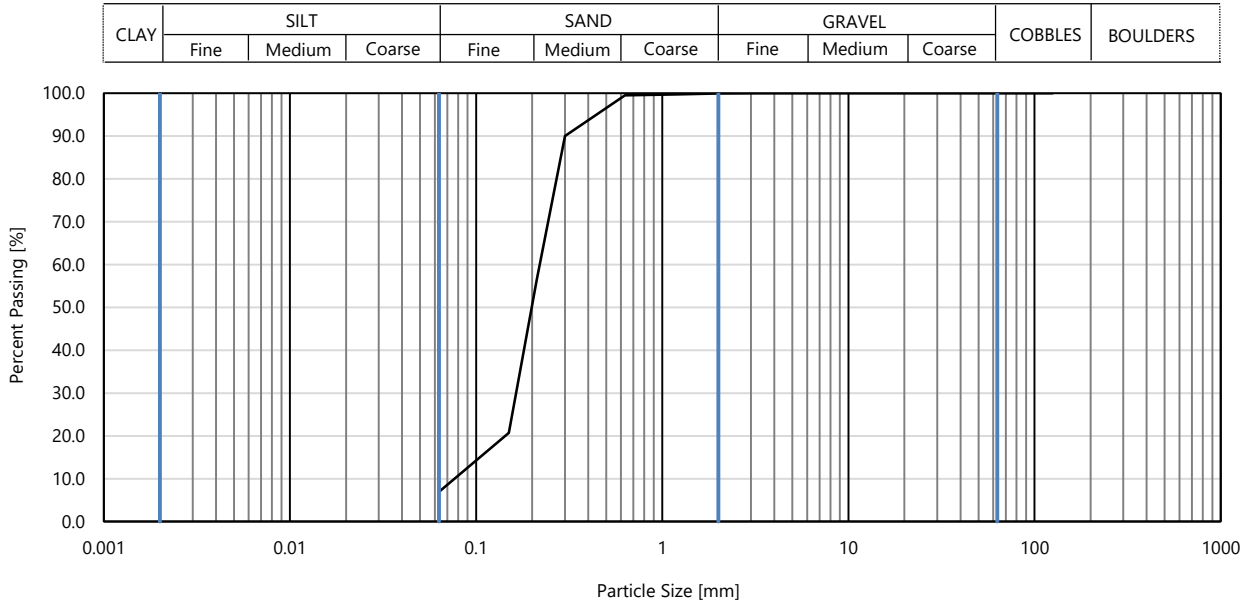
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clause 5.2

Project Reference	F190089	Location ID	LB_21_60_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	1.20
Specimen Description	Brown slightly gravelly silty SAND	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	10



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100		
90.0	100		
75.0	100		
63.0	100		
37.5	100		
20.0	100		
10.0	100		
6.30	100		
3.35	100		
2.00	100		
1.18	100		
0.630	100		
0.300	90		
0.212	56		
0.150	21		
0.0630	7		

Dry Mass of Sample [g]	1044
Particle Density [Mg/m <sup>3</sup> ]	

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	0.1
Sand	93.0
Fines <0.063mm	6.9

Grading Analysis	
D100 [mm]	3.35
D60 [mm]	0.22
D30 [mm]	0.164
D10 [mm]	0.0767
Coefficient of Uniformity	2.9
Coefficient of Curvature	1.6

Issue Date	21/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	21/01/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW  Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.	
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# LABORATORY TEST CERTIFICATE

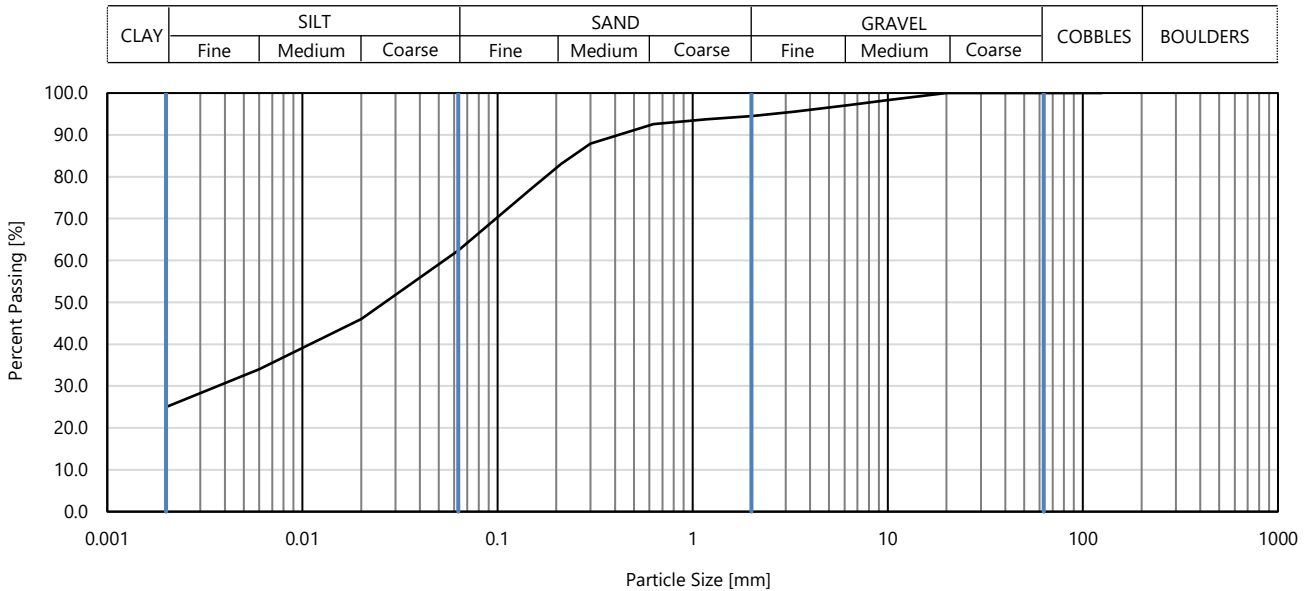
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_60_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	14.00
Specimen Description	Brown slightly gravelly slightly sandy CLAY	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	32



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	46
90.0	100	0.00600	34
75.0	100	0.00200	25
63.0	100		
37.5	100		
20.0	100		
10.0	98		
6.30	97		
3.35	96		
2.00	95		
1.18	94		
0.630	93		
0.300	88		
0.212	83		
0.150	77		
0.0630	62		

Dry Mass of Sample [g]	1552
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	5.5
Sand	32.1
Silt	37.0
Clay	25.4


Grading Analysis	
D100 [mm]	20
D60 [mm]	0.0531
D30 [mm]	0.00355
D10 [mm]	-
Coefficient of Uniformity	Not applicable
Coefficient of Curvature	Not applicable

Issue Date	04/02/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	04/02/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW

Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.



	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_63_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E330166.77 N366961.45	Ground Elevation (m Datum)	75.63	Sheet 1 of 1	
	Hole Type		Cable Percussion			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	16/02/2022	16/02/2022	Hand excavated			HT, KM, SD	HT	
1.20	20.00	CP	16/02/2022	25/02/2022	Dando 3000			KM, SD	HT, JL	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
16/02/2022	07:30	0.00			Dry									
16/02/2022	17:00	5.65	6.00		Dry									
17/02/2022	07:30	5.80	11.75		5.40									
17/02/2022	17:00	11.75	11.75		6.20									
21/02/2022	07:30	11.75	11.75		6.10									
21/02/2022	17:00	12.53	12.00		6.10									
23/02/2022	07:00	12.53	12.00		5.50									
23/02/2022	17:30	13.85	12.20		5.50									
24/02/2022	07:30	13.85	18.00		4.10									
24/02/2022	17:00	18.95	18.00		6.40									
25/02/2022	07:30	18.95	18.00		3.10									
25/02/2022	17:00	20.00	18.00		3.10									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
13.85	250	13.85	250
20.00	200	20.00	200

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

**Water Strike Remarks**  
Groundwater not encountered during excavation.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
GMP	10.00	3.50	10.00	28/02/2022	1	0.00	3.50	50	Plain	-0.50	0.00	Upstanding Cover Bentonite Gravel Bentonite	28/02/2022
						3.50	10.00	50	Slotted	0.00	3.50		28/02/2022
										3.50	10.00		28/02/2022
										10.00	20.00		28/02/2022

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB
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	Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID <b>LB_21_63_BH</b>
	Client	Eni UK Limited		
	Fugro Reference	F190089		Sheet 1 of 3
	Coordinates (m)	E330166.77 N366961.45	Ground Elevation (m Datum) 75.63	
Hole Type	Cable Percussion		Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10 - 0.30	B	3			MADE GROUND. Dark brown gravelly clayey SAND with frequent rootlets and roots (<2mm). Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, mudstone, brick, concrete, chert and possibly quartzite.	(0.80)				
0.20 - 0.30	D	2			[MADE GROUND] [SAND]	0.80	74.83			
0.20 - 0.30	ES	1	0.3 ppm							
0.70 - 0.80	D	5			MADE GROUND. Dark pinkish grey gravelly clayey SAND with medium cobble content. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including sandstone, concrete and mudstone. Cobbles (65mm x 80mm x 85mm) are angular and subangular cuboid rough to smooth of concrete.	(0.20)				
0.70 - 0.80	ES	4	0.5 ppm		[MADE GROUND] [SAND]	1.00	74.63			
0.70	PID									
0.80 - 1.00	B	6		1		(0.20)				
1.00 - 1.20	D	7								
1.10 - 1.20	B	9								
1.10 - 1.20	ES	8	1.0 ppm							
1.10	PID									
1.20 - 1.65	D	10								
1.20 - 1.65	SPT		N = 20 (S)							
1.70 - 1.90	ES	11	3.5 ppm	2	MADE GROUND. Dark greyish brown gravelly slightly peaty slightly clayey SAND with frequent rootlets (relic topsoil). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including brick, concrete, sandstone, mudstone and chert.	(1.60)				
1.70 - 1.90	PID									
1.70	D	12								
2.00	D	12								
2.20 - 2.40	ES	14								
2.20 - 2.65	D	13								
2.20 - 2.65	SPT		N = 10 (S)							
2.20	PID		5.8 ppm							
2.20	PID									
2.80	ES	15								
2.80	PID		1.5 ppm	3	MADE GROUND. Medium dense dark brown slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, mudstone, concrete, brick and chert.	2.80	72.83			
2.80	D	16								
2.90	D	16								
2.90 - 3.20	B	17								
3.20 - 3.65	D	18								
3.20 - 3.65	SPT		N = 8 (S)			(1.10)				
					Loose dark orangish brown slightly gravelly slightly clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone and possibly quartzite.					
3.80	D	19								
3.80 - 4.20	B	20		4	[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]	3.90	71.73			
					Loose dark brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subrounded and rounded fine and medium of sandstone.					
4.20 - 4.65	D	21								
4.20 - 4.65	SPT		N = 8 (S)							
					[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]					
4.70	D	22								
4.70 - 5.20	B	23								
5.20 - 5.65	D	24		5		(2.30)				
5.20 - 5.65	SPT		N = 10 (S)							
5.80	D	25								
6.20	D	26		6		6.20	69.43			
6.30 - 6.75	B	27			Medium dense dark orangish brown very gravelly SAND. Sand is fine to coarse, predominantly coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, granite, quartz, slate and siltstone.	(0.60)				
6.30 - 6.75	SPT		N = 20 (C)							
					[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]					
6.80	D	28								
6.80 - 7.30	B	29		7	Loose dark orangish brown very sandy GRAVEL with low cobble content. Sand is fine to coarse, predominantly coarse. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, granite, quartz siltstone and slate. Cobbles (<80mm x 65mm) are subrounded cuboid rough to smooth of mixed lithologies including slate and granite.	6.80	68.83			
7.30 - 7.75	B	31								
7.30 - 7.75	D	30								
7.30 - 7.75	SPT		N = 7 (C)							
7.80	D	32								
7.80 - 8.30	B	33		8	[OUTWASH GLACIO-FLUVIAL DEPOSITS] [GRAVEL]	(2.40)				
8.30 - 8.75	B	35								
8.30 - 8.75	D	34								
8.30 - 8.75	SPT		N = 7 (C)							
8.80	D	36		9		9.20	66.43			
8.80 - 9.20	B	37								
9.30 - 9.75	D	38			Medium dense becoming very dense dark orangish brown slightly gravelly SAND. Sand is fine to coarse, predominantly coarse. Gravel is subangular to rounded fine to coarse, predominantly medium of mixed lithologies including sandstone, quartz, granite and siltstone.					
9.30 - 9.75	SPT		N = 15 (S)							
9.80	D	39								
9.80 - 10.30	B	40								

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_63_BH</b>
	Eni UK Limited		
	F190089		
	E330166.77 N366961.45	Ground Elevation (m Datum) 75.63	Sheet 2 of 3
	Cable Percussion	Status	Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
10.30 - 10.75	D SPT	41	N = 16 (S)		[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND] 9.80m to 10.30m; sand is predominantly fine and medium.						
10.30 - 10.75						(3.00)					
10.80	D B	42									
10.80 - 11.30		43		11							
11.30 - 11.75	B SPT	44	50/295 mm (S)		From 11.30m; very dense.						
11.30 - 11.74											
11.80	D B	45									
11.80 - 12.20		46		12							
12.20 - 12.53	D SPT	47	50/180 mm (S)		Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular to rounded fine to coarse, predominantly fine and medium of mixed lithologies including siltstone and sandstone.	12.20	63.43				
12.20 - 12.53											
12.60	D B	48									
12.60 - 13.00		49		13	[PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]	(1.10)					
13.30 - 13.85	D SPT	50	N = 3 (S)		Very loose dark brown slightly gravelly SAND. Sand is fine. Gravel is subangular to rounded fine of mixed lithologies including siltstone and sandstone.	13.30	62.33				
13.30 - 13.75											
13.90	D B	51			[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND]						
13.90 - 14.40		52		14	13.90m to 14.00m; locally gravel is angular of coal. Sand is fine and medium predominantly fine.	(1.20)					
14.50 - 14.95	D SPT	53	N = 19 (S)		Medium dense brown SAND. Sand is fine and medium.	14.50	61.13				
14.50 - 14.95					[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND]	(0.60)					
15.10	D B	54									
15.10 - 15.50		55		15	Dark brown slightly gravelly SAND. Sand is fine and medium. Gravel is subangular to rounded fine of mixed lithologies including siltstone and sandstone.	15.10	60.53				
15.50 - 15.95	D SPT	56	N = 18 (S)		[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND]						
15.50 - 15.95											
16.10	D B	57			Medium dense brown slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of coal, quartz and sandstone.	15.50	60.13				
16.10 - 16.50		58		16	[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND]	(1.00)					
16.50 - 16.89	D SPT	59	50/235 mm (S)		Very dense brown SAND. Sand is fine and medium.	16.50	59.13				
16.50 - 16.89					[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND]	(0.80)					
17.10	D	60									
17.10	D	61									
17.50 - 17.95	D SPT	62	50/295 mm (S)		Very stiff brown slightly gravelly CLAY. Gravel is angular to subrounded fine and medium of coal, sandstone and limestone.	17.30	58.33				
17.50 - 17.94					[PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]						
18.30	D	63									
18.50 - 18.95	U#B	64	35/0 mm	17							
19.10	D B	65									
19.10 - 19.50		66		19	Very stiff slightly gravelly slightly sandy CLAY. Sand is fine and medium. Gravel is angular to subrounded fine and medium of coal and occasional sandstone fragments.	19.10	56.53				
19.50 - 19.71	D SPT	67	50/200 mm (S)		[PENNINE MIDDLE COAL MEASURES FORMATION] [CLAY]						
19.50 - 19.71											
					Very dense slightly gravelly silty SAND. Sand is fine to coarse. Gravel is angular and subangular fine of coal.	19.50	56.13				
						(0.50)					
						20.00	55.63				

Continued next page


<b>Notes</b> - Abbreviations and results data defined on 'Notes on Exploratory Position Records'		
Template: FGSL/HBSI/FGSL Cable Percussion.hbt/Config Fugro Rev5/24/01/2020/TS+AW	Print Date	27/04/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			LB_21_63_BH
Fugro Reference	F190089			
Coordinates (m)	E330166.77 N366961.45	Ground Elevation (m Datum)	75.63	Sheet 3 of 3
Hole Type	Cable Percussion			Status
				Draft

Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
					[PENNINE MIDDLE COAL MEASURES FORMATION] [SAND] End of Borehole at 20.00 m						
				21							
				22							
				23							
				24							
				25							
				26							
				27							
				28							
				29							

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_65_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E329899.82 N367060.50	Ground Elevation (m Datum)	80.05	Sheet 1 of 1	
	Hole Type		Cable Percussion			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	30/11/2021	30/11/2021	Hand excavated			EA, KM, SD	EA	
1.20	21.57	CP	30/11/2021	08/12/2021	Dando 3000			KM, SD	EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
30/11/2021	07:30	0.00	0.00	0.00	Cloudy									
30/11/2021	16:30	6.95	6.00	6.00	Dry									
01/12/2021	07:30	6.95	6.00	6.00	Fine									
01/12/2021	16:30	8.45	8.50	7.10										
02/12/2021	07:30	8.45	8.00	7.20	Rain									
02/12/2021	16:30	14.45	14.00	14.00	Dry									
03/12/2021	07:30	14.45	14.00	7.30	Slight showers									
03/12/2021	17:00	15.45	14.50											
06/12/2021	07:30	15.45	14.50	5.30										
06/12/2021	16:30	17.45	14.50	6.00										
07/12/2021	07:30	17.45	17.00	5.60										
07/12/2021	16:30	20.45	17.00	5.60										
08/12/2021	07:30	20.45	20.00	5.70										
08/12/2021	16:30	21.57	20.00	5.70										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
21.57	250	21.57	250

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)
10.20	8.00	20	10.00			

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	21.57	Bentonite	08/12/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022





<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_65_BH</b>
	Eni UK Limited		
	F190089		<b>Sheet 1 of 3</b> <b>Status</b> <b>Draft</b>
	E329899.82 N367060.50	Ground Elevation (m Datum) 80.05	

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10	D	1			<b>TOPSOIL.</b> Firm dark brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of flint and quartzite. <b>[TOPSOIL] [CLAY]</b> At 0.10m; ceramic fragment (<5mm x 15mm x 25mm).	(0.30)	79.75			
0.10 - 0.30	B	2	118 kPa (32 kPa) 122 kPa (22 kPa) 132 kPa (28 kPa)			0.30				
0.30	HVane				Stiff becoming firm slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, sandstone, quartzite and coal. <b>[GLACIAL TILL DEPOSITS] [CLAY]</b> 0.65m to 1.20m; firm.	(0.90)				
0.30	HVane					1.20	78.85			
0.35	D	3			Firm and stiff brown slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, sandstone, mudstone and rare coal. <b>[GLACIAL TILL DEPOSITS] [CLAY]</b> 0.90m to 1.10m; becoming gravelly with low cobble content. Cobbles (<65mm x 70mm x 110mm) are subangular and subrounded of weak sandstone.	(0.80)				
0.35 - 0.60	B	4				2.00	78.05			
0.60	ES	5			Brown sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone and sandstone. <b>[GLACIAL TILL DEPOSITS] [CLAY]</b> From 2.70m; increasing sand content. Gravel is predominantly sandstone.	(0.80)				
0.60	PID		< 0.1 ppm			2.80	77.25			
0.60	HVane		100 kPa (18 kPa)		Loose to medium dense brown slightly gravelly silty SAND. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, quartz and sandstone. <b>[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND]</b>	(5.80)				
0.60	HVane		114 kPa (18 kPa)							
0.60	HVane		98 kPa (20 kPa)							
0.70	D	6								
0.70 - 1.00	B	7								
1.10	D	8								
1.20 - 1.65	D	9								
1.20 - 1.65	SPT		N = 19 (S)							
1.70	D	10								
1.70 - 2.00	B	11								
2.20 - 2.65	B	12								
2.20 - 2.65	SPT		N = 20 (C)							
2.70	D	13								
2.80 - 3.20	B	14								
3.20 - 3.65	D	15								
3.20 - 3.65	SPT		N = 6 (S)							
3.70	D	16								
3.70 - 4.20	B	17								
4.20 - 4.65	D	18								
4.20 - 4.65	SPT		N = 8 (S)							
4.70	D	19								
4.70 - 5.20	B	20								
5.20 - 5.65	D	21								
5.20 - 5.65	SPT		N = 4 (S)							
5.70	D	22								
5.80 - 6.30	B	23								
6.50 - 6.95	D	24								
6.50 - 6.95	SPT		N = 4 (S)							
7.20	D	25								
7.30 - 7.80	B	26			7.20m to 7.30m; dark brown.					
8.00 - 8.45	D	27								
8.00 - 8.45	SPT		N = 18 (S)		8.00m to 8.45m; medium dense, gravelly.					
8.80	D	28								
8.90 - 9.40	B	29			Brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, flint and quartz. <b>[OUTWASH GLACIO-FLUVIAL DEPOSITS] [GRAVEL]</b>	8.60	71.45			
9.50 - 9.95	D	30				(0.90)				
9.50 - 9.95	SPT		N = 19 (S)		Medium dense brown slightly gravelly SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, flint, mudstone, quartz and	9.50	70.55			


<b>Notes</b> - Abbreviations and results data defined on 'Notes on Exploratory Position Records'		
Template: FGSL/HBSI/FGSL Cable Percussion.hbt/Config Fugro Rev5/24/01/2020/TS+AW	Print Date	21/04/2022


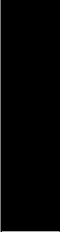


<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_65_BH</b>
	Eni UK Limited		
	F190089		<b>Sheet 2 of 3</b>
	E329899.82 N367060.50	Ground Elevation (m Datum) 80.05	
Cable Percussion	Status	Draft	

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.20	D	31			quartzite.					
10.40 - 10.90	B	32			[OUTWASH GLACIO-FLUVIAL DEPOSITS] [SAND] 9.50m to 9.95m; with clay laminations.					
11.00 - 11.45	D	33		11	At 11.00m; driller notes; large cobble removed from SPT spoon.	(3.30)				
11.00 - 11.45	SPT		N = 49 (S)							
11.60	D	34								
11.80 - 12.20	B	35		12	11.80m to 12.20m; with rare fragments of coal.					
12.20 - 12.65	D	36								
12.20 - 12.65	SPT		N = 19 (S)							
12.90	D	37				12.80	67.25			
13.00 - 13.45	U	38	70/350 mm	13	Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies, including flint, mudstone and sandstone. [GLACIAL TILL DEPOSITS] [CLAY] 12.80m to 13.40m; clayey.	(1.30)				
13.50	D	39								
13.60 - 14.00	B	40								
14.00 - 14.45	D	41		14		14.10	65.95			
14.00 - 14.50	B	42			Dense brown SAND with pockets of brown slightly gravelly sandy clay. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [SAND]	(0.40)				
14.00 - 14.45	SPT		N = 36 (S)							
14.60	D	43				14.50	65.55			
14.60 - 15.00	B	44			Stiff brown slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including mudstone, flint and sandstone. [GLACIAL TILL DEPOSITS] [CLAY]	(1.40)				
15.00 - 15.45	U	45	60/300 mm	15						
15.50	D	46								
15.50 - 15.90	B	47								
16.00 - 16.33	D	48		16	Very dense brown SAND. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [SAND]	15.90	64.15			
16.00 - 16.33	SPT		50/180 mm (S)			(0.55)				
16.50	D	49				16.45	63.60			
16.50 - 16.90	B	50			Stiff brown slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone and coal. [GLACIAL TILL DEPOSITS] [CLAY]	(1.15)				
17.00 - 17.45	U#B	51	80/0 mm	17						
17.60	D	51				17.60	62.45			
17.60 - 18.00	B	52			Very dense brown silty SAND. Sand is fine and medium. [GLACIAL TILL DEPOSITS] [SAND]	(2.40)				
18.00 - 18.37	D	53		18						
18.00 - 18.36	SPT		50/215 mm (S)							
18.50	D	54								
18.60 - 18.90	B	55								
19.00 - 19.45	D	56		19	From 19.00m; dense.					
19.00 - 19.45	SPT		N = 49 (S)							
19.50	D	57								
19.50 - 19.90	B	58								
20.00 - 20.45	D	59				20.00	60.05			
20.00 - 20.45	SPT		N = 42 (S)		Continued next page					


**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_65_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E329899.82 N367060.50	Ground Elevation (m Datum)	80.05	Sheet 3 of 3	
	Hole Type		Cable Percussion			Status	Draft

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
20.50	D B	60			Stiff brown slightly gravelly sandy CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone, quartzite, sandstone and coal. [GLACIAL TILL DEPOSITS] [CLAY]	(1.57)	58.48			
20.60 - 21.00		61								
21.00 - 21.04	D SPT	62	50/5 mm (S)	21						
21.30 - 21.57	D SPT	63	50/235 mm (S)		End of Borehole at 21.57 m	21.57				
				22						
				23						
				24						
				25						
				26						
				27						
				28						
				29						

Notes

- Abbreviations and results data defined on 'Notes on Exploratory Position Records'

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_65_CPT</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E329900.01 N367060.28	Ground Elevation (m Datum)	80.02	Sheet 1 of 1	
	Hole Type		Inspection Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	27/10/2021	27/10/2021	Hand excavated			LT, MW, CS	LT	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
27/10/2021	13:00	0.00			Cloudy									
27/10/2021	13:45	1.20			Dry Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)



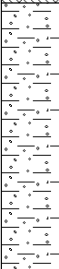



**Water Strike Remarks**  
Groundwater not encountered during excavation.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID		<b>LB_21_65_CPT</b>		
	Client		Eni UK Limited			Sheet 1 of 1				
	Fugro Reference		F190089			Status		Draft		
	Coordinates (m)		E329900.01 N367060.28	Ground Elevation (m Datum)	80.02					
	Hole Type		Inspection Pit							
Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.20 - 0.30	D	1			TOPSOIL. Soft dark brown sandy CLAY. Sand is fine and medium. [TOPSOIL] [CLAY]	(0.30)				
0.50 - 0.60	D	2			Stiff orangish light brown slightly sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, mudstone and flint. [GLACIAL TILL DEPOSITS] [CLAY]	0.30	79.72			
				1		(0.90)				
					End of Inspection Pit at 1.20 m	1.20	78.82			
				2						
				3						
				4						
Notes					Pit Stability		Plan			
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'					Stable		<div style="text-align: center;">0.30 m</div> <div style="display: flex; align-items: center; justify-content: center;"> <span style="margin-right: 10px;">0.30 m</span>  <span style="margin-left: 10px;">120°</span> </div>			
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW							Print Date	21/04/2022		

Institute of Geological Sciences  
 RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration

SJ 27 SE/177

Name and Number of Shaft or Borehole

LEADBROOK HALL FARM (BOREHOLE NO 13)

National Grid Reference

SJ 2545 7072

For whom made BGS

Town or Village FLINT County DELYN

Exact site (reference to a fixed point on 1-in or 1:50 000 Map)

1-in or 1:50 000  
New Series Map No.

Enter 'C' if  
Confidential

108

Purpose for which made To investigate drift deposits

Ground level at shaft bore relative to O.D.  $\approx$  57.00 m. If not ground level give O.D. of beginning of shaft bore \_\_\_\_\_ m.

Made by Norwest Holst Date of sinking 8.12.86

Information from \_\_\_\_\_ Examined by M Smith

Specimen Numbers and Additional Notes

Geological Classification	Description of Strata	Thickness metres	Depth metres
Made ground	Reddish brown clayey sand with occasional pebbles		
	variegated = fill	5.0	5.0
Boulder clay	Dark reddish brown boulder clay with lenses of clayey sand and gravel	12.10	17.10
	Borehole terminated due to difficult penetration		

Institute of Geological Sciences  
 RECORD OF SHAFT OR BOREHOLE

6-in or 1:10 000 Map Registration

SJ 27 SW/249

Name and Number of Shaft or Borehole

TROES-Y-MYNYDD (BOREHOLE NO 8)

National Grid Reference

SJ /2495 7057/

For whom made BGS

Town or Village FLINT MOUNTAIN County DELYN

Exact site (reference to a fixed point on 1-in or 1:50 000 Map)

900 m NE of chapel in Flint Mt

1-in or 1:50 000  
 New Series Map No.

108

Enter 'C' in  
 Confidential

Purpose for which made Investigation of drift deposits

Ground level at shaft bore relative to O.D. 69.00 m. If not ground level give O.D. of beginning of shaft bore \_\_\_\_\_ m.

Made by Norwest Holst


Date of sinking 3.12.86

Information from \_\_\_\_\_

Examined by M Smith

Specimen Numbers and Additional Notes

Geological Classification	Description of Strata	Thickness metres	Depth metres
Head	Thin cover of slope wash comprising dark brown silty clay	0.3	0.3
Boulder clay	Dark reddish brown clayey sands and stiff silty clays with abundant pebbles and cobbles	5.1	5.4
Sands & gravel	Dark reddish brown clayey sand passing down into well sorted clean orange/reddish brown sands	4.1	9.5
Boulder clay	Dark brown clayey sands and gravels passing rapidly into firm boulder clay		
	Borehole terminated at obstruction	1.7	11.2

	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_82_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E325269.20 N370034.25	Ground Elevation (m Datum)	89.75	Sheet 1 of 1	
	Hole Type		Trial Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	2.00	TP	18/10/2021	18/10/2021	Machine excavated : JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
18/10/2021	15:00	0.00			Dry									
18/10/2021	16:00	2.00			Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. Services were not located. 2. Trial pit remained unstable during excavation. 3. Trial pit terminated following collapse of side B on excavation below 2.00m.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	2.00	Arisings	18/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022





Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_82_TP</b>
Fugro Reference	F190089			
Coordinates (m)	E325269.20 N370034.25	Ground Elevation (m Datum)	89.75	Sheet 1 of 1
Hole Type	Trial Pit / Trench			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.20 - 0.30	B	3	< 0.1 ppm	1	Firm and stiff dark grey friable CLAY. [GLACIAL TILL DEPOSITS] [CLAY] 0.00m to 0.30m; clay too friable for a hand vane.	(0.30)	89.45			
0.20 - 0.30	D	2								
0.20 - 0.30	ES	1								
0.20 - 0.30	PJD									
0.30 - 0.50	B	5			Firm and stiff light brown friable slightly gravelly sandy CLAY with low cobble and low boulder content. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of quartzite and sandstone. Cobbles (100m x 150mm x 150mm) are angular to subrounded fine to coarse of medium strong sandstone. Boulders (250mm x 250mm x 270mm) are angular to subrounded and medium strong. [GLACIAL TILL DEPOSITS] [CLAY] 0.30m to 0.70m; clay too friable for a hand vane.	(0.40)				
0.40 - 0.50	B	4								
0.40 - 0.50	D	4								
0.80 - 1.00	B	7			Light brown clayey SAND. Sand is fine to coarse. [GLACIAL TILL DEPOSITS] [SAND] 0.80m to 1.00m; very clayey.	(0.70)				
0.90 - 1.00	D	6								
1.30 - 1.50	B	9								
1.40 - 1.50	D	8								
1.80 - 2.00	B	11	2	End of Trial Pit / Trench at 2.00 m	2.00	87.75				
1.90 - 2.00	D	10								
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Side B collapsed on excavation below 2.00mbgl.	<div style="text-align: center;"> </div>

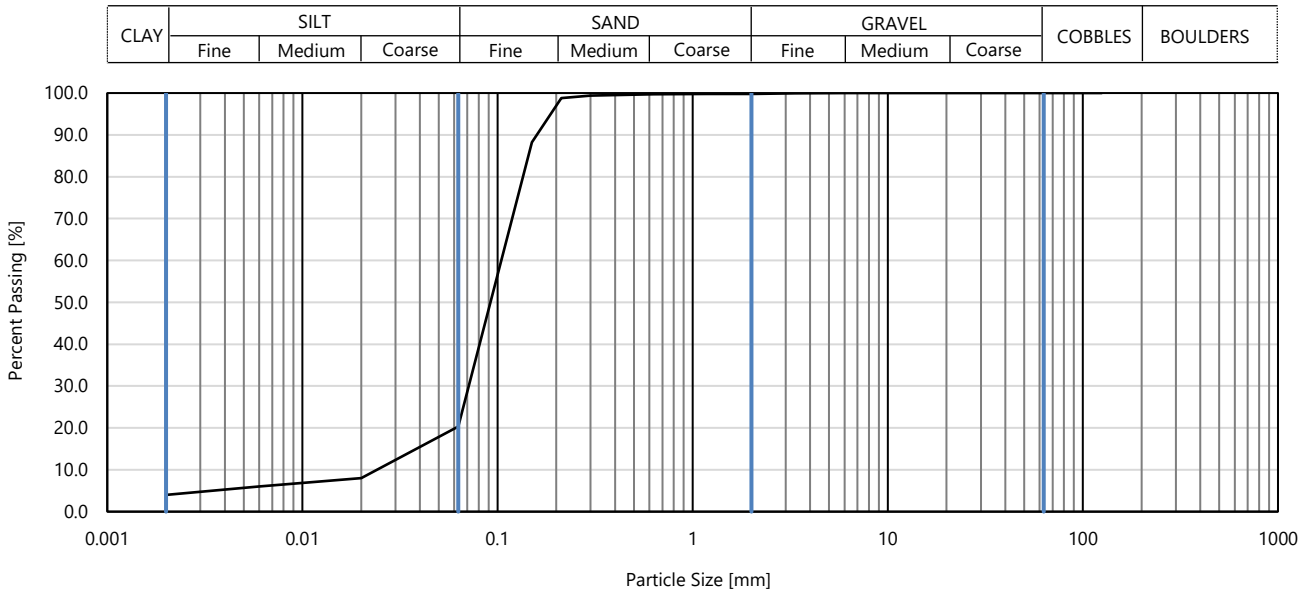
# LABORATORY TEST CERTIFICATE

## Determination of Particle Size Distribution



BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_82_TP
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	0.80
Specimen Description	Brown slightly gravelly very silty SAND	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	7



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	8
90.0	100	0.00600	6
75.0	100	0.00200	4
63.0	100		
37.5	100		
20.0	100		
10.0	100		
6.30	100		
3.35	100		
2.00	100		
1.18	100		
0.630	100		
0.300	99		
0.212	99		
0.150	88		
0.0630	20		

Dry Mass of Sample [g]	1154
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	0.2
Sand	79.5
Silt	16.1
Clay	4.2


Grading Analysis	
D100 [mm]	6.3
D60 [mm]	0.105
D30 [mm]	0.0713
D10 [mm]	0.0239
Coefficient of Uniformity	4.4
Coefficient of Curvature	2

Issue Date	21/12/2021	Certificate Reference		Authorised by	lindsayc
Client	Eni UK Limited			Authorised Date	21/12/2021
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW

Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.



	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_83B_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E325084.85 N370415.57	Ground Elevation (m Datum)	73.25	Sheet 1 of 1	
	Hole Type		Trial Pit			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	4.50	TP	12/10/2021	12/10/2021	Machine excavated : JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
12/10/2021	14:45	0.00			Drizzle									
12/10/2021	16:30	4.50			Dry									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)






















**Water Strike Remarks**  
At 4.50m; water seepage was observed.

**General Remarks**  
1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. Services were not located.  
2. Trial pit remained stable during excavation.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	4.50	Arisings	12/10/2021

**Notes**  
- Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR/CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_83B_TP	
		Fugro Reference				F190089					
		Coordinates (m)		E325084.85 N370415.57		Ground Elevation (m Datum)		73.25		Sheet 1 of 1	
Hole Type		Trial Pit / Trench				Status		Draft			
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.70	HVane		65 kPa (65 kPa)		TOPSOIL. Soft friable reddish brown slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of quartzite. [TOPSOIL] [CLAY]	(0.30)					
0.90 - 1.00	B	2			Firm and stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of quartzite and mudstone. [GLACIAL TILL DEPOSITS] [CLAY]	0.30	72.95				
0.90 - 1.00	D	1		1	Firm and stiff reddish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of quartzite, mudstone and flint. [GLACIAL TILL DEPOSITS] [CLAY]	(0.60)					
1.40 - 1.50	B	4			1.40m to 1.80m; grey mottling with decomposed rootlet fragments.						
1.40 - 1.50	D	3									
1.80	HVane		95 kPa (95 kPa)			(1.90)					
1.90 - 2.00	B	6			1.90m to 2.00m; slightly gravelly slightly sandy clay.						
1.90 - 2.00	D	5		2	Below 2.00m; clay becomes dry and friable.						
2.40 - 2.50	B	8									
2.40 - 2.50	D	7									
2.90 - 3.00	B	10			Friable stiff reddish brown gravelly CLAY. Gravel is angular to rounded fine to coarse of quartzite and mudstone. [GLACIAL TILL DEPOSITS] [CLAY]	2.80	70.45				
2.90 - 3.00	D	9		3	2.90m to 3.00m; slightly gravelly sandy clay. Sand is fine to coarse.						
3.40 - 3.50	B	12									
3.40 - 3.50	D	11									
3.90 - 4.00	B	14									
3.90 - 4.00	D	13		4							
4.40 - 4.50	B	16									
4.40 - 4.50	D	15									
					End of Trial Pit / Trench at 4.50 m	4.50	68.75				
Notes					Pit Stability		Plan				
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'					Stable		3.40 m 0.60 m  45°				
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW							Print Date		29/04/2022		

# LABORATORY TEST CERTIFICATE

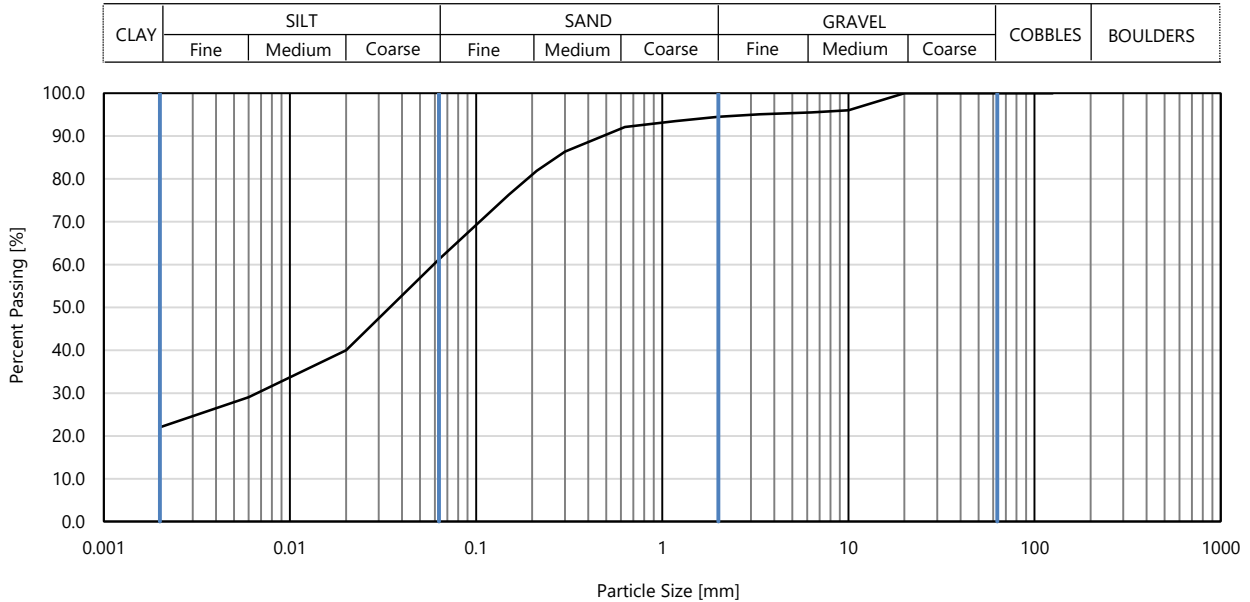
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_83B_TP
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	2.90
Specimen Description	Brown slightly gravelly slightly sandy CLAY	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	10



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	40
90.0	100	0.00600	29
75.0	100	0.00200	22
63.0	100		
37.5	100		
20.0	100		
10.0	96		
6.30	96		
3.35	95		
2.00	95		
1.18	94		
0.630	92		
0.300	86		
0.212	82		
0.150	76		
0.0630	61		


Dry Mass of Sample [g]	1126
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	5.5
Sand	33.3
Silt	39.3
Clay	21.9

Grading Analysis	
D100 [mm]	20
D60 [mm]	0.0592
D30 [mm]	0.0065
D10 [mm]	-
Coefficient of Uniformity	Not applicable
Coefficient of Curvature	Not applicable

Issue Date	25/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	25/01/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW  Testing was performed at the Fugro GeoServices Ltd laboratory at the address shown above. Results relate only to the sample tested, having been authorised by persons qualified to do so. Opinions and interpretations are outside the scope of accreditation. Unless stated otherwise the sample was tested in the condition it was received at the laboratory.	
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	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_88_BH</b>	
	Fugro Reference		F190089				
	Coordinates (m)		E325184.86 N370845.85	Ground Elevation (m Datum)	54.04	Sheet 1 of 1	
	Hole Type		Cable Percussion			Status	Draft

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	1.20	IP	12/10/2021	12/10/2021	Hand excavated			EA, TQ, SW	EA	
1.20	14.00	CP	12/10/2021	15/10/2021	Dando 3000			TQ, SW	EA	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
12/10/2021	08:00	0.00			Dry									
12/10/2021	18:00	10.39	10.00		Dry									
13/10/2021	08:00	10.39	6.10	8.20	Drizzle									
13/10/2021	18:00	14.00	6.10	13.50	Fine									

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)
14.00	200	14.00	200

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located. 2. Inspection pit remained stable during excavation.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	14.00	Bentonite	15/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	SAF	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	21/04/2022



<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_88_BH</b>
	Eni UK Limited		
	F190089		<b>Sheet 1 of 2</b>  <b>Status</b> <b>Draft</b>
	E325184.86 N370845.85	Ground Elevation (m Datum) 54.04	

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10	D	1			TOPSOIL. Grass over soft dark brown slightly sandy CLAY with frequent rootlets (<1mm-2mm). Sand is fine to coarse.	(0.20)				
0.10 - 0.20	B	2				0.20	53.84			
0.25	D	3			[TOPSOIL] [CLAY]	(0.20)				
0.45	D	5			Firm brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of flint and quartzite.	0.40	53.64			
0.45 - 0.75	B	6			[GLACIAL TILL DEPOSITS] [CLAY]	(0.40)				
0.45	HVane		130 kPa (34 kPa)							
0.45	HVane		134 kPa (32 kPa)							
0.45	HVane		146 kPa (40 kPa)							
0.60	ES	7		1	Stiff reddish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of quartzite, flint and rare quartz. Cobbles (<70mm x 75mm x 88mm) are subangular of quartzite.	(0.40)				
0.60	PID		< 0.1 ppm		[GLACIAL TILL DEPOSITS] [CLAY]	(0.40)				
0.80	D	8				1.20	52.84			
0.80 - 1.10	B	9								
1.20 - 1.65	D	10								
1.20 - 1.65	SPT		N = 9 (S)							
1.70 - 2.25	B	11								
2.00	D	12		2	Firm and stiff reddish brown locally yellowish brown and greenish grey sandy gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including flint, mudstone and quartzite.	(1.40)				
2.25 - 2.60	B	14			[GLACIAL TILL DEPOSITS] [CLAY]					
2.25 - 2.60	UT#	13	100/0 mm							
2.80 - 3.20	B	16			Stiff reddish brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including quartzite, flint, mudstone and rare quartz.	2.60	51.44			
2.80 - 3.20	UT#	15	100/0 mm		[GLACIAL TILL DEPOSITS] [CLAY]					
3.20 - 3.65	D	17		3	2.30m to 2.50m; light brown clayey sand. Sand is fine and medium. 2.50m to 2.60m; becoming brown.					
3.20 - 3.65	SPT		N = 32 (S)							
3.70 - 4.30	B	18			Very stiff brown locally reddish brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of quartzite, flint and rare quartz.					
					[GLACIAL TILL DEPOSITS] [CLAY]					
					3.70m to 4.30m; slightly gravelly sandy clay.					
4.10	D	19		4						
4.30 - 4.75	D	20								
4.30 - 4.75	SPT		N = 37 (S)							
4.80 - 5.30	B	21								
5.00	D	22		5						
5.30 - 5.75	D	23								
5.30 - 5.75	SPT		N = 35 (S)							
6.00 - 7.00	B	24		6	6.00m to 6.20m; 1 No. subangular cobble (95mm x 190mm x 190mm) of quartzite.					
6.80	D	25								
7.00 - 7.41	D	26		7						
7.00 - 7.41	SPT		50/256 mm (S)							
7.70 - 8.10	B	27								
8.30	D	28		8						
8.60 - 9.03	D	29								
8.60 - 9.02	SPT		50/275 mm (S)							
9.20 - 9.60	B	30		9						
9.80	D	31								
10.00 - 10.39	D	32								
10.00 - 10.39	SPT		50/240 mm (S)							
					Continued next page					

**Notes**  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_88_BH</b>
Fugro Reference	F190089			
Coordinates (m)	E325184.86 N370845.85	Ground Elevation (m Datum)	54.04	Sheet 2 of 2
Hole Type	Cable Percussion			Status <span style="float:right">Draft</span>

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
10.60 - 11.10	B	33		11						
11.30	D	34		11						
11.50 - 11.90	D	35	50/245 mm (S)	11	11.50m to 12.80m; brown and reddish brown.					
11.50 - 11.90	SPT			11						
12.10 - 12.60	B	36		12						
12.80	D	37		13						
13.00 - 13.38	D	38	50/225 mm (S)	13						
13.00 - 13.38	SPT			13						
13.50 - 14.00	B	39		14						
				14	End of Borehole at 14.00 m	14.00	40.03			
				15						
				16						
				17						
				18						
				19						

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'



# LABORATORY TEST CERTIFICATE

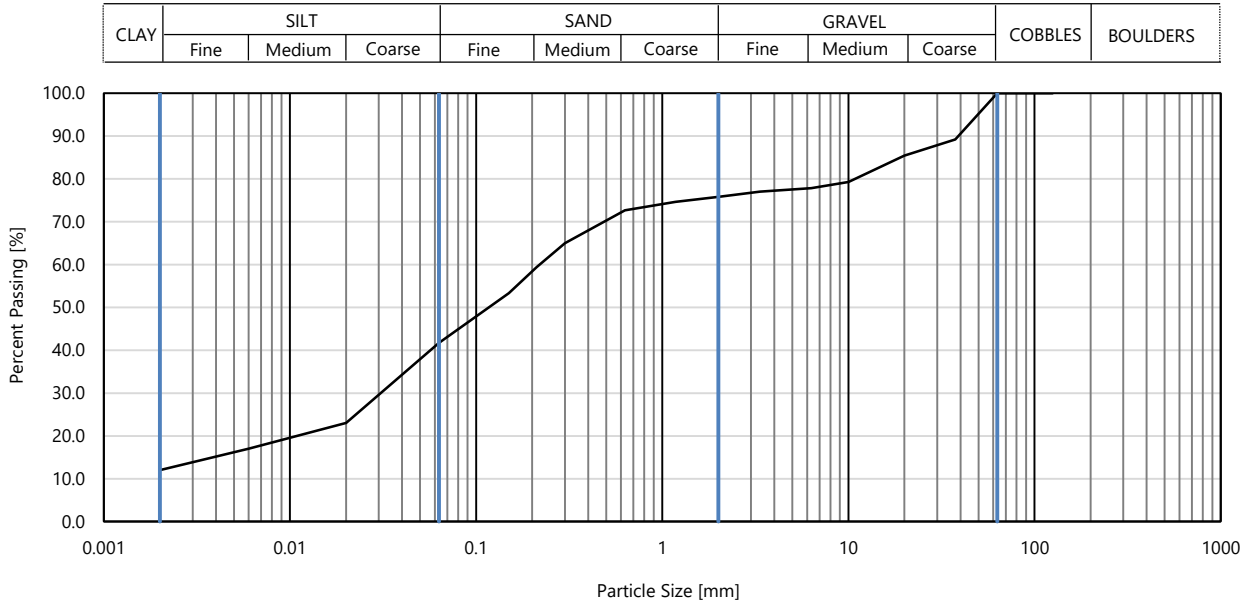
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_88_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	0.80
Specimen Description	Brown slightly gravelly slightly sandy CLAY	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	9



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	23
90.0	100	0.00600	17
75.0	100	0.00200	12
63.0	100		
37.5	89		
20.0	85		
10.0	79		
6.30	78		
3.35	77		
2.00	76		
1.18	75		
0.630	73		
0.300	65		
0.212	59		
0.150	53		
0.0630	42		

Dry Mass of Sample [g]	8878
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	24.2
Sand	34.1
Silt	29.8
Clay	11.9

Grading Analysis	
D100 [mm]	63
D60 [mm]	0.22
D30 [mm]	0.0305
D10 [mm]	-
Coefficient of Uniformity	Not applicable
Coefficient of Curvature	Not applicable

Issue Date	25/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	25/01/2022
Remarks:	Insufficient material to comply with the recommended minimum mass.				

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# LABORATORY TEST CERTIFICATE

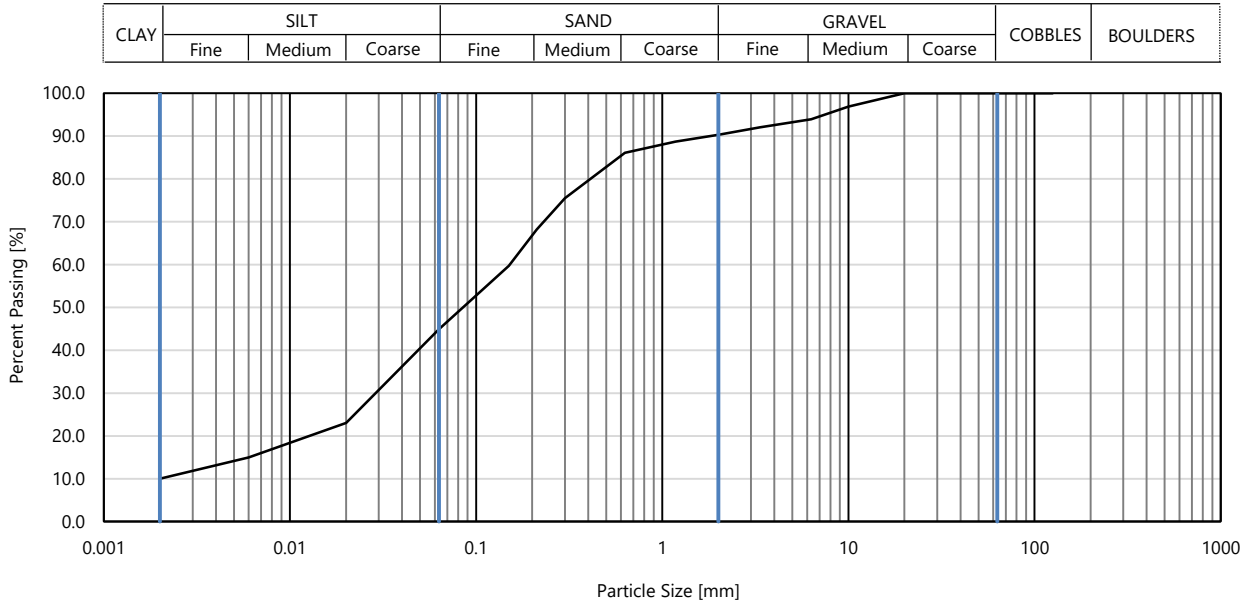
## Determination of Particle Size Distribution



1483

BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_88_BH
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	3.70
Specimen Description	Brown slightly gravelly sandy SILT	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	18



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	23
90.0	100	0.00600	15
75.0	100	0.00200	10
63.0	100		
37.5	100		
20.0	100		
10.0	97		
6.30	94		
3.35	92		
2.00	90		
1.18	89		
0.630	86		
0.300	76		
0.212	68		
0.150	60		
0.0630	45		

Dry Mass of Sample [g]	1190
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	9.7
Sand	45.5
Silt	35.2
Clay	9.6


Grading Analysis	
D100 [mm]	20
D60 [mm]	0.152
D30 [mm]	0.0289
D10 [mm]	0.00215
Coefficient of Uniformity	71
Coefficient of Curvature	2.6

Issue Date	25/01/2022	Certificate Reference		Authorised by	alcocka
Client	Eni UK Limited			Authorised Date	25/01/2022
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW



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	Contract Name		LBA CCS Transport and Storage Project Ground Investigations			Location ID	
	Client		Eni UK Limited			<b>LB_21_89_TP</b>	
	Fugro Reference		F190089				
	Coordinates (m)					Sheet 1 of 1	
	Hole Type		Trial Pit			Status	Preliminary

Equipment										
Depth From (m)	Depth To (m)	Hole Type	Date From	Date To	Equipment	Core Barrel	Core Bit	Drilling Crew	Logged By	Remarks
0.00	2.80	TP	13/10/2021	13/10/2021	Machine excavated : JCB 3CX			MR, RB	MR	

Progress						Rotary Details					Core Details			
Date (dd/mm/yyyy)	Time (hh:mm)	Hole Depth (m)	Casing Depth (m)	Water Depth (m)	Weather	Depth From (m)	Depth To (m)	Flush Type	Flush Return (%)	Flush Colour	Run Time (hh:mm)	Depth From (m)	Depth To (m)	Diameter (mm)
13/10/2021	14:30	0.00			Overcast									
13/10/2021	16:00	2.80		Dry Dry										

Hole and Casing			
Depth To (m)	Hole Diameter (mm)	Depth To (m)	Casing Diameter (mm)

Chiselling / Slow Progress			
Depth From (m)	Depth To (m)	Duration (hh:mm)	Tool / Remark

Water Strike			Water Added			
Strike At (m)	Rise To (m)	Time Elapsed (mins)	Casing Depth (m)	Depth Sealed (m)	Depth From (m)	Depth To (m)

Water Strike Remarks	General Remarks
Groundwater not encountered during excavation.	1. Prior to excavation, a Cable Avoidance Tool (CAT) survey was carried out. A trial pit was hand-dug to 2.80m depth and rescanned using the CAT to check for services. Services were not located. 2. Trial pit remained stable during excavation. 3. CBR test carried out at 0.50m. Results presented separately. 4. Trial pit terminated at 2.80m due to bladed bucket refusal on very stiff clay with mudstone present.

Installation					Pipe					Backfill			
Type	Tip Depth / Distance (m)	Response Zone Top (m)	Response Zone Base (m)	Installation Date	ID	Top Depth (m)	Base Depth (m)	Diameter (mm)	Type	Depth From (m)	Depth To (m)	Backfill Material	Date
										0.00	2.80	Arisings	13/10/2021

**Notes**  
 - Abbreviations and results data defined in 'Exploratory Location Records Keysheets'

Checked By	JR/CK	Elevation Datum	Ordnance Datum	Grid Coordinate System	OSGB	
Template: FGSL/HBSI/FGSL BH Summary.hbt/Config Fugro Rev5/26/06/2019/TS+AW					Print Date	20/10/2021



Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID
Client	Eni UK Limited		<b>LB_21_89_TP</b>
Fugro Reference	F190089		
Coordinates (m)		Ground Elevation (m Datum)	Sheet 1 of 1
Hole Type	Trial Pit / Trench		Status Preliminary

Sampling and In Situ Testing				Strata Details				Groundwater		
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.20 - 0.30	B	3	45 kPa (65 kPa)	1	TOPSOIL. Soft friable slightly gravelly CLAY. Gravel is subangular to rounded fine to coarse of quartzite. [TOPSOIL] [CLAY]	0.30	0.30			
0.20 - 0.30	D	2								
0.20 - 0.30	ES	1								
0.40 - 0.50	B	5								
0.40 - 0.50	D	4	50 kPa (62 kPa)	1	Firm and stiff reddish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of quartzite, flint, mudstone and sandstone. [GLACIAL TILL DEPOSITS] [CLAY]	1.00	1.30			
0.90 - 1.00	B	7								
0.90 - 1.00	D	6	50 kPa (62 kPa)	1	Stiff friable reddish brown mottled grey gravelly CLAY with low cobble content. Gravel is angular to rounded fine to coarse of quartzite, flint and mudstone. Cobbles are angular to subrounded mudstone and quartzite. [GLACIAL TILL DEPOSITS] [CLAY]	1.30	1.50			
1.00	HVane	4								
1.30 - 1.50	B	9	50 kPa (62 kPa)	2		1.50	2.80			
1.40 - 1.50	D	8								
1.90 - 2.00	B	11	50 kPa (62 kPa)	2		2.80	2.80			
1.90 - 2.00	D	10								
2.30 - 2.50	B	13	50 kPa (62 kPa)	3		2.80	2.80			
2.40 - 2.50	D	12								
2.70 - 2.80	B	15	50 kPa (62 kPa)	3		2.80	2.80			
2.70 - 2.80	D	14								
				3	End of Trial Pit / Trench at 2.80 m	2.80	2.80			
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	3.50 m 0.60 m  180°
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW	Print Date	20/10/2021



Contract Name	LBA CCS Transport and Storage Project Ground Investigations			Location ID
Client	Eni UK Limited			<b>LB_21_89_TP</b>
Fugro Reference	F190089			
Coordinates (m)		Ground Elevation (m Datum)		Sheet 1 of 1
Hole Type	Trial Pit			Status Preliminary

**Standard Penetration Test Results**

Test Depth (m)	Test Type	Self Weight Penetration (mm)	Test Result	Total Penetration (mm)	Hammer Serial Number	Energy Ratio (%)	Casing Depth (m)	Water Depth (m)

**In Situ Vane Test Results**

**In Situ Hand Penetrometer Results**

**Volatile Headspace Testing by Photoionisation Detector**

Test Depth (m)	Test Type	Undisturbed Undrained Shear Strength (kPa)	Residual Undrained Shear Strength (kPa)	Test Depth (m)	Undisturbed Undrained Shear Strength (kPa)	Test Depth (m)	PID Result (ppm)
0.50	HVane	45.00	65.00				
1.00	HVane	50.00	62.00				

Notes  
 - Abbreviations and results data defined on 'Notes on Exploratory Position Records'

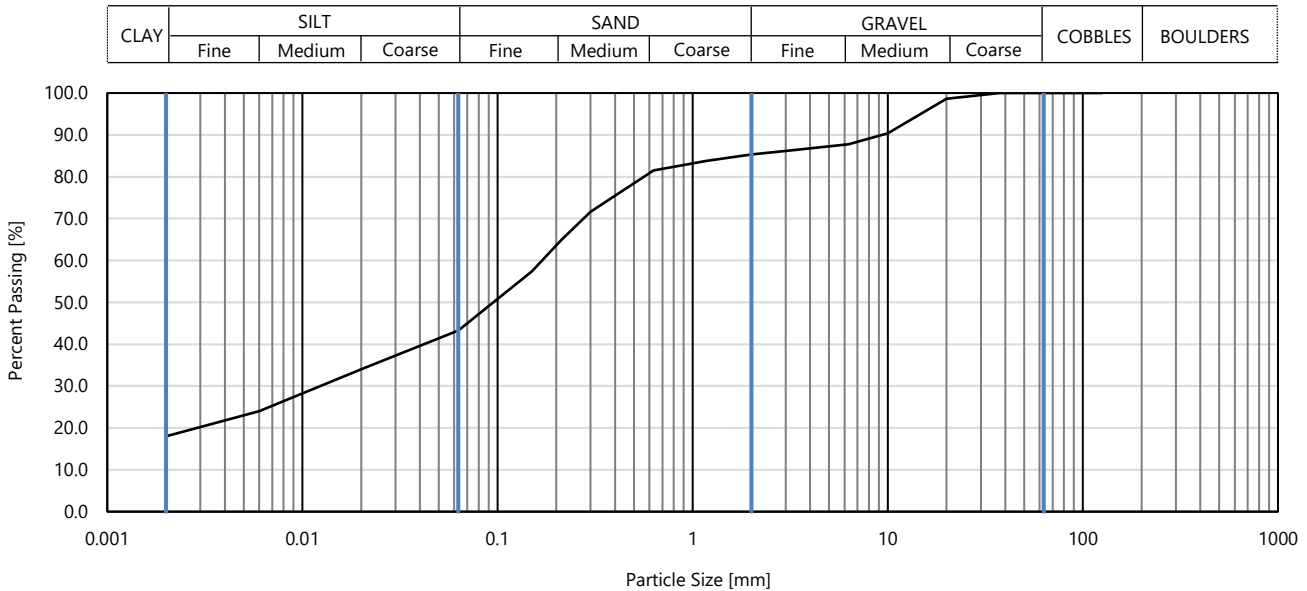
# LABORATORY TEST CERTIFICATE

## Determination of Particle Size Distribution



BS EN ISO 17892-4:2016 Clauses 5.2 and 5.4

Project Reference	F190089	Location ID	LB_21_89_TP
Project Name	LBA CCS Transport and Storage Project Ground Investigations	Depth Top [m]	2.30
Specimen Description	Brown slightly gravelly sandy CLAY	Sample Type	B
Specimen Reference		Specimen Depth [m]	
		Sample Reference	13



Sieving		Sedimentation	
Particle Size [mm]	Passing [%]	Particle Size [mm]	Passing [%]
125	100	0.0200	34
90.0	100	0.00600	24
75.0	100	0.00200	18
63.0	100		
37.5	100		
20.0	99		
10.0	90		
6.30	88		
3.35	86		
2.00	85		
1.18	84		
0.630	82		
0.300	72		
0.212	65		
0.150	57		
0.0630	43		

Dry Mass of Sample [g]	3259
Particle Density [Mg/m <sup>3</sup> ]	2.70 assumed

Sample Proportions	Dry Mass [%]
Very coarse	0.0
Gravel	14.7
Sand	41.9
Silt	25.1
Clay	18.3





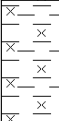

Grading Analysis	
D100 [mm]	37.5
D60 [mm]	0.169
D30 [mm]	0.0118
D10 [mm]	-
Coefficient of Uniformity	Not applicable
Coefficient of Curvature	Not applicable






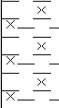


Issue Date	21/12/2021	Certificate Reference		Authorised by	lindsayc
Client	Eni UK Limited			Authorised Date	21/12/2021
Remarks:					

Fugro GeoServices Ltd. Unit 43, Number One Industrial Estate, Medomsley Road, Consett, DH8 6TW

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		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_303_TP	
		Fugro Reference				F190089					
		Coordinates (m)				Ground Elevation (m Datum)				Sheet 1 of 1	
		Hole Type				Trial Pit / Trench				Status	Preliminary
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.10 - 0.20	D	1			TOPSOIL. Grass over dark brown slightly gravelly clayey SAND with roots (<5mm x 450mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, limestone and flint.	(0.40)					
0.30 - 0.40	B	2			[TOPSOIL] [SAND]	0.40					
0.50 - 0.60 0.50	ES PID	3	0.2 ppm		Yellowish brown and grey slightly gravelly very clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, quartzite and granite.						
0.70 - 0.90	B	4				(0.80)					
1.00	D	5		1							
1.40 - 1.50 1.40 1.40 1.40 1.60 - 1.70	B HVane HVane HVane D	6	84 kPa (40 kPa) 86 kPa (48 kPa) 92 kPa (56 kPa)		Firm and stiff yellowish brown and grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone and limestone.	1.20					
1.90 1.90 1.90	HVane HVane HVane		102 kPa (58 kPa) 108 kPa (58 kPa) 92 kPa (52 kPa)	2		(1.50)					
2.20 - 2.30	D	8									
2.40 - 2.50	B	9									
End of Trial Pit / Trench at 2.70 m						2.70					
						3					
						4					
Notes						Pit Stability		Plan			
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'								1.30 m 0.55 m 			
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW								Print Date	04/03/2022		

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_304_TP	
		Fugro Reference				F190089					
		Coordinates (m)				Ground Elevation (m Datum)				Sheet 1 of 1	
		Hole Type				Trial Pit / Trench				Status	Preliminary
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.20 - 0.30	D	1			TOPSOIL. Grass over dark brown slightly gravelly clayey SAND with abundant roots (<5mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, limestone and flint. [TOPSOIL] [SAND]	(0.40)					
0.40 - 0.50	B	2			Brown yellowish grey slightly gravelly clayey to very clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies of sandstone, quartzite and granite.	0.40					
0.50	ES	3	0.2 ppm								
0.50	PID										
0.60 - 0.70	B	4									
0.70 - 0.80	D	5				(0.50)					
0.90 - 1.00	B	6			Firm and stiff brown yellow and grey slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone and limestone.	0.90					
0.90	HVane		150 kPa (48 kPa)	1							
0.90	HVane		150 kPa (58 kPa)								
0.90	HVane		150 kPa (62 kPa)								
1.20 - 1.30	D	7				(0.80)					
1.40	HVane		148 kPa (60 kPa)								
1.40	HVane		150 kPa (58 kPa)								
1.40	HVane		150 kPa (66 kPa)								
					End of Trial Pit / Trench at 1.70 m	1.70					
				2							
				3							
				4							
Notes					Pit Stability			Plan			
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'								1.20 m 0.25 m 			
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW								Print Date	04/03/2022		























<b>Contract Name</b> <b>Client</b> <b>Fugro Reference</b> <b>Coordinates (m)</b> <b>Hole Type</b>	LBA CCS Transport and Storage Project Ground Investigations		<b>Location ID</b>  <b>LB_21_305_TP</b>
	Eni UK Limited		
	F190089		<b>Sheet 1 of 1</b>  <b>Status</b> <b>Preliminary</b>
	Trial Pit / Trench		

Sampling and In Situ Testing				Strata Details					Groundwater		
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.20 - 0.30	D	1		1	TOPSOIL. Grass over dark brown slightly gravelly clay SAND with roots (<5mm x 400mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, limestone and flint. [TOPSOIL] [SAND]	(0.40)					
0.40 - 0.50	B	2			Brown grey yellowish slightly gravelly clayey to very clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, quartzite and granite.	0.40					
0.60 - 0.70 0.60	ES PID	3	0.2 ppm				(0.40)				
0.80 - 0.90	D	4					0.80				
0.90 0.90 0.90	HVane HVane HVane		150 kPa (66 kPa) 150 kPa (68 kPa) 150 kPa (72 kPa)			Firm and stiff light brown mottled light grey and yellow slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mudstone and occasionally sandstone.					
1.00 - 1.10	B	5									
1.40 - 1.50	D	6					(1.20)				
1.50 1.50 1.50	HVane HVane HVane		150 kPa (56 kPa) 150 kPa (60 kPa) 150 kPa (62 kPa)								
1.60 - 1.80	B	7									
2.00 - 2.10	D	8			2	Light brown grey and dark brown sandy clayey locally very clayey GRAVEL with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mudstone and occasionally sandstone. Cobbles (<50mm x 50mm x 150mm) are subangular of sandstone and mudstone. Boulders (<300mm) are subrounded of sandstone.	2.00				
2.20 - 2.30	B	9					(0.70)				
2.60 - 2.70	D	10					2.70				
					End of Trial Pit / Trench at 2.70 m						
					3						
					4						

<b>Notes</b> - Abbreviations and results data defined on 'Notes on Exploratory Position Records'	<b>Pit Stability</b> Stable	<b>Plan</b> 1.15 m  0.55 m

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID		
		Client				Eni UK Limited				LB_21_306_TP		
		Fugro Reference				F190089						
		Coordinates (m)				Ground Elevation (m Datum)				Sheet 1 of 1		
Hole Type		Trial Pit / Trench				Status		Preliminary				
Sampling and In Situ Testing					Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation		
0.30 - 0.40	B	1	0.2 ppm	0.10	TOPSOIL. Grass over dark brown slightly sandy slightly gravelly CLAY with roots (<3mm x 150mm). Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies of sandstone, limestone, quartzite and granite.	0.10						
0.40 - 0.50	D	2		0.20	[TOPSOIL] [CLAY]	0.30						
0.70 - 0.80	ES	3		0.60	MADE GROUND. COBBLES are subrounded of sandstone and limestone placed on tarram (old access to field).	0.90						
0.70	PID				[MADE GROUND] [COBBLES]	1.00						
0.80 - 0.90	B	4			Brown slightly gravelly clayey SAND. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, limestone and granite.	1.30						
0.90 - 1.00	D	5			Brown slightly gravelly clayey SAND with medium cobble and boulder content. Sand is fine to coarse. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone, limestone and granite. Cobbles are subangular and subrounded of mixed lithologies including sandstone, granite and limestone. Boulders (<400mm) are subangular and subrounded of mixed lithologies including limestone, granite and sandstone.	1.40						
1.30 - 1.40	B	6				1.40 - 1.50						
1.40 - 1.50	D	7				1.80 - 1.90						
1.80 - 1.90	B	8		1	End of Trial Pit / Trench at 1.90 m	1.90						
				2								
				3								
				4								

Notes		Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'		Stable	1.45 m
			0.55 m 
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW		Print Date	04/03/2022



Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID
Client	Eni UK Limited		<b>LB_21_307_TP</b>
Fugro Reference	F190089		
Coordinates (m)		Ground Elevation (m Datum)	Sheet 1 of 1
Hole Type	Trial Pit / Trench		Status Preliminary

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10 - 0.20	D	1			TOPSOIL. Dark brown slightly sandy slightly gravelly CLAY with abundant rootlets. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone and mudstone.	(0.30)				
0.10 - 0.30	B	2								
0.30 - 0.50	B	5			[TOPSOIL] [CLAY]	0.30				
0.40 - 0.50	D	4			Stiff dark brown slightly sandy slightly gravelly CLAY with abundant rootlets. Sand is fine and medium. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, quartz and mudstone.	(0.40)				
0.40 - 0.50	ES	3								
0.40 - 0.50	PJD		0.2 ppm							
0.50	HVane		100 kPa (40 kPa)							
0.50	HVane		114 kPa (34 kPa)							
0.50	HVane		98 kPa (38 kPa)							
0.70 - 0.80	D	6			Dark orangish brown slightly clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of quartz flint and slate.	0.70				
0.80 - 1.00	B	7					(0.30)			
1.00 - 1.10	D	8		1	Firm slightly gravelly sandy SILT. Sand is fine to coarse mainly fine. Gravel is angular to rounded fine and medium of sandstone limestone quartz mudstone and slate.	1.00				
1.20 - 1.50	B	9					(0.80)			
1.80 - 1.90	D	10			Orange slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to rounded fine of sandstone limestone and mudstone.	1.80				
1.90 - 2.10	B	11					(0.30)			
				2	2.00m to 2.10m; 1 No boulder (300mm x 400mm x 500mm) triangular of limestone.	2.10				
					End of Trial Pit / Trench at 2.10 m					
				3						
				4						











Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	1.00 m  1.00 m → 270°
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW	Print Date	04/03/2022















	Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID	<b>LB_21_307_TP</b>
	Client	Eni UK Limited		Sheet 1 of 1	
	Fugro Reference	F190089			
	Coordinates (m)		Ground Elevation (m Datum)		
Hole Type	Trial Pit / Trench			Status	Preliminary

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10 - 0.20	D	1			TOPSOIL. Dark brown slightly sandy slightly gravelly CLAY with abundant rootlets. Sand is fine and medium. Gravel is subangular and subrounded fine to coarse of mixed lithologies including sandstone and mudstone.	(0.30)				
0.10 - 0.30	B	2								
0.30 - 0.50	B	5			[TOPSOIL] [CLAY]	0.30				
0.40 - 0.50	D	4			Stiff dark brown slightly sandy slightly gravelly CLAY with abundant rootlets. Sand is fine and medium. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, quartz and mudstone.	(0.40)				
0.40 - 0.50	ES	3								
0.40	PJD		0.2 ppm							
0.50	HVane		100 kPa (40 kPa)							
0.50	HVane		114 kPa (34 kPa)							
0.50	HVane		98 kPa (38 kPa)							
0.70 - 0.80	D	6			Dark orangish brown slightly clayey SAND and GRAVEL. Sand is fine to coarse. Gravel is angular to subrounded fine and medium of quartz flint and slate.	0.70				
0.80 - 1.00	B	7				(0.30)				
1.00 - 1.10	D	8		1	Firm slightly gravelly sandy SILT. Sand is fine to coarse mainly fine. Gravel is angular to rounded fine and medium of sandstone limestone quartz mudstone and slate.	1.00				
1.20 - 1.50	B	9				(0.80)				
1.80 - 1.90	D	10			Orange slightly gravelly SAND. Sand is fine to coarse. Gravel is angular to rounded fine of sandstone limestone and mudstone.	1.80				
1.90 - 2.10	B	11		2	2.00m to 2.10m; 1 No boulder (300mm x 400mm x 500mm) triangular of limestone.	(0.30)				
					End of Trial Pit / Trench at 2.10 m	2.10				
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Stable	<div style="text-align: center;"> </div>
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW	Print Date	04/03/2022















		Contract Name			LBA CCS Transport and Storage Project Ground Investigations			Location ID			
		Client			Eni UK Limited			LB_21_308_TP			
		Fugro Reference			F190089						
		Coordinates (m)			Ground Elevation (m Datum)			Sheet 1 of 1			
Hole Type		Trial Pit / Trench			Status		Preliminary				
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.10 - 0.20	D	1			TOPSOIL. Dark brown slightly sandy slightly gravelly CLAY with abundant rootlets. Sand is fine and medium. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone. [TOPSOIL] [CLAY]	(0.30)					
0.10 - 0.30	B	2									
0.30 - 0.40	D	3			Very stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine and medium. Gravel is subangular to rounded fine to coarse of mixed lithologies including sandstone, mudstone and quartz.	0.30					
0.40 - 0.60	B	5									
0.40 - 0.60	ES	4	0.3 ppm								
0.40	PID										
0.60	HVane		150 kPa (30 kPa)								
0.60	HVane		150 kPa (35 kPa)								
0.60	HVane		150 kPa (40 kPa)								
1.30 - 1.40	D	6		1		(1.30)					
1.40 - 1.60	B	7									
End of Trial Pit / Trench at 1.60 m						1.60					
				2							
				3							
				4							
Notes				Pit Stability			Plan				
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'				Stable			2.00 m 1.00 m  → 270°				
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW							Print Date		04/03/2022		

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_309_TP	
		Fugro Reference				F190089					
		Coordinates (m)				Ground Elevation (m Datum)				Sheet 1 of 1	
		Hole Type				Trial Pit / Trench				Status	Preliminary
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.10 - 0.20 0.10 - 0.30 0.10 - 0.30 0.10	D B ES PID	1 2 3	0.1 ppm		TOPSOIL. Dark brown slightly sandy CLAY with abundant rootlets. Sand is fine and medium. [TOPSOIL] [CLAY]	(0.30)					
0.60 - 0.80 0.60 - 0.80 0.60 0.60 0.60	B D HVane HVane HVane	5 4	58 kPa (10 kPa) 65 kPa (8 kPa) 72 kPa (8 kPa)		Firm dark orangish brown slightly gravelly slightly sandy CLAY. Sand is fine and medium. Gravel is angular to rounded fine to coarse of mixed lithologies including sandstone and mudstone.	0.30					
1.20 - 1.30 1.20 - 1.50	D B	6 7				(2.00)					
1.60 1.60 1.60	HVane HVane HVane		45 kPa (10 kPa) 48 kPa (12 kPa) 56 kPa (10 kPa)								
2.20 - 2.30 2.20 - 2.30 2.30 2.30 2.30	B D HVane HVane HVane	9 8	58 kPa (10 kPa) 68 kPa (12 kPa) 70 kPa (15 kPa)		End of Trial Pit / Trench at 2.30 m	2.30					
Notes					Pit Stability		Plan				
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'					Unstable at 2.30m with collapse in faces A, B and D.		1.00 m 2.00 m  240°				
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev/05/12/2019/TS-AW							Print Date		07/03/2022		

	Contract Name	LBA CCS Transport and Storage Project Ground Investigations		Location ID	<b>LB_21_310_TP</b>
	Client	Eni UK Limited			
	Fugro Reference	F190089			
	Coordinates (m)		Ground Elevation (m Datum)		Sheet 1 of 1
	Hole Type	Trial Pit / Trench		Status	Preliminary

Sampling and In Situ Testing				Strata Details					Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation
0.10 - 0.20 0.10 - 0.30 0.20 - 0.30 0.20	D B ES PID	1 2 3	0.1 ppm		TOPSOIL. Dark brown slightly sandy CLAY with abundant rootlets. Sand is fine and medium. [TOPSOIL] [CLAY]	(0.20) 0.20				
0.60 0.60 0.60	HVane HVane HVane		62 kPa (8 kPa) 66 kPa (10 kPa) 72 kPa (10 kPa)		Firm dark orangish brown slightly sandy CLAY. Sand is fine and medium.					
1.20 - 1.30 1.20 - 1.50	D B	4 5		1		(1.60)				
1.50 1.50 1.50	HVane HVane HVane		65 kPa (10 kPa) 68 kPa (10 kPa) 75 kPa (12 kPa)							
					End of Trial Pit / Trench at 1.80 m	1.80				
				2						
				3						
				4						

Notes	Pit Stability	Plan
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'	Unstable and collapsed on faces A, B and D at 1.80m.	
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW	Print Date	07/03/2022

		Contract Name				LBA CCS Transport and Storage Project Ground Investigations				Location ID	
		Client				Eni UK Limited				LB_21_311_TP	
		Fugro Reference				F190089					
		Coordinates (m)				Ground Elevation (m Datum)				Sheet 1 of 1	
Hole Type		Trial Pit / Trench				Status		Preliminary			
Sampling and In Situ Testing				Strata Details						Groundwater	
Depth (m)	Type	No.	Test Results	Depth (m)	Strata Descriptions	Depth (Thickness) (m)	Level (m Datum)	Legend	Water Strike	Backfill / Installation	
0.10 - 0.15	D	1	< 0.1 ppm	1	TOPSOIL. Grass over dark brown slightly gravelly silty SAND with frequent rootlets. Sand is fine to coarse. Gravel is subrounded and rounded fine to coarse of limestone. [TOPSOIL] [CLAY]	0.30					
0.10 - 0.50	B	2				0.30					
0.50	ES PID	3				0.60					
0.50						0.90					
1.00 - 1.05	D B	4 5				1.10					
1.00 - 1.50						2.00					
1.50 - 1.55	D B	6 7				End of Trial Pit / Trench at 2.00 m					
1.50 - 2.00											
Notes				Pit Stability		Plan					
- Abbreviations and results data defined on 'Notes on Exploratory Position Records'				Stable		2.00 m 0.60 m  90°					
Template: FGSL/HBSI/FGSL Trial Pit.hbt/Config Fugro Rev5/05/12/2019/TS-AW						Print Date		04/03/2022			



# Annex K

## **CONSULTATIONS**

## Vincent, Tom

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**From:** GREENWOOD, Ben [REDACTED]  
**Sent:** 03 December 2021 11:04  
**To:** Morgan, Emily  
**Cc:** Corless, Natalie; Greslow, Mike; Peter, Lara; Franklin-Losardo, Declan; Meynell, Gareth; MORGETROYD, Catherine  
**Subject:** RE: HyNet - Mineral Resource Assessment

Hi Emily,

Please see below the repose in red to your questions from our the minerals policy officer (Catherine Morgetroyd).

- The pipeline trench would be approximately 1.2m deep and approximately 1.0m wide (an easement of up to 25m will be place upon the finished pipeline). The trench would need to be refilled with a granular material and therefore the extraction of sand/gravel only to be replaced with sand / gravel seems like a waste of resources. I agree that extraction of sand/gravel along the route of the trench to replace with sand/gravel from elsewhere wouldn't be a sensible approach and it would be better to use the existing sand/gravel on site. However, the pipeline may also sterilise sections of the Mineral Safeguarding Area (MSA) either side of the trench. The Mineral Resource Assessment (MRA) could consider whether it would be possible to extract the sand/gravel from these areas and use it along other sections of the pipeline trench, to avoid importing sand and gravel from further away.
- The area to the south of Thornton Green Farm is within an area where there is a high volume of streams and other surface water features. The presence of a high groundwater table would make extraction difficult and additional assessment would need undertaking on; the feasibility, how de-watering would work, the impact of de-watering on the local water table, the potential to affect the nearby Gowy landfill and the potential to affect (undermine) the adjacent M56. Further details / evidence of this could be provided as part of the MRA to justify why prior extraction is not viable in this specific location. Sand extraction in the Cheshire area often uses dredging, so further investigation would be required to assess if it is possible in this location and the potential impacts and associated costs.
- In the area north of Caughall the presence of clay within the Alluvium would likely make it impracticable and not economically viable to process such a small volume of material to remove the sand and gravel from the clay. Where has the evidence of clay within the alluvium been taken from? Further details / evidence of this could be provided as part of the MRA to justify why prior extraction is not viable in this specific location. Would the material in this area be suitable for use as fill within the pipeline trench to avoid the need to import sand and gravel from further away?

Regards

Ben

---

**From:** Morgan, Emily [REDACTED] >  
**Sent:** 29 November 2021 16:44  
**To:** GREENWOOD, Ben [REDACTED] >  
**Cc:** Corless, Natalie [REDACTED]  
[REDACTED]  
**Subject:** RE: HyNet - Mineral Resource Assessment

CAUTION: This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Thanks Ben

That is really helpful – they were the maps I was looking for but could not find.

I will await the comment from the policy team but it looks like we'll need an assessment based on your comments.

Kind regards

Emily



**Emily Morgan**

Principal Consultant, Ground and Water  
MSc, BSc (Hons), CGeol, EurGeol, FGS



---

**From:** GREENWOOD, Ben <[redacted]>

**Sent:** 29 November 2021 16:41

**To:** Morgan, Emily <[redacted]>

**Subject:** RE: HyNet - Mineral Resource Assessment

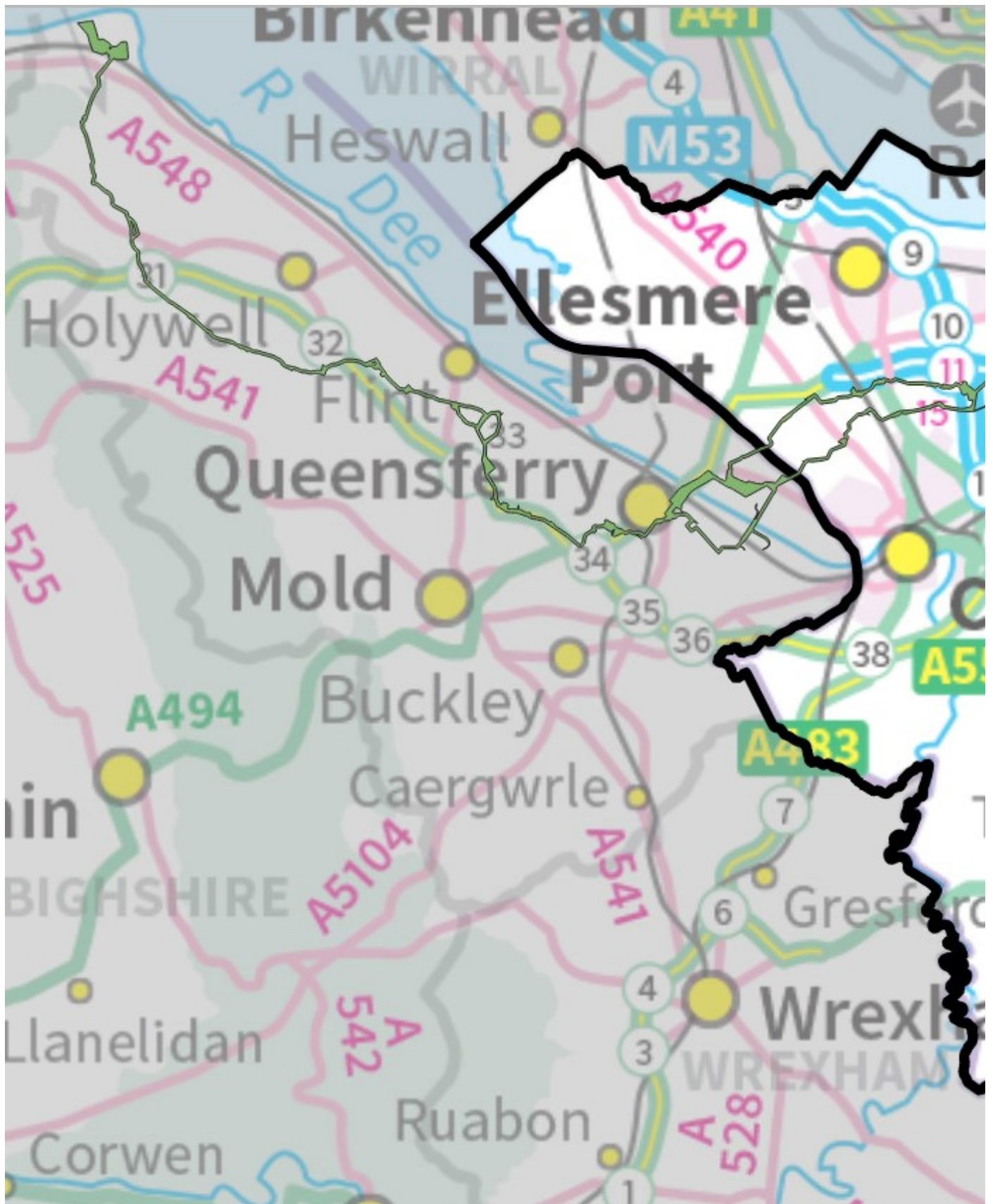
Hi Emily,

Thank you for your query. I will pass on your below questions to our policy team for comment.

Having already reviewed the mineral safeguarding matters with our policy team I can provide the following detail in respect the locations of mineral safeguarding areas in relation to the indicated pipeline route.

The first map shows the M 1 allocations, which are all to the east of the borough and don't overlap with the pipeline route at all. Clearer PDF maps of the M 1 sites are available at page 246-249 in the SD2 Submission policies map, which is available online at: [Cheshire West and Chester Council - Submission - Local Plan \(Part Two\) Land Allocations and Detailed Policies](#)

The second map shows the sand and gravel mineral safeguarding area (mapped as ENV 9 in the Local Plan (Part One) and also covered by policy M 2 in the Local Plan (Part Two)) and there are several areas where the pipeline route crosses the mineral safeguarding area. As such, for these areas it would be necessary to show how the application meets at least one of the criteria in policy M 2 and a mineral resource assessment may be required in order to do this. One of the affected mineral safeguarding areas already has the M56 running through it and another has the canal going through it, which will already have affected part of the resource and additional impacts resulting from the pipeline could mean that the whole of those safeguarded areas was sterilised. This will need to be considered in any mineral resource assessment.





Please note the maps are screenshots and can't be published in any format due to Ordnance Survey licensing issues. You can however view the local plan policy maps here: [Local Plan \(cheshirewestandchester.gov.uk\)](http://cheshirewestandchester.gov.uk) (in the map if you press t it will clear all layers then in options you can just add local plan part 1 layer and you can see all the MSAs in brown hatch as above.

I hope this is of assistance

Regards

Ben

---

**From:** Morgan, Emily [REDACTED] >

**Sent:** 29 November 2021 16:10

**To:** GREENWOOD, Ben [REDACTED]

**Cc:** Corless, Natalie [REDACTED]  
[REDACTED]

**Subject:** HyNet - Mineral Resource Assessment

**CAUTION:** This email originated from outside of the organisation. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi Ben

I am contacting you as the case officer for HyNet but I understand you may need to send this onto the Mineral Planning Officer at Chester and Cheshire West (CCW).

I am working on the Land and Soils section of the HyNet DCO application and am getting in touch regarding the Mineral Resources which are within the CCW boundary (I will email Flintshire County Council separately regarding resources in their jurisdiction).

I have reviewed the local CCW planning policy. In DM56 – Mineral Safeguarding Areas (MSAs) (text attached) it sets out CCWs requirements regarding mineral resourcing and planning. If it has been interpreted correctly then WSP would need to consider the potential for sand and gravel extraction only from any MSAs.

It states the MSAs are shown on the local policies map however I cannot seem to find them, it does however mention that all sand and gravel deposits as shown on the BGS mineral resource maps are MSAs. I have created a map (attached) which shows the current proposed route against the deposits shown on BGS mineral resource map.

I note the following:

- A 1km section of the pipeline would intercept 800m of sub-alluvial deposits (measured from east to west) (shown as Blown Sand on the BGS online viewer) to the south of Thornton Green Farm.
- The pipeline would intercept a 50m wide section of sub-alluvial deposits (shown as Alluvium – clay, silt and sand) to the north of Caughall.

Given the following points I do not think that prior extraction is feasible for such small areas of potential resource, however it would be good to hear your thoughts:

- The pipeline trench would be approximately 1.2m deep and approximately 1.0m wide (an easement of up to 25m will be placed upon the finished pipeline). The trench would need to be refilled with a granular material and therefore the extraction of sand/gravel only to be replaced with sand / gravel seems like a waste of resources.
- The area to the south of Thornton Green Farm is within an area where there is a high volume of streams and other surface water features. The presence of a high groundwater table would make extraction difficult and additional assessment would need undertaking on; the feasibility, how de-watering would

work, the impact of de-watering on the local water table, the potential to affect the nearby Gowy landfill and the potential to affect (undermine) the adjacent M56.

- In the area north of Caughall the presence of clay within the Alluvium would likely make it impracticable and not economically viable to process such a small volume of material to remove the sand and gravel from the clay.

I would welcome your comments on the above and I am happy to arrange a meeting (if required) to discuss any of the points raised.

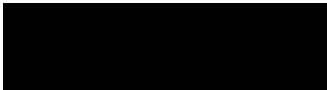
Kind regards

Emily



**Emily Morgan**

Principal Consultant, Ground and Water  
MSc, BSc (Hons), CGeol, EurGeol, FGS



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**Vincent, Tom**

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**From:** Hannah Parish [REDACTED]  
**Sent:** 08 December 2021 16:15  
**To:** Morgan, Emily  
**Cc:** Meynell, Gareth; Corless, Natalie; Greslow, Mike; Peter, Lara; Franklin-Losardo, Declan; Gary Nancarrow  
**Subject:** RE: Flintshire County Council HyNet Mineral Resources  
**Attachments:** HyNet DCO EIA Scoping Consultation Response FCC 30.06.21 Final.pdf

Emily,

**RE: Flintshire County Council HyNet Mineral Resources**

Further to your email of 29 November I can offer the following comments which I hope are of assistance.

As you have noted, the proposed route of the pipeline would transect; brick clay, primary shallow coal reserves, glaciofluvial deposits and secondary shallow coal. However, the mineral resource that would be affected by the pipeline and any required easement may already be sterilised by existing built development when applying an appropriate buffer zone, or the size of the resource plot maybe uneconomic to work due to the present of existing infrastructure and or development.

I think a good starting point would be to consider and quantify what mineral resource is already sterilised by existing built development, applying the appropriate buffer zone also considering other existing development such as powerlines, pipelines, roads, and considering the size of the resource plot. This sterilised mineral could be effectively discounting or sieved out from the mineral resource assessment.

The mineral resources assessment could then focus on the unconstrained mineral resource that would be sterilised by virtue of the pipeline itself and the required easement. The assessment should also take in to account any wider sterilisation that the proposal would result either side of the pipeline and easement, if the pipeline route transects a larger section of unconstrained mineral of economic importance.

With regards to coal deposits, as you have stated, the primary coal and secondary coal deposits are unlikely to be intercepted by the trenching due to the depth of the bedrock below the surface in this location. However, the pipeline and easement would introduce an element of sterilisation of this resource, and a sterilisation of a wider resource even if the pipeline lies above the bedrock and does not intercept it. That's said, PPW11 and the emerging LDP no longer requires coal to be safeguarded, whilst the adopted UDP requires coal to be safeguarded. It could be argued that PPW11 and the policy position carries more weight than the UDP (should it remain adopted at the time of the inquiry) to justify excluding coal out of the minerals resources assessment. Furthermore, it may be the case that the coal resource may already have been sieved out of the assessment as it may already be sterilised by existing built development.

Should there be unconstrained and unsterilised Clay deposits, the current adopted UDP seeks to safeguard clay resources therefore should be included in the assessment as the LDP may not be adopted at the time of the inquiry. As with coal, sterilisation of unconstrained clay as a direct result of the pipeline trench and easement, and any wider indirect sterilisation that the proposal would result in should be included in the assessment.

With regards to unconstrained/unsterilised sand and gravel deposits, this should also be included in the minerals resource assessment. Whilst I note that the trench would be infilled with any excavated sand and gravel which is welcomed, the linear nature of the pipeline may also result in sterilising a much wider area within the mineral safeguarding area than just the development itself, either side of the trench and easement. Therefore the mineral resource assessment should also take into account any indirect wider sterilisation that would result should the trench and easement intersect larger blocks of unconstrained mineral resource which may result in future extraction being economically unviable.



The mineral resource assessment should also considered the possibility of prior extraction of sand and gravel resource either side of the pipe trench and easement which could be used along other sections of the pipe that does not interact with sand thus avoiding importation of sand and gravel in the bedding of the pipeline.

The Council's consultation response to the DCO Scoping Request is attached and includes a section on Mineral Safeguarding which may also be of some assistance. Please come back to me if you seek any further clarification.

Kind Regards/Cofion Cynnes  
Hannah Parish

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Senior Minerals and Waste Planning Officer | Uwch Swyddog Cynllunio Mwynau a Gwastraff  
North Wales Minerals and Waste Planning Service | Gwasanaeth Cynllunio Mwynau a Gwastraff Gogledd Cymru  
Planning, Environment & Economy | Cynllunio, Amgylchedd ac Economi  
Flintshire County Council | Cyngor Sir y Fflint

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Cyn argraffu yr e bôst hon, ystyriwch eich cyfrifoldeb amgylcheddol os gwelwch yn dda.

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**I am currently working from home**



---

**From:** Morgan, Emily [Redacted]

**Sent:** 29 November 2021 16:51

**To:** Gary Nancarrow [Redacted]

**Subject:** Flintshire County Council HyNet Mineral Resources

Hi Gary and Hannah,

I have been passed your details in order to discuss the Mineral Resources within the Flintshire County Council (FCC) jurisdiction as part of the HyNet application (I have sent a separate email to Chester and Cheshire West).

I have prepared the attached plan which shows the current approximate pipeline route against the BGS mineral resources map. I note the pipeline transects; brick clay, primary shallow coal reserves, glaciofluvial deposits and secondary shallow coal.

The pipeline within Flintshire would involve the excavation of an approximately 1m wide and 1.2m deep trench that would then be backfilled. An easement of up to 25m would be in place at the surface.

**Coal Deposits**

The pipeline would intercept primary and secondary coal deposits based on the map. However, BGS online geology viewer indicates that superficial deposits overlay the coal bedrock deposits and given the shallow nature of the trenching the pipeline installation is unlikely to intercept the bedrock.

It is understood from the attached Flintshire Local Development Plan Background Paper 4 Minerals (labelled as FCC\_Minerals) that safeguarding of coal is no longer a requirement.

“PPW10 states that safeguarding of coal is no longer required, Policy EN23 does not require the submission of a prior extraction assessment for sites underlain by coal. The requirement for developers to address risks arising from past coal mining in Policy DM1 would secure prior extraction on sites underlain by coal where it is an appropriate means of remediation.”

N.B. The risks from past coal mining works are being picked up separately by EniProgetti.

**Glaciofluvial Deposits and Brick Clay**

The brick clay deposits appear to correspond to the extent of the Etruria formation (overlain by Glacial Till) and the glaciofluvial deposits appear to correspond with superficial glaciofluvial deposits on the geological mapping. As with the coal it is unlikely the pipeline trench would excavate into the Etruria bedrock through the Till deposits. However it is noted that the pipeline trench would excavate through areas of Glaciofluvial deposits. I note these are Category 1 resources within the guidance attached.

I would point out that extraction of sand/gravel from glaciofluvial deposits would result in the infilling of the area with sand/gravel.

Given the attached information and the above notes I would welcome your comments and the requirements for a formal mineral resource assessment on all or some of the proposed pipeline?

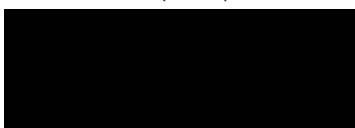
I am happy to discuss and if you think a phone call would be easier just let me know.

Kind regards

Emily



**Emily Morgan**  
Principal Consultant, Ground and Water  
MSc, BSc (Hons), CGeol, EurGeol, FGS



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Deallir na fydd unrhyw safbwyntiau, na chynghorion, na chasgliadau nac unrhyw wybodaeth arall yn y neges hon, nad ydynt yn berthnasol i waith swyddogol

Cyngor Sir y Fflint, yn cael eu cynnig na'u cadarnhau ganddo nac ar ei ran, ac felly ni fydd Cyngor Sir y Fflint yn derbyn unrhyw gyfrifoldeb am y rhannau hynny o'r neges.

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## Vincent, Tom

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**From:** Sharp, Jon (Bradford) GBR [REDACTED] >  
**Sent:** 16 May 2022 09:58  
**To:** Vincent, Tom  
**Subject:** RE: Minerals Resource Assessment as part of pipeline scheme - consultation

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

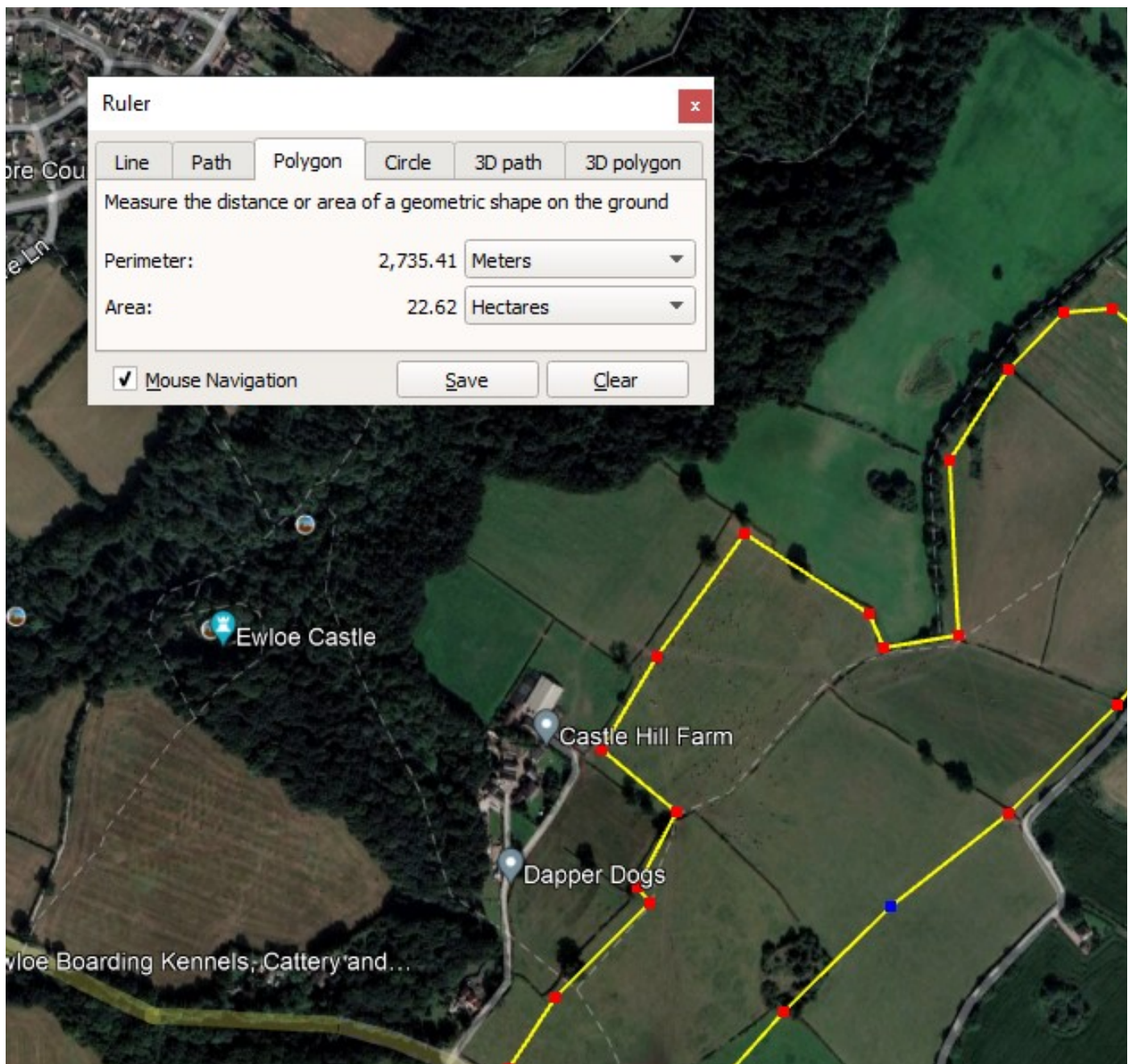
Hi Tom, responses attached from our lands and geology departments, a number of issues raised, you may have answers to some of the points raised, please advise any further questions

Kind Regards

Jon

The grading results provided suggest a poor quality deposit that probably isn't worth the planning difficulties. About 5 of the 40 or so gradings look good but a further drilling exercise would be required to determine if the good quality areas are extensive enough to make the site a worthwhile prospect.

Of the area highlighted it looks like approx. 22ha of land is mapped as glaciofluvial sand and gravel assuming a thickness of 8m there may be up to some 2.5Mt of sand and gravel (logs provided indicate predominantly sand). A site investigation would likely find thinning of the deposit at the margins and some poor quality material that would significantly reduce this figure. Also worth noting the presence of coal within the deposit as would be expected given the proximity to the coal measures strata.



From land and planning perspectives, I would say the site presents significant obstacles to mineral working as detailed below.

**Built Constraints**

- The site is split east/west by Shotton Lane. Shotton Lane itself is a single track road and thus unsuitable for HGV's. From a desk top review it's hard to see how you could access the site.
- Everything east of Shotton Lane looks to be constrained by a combination of the railway to the north east and housing to the south and east.
- The site is within 5km of Hawarden airfield (to the east) and therefore will be subject to airport safeguarding – bird strike risks from water based restoration would be a potential issue.

**Ecological Constraints**

- To the west of Shotton Lane, the land is adjacent to the Deeside and Buckley Special Area of Conservation for Great Crested Newts and the Connah's Quay Ponds and Woodland SSSI.
- To the south west is Ewloe Castle, a grade 2 listed building and therefore landscape and heritage asset setting will be significant issues.

**Land Use Constraints**

- The SAC and SSSI also form part of Wepre County Park and the land to the west of Shotton Lane is crisscrossed by a network of footpaths which link in to the castle and park. itself. The same land also appears to be crossed by a network of power lines.

In summary, from a desk top lands and planning review, the site would appear to present significant design, operational, amenity and environmental challenges and would need to hold a significant reserve to justify considering further.



Jon Sharp  
Regional Technical Manager  
Aggregates and Asphalt  
Hanson North, Central and MQP



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**From:** Vincent, Tom <Thomas.Vincent@wsp.com>  
**Sent:** 09 May 2022 15:48  
**To:** Sharp, Jon (Bradford) GBR <Jon.Sharp@hanson.biz>  
**Subject:** RE: Minerals Resource Assessment as part of pipeline scheme - consultation

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Hi Jon,

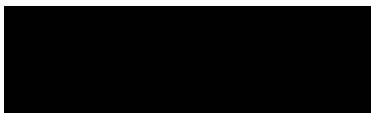
Thanks for this! Unfortunately all of the information that I have on the mineral deposits were attached to the previous email I sent over. As the ground investigation did not specifically target Mineral Deposits, our records don't actually capture the information from the area that I sent over to you.

I hope the information I did send can be of some use though, and can provide some sort of basis to form an opinion as to whether the mineral resources here appear economically / commercially viable for extraction prior to development.

Kind regards,  
Tom



**Dr Thomas Vincent**  
Assistant Geo-Environmental Consultant, Ground and Water  
BSc (Hons), FGS



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100 Wharfside Street  
Birmingham  
B1 1RT

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**From:** Sharp, Jon (Bradford) GBR [REDACTED]  
**Sent:** 09 May 2022 10:26  
**To:** Vincent, Tom [REDACTED]  
**Subject:** RE: Minerals Resource Assessment as part of pipeline scheme - consultation

Hi Tom, I have shared internally, a couple of questions from me – have any gradings been carried out on the boreholes? Also have any mechanical, chemical or physical properties been reported on the aggregate?  
Thanks  
Jon

[REDACTED]

Regional Technical Manager  
Aggregates and Asphalt  
Hanson North, Central and MQP

[REDACTED]

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**From:** Vincent, Tom [REDACTED]  
**Sent:** 09 May 2022 09:18  
**To:** Sharp, Jon (Bradford) GBR [REDACTED]  
**Subject:** RE: Minerals Resource Assessment as part of pipeline scheme - consultation

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Hi Jon,

Much appreciated. Thanks as well for taking the time to talk to me over the phone as well!

Kind regards,  
Tom



**Dr Thomas Vincent**  
Assistant Geo-Environmental Consultant, Ground and Water  
BSc (Hons), FGS

[REDACTED]

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---

**From:** Sharp, Jon (Bradford) GBR <[REDACTED]>  
**Sent:** 06 May 2022 12:04  
**To:** Vincent, Tom [REDACTED]  
**Subject:** RE: Minerals Resource Assessment as part of pipeline scheme - consultation

Hi Tom, thanks for this, I will have a look hopefully today and get back to you with our thoughts  
All the best  
Jon

[REDACTED]

Jon Sharp  
Regional Technical Manager  
Aggregates and Asphalt  
Hanson North, Central and MOP

[REDACTED]

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**From:** Vincent, Tom [REDACTED]  
**Sent:** 06 May 2022 10:53  
**To:** Sharp, Jon (Bradford) GBR [REDACTED]  
**Subject:** Minerals Resource Assessment as part of pipeline scheme - consultation

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Hi Jon,

Thanks for getting back to me earlier – great to chat to you.

A little bit of context to refresh you. WSP are involved in the design of a pipeline scheme which spans from Flintshire to Liverpool. The proposed route of the pipeline intersects several Mineral Safeguarding Areas and as a result, a minerals resource assessment is as part of the planning process. As part of the assessment we must consider whether the minerals intersected by the pipeline are economically viable enough to warrant extraction prior to the development, rather than being 'sterilised' by the development.

The primary area I have identified within a mineral safeguarding area which has not already been sterilised by existing development is located north of Ewloe Green. Details include:

- 46ha of undeveloped land adjacent a SSSI and within a green barrier zone
- Pipeline will truncate 7ha of the Mineral Safeguarding Area
- Deposits identified as glaciofluvial sand & gravels, but GI suggests glacial till
- BGS borehole records indicate that an opencast may previously have been situated there – this may have compromised minerals already?
- Logs suggest that the deposits include sandy gravelly clays, slightly gravelly silty sands, and sand and gravel.

I have attached a figure of the area I am referring to, as well as logs taken from within the mineral safeguarding area (marked by red squares on the figure). I have also taken particle size info from the preliminary ground investigation report. If you have time to give your informal opinion as to whether these deposits may warrant extraction prior to development, that would be extremely helpful.



Please let me know if you have any further questions!

Kind regards,  
Tom



**Dr Thomas Vincent**

Assistant Geo-Environmental Consultant, Ground and Water  
BSc (Hons), FGS



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