Appendix 9.1 AECOM Desk Study

Shetland Space Centre

Desk Study and Site Appraisal

Shetland Space Centre

Project Number : 60617516

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Quality information

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Revision History

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The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was undertaken between 14th November and 5th December 2019 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

The opinions expressed in this report and the comments and recommendations given are based on a desk assessment of readily available information and an initial site reconnaissance by an AECOM Engineer. At this stage intrusive investigations have yet to be undertaken at site to establish actual ground and groundwater conditions and to provide data for an assessment of the geo-environmental status of the site.

Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Reference to historical Ordnance Survey (OS) maps and/or data provides invaluable information regarding the land use history of a site. However, it should be noted that historical evidence will be incomplete for the period pre-dating the first edition and between the release of successive maps and/or data.

Table of Contents

1. Introduction

1.1 Background

AECOM Infrastructure & Environment UK Limited ('AECOM') was appointed by the Shetland Space Centre to undertake an initial Desk Study and Site Appraisal for a site proposed for the development as the Shetland Space Centre. The site is located at Lamba Ness, near Skaw on the island of Unst, which is part of the archipelago of the Shetland Isles in Scotland.

The area included within the initial study extends over approximately 245 hectares and includes access routes along the existing road network leading to the main site at Lamba Ness. The area being considered for the Launch Site extends over a smaller area, extending to185 hectares on Lamba Ness and was an active RAF Radar Station (RAF Skaw) during World War 2 (WW2).

A Site Location Plan (drawing no.60617518-ACM-XX-00-DR-CE-0001), is included within Appendix A.

1.2 Objectives and Aims

The main objective of the Desk Study and Site Appraisal is to provide background information relating to the general setting of the site and to highlight any potential constraints to the proposed development that may impact the planning process.

Specific objectives included:

- Provide information on the history of the site;
- Obtain information on the geological setting and underlying ground conditions; and
- Review present access routes to the site and assess possible alternatives.

The scope of services for the study included:

- Commissioning and review of a Groundsure Report;
- Review of publicly available web-based sources, including the British Geological Survey (BGS), Historic Environment Scotland and Scottish Natural Heritage; and
- Site Walkover.

2. Site Details

2.1 Site Location

The site is located on a peninsula called Lamba Ness which is on the north east of the island of Unst within the Shetland archipelago. The site is approximately 77km north east from Lerwick. Access to the site is gained from the B9087 via Norwick and then from an unclassified road to Skaw, where the most northerly property on the British Isles is located.

The main site on Lamba Ness is at approximate national grid coordinates HP 66646 15569.

2.2 Site Description and Topography

The main site extends east from the unclassified Skaw Road to the headland of Lamba Ness. Large coastal cliffs form the perimeter of the peninsula, some extending to a height of approximately 50m above sea level. The peninsula covers an area of approximately 185 hectares and was previously utilised by the RAF as an early warning radar station during WW2.

A Groundsure Report was purchased which provided historical Ordnance Survey (OS) maps and Lidar data was provided by the client. From a review of these sources, the ground levels across the site are indicated to fall from west to east, with the ground levels at the access to the site starting at approximately 65m above ordnance datum (m AOD) and falling to approximately10mAOD at its lowest point before rising again to approximately 30m AOD at the eastern tip. Using the Lidar data, a contoured plan was produced (drawing no. 60617518-ACM-XX-00-DR-CE-0010), along with a plan that assessed the slope angles across the site (drawing no. 60617518-ACM-XX-00-DR-CE-0011). Both drawings are contained within Appendix A.

To the west of the site, the land rises steeply to the Ward of Norwick at approximately 186m AOD and then on again to the present RAF Radar Station at Saxa Vord which is at a level of approximately 285m AOD.

2.3 Site History

A Groundsure Report was commissioned which included copies of historical OS maps for the site. It should be noted that no historic OS maps were available for the period between 1901 and 1970. This is assumed to be as a direct result of the site being occupied by RAF Skaw which was part of the Chain Home radar network which formed part of the defences of the Sullom Voe flying boat base.

Table 1 : Historic Map Summary

Source	Within the Site	Adjacent to Site
1878 County Series 1:10,560 map	There is a Cairn noted in the approximate centre of the site. There appears to be several buildings noted as Inner Skaw. Loch of Lambness is shown towards the east end of the site.	Approximately 250 to 750m north of the western end of the site a settlement named Skaw is present, consisting of several buildings, a foot bridge of the Burn of Skaw and at least two wells. To the west of the south west corner of the site there is a well noted. To the south off the south west corner of the site a property named Braehead is present above “The Clifts”.
1880 County Series 1:2,500 map	No significant changes.	No significant changes.
1900 County Series	No significant changes.	No significant changes.

1:10,560 map		
1901 County Series 1:2,500 map	No significant changes.	No significant changes.
	No historical maps available between 1901 and 1971	
1971 – 1972 National Grid 1:10,000	The properties associated with Inner Skaw no longer appear. Several new buildings (approx. 40 in number) are now shown on the site. These are understood to be from the former RAF radar station on the site. None of the buildings are named.	Iron age potter found now noted north east of Skaw. Several track/roads now shown surrounding the site, including three cattle grids.
2001 National Grid 1:10,000	Two quarries are shown on the site. Less of the (understood to be derelict) buildings are shown on the site.	One quarry shown immediately west of the site.
2003 Landline 1:1,250	No significant changes.	No significant changes.
2010 National Grid 1:10,000	No significant changes.	No significant changes.
2019 National Grid 1:10,000	Fewer (derelict) buildings are shown on the site.	No significant changes.

Due to the lack of historic OS maps, a further literature review was undertaken on-line. Detailed information was obtained from a blog titled, “A History of RAF Saxa Vord”, created by Gordon Carle. From the anecdotal information provided in the blog, there was a great deal of activity on the site during WW2 with approximately 50 buildings constructed to house the 150 servicemen stationed at the site. Many of these buildings remain on site, albeit in a state of disrepair or ruin. The four radio masts were removed. However, their original foundations remain visible.

A summary of the information pertaining to the site that was obtained from the blog and other on-line sources is included in Appendix B

A copy of the Groundsure report can be found within Appendix H.

2.4 Archaeology

A review of PastMaps, the Historic Environment Scotland online interactive viewer, indicates that the former RAF base on Lamba Ness is a Scheduled Monument. A description of the Scheduled Monument is provided below with further details provided in Appendix C.

Scheduled Monument Skaw, radar station (SM13097)
The monument comprises the remains of a Second World War Chain Home radar station. The station is spread over two sites, a main and a reserve site, with over 50 buildings and structures reflecting its core early warning function and with supporting infrastructure and domestic blocks. The radar complex is the furthest north of its type in the United Kingdom. It is located on rough grazing land over two headlands (Lamba Ness and Blue Jibs) at the northeast corner of Unst.

This monument is of national importance because it has an inherent potential to make a significant addition to the understanding of the past, in particular the advance of radar technology and the development of an early warning

system protecting the sea and airspace around the United Kingdom. It survives in good condition as a complete example of the technical, support and domestic buildings and structures necessary to provide an early warning reporting function. The loss of the monument would significantly diminish our future ability to appreciate and understand the scale of the efforts employed on the home front in the defence of Britain.

In addition to the site being a Scheduled Monument, many of the buildings built during the war also have entries within Historic Environments online catalogue of National Records (Canmore). There are also a number of structures which pre-date the war and those with ancient archaeological interest including a cairn. Details from Canmore are summarised in Appendix D.

2.5 Sensitive Sites

A review of the Scottish Natural Heritage online interactive viewer, SiteLink, has indicated that the site at Lamba Ness is bounded by a Site of Special Scientific Interest (SSSI). There is a second SSSI further south within the village of Norwick which is close to an area where a new alignment for an access road is being considered.

The site adjacent to Lamba Ness, the **Norwick SSSI (Structural and metamorphic geology : Caledonian Structure)** is described as follows:

“Comprises rock outcrops at The Taing and Shure Taings at the head of Nor Wick and cliff exposures on the north side of the bay. The rocks are principally of interest because they show the boundary between the serpentine rocks of the Unst “ophiolite”, which were originally ocean floor, and the continental rocks that make up the rest of the island.”

This SSSI is contained within a Geological Conservation Review site, which contains features of national and international importance that are considered to qualify for designation in Sites of Special Scientific Interest (SSSIs).

The second SSSI within Norwick, the **Norwick Meadows (Valley Fen and Sand Dunes)** is described as follows:

“Norwick Meadows SSSI is located in the north-east of Unst, the most northerly isle of Shetland. The site consists of a valley fen, with swamp, mire and meadows along the course of the Burn of Norwick, from the Mires of Northdale through to the Norwick Meadows, and the sand dune complex at Norwick Beach.”

Refer to Appendix A for the Constraints Plan (drawing no.60617518-ACM-XX-00-DR-CE-0012), showing the location of the SSSI’s and Geological Conservation Review site.

2.6 Site Geology

The following summary of the geology at the Lamba Ness site is based on a review of the BGS interactive map. The superficial geology predominantly comprised of glacial till. These deposits vary in lithology and are typically poorly sorted sandy, silty clay with possible laminated sand layers and coarse granular material. There is an area of blown sand approximately half way along the peninsula. Where the top of the cliff faces are exposed, a thin layer of superficial material overlies the exposed rock.

Based on the available aerial photography it is expected that peat deposits may be present locally, particularly on flat lying areas to the western side of the site. There appears to be many drainage ditches cut through the peat and areas of standing water. It is also expected that made ground associated with the historic development across the site will be present is areas previously developed.

The bedrock geology is formed from the Skaw Intrusion – a Porphyritic Microgranite which can be described as a medium-grained intrusive igneous rock with several dyke intrusions of North Britain Siluro-Devonian Calc-Alkaline Lamprophyre. There is a fault recorded approximately ¾ of the way along the peninsula.

Refer to Appendix E for extracts from the Drift and Solid geological maps for the site.

2.7 Hydrology

There is no major water course within the main Lamba Ness site. However, there are 3 smaller natural streams following the existing topography and flowing to the coast. Two of these flow to the north with a single stream flowing to the south. Drainage ditches have been cut in the flatter areas to aid drainage which flow into the natural streams. Lamba Ness site is a peninsula and is therefore surrounded by the North Sea on three sides.

Within the full development site there are many drainage ditches and small unnamed water courses, and the Burn of Norwick is located within the village of Norwick and the Norwick Meadows SSSI.

2.8 Hydrogeology

The bedrock on site is classified as a concealed aquifer, aquifer of limited potential and a region without significant groundwater. SEPA classified the groundwater on Unst as good quality in 2017.

2.9 Radon

The Groundsure reports the site to be in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level. As such, any buildings constructed on the site may require Radon protection measures.

2.10 Flooding

The Groundsure report shows the Lamba Ness to have localised areas at risk from Surface Water flooding (Pluvial). Further information can be found within the Groundsure report contained in Appendix H.

2.11 Unexploded Ordnance

Given the past use of the site as an RAF Radar Station, it was considered there was a reasonable risk it was subjected to attack during World War Two. As such Zetica UXO was consulted and initially their free maps were reviewed. These maps classified the site as low risk from potential unexploded bombs, with low risk classified as having 15 bombs per 1000 acres or less.

During an internet review of the sites history and information provided on the blog site “A History of RAF Saxa Vord” which provides anecdotal information from accounts provided by local residents and RAF personnel who were posted at RAF Saxa Vord, it was found that the site was targeted by both bombs and machine gun fire from German planes. The initial attacks prompted the installation of the anti-aircraft gunning positions.

This information was highlighted to Zetica UXO who in turn provided a Pre-Desk Study Assessment (PDSA) that contains a brief summary report detailing what sources of Unexploded Ordnance (UXO) (if any) may be present and whether further detailed desk-based assessment is required. This PDSA concluded that a detailed desk study is required to assess, and potentially zone, the UXO hazard level on the Site.

A further website called “War State and Society” was consulted which provides a collection of information on the domestic situation during WW2 which references 11 UK government agencies including The National Archives. This website provides an interactive map called Bombing Britain which comprises an air raid map showing the location of 32,000 German air raids on the UK. This indicates that on the RAF Skaw site 4 bomb attacks were undertaken.

Information from the above can be found in Appendix F.

3. Site Walkover

3.1 Lamba Ness Site

A detailed site walkover was undertaken by AECOM staff on Tuesday 19th November 2019. Due to the potential risk of unexploded ordnance (UXO), no intrusive investigation was undertaken at this stage.

Photographs were taken, and buildings and other features on site have been identified and summarised on drawings. Names and uses of buildings have been obtained from various sources, including the 'History of Saxa Vord', and other websites and drawings.

A subsequent visit to Unst Heritage Centre in Haroldswick and Shetland Museum and Archives in Lerwick was also carried out, which uncovered more useful information on the site, specifically relating to the various buildings and their use during the operation of the radar station.

Several buildings remain on the site, in various states of disrepair or ruin, including transmitter and receiver buildings, bunkers, gun emplacements, and the remains of the power station. The original crofters cottage and various dry-stone walls also remain.

An unsurfaced access track runs west-east along the full length of the peninsula, which would have provided access to each of the main buildings during the operation of the radar station. A section of this track towards the eastern end is built up where the existing ground level dips down. A cast in-situ concrete culvert passes underneath the track at this point.

Three small quarries have been identified on site. Two adjacent to the site entrance, and another approximately 600m further east. These quarries are likely to have been a source of roadstone for the access track to the radar station.

Bomb craters (both known and potential) were identified on site. These were further verified by information shown on historical drawings.

At many locations along the sea cliffs and at the quarries within the site, the soil profile was clearly exposed. This indicated that the superficial deposits comprise topsoil / peat overlying glacial till with rock at shallow depth. The depth of peat is generally of the order of 0.5m, where visible at sea cliffs and excavations at quarries. Drainage ditches are generally cut to a depth of up to 1m below surrounding ground level and are predominantly in peat.

A number of natural streams mainly flowing to the north were noted. These are fed by drainage ditches cut through areas of peat. A couple of small lochans are also present on the site.

A selection of photographs is contained within the Appendix G. Drawings 60617518-ACM-XX-00-DR-CE-0013 & 0014, which provide details of the locations of the photographs are contained within Appendix A.

3.2 Local Access Routes

If is anticipated that for access to the site, the existing road network across Unst will generally be adequate, but a closer visual inspection of local access roads nearer the site was carried out during the site visit.

It should be noted however that this visual inspection was purely an initial assessment of the potential route options. As the project progresses, a more detailed appraisal and specific design proposal exercise will be carried out.

3.2.1 Haroldswick to Saxa Vord Resort

For the section between the A968 approaching Haroldswick and the four-way junction at Saxa Vord Resort, three route options have been considered, and were assessed during the site visit. These route options are shown on drawing number 60617518-ACM-XX-00-DR-CE-0003, contained in Appendix A. A selection of photographs for each of the routes are included in Appendix H, with details of the locations of the photographs show on drawing 60617518-ACM-XX-00-DR-CE-0015, contained in Appendix A.

3.2.1.1 Route option 1.

This route option is from the junction of A968 / B9086 / Beach Road, and runs northwest along the B9086, then turns northeast along an unclassified road past the Unst Heritage Centre, and onwards along the B9087 to the four-way junction at Saxa Vord Resort.

Generally, the road is 2.5m-3.5m wide, with passing places. Steep-sided drainage ditches run along both sides of the road, with some small diameter culverts passing under. The road surface is in generally good condition.

This route is considered to be a viable option, with only minimal localised widening / additional passing places likely to be required.

3.2.1.2 Route option 2.

The route option is from the junction of A968 / B9086 / Beach Road, and runs northeast along Beach Road, then turning left onto B9087, and onwards towards Route option 1 at the Unst Heritage Centre.

Generally, the road is 2.0m-2.5m wide, with very few passing places. The road surface is in generally poor condition. The junction with Beach Road is quite a tight turn and has poor visibility for oncoming traffic. Two tight 90° bends along the route would likely require some localised widening.

Due to the constraints noted above, this route is not considered a viable option.

3.2.1.3 Route option 3.

This route option is from the junction of A968 / B9086 / Beach Road, and runs northeast along Beach Road, following the coast, and onwards through Valsgarth to the four-way junction at Saxa Vord Resort.

Generally, the road is 2.5m-3.0m wide with passing places. The road surface is in generally good condition. Some steep-sided drainage ditches run alongside the road, and several small diameter culverts pass under it.

This route is considered to be a viable option, with only minimal localised widening / additional passing places likely to be required.

3.2.2 Saxa Vord Resort to Site

For the section between the four-way junction at Saxa Vord Resort and the Site entrance, three route options have been considered, and were assessed during the site visit. These route options are shown on drawing 60617516-ACM-XX-00-DR-CE-0003, contained in Appendix A.

3.2.2.1 Route option 4.

This route currently provides existing access to the site. From the four-way junction at Saxa Vord Resort, it runs northeast along the B9087 to Norwick, then turns onto an unclassified road (part of which is noted as Holsens Road), and onwards to the site entrance.

The section along B9087 is generally 3.0m-3.5m wide, with passing places. The road surface is generally good.

The section along the unclassified road is generally 2.0m-2.5m wide, with passing places. The road surface is generally good. One section of the road is particularly steep, with gradients of around 1:8. The road continues as generally 2.0m-2.5m wide with passing places and 4no. 3m wide cattle grids, before reaching the site entrance.

This route is considered a viable option, with only minimal localised widening / additional passing places likely to be required. A closer analysis of the steep gradients would be required.

3.2.2.2 Route option 5.

This route option is from the four-way junction at Saxa Vord Resort and runs northwest along an unclassified road (this road provides access to the Saxa Vord Radar Station), before turning northeast to Northdale.

The road is generally 2.0m-2.5m wide, with passing places.

From Northdale, a new section of road, approximately 450m long would require to be constructed, to connect to the existing road noted in option 4. This would generally follow an existing rough track but would require to overcome some steep gradients.

This route is considered a viable option, albeit requiring some new road construction. The existing road would require some localised widening and additional passing places.

3.2.2.3 Route option 6.

This route option is from the four-way junction at Saxa Vord Resort and runs northeast along the B9087 and through the settlement of Norwick. From here, it continues up the steep slope of a now-closed road historically referred to as 'the Floggie'. This road is generally 1.5m-2.0m wide and has been closed for a number of years as landslides and erosion have left the road in a state of disrepair. It is completely impassable for vehicles.

Due to the current condition of the road, and the likely cost involved in repairing, widening, and consolidating it, this route is not considered a viable option.

3.3 Baltasound Harbour

Baltasound Harbour, located approximately 9km south of the site, has been identified as a potential jetty for bringing in materials by sea. A visual inspection of the harbour was carried out during the site visit.

According to the Shetland Islands Council website, Baltasound Harbour has 160m of berthage, and 5m deep water.

The harbour appears to be in adequate condition, though it is noted that no crainage currently exists.

4. Conclusions

4.1 Lamba Ness Site

The drift and solid geology across the site comprises the following:

- Drift geology – the superficial deposits comprised topsoil/peat overlying a glacial till which is described as a poorly sorted sandy, silty clay with possible laminated sand layers and coarse granular material.
- Solid geology – bedrock comprises a medium-grained intrusive igneous rock (Porphyritic Microgranite – Skaw Intrusion) with several dyke intrusions.

The soil profile visible in quarry faces and at the edges of the sea cliffs confirms the above and indicates that there is only a shallow covering of superficial deposits of between approximately 0.5m and 1.0m depth over the rock.

Peat was also visible in drainage ditches cut through the flatter areas of the site. In some areas the peat extended to the base of the drainage ditches reaching a depth of approximately 1.0m. It is considered that deeper accumulations of peat are likely to occur across the site within these flat lying boggy areas.

As no intrusive investigation was possible due to the potential risk from UXO, the range of depths of peat and depth to rockhead was unable to be confirmed. This needs to be verified by a ground investigation targeted to the development needs.

Quarries have been developed at three locations within or immediately adjacent to the site. It is considered that the material won from the quarries would have been used as roadstone in the construction of the access track.

The sea cliffs that surround the peninsula vary in height up to a maximum of approximately 50m above sea level. The rocks exposed in the cliffs along the south western corner of the site are recorded as being a SSSI in terms of their Geological Importance.

The site is considered to be with in a Radon Affected Area. As such, any buildings constructed on the site as part of the development may require Radon protection measures.

The Lamba Ness site was previously developed for use as a RAF Radar Station during WW2. Due to its previous use there are a number of potential hazards and constraints to development within the site. These are summarised below:

- The site is a Scheduled Monument
- There are numerous derelict buildings located across the site relating to the WW2 activities
- Other buildings/structures/areas of interest which pre-date the WW2 which are recorded by Canmore and are of archaeological interest.
- Made ground and buried foundations associated with the previous development at the site remain in place.
- The site was attacked on a number of occasions during WW2 with bombs dropped. Therefore, there remains a risk from UXO across the site.
- A magnetometer survey should be undertaken prior to excavation at each exploratory hole position as part of the ground investigation in order to clear the excavation for UXO.

4.2 Site Access Routes

As noted in Section 3.2 above, an initial visual assessment of the local road network was carried out, to establish viable options for construction traffic site access. It should be noted again however, that this was purely an initial overview, and did not target particular areas or specific road improvements.

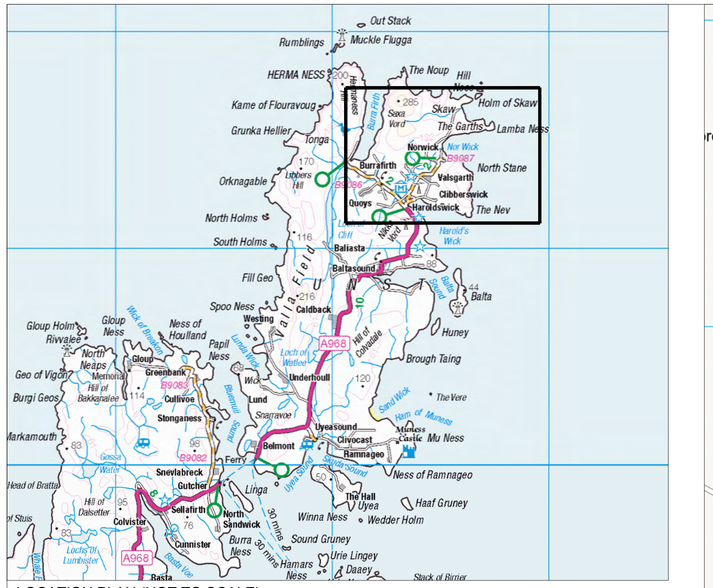
As the project progresses, a more detailed appraisal and specific design proposal exercise will be carried out.

The assessment concluded that many of the options noted above are potentially viable, but it is noted that these options may be affected by such factors as cost, landowner agreements, environmental constraints, etc. Further discussion between Shetland Space Centre, Shetland Island Council, and local landowners will be required.

A development strategy considering short-term and long-term works, and a phased approach based on the preferred route should be adopted. As the project develops, scheme drawings showing layouts, alignments, typical widths, vertical geometry, localised widening, and additional passing places will be developed.

Appendix A Drawings

Project Management Initials: Designer: EP Checked: CGY Approved: CGY ISO A1 594mm x 841mm



LOCATION PLAN (NOT TO SCALE)

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Notes

REDLINE APPLICATION BOUNDARY

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr

Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60617516

Sheet Title

SITE PLAN

Sheet Number

60617516-ACM-XX-00-DR-CE-0001

Scale: 1:10,000 **Rev:**

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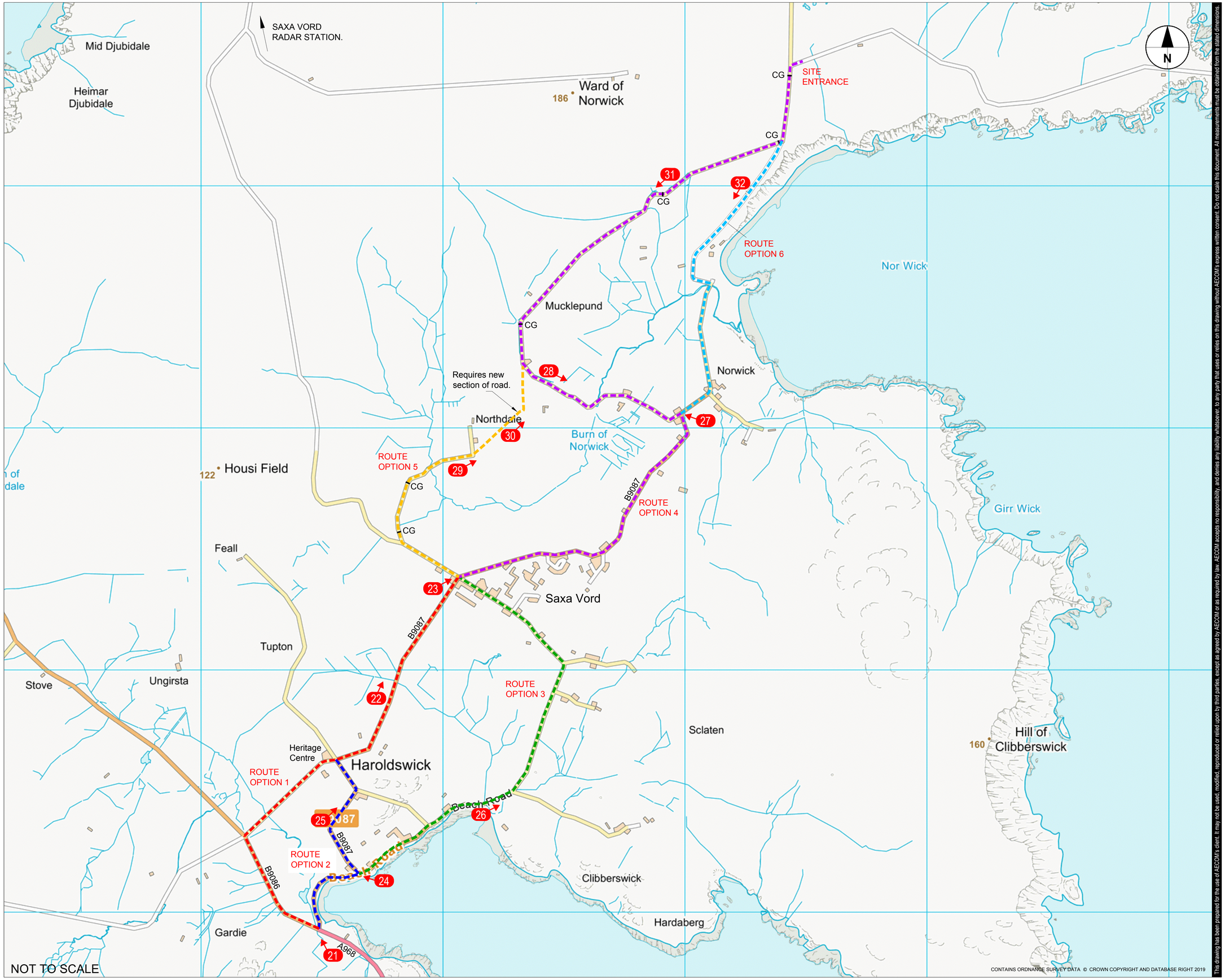

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Notes

- ROUTE OPTION 1
- ROUTE OPTION 2
- ROUTE OPTION 3
- ROUTE OPTION 4
- ROUTE OPTION 5
- ROUTE OPTION 6

21 PHOTOGRAPH LOCATION & DIRECTION

REFER TO AECOM SITE APPRAISAL REPORT FOR PHOTOGRAPHS.

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr

Key Plan

Purpose Of Issue

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Sheet Title

SITE ACCESS OPTIONS - SAMPLE PHOTOGRAPH LOCATIONS

Sheet Number

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01 PHOTOGRAPH LOCATION & DIRECTION

REFER TO AECOM SITE APPRAISAL REPORT FOR PHOTOGRAPHS.

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr

Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60617516

Sheet Title

SAMPLE SITE PHOTOGRAPHS LOCATION PLAN 1

Sheet Number

60617516-ACM-XX-00-DR-CE-0013

Scale: Not to Scale   Rev:

Project Management Initials: Designer: BS Checked: DR Approved: CGY ISO A1 594mm x 841mm

Last saved by: BRUCE.SHEARER(2019-12-02) Last Plotted: 2019-12-05
Filename: \\UKGLASFP01.SCOTTWILSON.CO.UK\MOU9\MOU9 RJD\60617516 SHETLAND SPACE CENTRE\601 CAD\02 - SHEETS\60617516-ACM-XX-00-DR-CE-0600.DWG

The Punds
285 Saxa Vord
Skaw
Burn of Skaw
Outer Djubidale
Skoga Dale
Nerva Dale
Mid Djubidale
Heimar Djubidale
186 Ward of Norwick
The Ness
Muckle Flugga Shore Station
Nor Wick
Mucklepund
Norwick
Budabrake
Northdale
Burn of Norwick
Burn of Sulerdale
122 Housi Field
Girr Wick
Burrafirth
B9086
Feall
SAXA VORD
Tupton
Stove
Ungirsta
Quoys
Haroldswick
Sclaten
160 Hill of Clibberswick
B9087
Beach Road
Beach Road
Clibberswick
Mill Burn
Hardaberg
Gardie
The Dale
Harold's Wick

0 250 500 m
1:10000

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Notes

- REDLINE APPLICATION BOUNDARY
- SCHEDULED MONUMENT SITE
- GEOLOGICAL CONSERVATION SITE
- NORWICK MEADOWS SSSI SITE
- NORWICK SSSI SITE

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
A	05/12/19	FIRST ISSUE	BS/DR/CGY

Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60617516

Sheet Title

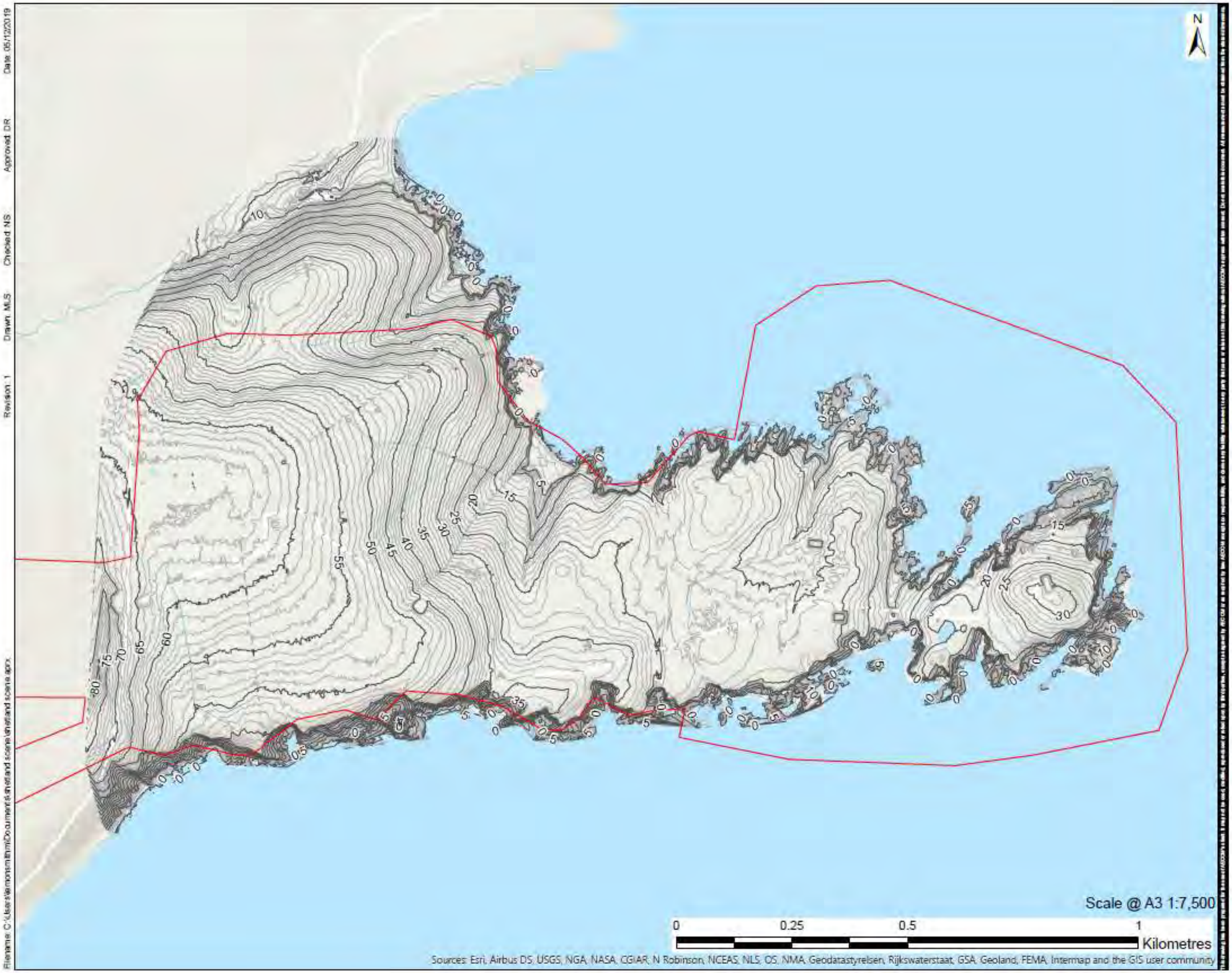
CONSTRAINTS PLAN

Sheet Number

60617516-ACM-XX-00-DR-CE-0012

Scale: 1:10,000 **Rev:** A

Revision 1 | Drawn MLS | Checked NS | Approved DR | Date: 05/12/2019



Filename: C:\Users\simon.smith\Documents\shetland scene\shetland scene.aprx

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LEGEND
- Redline Application Boundary
- Contours - 1m
- Contours - 5m

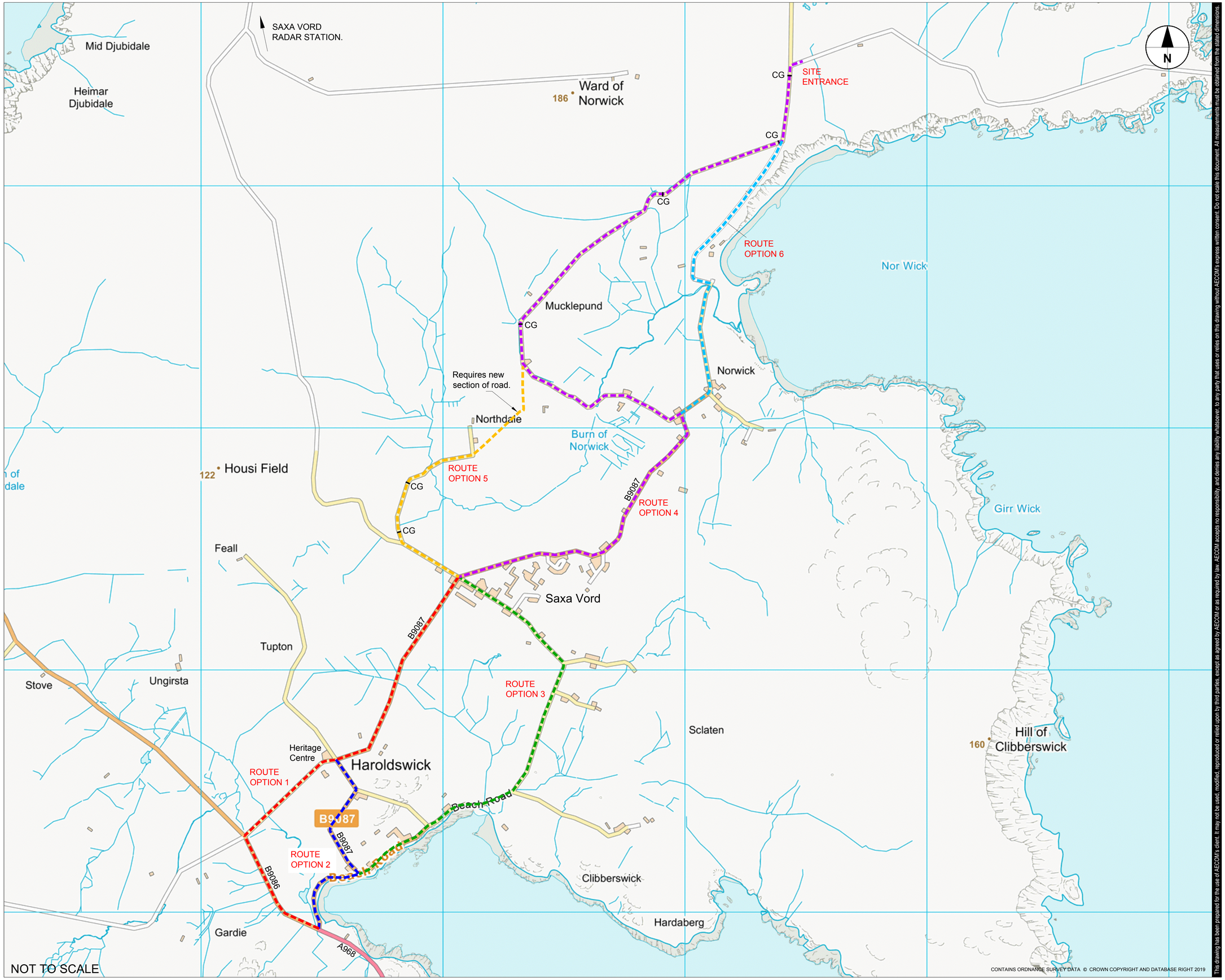
NOTES

ISSUE PURPOSE
FOR INFORMATION

PROJECT NUMBER
60617516

SHEET TITLE
LiDar Contoured Plan

SHEET NUMBER
60617516-ACM-XX-00-DR-CE-0010



Project Management Initials: Designer: EP Checked: CGY Approved: CGY ISO A1 594mm x 841mm

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Notes

- ROUTE OPTION 1
- ROUTE OPTION 2
- ROUTE OPTION 3
- ROUTE OPTION 4
- ROUTE OPTION 5
- ROUTE OPTION 6

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr

Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60617516

Sheet Title

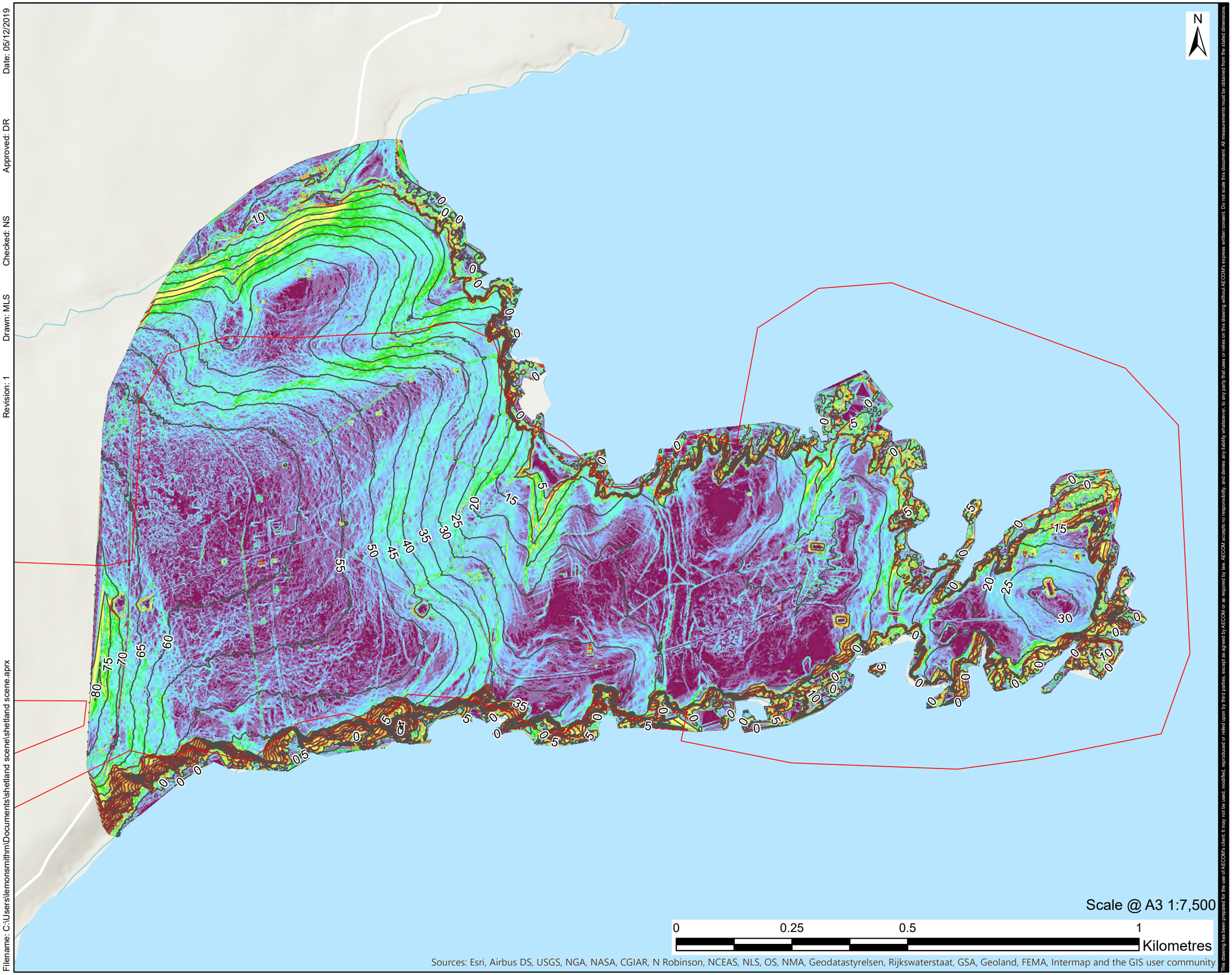
SITE ACCESS - ROUTE OPTIONS

Sheet Number

60617516-ACM-XX-00-DR-CE-0003

Scale: Not to scale **Rev:**

Date: 05/12/2019
Approved: DR
Checked: NS
Drawn: MLS
Revision: 1



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LEGEND

- Redline Application Boundary
- Contours - 5m

Slope Angle
Value

- ≤ 2
- ≤ 4
- ≤ 6
- ≤ 8
- ≤ 11
- ≤ 14
- ≤ 17
- ≤ 21
- ≤ 30
- ≤ 45
- ≤ 90

NOTES

ISSUE PURPOSE

FOR INFORMATION

PROJECT NUMBER

60617516

SHEET TITLE

LiDar Slope Angles Plan

SHEET NUMBER

60617516-ACM-XX-00-DR-CE-0011

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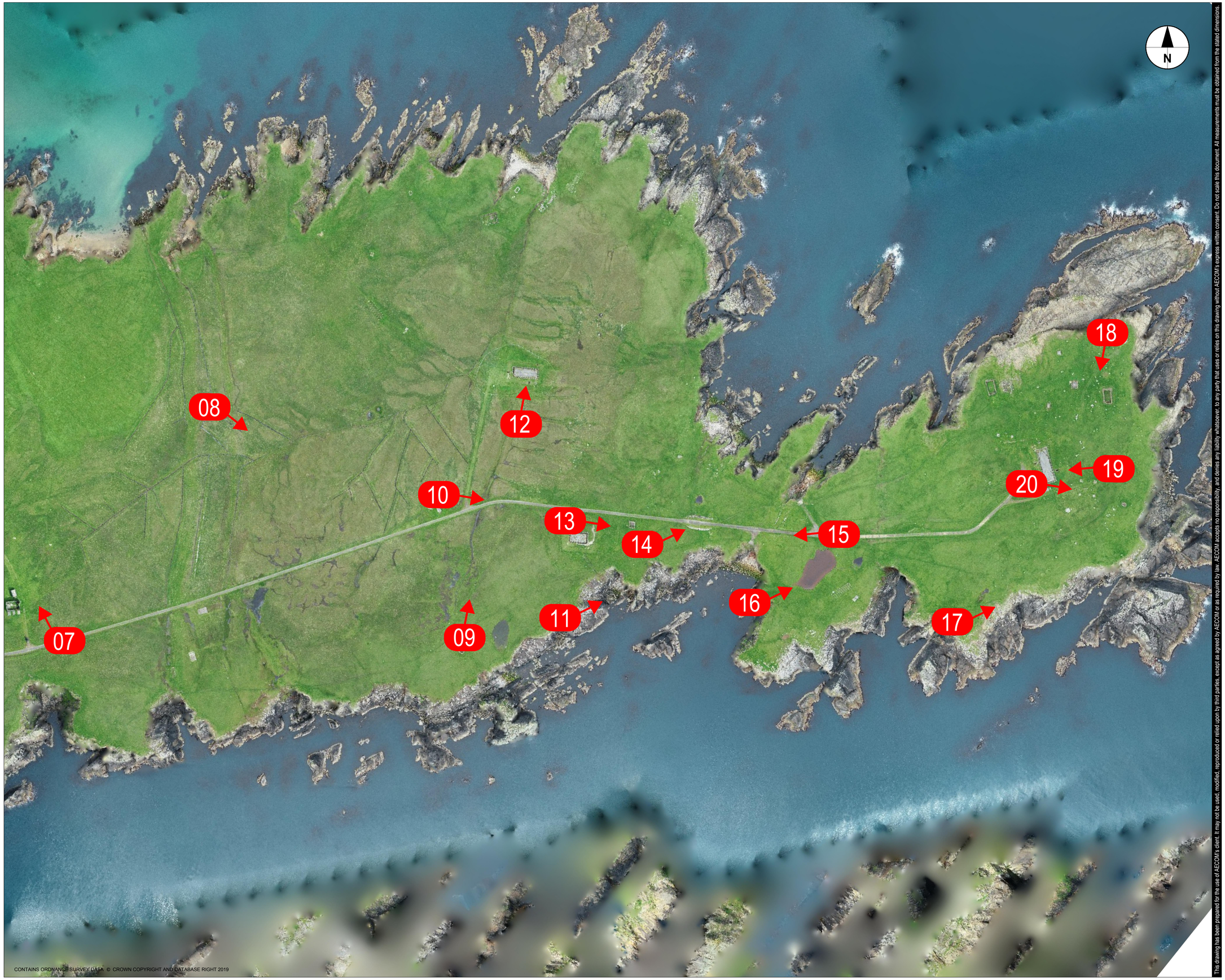
Filename: C:\Users\lemonsmithm\Documents\shetland scene\shetland scene.aprx



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Project Management Initials: Designer: EP Checked: CGY Approved: CGY ISO A1 594mm x 841mm

Last saved by: EUAN.PROUDFOOT(2019-12-05) Last Plotted: 2019-12-05
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01 PHOTOGRAPH LOCATION & DIRECTION

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Key Plan

Purpose Of Issue

FOR INFORMATION

Project Number

60617516

Sheet Title

SAMPLE SITE PHOTOGRAPHS
LOCATION PLAN 2

Sheet Number

60617516-ACM-XX-00-DR-CE-0014

Scale: Not to Scale **Rev:**

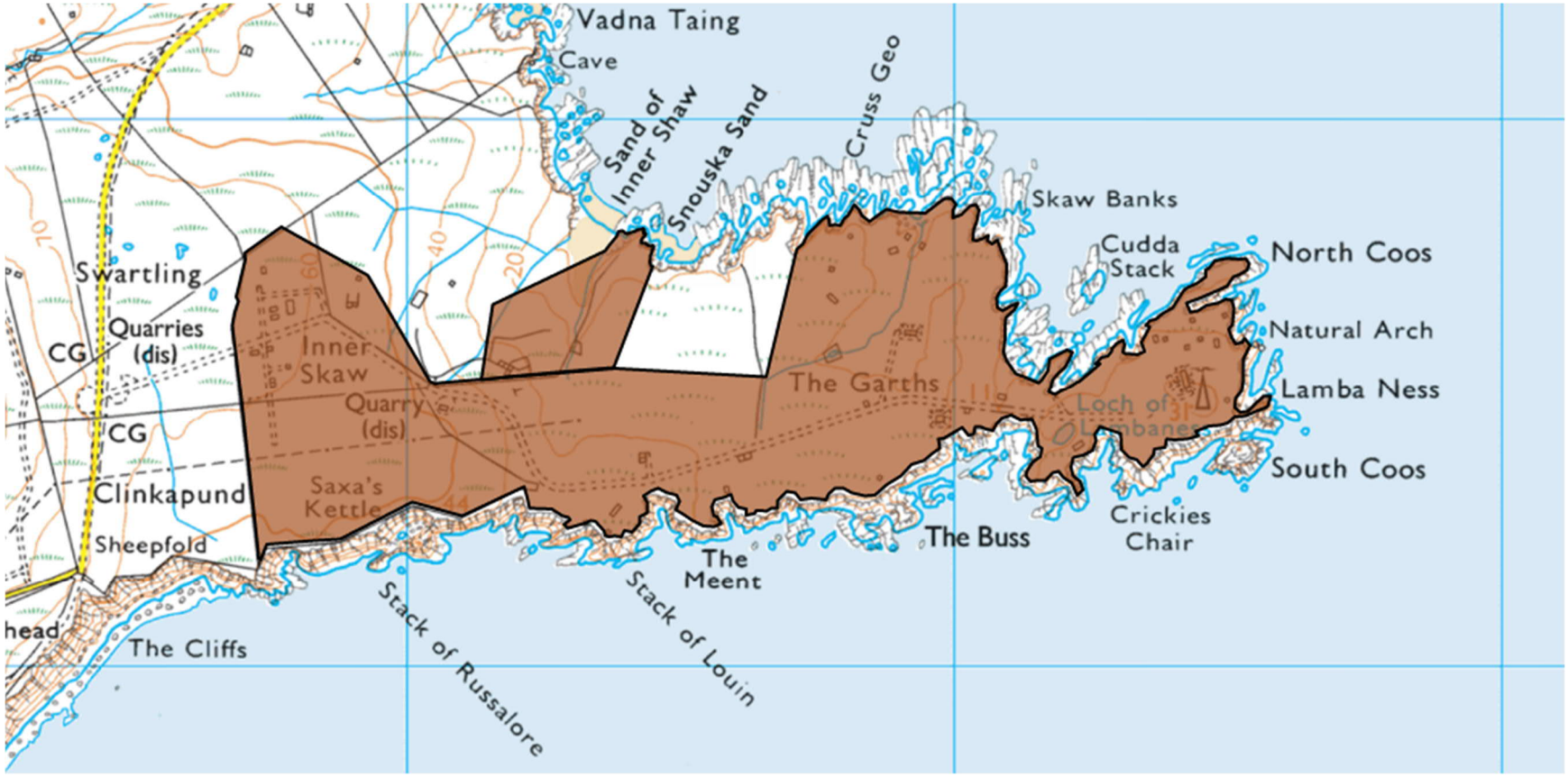
Appendix B Site History

Anecdotal Information

Source	Description
https://en.wikipedia.org/wiki/Skaw,_Unst	During World War II, the Royal Air Force built the Chain Home Radar Station at Skaw. A combined Coastal Defence U-boat and Chain Home Low station was also built at Saxa Vord; after the war this became a ROTOR radar station. RAF Saxa Vord continued as a radar station after the end of the ROTOR programme.
http://ahistoryofrafsaxavord.blogspot.com/2018/04/a-history-of-raf-skaw-ames-no56-part-1.html?_sm_au_=iVV0NJ3F3fj340nHkMMGvK6FH3tTM	In November 1940 servicemen arrived on Unst to begin construction of the RAF "Radar" base at Skaw. The Advance Chain Home (ACH) elements labelled were 3 brick built blast walls - each of the three would have protected a wooden hut, and the metal mountings for two 90' (27m) wooden towers. one of the servicemen in the first batch to arrive, describes the accommodation thus: *The domestic site, which was about half a mile inland from the point, consisted of about 7 large nissen huts and one small one. Four of these were our billets, 2 were stores huts and the remaining one was two-thirds the dining hall and one-third canteen. The small one was the CO's Quarters.* The equipment shipping list also included 105' guyed masts (number unspecified). Any airman who thought that a posting to the remote island of Unst would be a "safe billet, away from enemy action" had a rude awakening quite early on. Another quote, this time from Freddie Flowers: "*We had been on site for 3 or 4 weeks, when one morning we were all indoors keeping warm when suddenly a Dornier appeared at about 500' machine gunning our living quarters. He circled us 2 or 3 times and you could clearly see the gunners shooting at us. At the first shots we ran outside with our rifles, which were the only defence we had, and I, like most of the others, took cover behind a tuft of grass and returned his fire. Our C.O. was rushing about firing his revolver into the air and shouting "take cover". Behind what I am not sure.* *The technical site, which was not yet operational, was not attacked. On checking the damage, we were amazed to find no one had been hurt. Our billets were full of holes and so were our clothes and equipment which were hanging on the walls. The worst was the dining hall, the tables were riddled with bullets. Bottles of sauce, glass and crockery were in pieces. If we had been eating at the time of the attack there would have been many casualties.* *As a result of this attack, a detachment of Argyle and Sutherland Highlanders were sent to defend us and two or three machine gun posts were established, About a week after their arrival, one evening they broke into the storeroom and drank the entire stock of rum, The snow was about 3 feet deep and we had to search the area in the dark to get them all inside before they froze to death. We were not pleased but, I'm pleased to say, the rum was replaced*".
https://ahistoryofrafsaxavord.blogspot.com/2018/10/a-history-of-raf-skaw-ames-56-post-war.html	With the discovery of North Sea Oil two new masts were erected for navigation/communication purposes. The first, and smaller of the two, was erected just to the south of the old CH Receiver Block. It was owned by Racal Survey Norway and operated as part of a system called Deltafix. Also on site was a 300' guyed mast from Racal Survey From the Mid 50's both the RAF and the Admiralty had personnel at Saxa. Unfortunately people generate rubbish and, in the days before the Council accepted responsibility for removing domestic waste from service establishments, much of it was disposed of at the site of RAF Skaw using 2 tipping points (use dependent upon wind direction and strength). It is possible that these two places were in use during WWII but I have no record of that. The first tipping point, to the south, was into an area called The Mooasunds.
https://ahistoryofrafsaxavord.blogspot.com/2018/10/a-history-of-raf-skaw-ames-56-post-war.html	Another activity in the 70's, which would be strongly discouraged nowadays, was the use of a structure built in 1940 as part of the RAF Skaw Advance Chain Home radar site, for fire practice.
http://ahistoryofrafsaxavord.blogspot.com/2018/05/a-history-of-raf-skaw-ames-56-part-2.html?_sm_au_=iVV0NJ3F3fj340nHkMMGvK6FH3tTM	Whilst the staff of the ACH were concentrating on their operational role they would have been very aware of the massive construction project taking place around them. A 240' receiver tower was being erected just 60 yards south of their transmitter hut and the large CH Receiver Bunker was being prepared just beyond the tower. During Mar 41 German aircraft attacked the station twice. At about 17.00 on 26 Mar an unidentified intruder approached from the east at about 200'. It was snowing at the time and the visibility was poor. Four bombs were dropped into the sea close to the ACH Transmitter Hut near the point of Lamba Ness. The aircrafts wing clipped a top corner section of a 240' Receiver Tower, which was not yet operational. It is possible that the bombs had been jettisoned when the

Source	Description
	pilot saw the tower suddenly looming into view through the falling snow. Luckily, the Riley and Neat workmen who had erected the tower, were still at Skaw and were able to repair the damage. The following morning at about 08.15 there was another attack and this time the enemy aircraft was identified - it was a JU88. **Two 250Kg bombs** were dropped from around 400'. They hit the ground about 100 yards from the CH Transmitter block, which was still under construction, and about 600 yards west of the ACH Ops/Tech site. The "standard" East Coast CH Transmitting Tower, which was used at the early sites was very different from the later towers used at what were known as the West Coast sites The East Coast Tower was designed to be just under 360' high, with 3 cantilevers (the bits sticking out) at 50', 200' and 350'). A pipe was then laid about a mile to the western side of the camp where tanks had been made to purify and contain the water, whilst still providing enough height to allow a sufficient gradient for the water to flow around the station as required. The distance from the water tank to the CH Receiver Block was roughly a mile and a half. The ACH was fully functional but the CH Site was growing all around the operators & technicians as they performed their duties. By the first week in April 1941 the two 360' (109m) Transmitter Towers and one of the 240' (73m) Receiver Towers were in position, ready for fitting parties to arrive to assemble and start to fit the electrical components. Four sites were selected and prepared before the first 2 guns, with crews, arrived in Jan '42. On the following day, 5 Oct, RAF Skaw was subjected to an attack by a JU88. The aircraft appeared suddenly out of the mist, gave a short burst of machine-gun fire and dropped **4 bombs**. Three of these bombs exploded causing no casualties but they did cause a temporary disruption to communications on camp. A bomb disposal team was unable to find the fourth bomb, only managing to locate its tail fin - the rest may have ended up in the sea. On the 15th at about 13.20 there was a hit and run attack on the main Domestic site by a JU88. The aircraft dropped a **single 500Kg bomb** to the NW of the site, it bounced over the accommodation buildings, bounced for a second time and then **exploded** harmlessly in a field. Bursts of machine gun fire caused hits on some of the huts but no one was injured. Another hit and run attack by a JU88 happened on the 4th January 1942 during a severe snow storm. **Two bombs fell in the sea** and a burst of machine gun fire was ineffectual, with no casualties or damage caused.
http://portal.historicenvironment.scot/designation/SM13097	Over 100 aircraft observations were recorded in 1941 by radar at Skaw and the complementary Chain Home Low station at Saxa Vord. Some of these targets were not intercepted and, as a result, the bombing of various targets in Shetland was successful. Skaw itself bears the (surviving) scars of two such attacks. This monument is of national importance because it has an inherent potential to make a significant addition to the understanding of the past, in particular the advance of radar technology and the development of an early warning system protecting the sea and airspace around the United Kingdom. It survives in good condition as a complete example of the technical, support and domestic buildings and structures necessary to provide an early warning reporting function. The loss of the monument would significantly diminish our future ability to appreciate and understand the scale of the efforts employed on the home front in the defence of Britain.

Appendix C Scheduled Monument



SCHEDULED MONUMENT

"*The monument comprises the remains of a Second World War Chain Home radar station. The station is spread over two sites, a main and a reserve site, with over 50 buildings and structures reflecting its core early warning function and with supporting infrastructure and domestic blocks. The radar complex is the furthest north of its type in the United Kingdom. It is located on rough grazing land over two headlands (Lamba Ness and Blue Jibs) at the northeast corner of Unst.*

This extensive complex includes a variety of concrete and brick buildings and structures, some of which are heavily protected with blast walls. The site includes four key elements: buildings and structures for signal receiving and transmitting; defensive structures built to protect the complex; supporting infrastructure to service the radar function; and domestic buildings to house the military personnel stationed here. The reserve site, to the north of the main complex, comprises the essential components for transmission, reception and defence only. The main complex covers an area of Lamba Ness approximately 1800m long by 450m wide. The reserve site has a more compact footprint covering an area approximately 200m long by 200m wide.

The area to be scheduled comprises two irregular-shaped polygons and includes the remains described above and an area around them within which evidence relating to the monument's construction, use and abandonment may survive, as shown in red on the accompanying map. Specifically excluded from the scheduled area are the above-ground elements of a modern transmission mast, its anchor points, cabling and cable channelling and associated maintenance cabin, the above-ground elements of an electricity transmission line and its anchor points, the above-ground elements of all modern farm buildings, the above-ground elements of a small building to the immediate north of the building known as 'the engine house', all modern boundary features not associated with the original function of the site, all cattle grids, the above-ground elements of interpretative signage and the uppermost surface of the metalled access track, to allow for their maintenance.

Cultural Significance

The monument's cultural significance can be expressed as follows:

Intrinsic characteristics

This is a remarkably well-preserved military complex dating to the early 1940s. Its function was to warn the military authorities of the position, course and speed of aircraft observed in the radar's transmission area. The eastern edge of the main site was where the technical buildings and structures were erected: the receiving and transmitting masts and buildings. The masts here were over 100m tall, while the processing rooms were heavily reinforced to survive direct hits from airborne ordnance. Only the metal anchor points and concrete plinths survive from the masts, but the transmission and receiving blocks are remarkably intact with several fixtures in situ and most of their structure intact. The support elements were positioned further inland and included the powerhouse, guardrooms and anti-aircraft positions, among other structures. These tend to survive in a ruined state, but with their individual footprints and lower structure clearly visible. The brickwork and brick manufacturer (ETNA and Edinburgh brickworks) are also clearly visible. Lastly, the domestic part of the site at its western edge includes all the elements necessary to sustain the RAF workforce. These include the accommodation blocks, ammunition stores, ablution units, cookhouse, decontamination building, air raid shelters, medical block, motor transport housing, a cinema and an outdoor boxing ring. They tend to survive as the low courses and foundations of individual buildings, or as simple concrete pads marking the building's outline. In many cases the anchor points used to secure the roof structure (against extreme weather conditions) also survive, and in one case, the decontamination block, the building is roofed and generally intact.

This is a very coherent monument which has survived as an intact complex. It had a short lifespan during World War Two and reflects the functional and technical nature of Britain's early warning radar network.

Contextual characteristics

The complex at Skaw is part of the wider network of early warning radar stations developed in the 1930s and laid out along the coastline of Britain. By the end of 1945 there were over 300 such sites across Britain providing early warning reports for the overall air and sea defence of the nation. Skaw was one of the first batch of stations to be built (known as Chain Home) and was operational in 1941. It was one of approximately 17 that were built in Scotland and it provided radar cover for approaching airborne targets up to 100 miles away. It could not, however, detect low-flying or seaborne targets. This was a later development (known as Chain Home Low and Coastal Defence Chain Home) and, together with ten other radar sites in Shetland, reports from these stations allowed the military authorities to observe and intercept enemy craft attempting to cross or penetrate territorial waters, airspace or the coastline.

Following the German invasion of Norway in 1940, this early warning ability was seen as crucial for the defence of the wider United Kingdom and the development of the network, including the complex at Skaw, was brought forward as the perceived threat of invasion from Norway increased. Construction at Skaw took twice as long as many mainland counterparts because of the extreme conditions and remoteness of the location. Over 15,000 tonnes of material were transported by sea and landed at nearby Haroldswick to build the complex, which was the northernmost site in the whole Chain Home network. It was an important strategic reporting station because of the position of Shetland between mainland Europe and the Atlantic to the west.

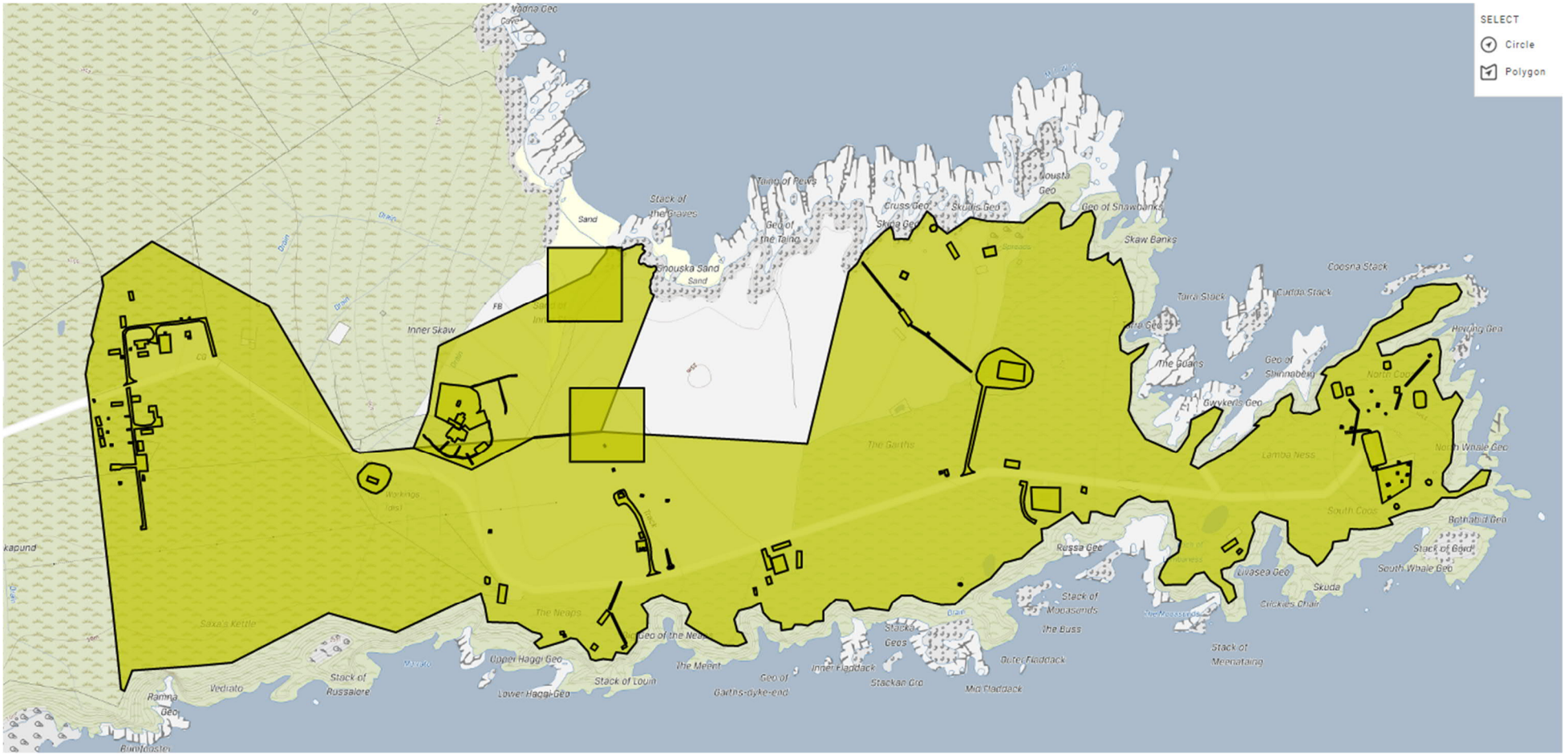
Over 100 aircraft observations were recorded in 1941 by radar at Skaw and the complementary Chain Home Low station at Saxa Vord. Some of these targets were not intercepted and, as a result, the bombing of various targets in Shetland was successful. Skaw itself bears the (surviving) scars of two such attacks.

The complex at Skaw has an important part to play in the story of the defence of the United Kingdom during World War Two. It is a good representative of it class and an important part of the mid 20th-century landscape of the Shetland Islands.

National Importance

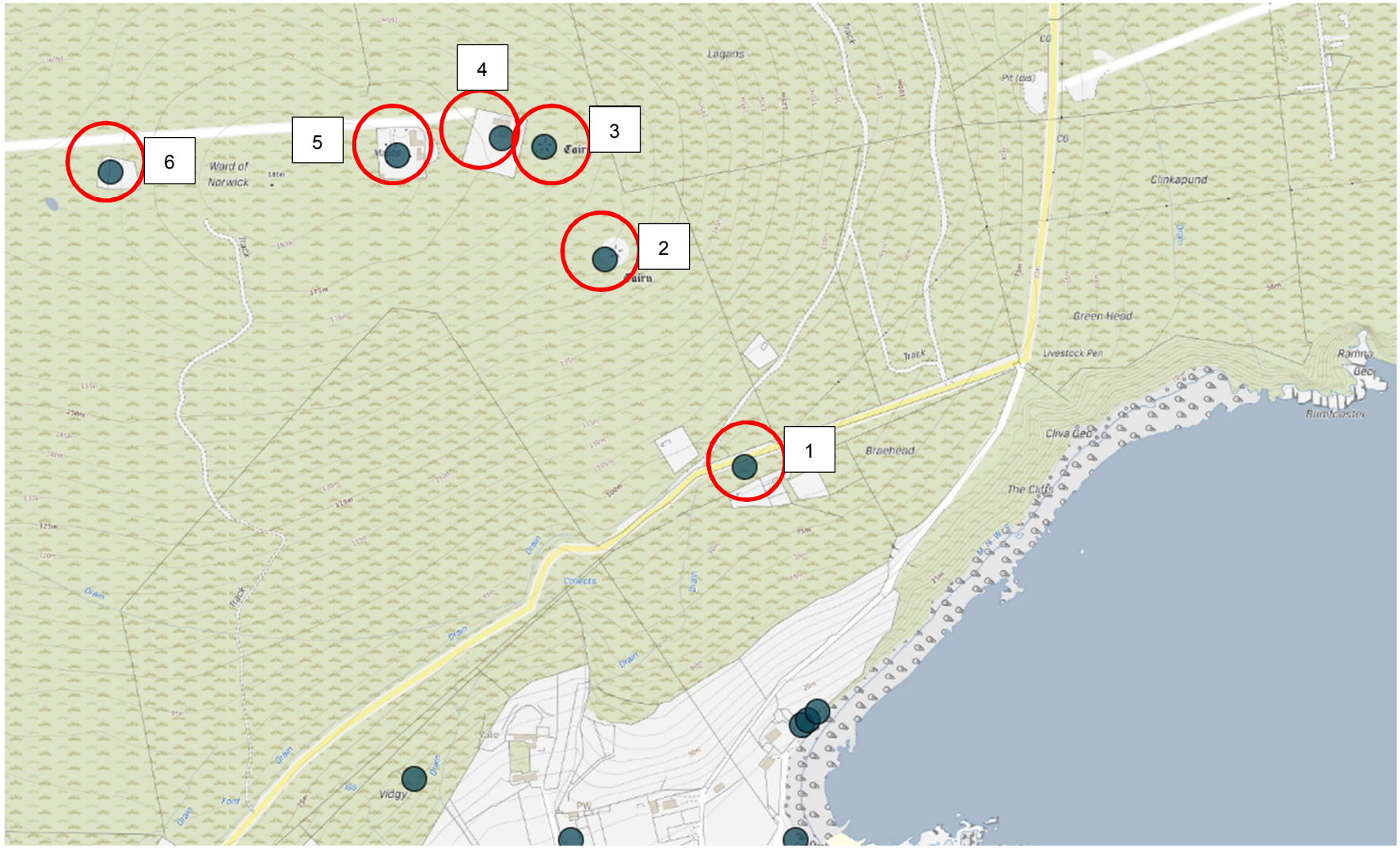
This monument is of national importance because it has an inherent potential to make a significant addition to the understanding of the past, in particular the advance of radar technology and the development of an early warning system protecting the sea and airspace around the United Kingdom. It survives in good condition as a complete example of the technical, support and domestic buildings and structures necessary to provide an early warning reporting function. The loss of the monument would significantly diminish our future ability to appreciate and understand the scale of the efforts employed on the home front in the defence of Britain."

Historic Environment Record

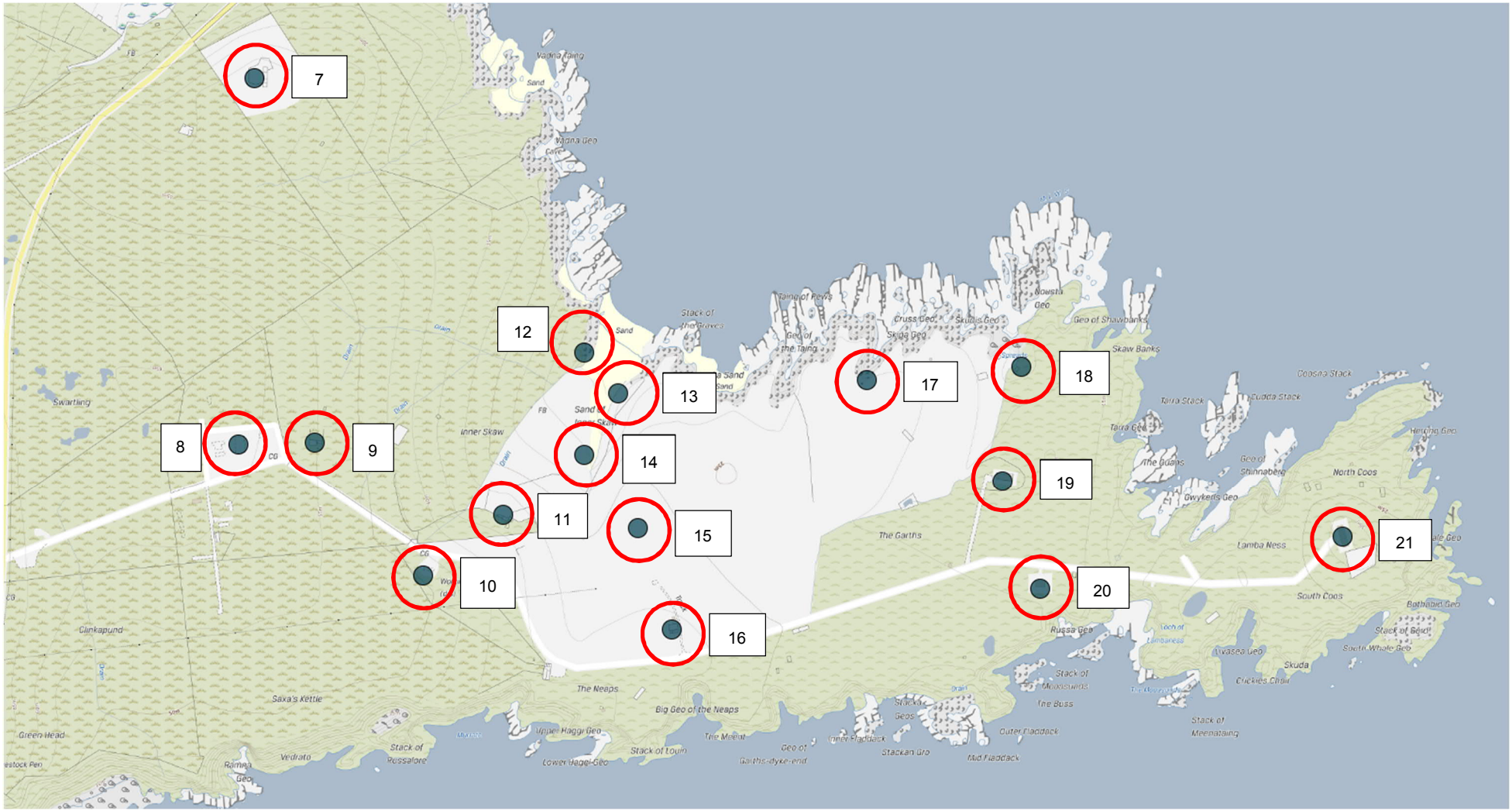


RAF Site layout is more apparent in the above, but no further information was available.

Appendix D Canmore


6
5
4
3
2
1
Ward of Norwick
Lagans
Clinkapund
Green Head
Livestock Pen
Braehead
Cliva Geo
The Cliffs
Ramna Geo
Bamfoster
Vidgy
Track
Drain
Ford
Culvert

1. From a walkover survey in advance of refurbishment to the 11Kv hydro-electric line was undertaken in 1999, The following sites were identified: HP 6508 1506 Croft remains. Easting/Northing 465080, 1215059 and Latitude/Longitude 60° 48′ 47″ N 0° 48′ 20″ W.
2. From the OS 6" map, Shetland, 2nd ed., (1900). A possibly chambered cairn, at present about 55' in diameter, but greatly disturbed and robbed in the centre, while the encroaching growth of peat has obscured the edges. Near the centre there stands an upright stone 2'3" wide, 1' thick and 4'6" high. Another large stone lies at right angles, its east end 2'3" north of the north end of the former stones. These might be part of a chamber. Easting/Northing 464923, 1215303 Latitude/Longitude 60° 48′ 55″ N 0° 48′ 30″ W.
3. From the OS 6" map, Shetland, 2nd ed., (1900). A possibly chambered cairn which has apparently had a diameter of about 40', but seems to have spread beyond the original edge on the east side. There is a great quantity of stone in this spread and peat encroaches on the edge in the same way as over the rest of the cairn. Some recent howking has exposed a 10' length of curved outer wall-face looking to the SE. If continued the wall would enclose an area of about 25' diameter in the west or main part of the cairn. To the north of the wall-face and a little wide its presumed position is an upright stone facing east. At present there is no further sign of any structure but a modern beacon built over the centre of this part of the cairn may well overlie the chamber or cist. Easting/Northing 464846, 1215430 Latitude/Longitude 60° 48′ 59″ N 0° 48′ 35″ W.
4. Unst, Saxa Vord Classification: BUILDING (20TH CENTURY) Easting/Northing 464799, 1215438 Latitude/Longitude 60° 49′ 00″ N 0° 48′ 38″ W.
5. Unst, Saxa Vord Classification: BUILDING(S) (20TH CENTURY), RADIO MAST(S) (20TH CENTURY) Easting/Northing 464685, 1215421 Latitude/Longitude 60° 48′ 59″ N 0° 48′ 46″ W.
6. A series of four conjoined enclosures is depicted on the 1st edition of the OS 6-inch map (Orkney and Shetland (Shetland) 1882, sheet ii). Two of the enclosures are shown on the current edition of the OS 1:10000 map (1972). Easting/Northing 464356, 1215404 Latitude/Longitude 60° 48′ 59″ N 0° 49′ 08″ W.



7. Skaw Classification: FARMSTEAD (PERIOD UNASSIGNED) Easting/Northing 465815, 1216210 Latitude/Longitude 60° 49′ 24″ N 0° 47′ 30″ W

8. The accommodation camp for the World War II military installations at Skaw are visible on evrtical air photographs (106G/Scot/Uk 97, 3107-3108, flown 18 May 1946), in an area around Inner Skaw. At least nineteen huts are visible, most of the Nissen type, but there are two groups of four conjoined to form an E in plan. Several hut bases survive at the site and these are depicted on the current OS 1:2500 digital scale map. Easting/Northing 465786, 1215660 Latitude/Longitude 60° 49′ 06″ N 0° 47′ 33″ W

9. Inner Skaw Classification: FARMSTEAD (PERIOD UNASSIGNED) Easting/Northing 465902, 1215667 Latitude/Longitude 60° 49′ 06″ N 0° 47′ 25″ W.

10. Inner Skaw Classification: QUARRY (PERIOD UNASSIGNED) Easting/Northing 466057, 1215467 Latitude/Longitude 60° 49′ 00″ N 0° 47′ 15″ W.

11. A farmstead comprising one unroofed building of complex shape, two conjoined enclosures and one unroofed structure, three separate buildings, one of which is partially roofed (HP 6604 1552) and two are unroofed (HP 6590 1567 and HP 6602 1569), three enclosures, one unroofed structure (HP 6608 1571) and a field-system are depicted on the 1st edition of the OS 6-inch map (Orkney and Shetland (Shetland) 1882, sheet iii). Two unroofed buildings, three enclosures, one unroofed structure and the fragmentary remains of the field-system are shown on the current edition of the OS 1:10000 map (1971). Easting/Northing 466180, 1215559 Latitude/Longitude 60° 49′ 03″ N 0° 47′ 07″ W.

12. Saddle quern: of rectangular beach-smoothed stone found at the head of the beach at the Sand of Inner Skaw. Easting/Northing 466301, 1215799 Latitude/Longitude 60° 49′ 10″ N 0° 46′ 58″ W.

13. Ashy midden material exposed to either side of a small burn leading into the sea. Numerous artefacts such as steatite vessel fragments, pottery, and stone tools have been recovered from the midden deposits. Easting/Northing 466351, 1215739 Latitude/Longitude 60° 49′ 08″ N 0° 46′ 55″ W.

14. Farmstead; Buildings; Enclosures; Structure; Field-system Easting/Northing 466300, 1215653 Latitude/Longitude 60° 49′ 06″ N 0° 46′ 59″ W.

15. Cairn (NR) (Site of). OS 6" map, Shetland, 2nd ed., (1900). An ancient cairn (Still extant). Easting/Northing 466383, 1215541 Latitude/Longitude 60° 49′ 02″ N 0° 46′ 53″ W.

16. Unst, Skaw, The Garths Classification: ENGINE HOUSE (20TH CENTURY) Easting/Northing 466431, 1215389 Latitude/Longitude 60° 48′ 57″ N 0° 46′ 50″ W.

17. One unroofed structure is depicted on the 1st edition of the OS 6-inch map (Orkney and Shetland (Shetland) 1882, sheet iii), but it is not shown on the current edition of the OS 1:10000 map (1971). Easting/Northing 466722, 1215759 Latitude/Longitude 60° 49′ 09″ N 0° 46′ 31″ W.

18. Four unroofed structures are depicted on the 1st edition of the OS 6-inch map (Orkney and Shetland (Shetland) 1882, sheet iii). Two unroofed structures and an enclosure are shown on the current edition of the OS 1:10000 map (1971). Easting/Northing 466951, 1215783 Latitude/Longitude 60° 49′ 09″ N 0° 46′ 15″ W.

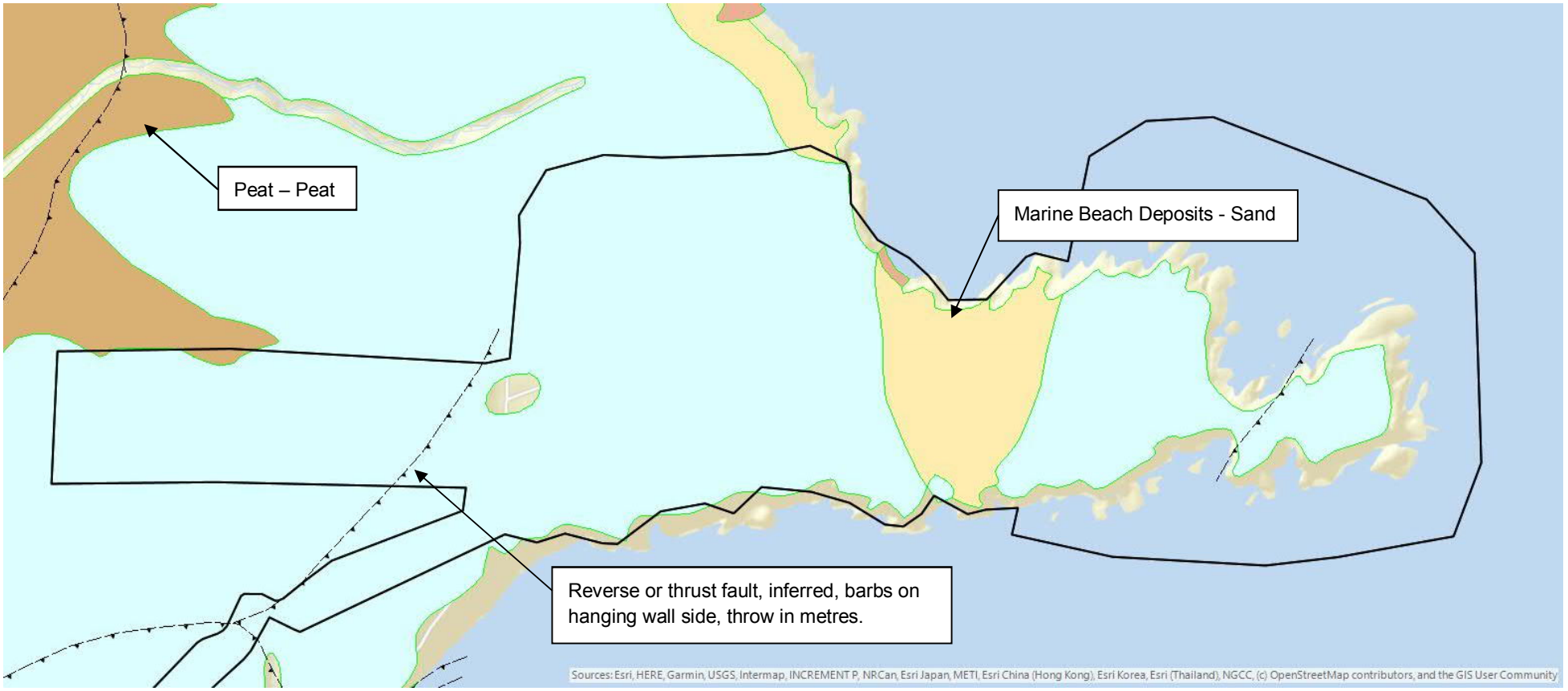
19. A Chain Home radar station situated on The Skaw, Unst. The installations and buildings cover a large area of The Skaw where the transmitter block, receiver block, engine houses, mast bases and light anti-aircraft emplacements are still to be seen. Easting/Northing 466921, 1215611 Latitude/Longitude 60° 49′ 04″ N 0° 46′ 18″ W.

20. Unst, Skaw, The Garths Classification: ENGINE HOUSE (20TH CENTURY) Easting/Northing 466977, 1215447 Latitude/Longitude 60° 48′ 59″ N 0° 46′ 14″ W.

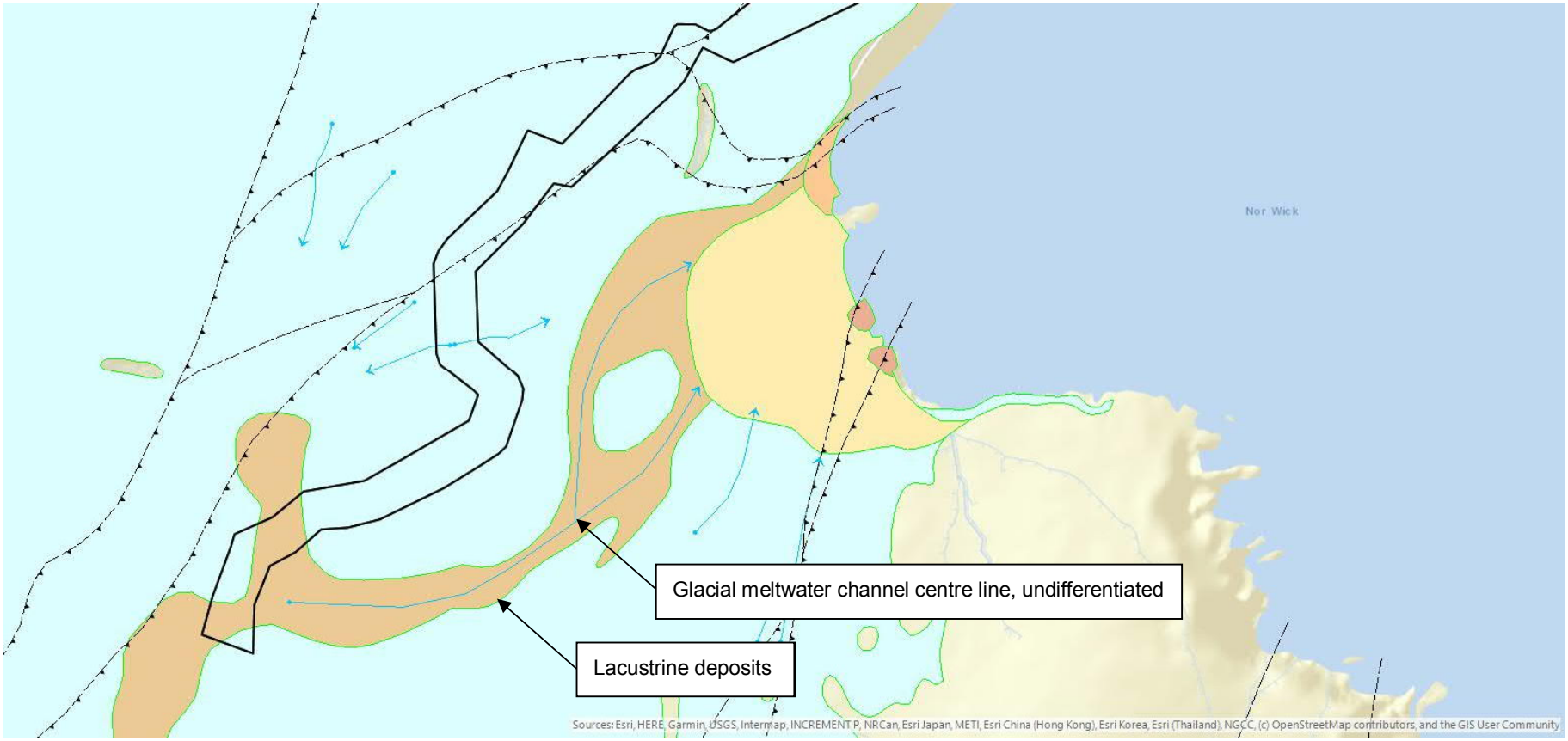
21. Unst, Skaw, The Garths Classification: RADAR SITE (SECOND WORLD WAR) Easting/Northing 467428, 1215523 Latitude/Longitude 60° 49′ 01″ N 0° 45′ 44″ W.

Appendix E Geology

DRIFT GEOLOGY



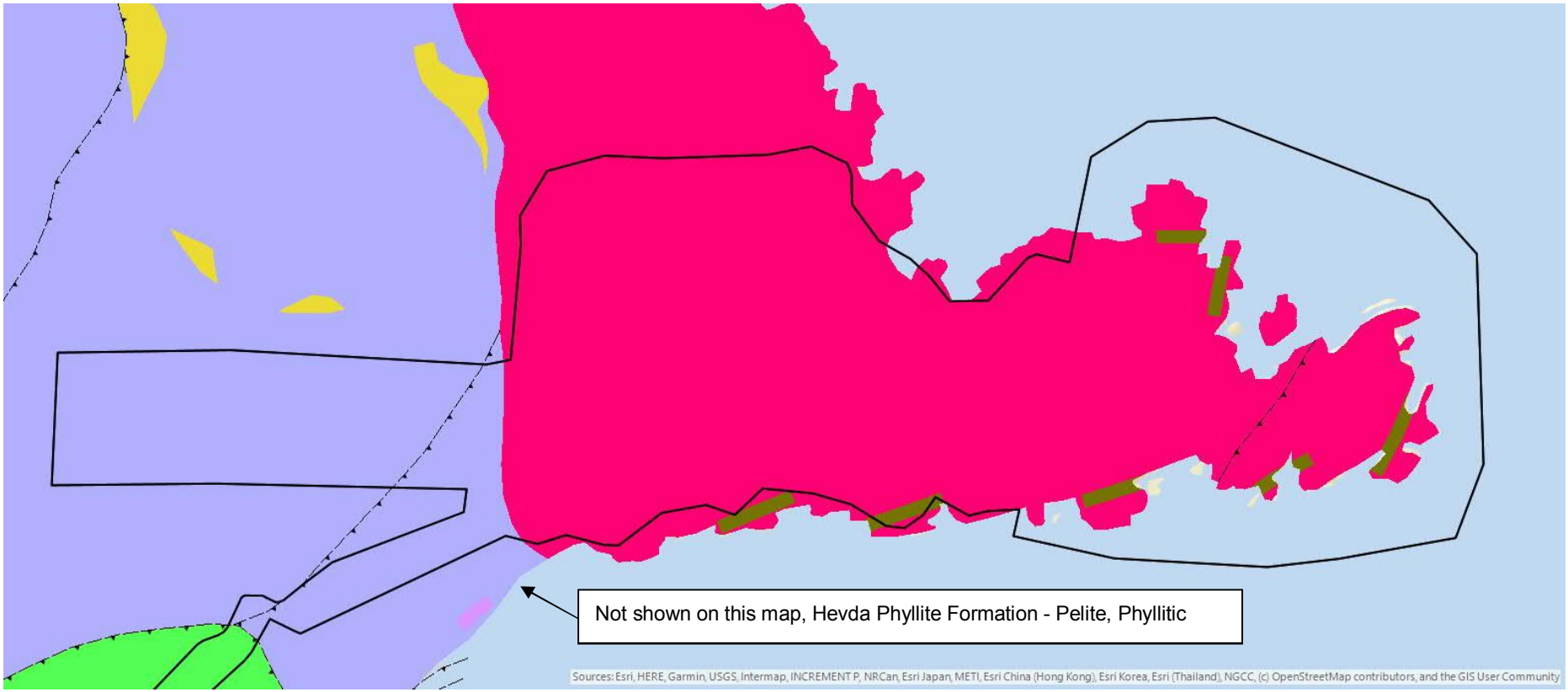
DRIFT GEOLOGY



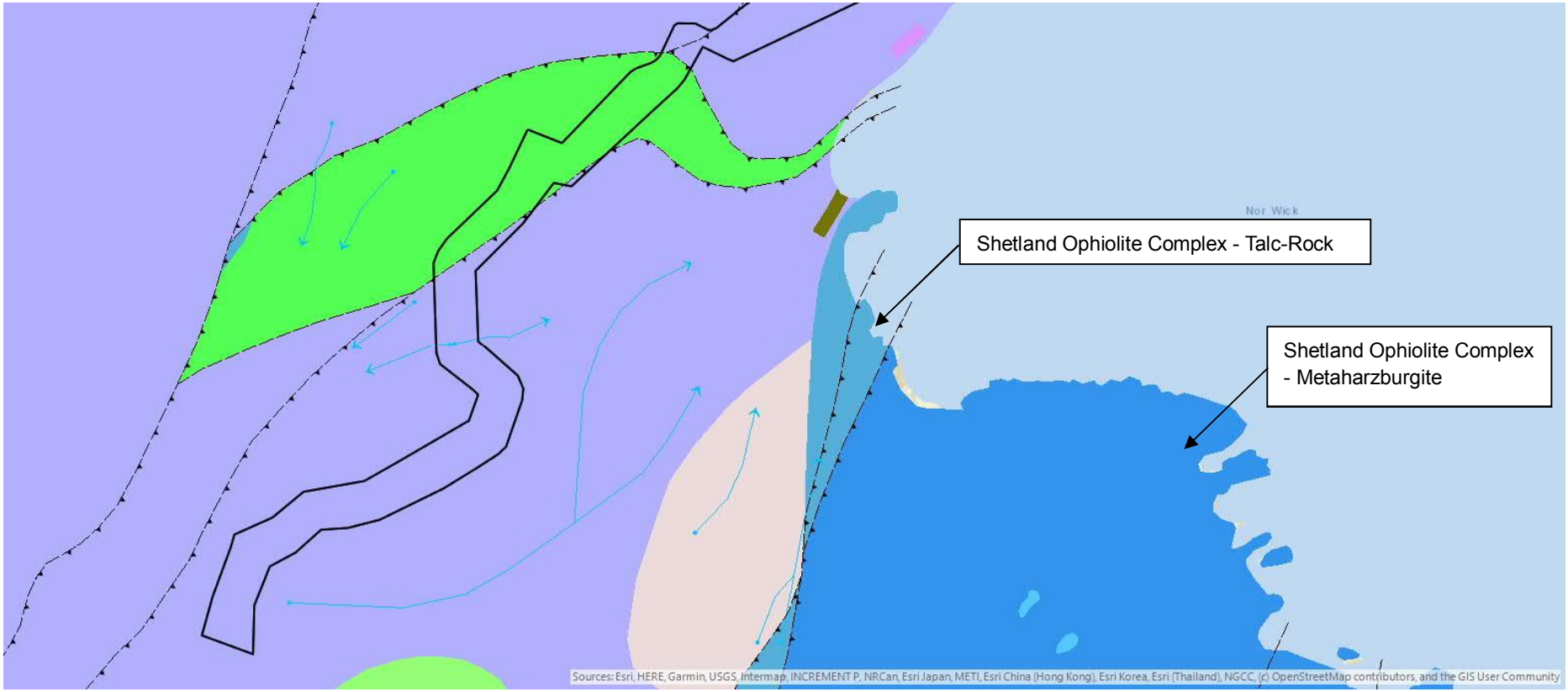
Legend

	No data, potentially shallow bedrock
	Till and Morainic Deposits (Undifferentiated) - Diamicton
	See plan
	Blown Sand - Sand

SOLID GEOLOGY



SOLID GEOLOGY



Legend

	SAXA VORD PELITE FORMATION - PELITE, PHYLLITIC (S) and HEVDA PHYLLITE FORMATION - PELITE, PHYLLITIC (H) and NORWICK PHYLLITE FORMATION - PELITE, PHYLLITIC (N)
	Norwick Graphitic Schist Formation - Phyllitic Semipelite And Quartzite
	Norwick Hornblendic Schist Type 1 - Metabasalt, Phyllitic
	North Britain Siluro-Devonian Calc-Alkaline Dyke Suite - Lamprophyre
	Skaw Intrusion - Microgranite, Porphyritic
	Hevda Phyllite Formation - Quartzite

Appendix F Unexploded Ordnance

Pre-Desk Study Assessment

Site:	Skaw Site, Unst, Shetlands
Client:	AECOM
Contact:	Bruce Shearer
Date:	14th November 2019
Pre-WWI Military Activity on or Affecting the Site	None identified.
WWI Military Activity on or Affecting the Site	None identified.
WWI Strategic Targets (within 5km of Site)	None identified.
WWI Bombing	None identified on the Site.
Interwar Military Activity on or Affecting the Site	None identified.
WWII Military Activity on or Affecting the Site	In 1940, Royal Air Force (RAF) Skaw Chain Home radar station was established on the Site. Its function was to serve as an early warning system against enemy invasion and air raids over the north of Scotland. RAF Skaw was put into care and maintenance in 1945.
WWII Strategic Targets (within 5km of Site)	The following strategic targets were located in the vicinity of the Site: ■ RAF Skaw. ■ Anti-Aircraft (AA) defences.
WWII Bombing Decoys (within 5km of Site)	None.
WWII Bombing	During WWII the Site was located in the Local Authority (LA) of Zetland, which officially recorded 72No. High Explosive (HE) bombs with a regional bombing density of 0.2 bombs per 405 hectares (ha). Readily available records have been found indicating that several HE bombs fell in close proximity to the Site.
Post-WWII Military Activity on or Affecting the Site	The radar station was officially closed in 1946 and some of the buildings and installations were demolished 1947.
Recommendation	It is recommended that a detailed desk study is commissioned to assess, and potentially zone, the Unexploded Ordnance (UXO) hazard level on the Site.

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

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

Volume Referenc	Intelligence Sum	Start Date	End Date	Time	Civil Defence Re	Location	Country	Killed	Injured	Total Casua	Additional Notes	Link to Page
HO 203/6	1143	27/03/1941	27/03/1941	Day	11: Scotland	Skaw	Scotland	0	0	0		http://www.warstateandsociety.com/Content/wtss.ho203/000006/001/427
HO 203/9	1529	06/10/1941	06/10/1941	Day	11: Scotland	Skaw	Scotland	0	1	1		http://www.warstateandsociety.com/Content/wtss.ho203/000009/001/098
HO 203/9	1626 + 1627	23/11/1941	24/11/1941	Night	11: Scotland	Skaw	Scotland	0	3	3		http://www.warstateandsociety.com/Content/wtss.ho203/000009/001/225
HO 203/9	1671	16/12/1941	16/12/1941	Day	11: Scotland	Skaw	Scotland	0	0	0		http://www.warstateandsociety.com/Content/wtss.ho203/000009/001/265
HO 203/10	1709 + 1710	04/01/1942	04/01/1942	Day	11: Scotland	Skaw	Scotland	0	0	0		http://www.warstateandsociety.com/Content/wtss.ho203/000010/001/010

Information Classification: General

Appendix G Site Photographs

Photograph 01 – Site entrance

Photograph 02 – Existing building

Photograph 03 – Potential LM area

Photograph 04 – Cattle grid and small quarry

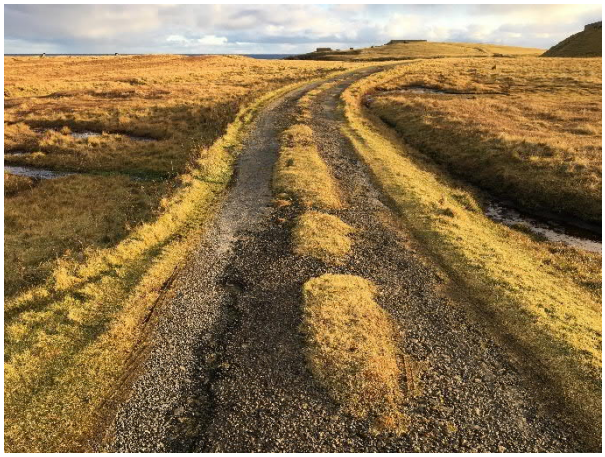
Photograph 05 – Site looking east

Photograph 06 – Overhead power line

Photograph 07 – Former power station building

Photograph 08 – Typical cut drainage ditch

Photograph 09 – Areas of ponding



Photograph 10 – Access track looking east

Photograph 11 – Typical steep sea cliffs

Photograph 12 – Former Transmitter Block

Photograph 13 – Site looking east

Photograph 14 – Built-up section of access track

Photograph 15 – Access track looking west

Photograph 16 – Loch of Lambaness

Photograph 17 – Typical exposed peat

Photograph 18 – Remains of operational buildings

Photograph 19 – Former Receiver Block

Photograph 20 – Tower foundations

Photograph 21
Route option 1 – Junction of A968 / Beach Road

Photograph 22
Route option 1 – B9087 looking east

Photograph 23
Route option 1 – Junction at Saxa Vord Resort

Photograph 24
Route option 2 – Junc. of Beach Road/B9087

Photograph 25
Route option 2 – B9087

Photograph 26
Route option 3 – Beach Road looking east

Photograph 27
Route option 4 – Junction of B9087 / Holsens Road

Photograph 28
Route option 4 – Steep section of road

Photograph 29
Route option 5 – Corner at Northdale

Photograph 30
Route option 5 – Existing farm track

Photograph 31
Route option 4 – Typical road leading to site

Photograph 32
Route option 6 – Section of damaged road

Appendix H Groundsure Report

Groundsure
LOCATION INTELLIGENCE

Scottish Insight

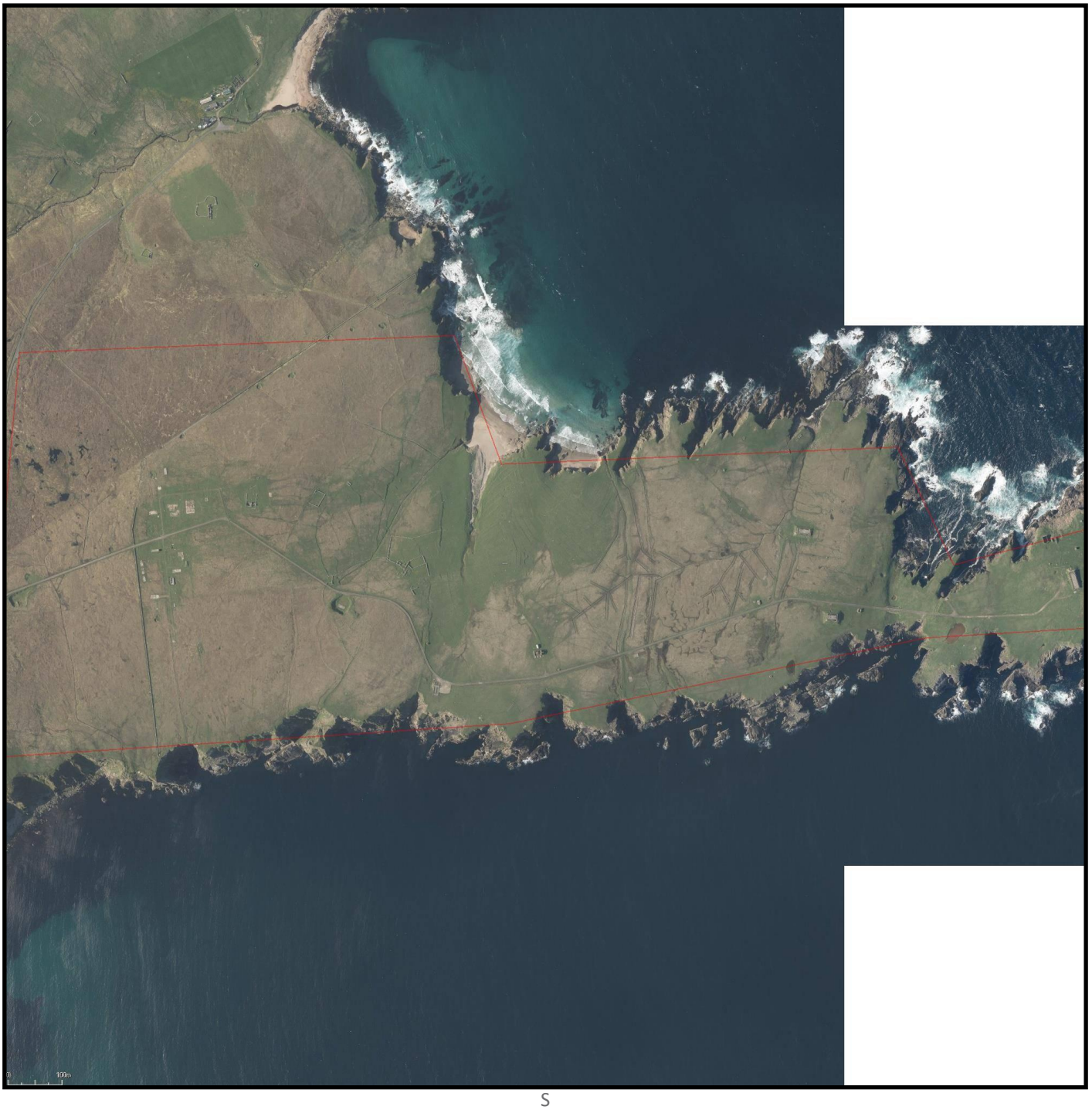
Insight Report

Date	Groundsure Reference	Address
11-11-2019	GS-6452860	FORMER RAF SITE, ZC600 FROM VALSGARTH ROAD (CROSSROADS) TO VALSGARTH RD (DERESTRICTION SIGN), HAROLDSWICK, UNST, ZE2 9EF
Grid Reference	**Your Reference**	
465837 1215427	Unst_Spaceport	

SITE MAP

Aerial Photograph

NW N NE



W E

SW S SE

Aerial photography supplied by Getmapping PLC.
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Site Address: FORMER RAF SITE, ZC600 FROM VALSGARTH ROAD (CROSSROADS) TO VALSGARTH RD (DERESTRICTION SIGN), HAROLDSWICK, UNST, ZE2 9EF
Grid Reference: 465837 1215427
Date of aerial image capture: 03-06-2016
Site Size: 105.15 ha

Overview of Findings

Report Section	Number of records found within (X) m of the study site boundary					
1 Historical Industrial Sites	**On site**	**0-50**	**51-250**	**251-500**		
1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping	0	0	2	0		
1.2 1:2,500 scale mapping – Historical Tank Database	N/A	N/A	N/A	N/A		
1.3 1:2,500 scale mapping – Historical Energy Features Database	N/A	N/A	N/A	N/A		
1.4 1:2,500 scale mapping – Historical Petrol and Fuel Site Database	N/A	N/A	N/A	N/A		
1.5 1:2,500 scale mapping – Historical Garage and Motor Vehicle Repair Database	N/A	N/A	N/A	N/A		
1.6 Potentially Infilled Land	3	0	3	0		
1.7 Historic Military and Ordnance sites	0	0	0	0		
2 Landfill and Other Waste Sites Findings	**On site**	**0-50**	**51-250**	**251-500**	**501-1000**	**1000-1500**
2.1 Groundsure SEPA Landfill Sites Data	0	0	0	0	0	0
2.2 Groundsure Recorded Landfill Sites	0	0	0	0	0	0
2.3 Historic Waste Sites	0	0	0	0	-	-
2.4 Groundsure SEPA Waste Sites Data	0	0	0	0	-	-
3 Current Land Use	**On site**	**0-50**	**51-250**	**251-500**		
3.1 Current Industrial Data	2	1	0	0		
3.2 Petrol and Fuel Sites	0	0	0	0		
3.3 Part A(1), IPPC and Historic IPC Authorisations	0	0	0	0		
3.4 Part B Authorisations	0	0	0	0		
3.5 National Grid High Pressure Gas Transmission Pipelines	0	0	0	0		
3.6 National Grid High Voltage Underground Electricity Transmission Cables	0	0	0	0		
3.7 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0		
4 Geology and Hydrogeology	**Presence of Records**					
4.1 Artificial Ground and Made Ground*	No					
4.2 Permability of Artificial Ground	No					
4.3 Superficial Ground and Drift Geology	No					
4.4 Permeability of Superficial Ground	Yes					
4.5 Bedrock and Solid Geology	Yes					
4.6 Permeability of Bedrock Ground	Yes					
4.7 Faults	Yes					
4.8 Landslip	No					
4.9 Landslip Permeability	No					
4.10 Groundwater Vulnerability and Soil Classification	Yes					
Source: Scale: 1:50,000 BGS Sheet * This includes an automatically generated 50m buffer zone around the site.						
5 Designated Environmentally Sensitive Sites	**On site**	**0-50**	**51-250**	**251-500**	**501-1000**	**1001-2000**
5.1 Sites of Special Scientific Interest (SSSI)	0	1	0	0	9	0
5.2 Ramsar Sites	0	0	0	0	0	0
5.3 National Nature Reserves (NNR)	0	0	0	0	0	0
5.4 Special Areas of Conservation (SAC)	0	0	0	0	0	0
5.5 Special Protection Areas (SPA)	0	0	0	0	0	1
5.6 Local Nature Reserves (LNR)	0	0	0	0	0	0
5.7 World Heritage Sites	0	0	0	0	0	0
5.8 Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
5.9 National Parks	0	0	0	0	0	0
5.10 Green Belt	0	0	0	0	0	0
5.11 Designated Ancient Woodland	0	0	0	0	0	0

6 Flooding					
6.1 Highest risk of flooding from rivers on-site	Negligible				
6.2 Highest risk of coastal flooding on-site	1 in 75 years.				
6.3 Highest Risk of Pluvial Flooding on-site	Highly Significant				
6.4 Groundwater Flooding Susceptibility Areas	Potential for groundwater flooding at surface				
6.5 Groundwater Flooding Confidence Rating	High				
6.6 Presence of geological indicators of flooding within 250m	Yes				
6.7 Potential risk in event of a reservoir failure	No				
7 Mining	**On site**	**0-50**	**51-250**	**251-500**	**501-1000**
7.1 Historical Mining	0	0	0	0	0
7.2 Coal Mining	0	0	0	0	0
7.3 Johnson Poole and Bloomer	0	0	0	0	0
7.4 Non-Coal Mining	2	0	4	3	0
7.5 Non-Coal Mining Cavities	0	0	0	0	0
7.6 Natural Cavities	0	0	0	0	0
7.7 Brine Extraction	0	0	0	0	0
7.8 Gypsum Extraction	0	0	0	0	0
7.9 Tin Mining	0	0	0	0	0
7.10 Clay Mining	0	0	0	0	0
8 Natural Hazards Findings					
8.1 Shrink Swell	Very Low				
8.2 Landslides	Moderate				
8.3 Soluble Rocks	Negligible				
8.4 Compressible Ground	Negligible				
8.5 Collapsible Rocks	Very Low				
8.6 Running Sand	High				
8.7 Radon Potential	Between 1% and 3%				
8.8 Radon Protective Measures	Basic radon protective measures are necessary.				
9 Borehole Records	**On site**	**0-50**	**51-250**		
9.1 Borehole Records	0	0	0		
10 Railways and Tunnels	**On site**	**0-50**	**51-250**		
10.1 Tunnels	0	0	0		
10.2 Historical Railway and Tunnel Features	0	0	0		
10.3 Historical Railways	0	0	0		
10.4 Active Railways	0	0	0		
10.5 Railway Projects	0	0	0		
11 Soil Chemistry	**On site**	**0-50**	**51-250**		
11.1 Estimated Background Soil Chemistry	58	32	N/A		
11.2 Estimated Urban Soil Chemistry	0	0	N/A		
11.3 Measured Urban Soil Chemistry	0	0	0		

Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections,

1 Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2 Landfill and Other Waste Sites Findings

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3 Current Land Use

Provides information on the current land use as taken from PointX data, petrol filling stations, and Part A(1), Part A(2), Part B , IPPC and IPC Authorisations and sites designated as Contaminated Land in proximity to the property.

4 Geology and Hydrogeology

Provides information on artificial and superficial deposits and bedrock beneath the study site and groundwater vulnerability and soil classification.

5 Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas and World Heritage Sites. These searches are conducted using radii of up to 2000m.

6 Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas, surface water flooding, geological indicators of flooding, reservoir failure and groundwater flood areas. This search is conducted using radii of up to 250m.

7 Mining

Provides information on areas of coal and non-coal mining.

8 Natural Hazards Findings

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence.

9 Borehole Records

Provides access to the National Geoscience Data Centre database of over a million scanned borehole, shaft and well records. This data is supplied to Groundsure by the British Geological Survey (BGS). The scanned records can be accessed by clicking on the weblinks within the data table.

10 Railways and Tunnels

Provides information on historic and current railways and tunnels, as well as data on some future rail projects.

11 Soil Chemistry

This section includes an estimation of the concentrations of selected potentially harmful elements (arsenic, cadmium, chromium, nickel and lead) in rural topsoils and of these chemical elements plus copper, tin and zinc in urban topsoils. The section also contains measurements made of urban topsoil. This data is provided by the British Geological Survey (BGS).

Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

Notes on Mapping

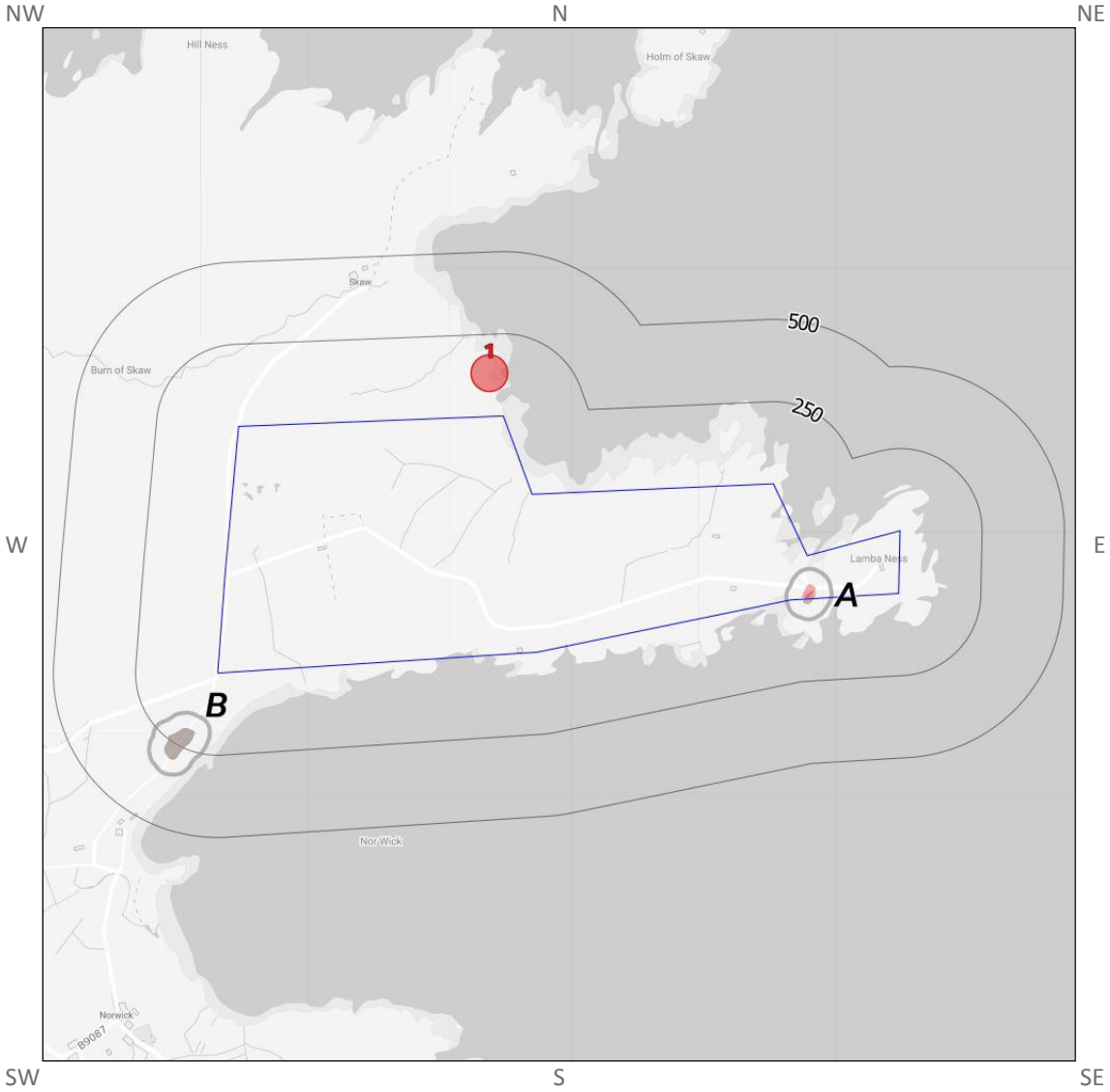
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id, 1, Id, 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N, North, E, East, NE, North East from the nearest point of the study site boundary.

1 Historical Industrial Sites

Historical Land Use Map



Historical Land Use Map

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Site Centre

Search Buffers (m)
250
500

Energy Features
Tanks
Industrial Land Use
Historical Military / Ordnance Sites
Garages
Petrol Stations
Potentially Infilled Land

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary:	2

ID	Distance (m)	Direction	Use	Date
B	191	SW	Unspecified Quarry	1900
B	191	SW	Unspecified Quarry	1878

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

No data available in this area.

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

No data available in this area.

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

No data available in this area.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

No data available in this area.

1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site	6

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance	Direction	Use	Date
A	0	on site	Loch	1971
A	0	on site	Loch	1900

ID	Distance	Direction	Use	Date
A	0	on site	Loch	1878
1	76	N	Cave	1971
B	191	SW	Unspecified Quarry	1900
B	191	SW	Unspecified Quarry	1878

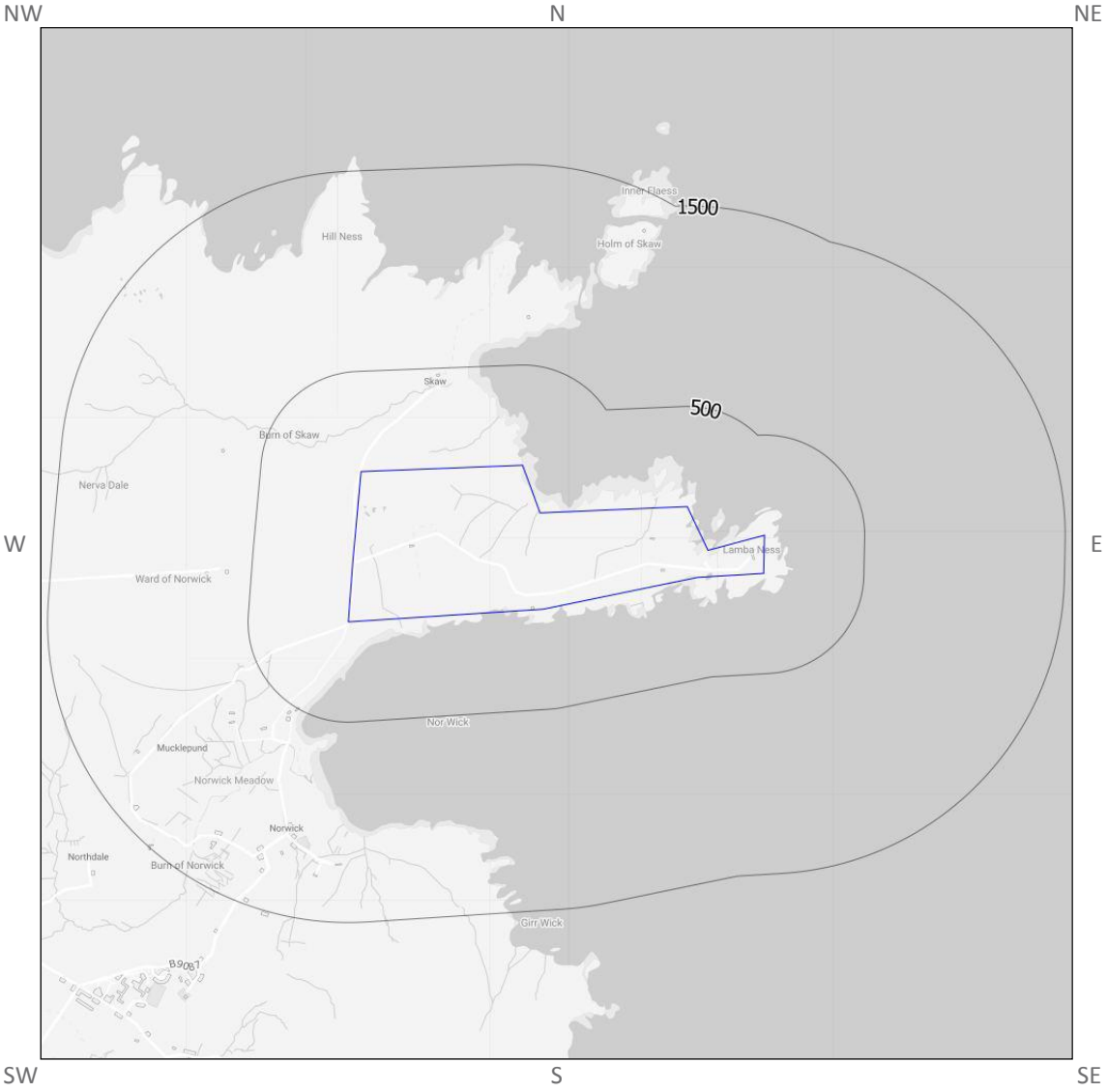
1.7 Historic Military and Ordnance sites

Database searched and no data found.

Certain military installations were not noted on historic mapping for security reasons. Whilst not all military land is necessarily of concern, Groundsure has researched and digitised a number of Ordnance Factories and other military industrial features (e.g. Ordnance Depots, Munitions Testing Grounds) which may be of contaminative concern. This research was drawn from a number of different sources, and should not be regarded as a definitive or exhaustive database of potentially contaminative military installations. The boundaries of sites within this database have been estimated from the best evidence available to Groundsure at the time of compilation.

2 Landfill and Other Waste Sites Findings

Landfill and Other Waste Sites Map



Landfill and Other Waste Sites Map

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Site Centre

500

1500

Search Buffers (m)

Waste Sites (SEPA polygon records)

Waste Sites (SEPA point records)

Waste Sites (historical mapping and planning records)

Landfill Sites (historical mapping and local authority records)

Landfill Sites (SEPA polygon records)

Landfill Sites (SEPA point records)

2.1 Groundsure SEPA Landfill Sites Data

Records of SEPA landfill sites within 1500m of the study site	0

Database searched and no data found.

2.2 Groundsure Recorded Landfill Sites

Records of landfill sites and refuse tips within 1500m of the study site	0

Database searched and no data found.

2.3 Historic Waste Sites

Records of waste treatment, transfer or disposal sites within 500m of the study site	0

Database searched and no data found.

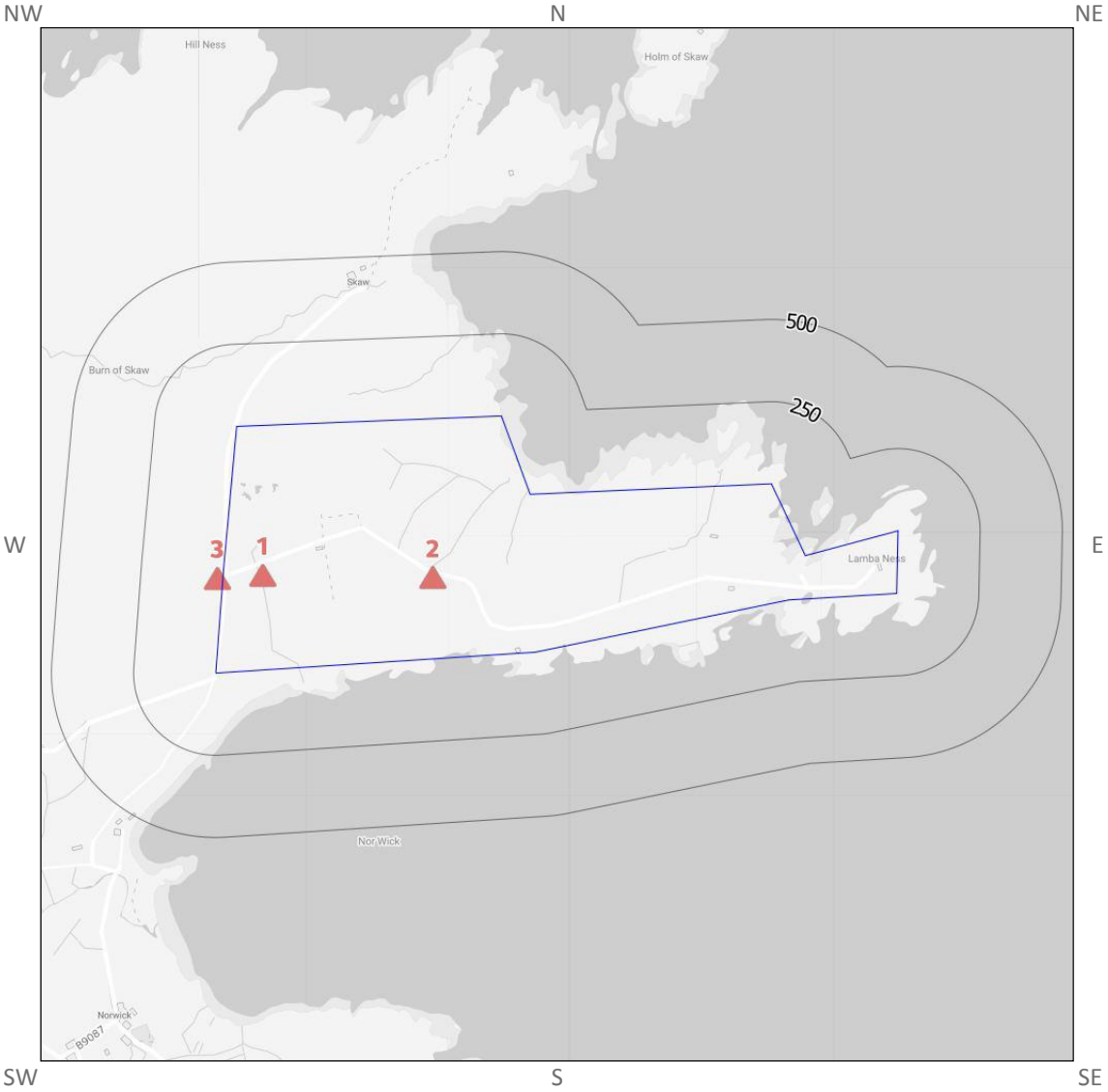
2.4 Groundsure SEPA Waste Sites Data

Records of SEPA waste sites within 500m of the study site	0

Database searched and no data found.

3 Current Land Use

Current Land Use Map



Current Land Use Map

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Sites Designated as Contaminated Land

National Grid Electricity Cables

Part A Authorised Processes

Site Centre

Petrol Stations

Part B Authorised Processes

250
500
Search Buffers (m)

Current Industrial Land Use

National Grid Gas Pipelines

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 500m of the study site	3

The following records are represented as points on the Current Land Uses map.

ID	Distance	Direction	Company	Address	Description	Category
1	0	on site	Quarries (Disused)	Shetland, ZE2	Unspecified Quarries Or Mines	Extractive Industries
2	0	on site	Quarry (Disused)	Shetland, ZE2	Unspecified Quarries Or Mines	Extractive Industries
3	18	W	Quarry (Disused)	Shetland, ZE2	Unspecified Quarries Or Mines	Extractive Industries

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site	0

Database searched and no data found.

3.3 Part A(1), IPPC and Historic IPC Authorisations

Records of Part A(1), IPPC and historic IPC Authorisations within 1000m of the study site	0

Database searched and no data found.

3.4 Part B Authorisations

Records of Part B Authorised Processes within 500m of the study site	0

Database searched and no data found.

3.5 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site	0

Database searched and no data found.

3.6 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site	0

Database searched and no data found.

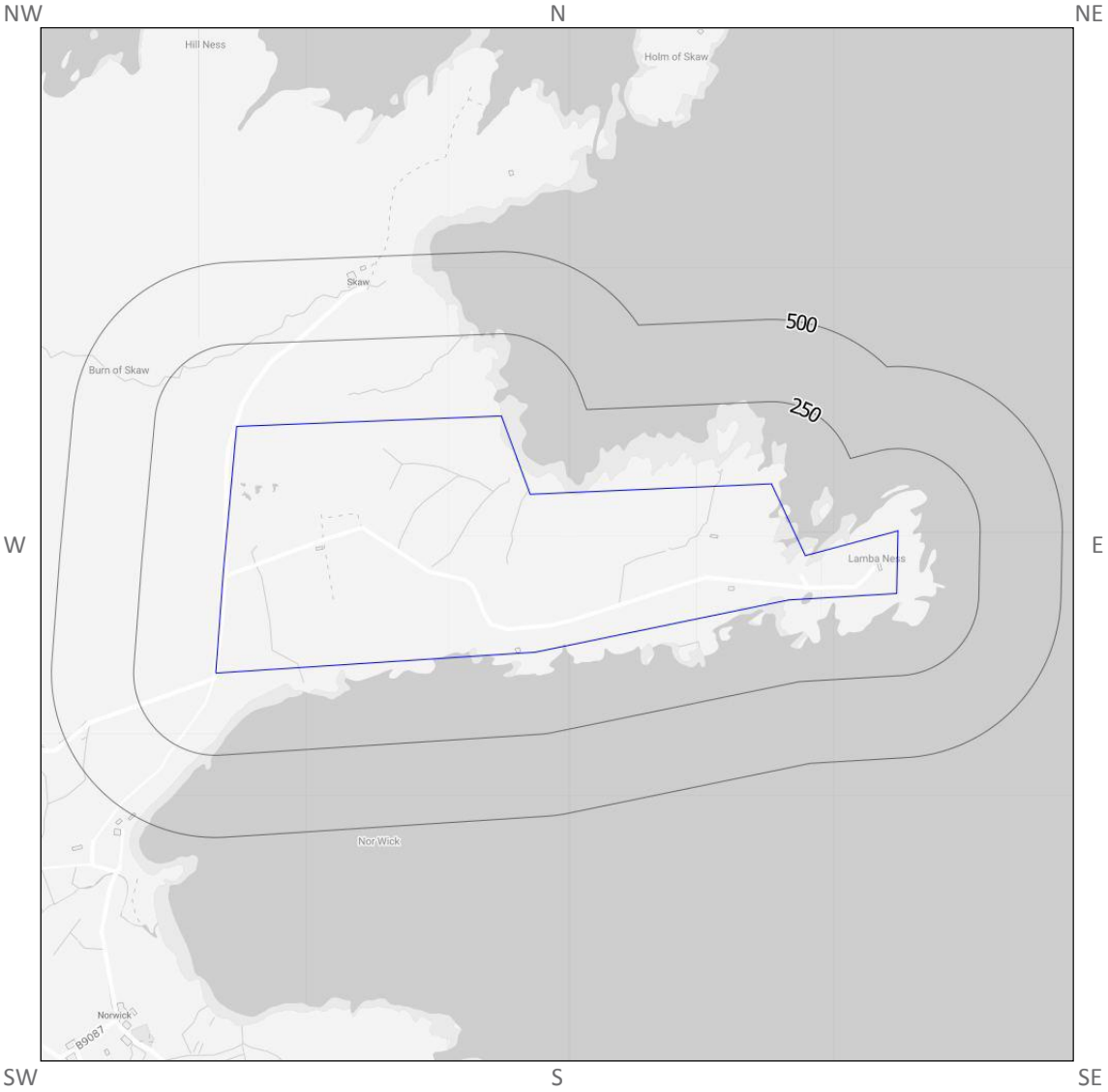
3.7 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many sites does the Local Authority hold information on under Section 78R of the Environmental Protection Act 1990 within 500m of the study site	0

Database searched and no data found.

4 Geology and Hydrogeology

Artificial Ground Map



Artificial Ground Map

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Site Centre

250

500

Search Buffers (m)

Infilled Ground

Made Ground (Undivided)

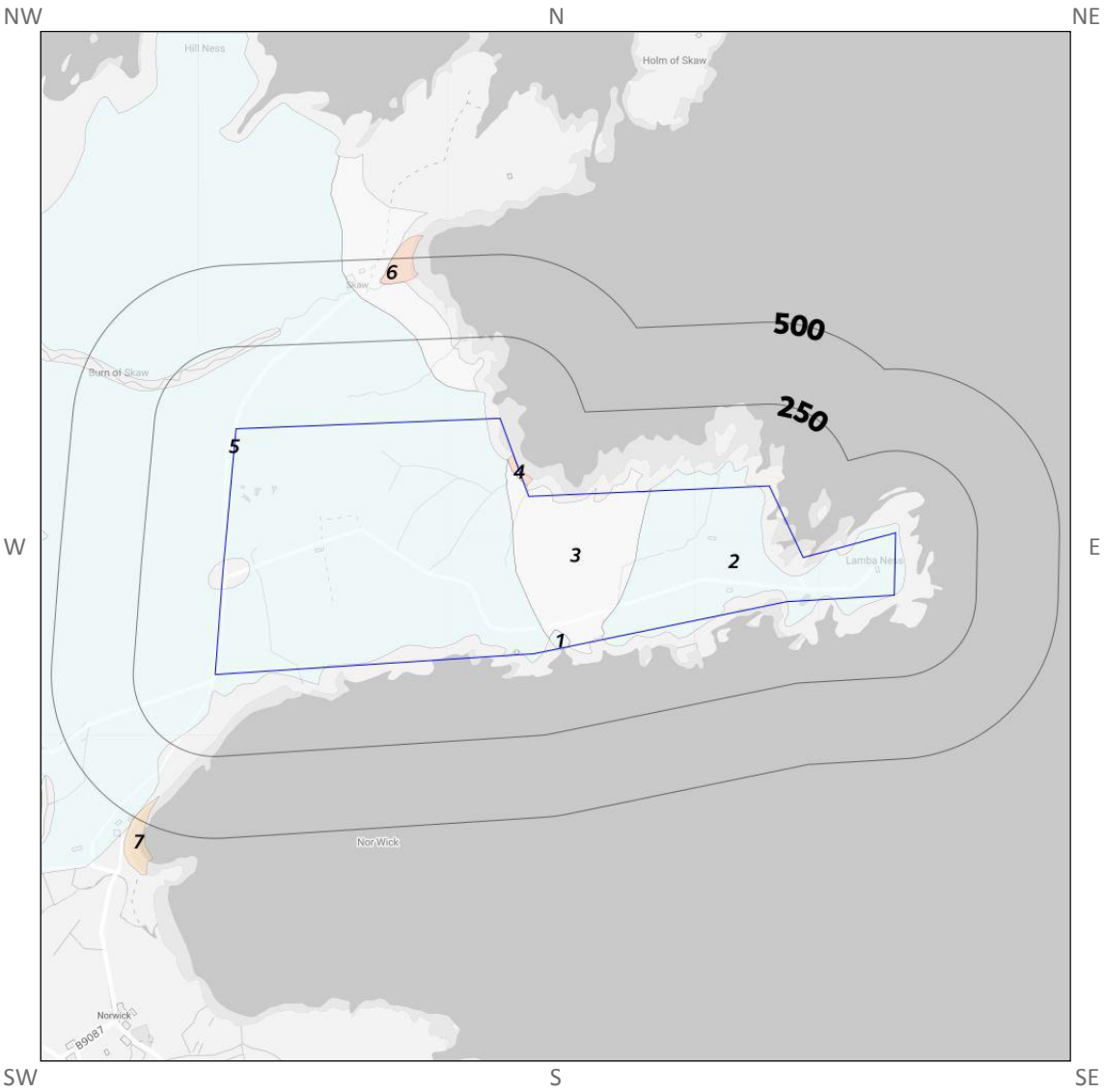
Worked Ground (Undivided)

Disturbed Ground (Undivided)

Landscaped Ground (Undivided)

Reclaimed Ground

Superficial Deposits Map



Superficial Deposits Map

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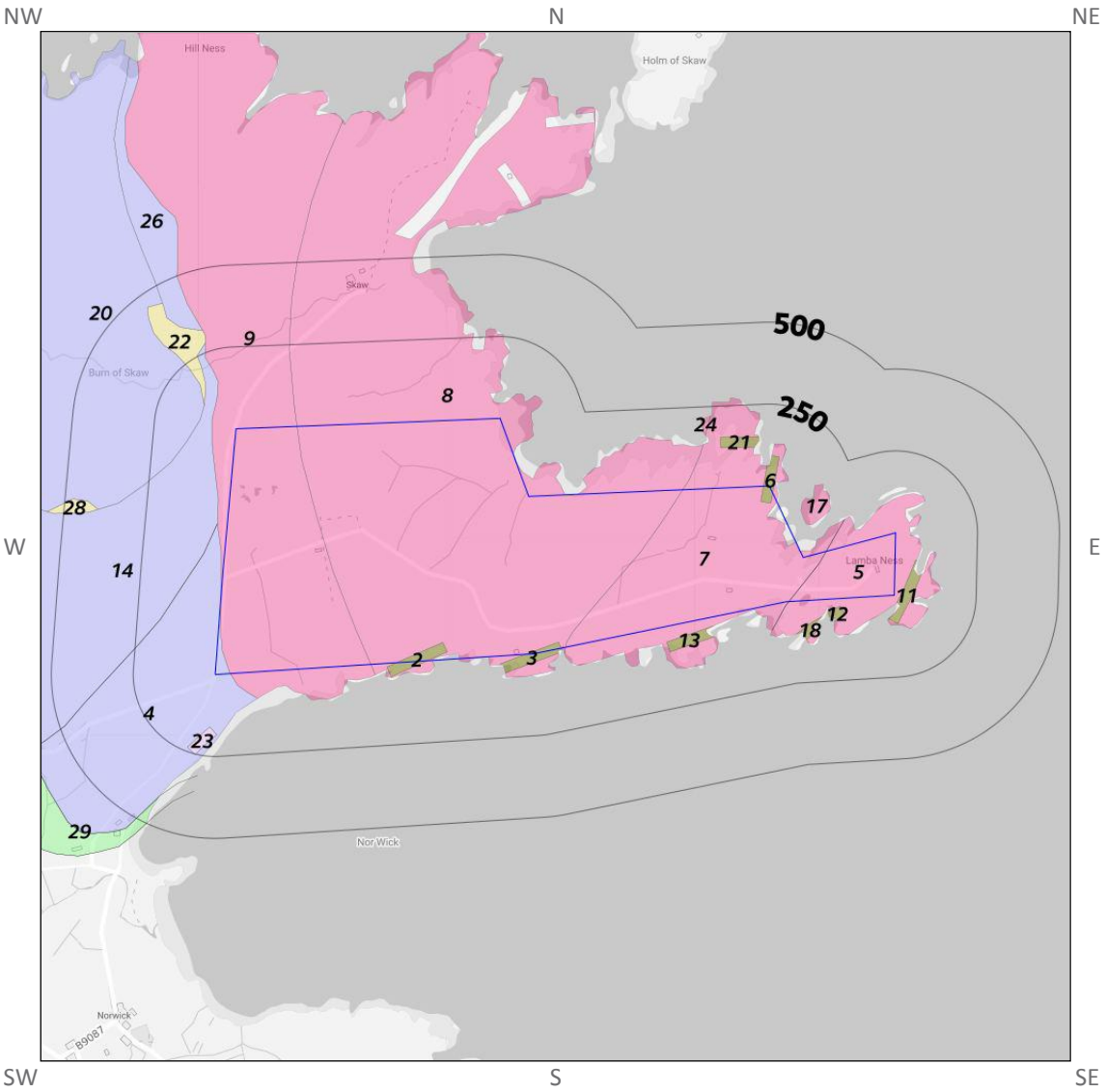
Site Centre

250 500 Search Buffers (m)

- BLOWN SAND
- MARINE BEACH DEPOSITS
- STORM BEACH DEPOSITS
- TILL, DEVENSIAN
- TILL AND MORAINIC DEPOSITS (UNDIFFERENTIATED)

Bedrock and Faults Map



Bedrock and Faults Map

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Site Centre
250
Search Buffers (m)
500
BGS Faults

NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE
SKAW INTRUSION
SAXA VORD PELITE FORMATION
HEVDA PHYLLITE FORMATION
NORWICK HORNBLENDIC SCHIST TYPE 1
NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE
HEVDA PHYLLITE FORMATION

4.1 Artificial Ground and Made Ground

Records of Artificial/Made Ground within 500m of the study site boundary	No

The following geological information represented on the mapping is derived from 1:50,000 scale BGS Geological mapping

4.2 Permability of Artificial Ground

Records relating to permeability of artificial ground within 500m of the study site boundary	No

4.3 Superficial Ground and Drift Geology

Records of Superficial Deposits/ Drift Geology within 500m of the study site boundary	Yes

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
1	0	on site	TILL, DEVENSIAN	DIAMICTON	TILLD-DMTN	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=TILLD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
2	0	on site	TILL, DEVENSIAN	DIAMICTON	TILLD-DMTN	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=TILLD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
3	0	on site	BLOWN SAND	SAND	BSA-S	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=BSA	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
4	0	on site	MARINE BEACH DEPOSITS	SAND	MBD-S	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=MBD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
5	0	on site	TILL AND MORAINIC DEPOSITS (UNDIFFERENTIATED)	DIAMICTON	TIMO-DMTN	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=TIMO	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
6	85	N	BLOWN SAND	SAND	BSA-S	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=BSA	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
7	408	SW	STORM BEACH DEPOSITS	BOULDERS	STOB-B	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=STOB	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	STORM BEACH
8	423	N	MARINE BEACH DEPOSITS	SAND	MBD-S	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=MBD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-

4.4 Permeability of Superficial Ground

Records relating to permeability of superficial ground within 500m of the study site boundary	Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0	on site	Intergranular	High	High
0	on site	Intergranular	High	High
0	on site	Mixed	High	Low
0	on site	Mixed	High	Low
0	on site	Mixed	High	Low
85	N	Intergranular	High	High
236	SW	Mixed	High	Low
408	SW	Intergranular	Very High	Very High
408	W	Mixed	High	Low
423	N	Intergranular	High	High
455	SW	Mixed	High	Low

4.5 Bedrock and Solid Geology

Records of Bedrock/ Solid Geology within 500m of the study site boundary

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
2	0	on site	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
3	0	on site	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
4	0	on site	HEVDA PHYLLITE FORMATION	PELITE, PHYLLITIC	HEVP-PEPH	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=HEVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
5	0	on site	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
6	0	on site	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
7	0	on site	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
8	0	on site	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
9	0	on site	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
10	14	S	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
11	17	SE	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
12	23	S	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
13	28	S	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
14	30	W	SAXA VORD PELITE FORMATION	PELITE, PHYLLITIC	SVP-PEPH	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
16	50	SE	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
17	52	NE	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
18	52	S	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
19	95	S	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
20	113	W	HEVDA PHYLLITE FORMATION	PELITE, PHYLLITIC	HEVP-PEPH	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=HEVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
21	121	N	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	LAMPROPHYRES	SDCAD-LMPY	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
22	121	NW	HEVDA PHYLLITE FORMATION	QUARTZITE	HEVP-QZITE	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=HEVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
23	161	S	NORTH BRITAIN SILURO-DEVONIAN CALC-ALKALINE DYKE SUITE	DIORITE, HORNBLENDE	SDCAD-HBDI	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SDCAD	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-

ID	Distance (m)	Direction	Unit name	Rock Type	BGS Code	BGS Unit Classification Link	BGS Rock Classification Link	Previous Name
24	164	N	SKAW INTRUSION	MICROGRANITE, PORPHYRITIC	SKAW-MCGNP	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SKAW	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	SKAW GRANITE
26	317	N	SAXA VORD PELITE FORMATION	PELITE, PHYLLITIC	SVP-PEPH	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=SVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
28	397	W	HEVDA PHYLLITE FORMATION	QUARTZITE	HEVP-QZITE	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=HEVP	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-
29	412	SW	NORWICK HORNBLENDIC SCHIST TYPE 1	METABASALT, PHYLLITIC	NORH1-MBAPH	http://www.bgs.ac.uk/Lexicon/lexicon.cfm?pub=NORH1	http://www.bgs.ac.uk/data/maps/maps.cfc?method=listResults&m	-

4.6 Permeability of Bedrock Ground

Records relating to permeability of bedrock ground within 500m of the study site boundary	Yes

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
0	on site	Fracture	Low	Low
0	on site	Fracture	Low	Low
0	on site	Fracture	Low	Low
0	on site	Fracture	Low	Low
0	on site	Fracture	Low	Low
14	SE	Fracture	Low	Low
17	E	Fracture	Low	Low
23	E	Fracture	Low	Low
28	SE	Fracture	Low	Low
30	W	Fracture	Low	Low

Distance (m)	Direction	Flow Type	Maximum Permeability	Minimum Permeability
50	E	Fracture	Low	Low
52	E	Fracture	Low	Low
52	E	Fracture	Low	Low
95	E	Fracture	Low	Low
113	NW	Fracture	Low	Low
121	NE	Fracture	Low	Low
121	NW	Fracture	Low	Low
161	SW	Fracture	Low	Low
201	SW	Fracture	Low	Low
201	SW	Fracture	Low	Low
317	NW	Fracture	Low	Low
397	W	Fracture	Low	Low
408	W	Fracture	Low	Low
412	SW	Fracture	Low	Low
420	SW	Fracture	Low	Low
447	W	Fracture	Low	Low
450	NW	Fracture	Low	Low
455	SW	Fracture	Low	Low

This includes an automatically generated 50m buffer zone around the site

4.7 Faults

Records of Faults within 1000m of the study site boundary	Yes

Distance	Direction	Category Description	Feature Description
0	on site	FAULT	Reverse or thrust fault, inferred
30	W	FAULT	Reverse or thrust fault, inferred
312	S	FAULT	Reverse or thrust fault, inferred
362	S	FAULT	Reverse or thrust fault, inferred

The geology map for the site and surrounding area are extracted from the BGS Digital Geological Map of Great Britain at 1:50,000 scale. This Geology shows the main components as discrete layers, these are: Bedrock/ Solid Geology and linear features such as Faults. These are all displayed with the BGS Lexicon code for the rock unit and BGS sheet number. Not all of the main geological components have nationwide coverage.

4.8 Landslip

Records of Landslip within 500m of the study site boundary?	No

Database searched and no data found.

4.9 Landslip Permeability

Records relating to permeability of landslips within 500m of the study site boundary	No

Database searched and no data found.

*This includes an automatically generated 50m buffer zone around the site

4.10 Groundwater Vulnerability and Soil Classification

Records of Groundwater Classification within 250m of the site	Yes

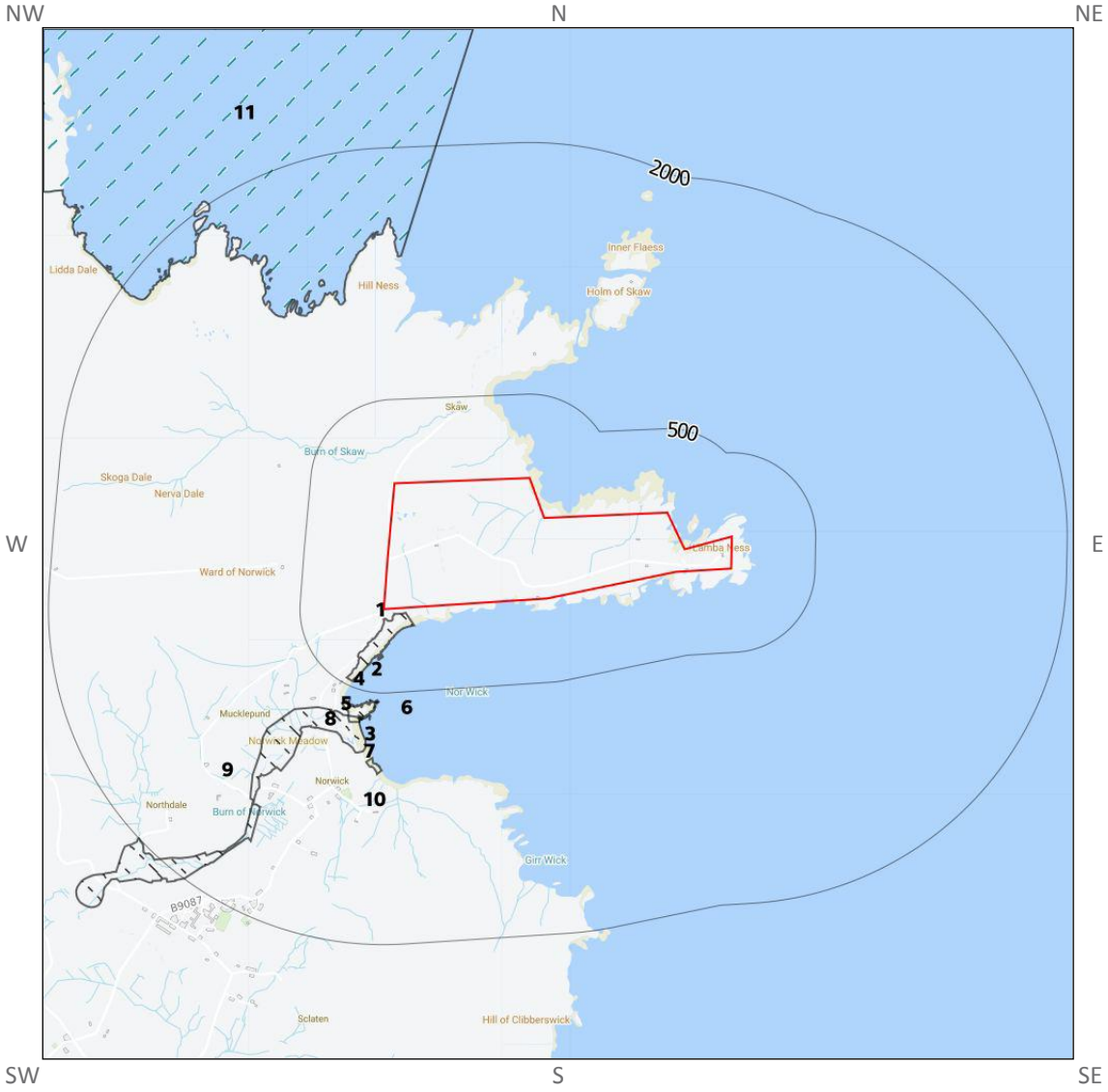
The following groundwater information is not represented on mapping:

Bedrock Geology

Distance (m)	Direction	Description	Type	Layer	Rock Description
0	on site	Concealed aquifers, aquifers of limited potential, regions without significant groundwater	Regions underlain by impermeable rocks, generally without groundwater except at shallow depth	SOLID	PreCambrian

5 Designated Environmentally Sensitive Sites

Designated Environmentally Sensitive Sites Map



Designated Environmentally Sensitive Sites Map

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- Site Centre
- Search Buffers (m): 500, 2000
- Greenbelt
- Ramsar Site
- Area of Outstanding Natural Beauty
- Sites of Special Scientific Interest
- National Park
- Ancient Woodland
- Special Area Of Conservation
- Local Nature Reserve
- National Nature Reserve
- Special Protection Area
- World Heritage Site

Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site?	Yes

5.1 Sites of Special Scientific Interest (SSSI)

Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:	10

The following Sites of Special Scientific Interest (SSSI) records are provided by Natural England/Natural Resources Wales/Scottish Natural Heritage:

ID	Distance (m)	Direction	SSSI Name	Data Source
1	30	S	Norwick	Scottish Natural Heritage
2	545	S	Norwick	Scottish Natural Heritage
3	546	S	Norwick	Scottish Natural Heritage
4	552	S	Norwick	Scottish Natural Heritage
5	557	S	Norwick	Scottish Natural Heritage
6	581	S	Norwick	Scottish Natural Heritage
7	642	S	Norwick	Scottish Natural Heritage
8	657	S	Norwick	Scottish Natural Heritage
9	662	S	Norwick Meadows	Scottish Natural Heritage
10	890	S	Norwick	Scottish Natural Heritage

5.2 Ramsar Sites

Records of Ramsar sites within 2000m of the study site:	0

Database searched and no data found.

5.3 National Nature Reserves (NNR)

Records of National Nature Reserves (NNR) within 2000m of the study site:	0

Database searched and no data found.

5.4 Special Areas of Conservation (SAC)

Records of Special Areas of Conservation (SAC) within 2000m of the study site:	0

Database searched and no data found.

5.5 Special Protection Areas (SPA)

Records of Special Protection Areas (SPA) within 2000m of the study site:	1

The following Special Protection Areas (SPA) records are provided by Natural England/Natural Resources Wales/Scottish Natural Heritage:

ID	Distance (m)	Direction	SPA Name	Data Source
11	1112	N	Hermaness, Saxa Vord and Valla Field	Scottish Natural Heritage

5.6 Local Nature Reserves (LNR)

Records of Local Nature Reserves (LNR) within 2000m of the study site:	0

Database searched and no data found.

5.7 World Heritage Sites

Records of World Heritage Sites within 2000m of the study site:	0

Database searched and no data found.

5.8 Areas of Outstanding Natural Beauty (AONB)

Records of Areas of Outstanding Natural Beauty (AONB)/National Scenic Areas within 2000m of the study site:	0

Database searched and no data found.

5.9 National Parks

Records of National Parks within 2000m of the study site:	0

Database searched and no data found.

5.10 Green Belt

Records of Green Belt land within 2000m of the study site:	0

Database searched and no data found.

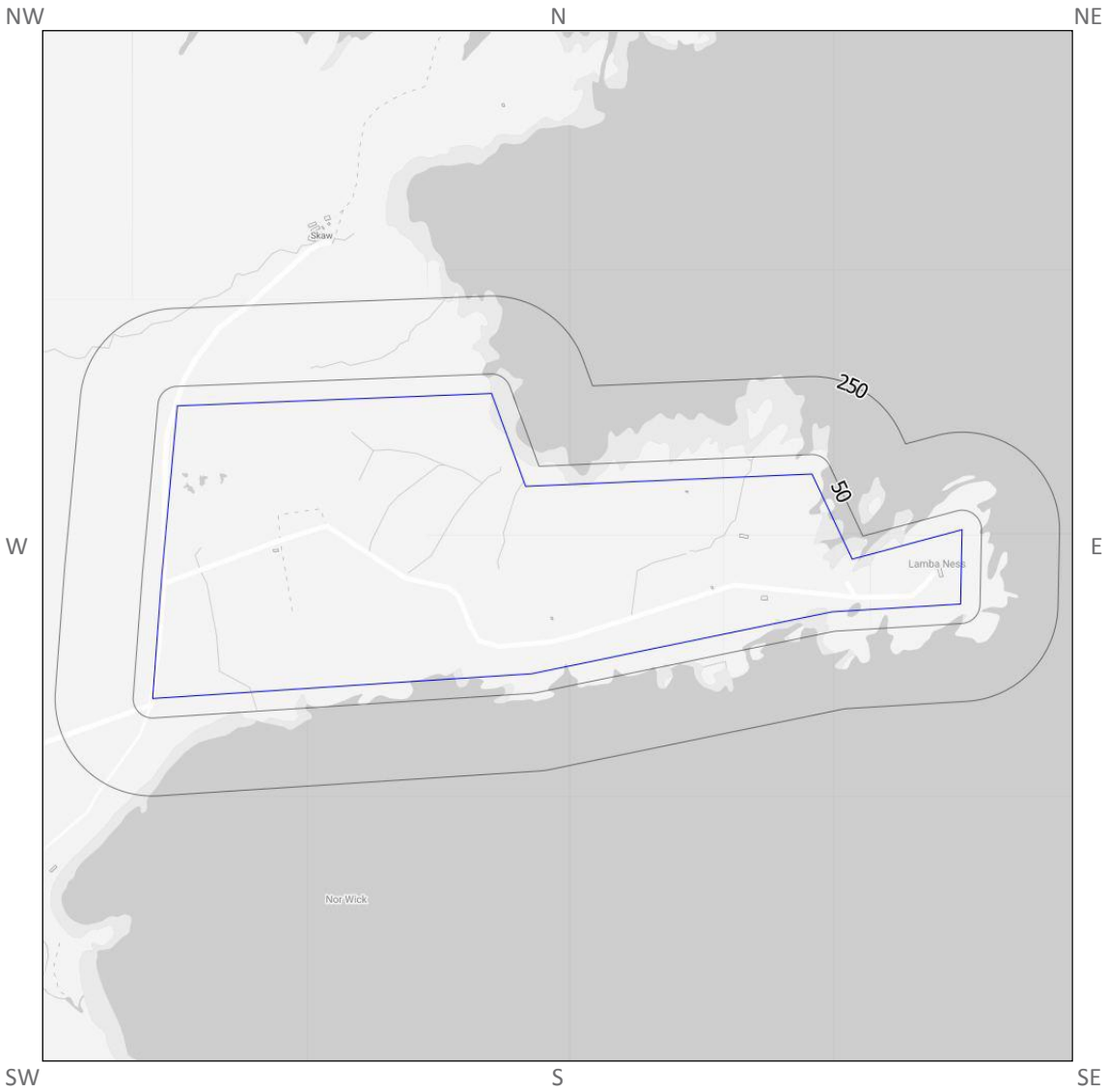
5.11 Designated Ancient Woodland

Records of Ancient Woodland within 2000m of the study site:	0

Database searched and no data found.

6 Flooding

River Flooding Map



River Flooding Map

Flood data provided by JBA Risk Management, Copyright JBA Risk Management Limited. 2008 - 2019

Site Centre

50

250

Search Buffers (m)

1 in 20 year risk of river flooding

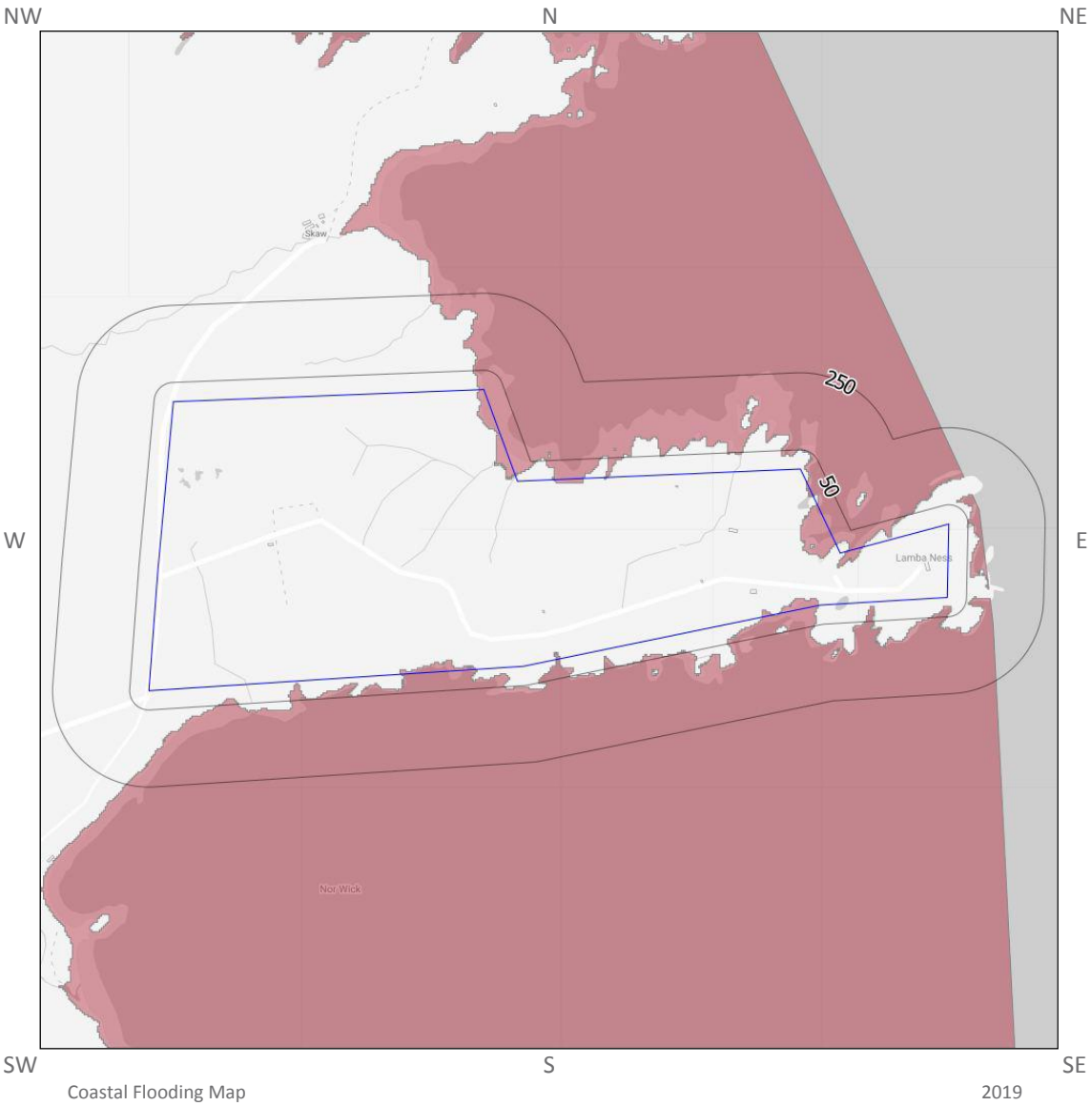
1 in 75 year risk of river flooding

1 in 100 year risk of river flooding

1 in 200 year risk of river flooding

1 in 1000 year risk of river flooding

Coastal Flooding Map



Site Centre

50

250

Search Buffers (m)

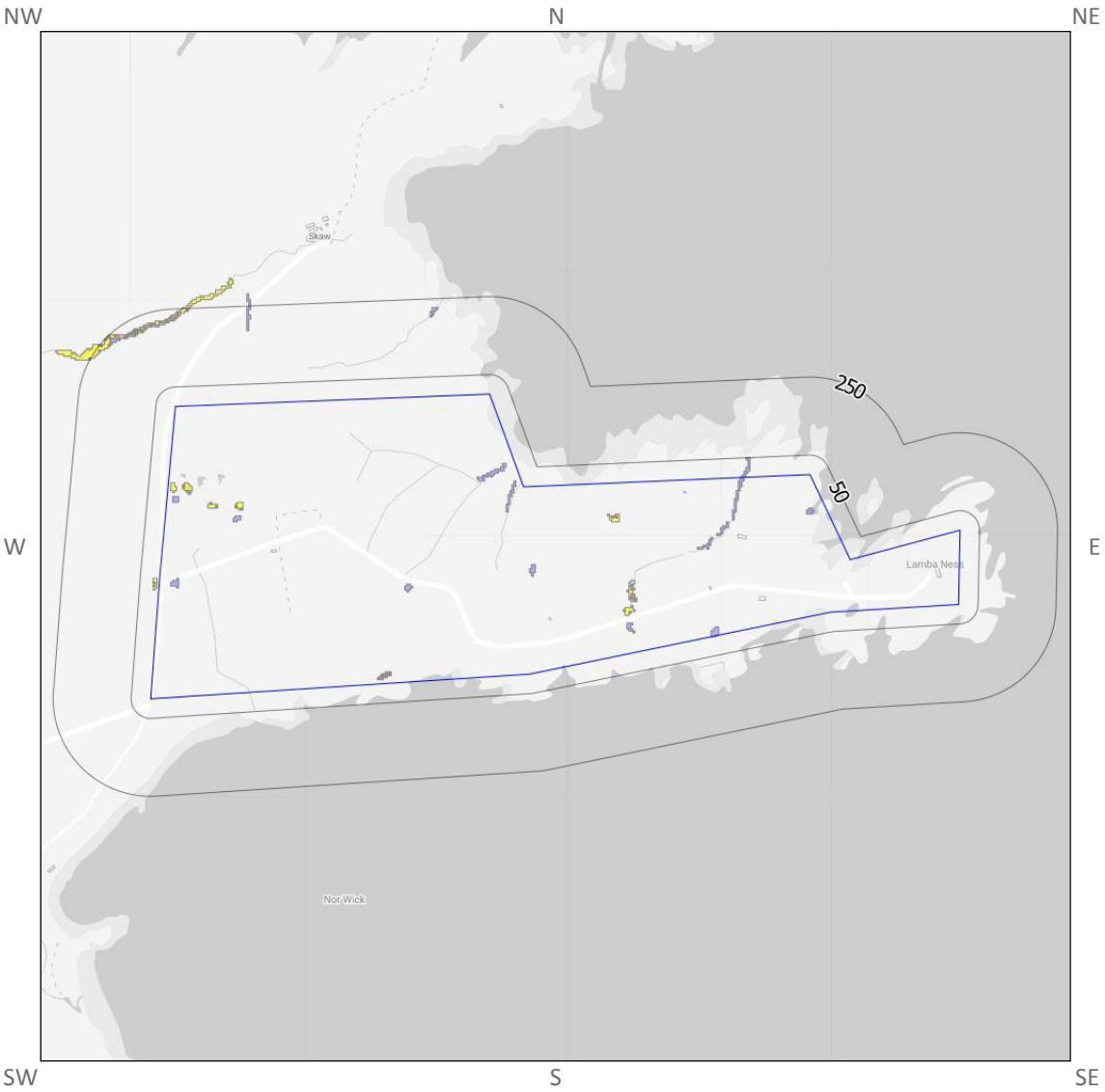
1 in 75 year risk of coastal flooding

1 in 100 year risk of coastal flooding

1 in 200 year risk of coastal flooding

1 in 1000 year risk of coastal flooding

Surface Water (pluvial) Flooding



Surface Water (pluvial) Flooding

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Site Centre

Search Buffers (m)
50
250

Low
Low to Moderate
Moderate
Moderate to High
High
Significant
Highly Significant

6.1 River Flooding

Highest risk of river flooding.	Negligible

The data is provided by JBA Risk Management. This is modelled data on a national scale. Large-scale national flood maps provide a convenient and consistent approach to peril assessment; they are indicative and are not a substitute for detailed site level hydraulic modelling. Further study may be required to assess the level of flood hazard for a specific development.

6.2 Coastal Flooding

Highest risk of coastal flooding.	1 in 75 years.

The data is provided by JBA Risk Management. This is modelled data on a national scale. Large-scale national flood maps provide a convenient and consistent approach to peril assessment; they are indicative and are not a substitute for detailed site level hydraulic modelling. Further study may be required to assess the level of flood hazard for a specific development.

Distance	Direction	Risk
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 1000 year risk of river flooding
0	on site	1 in 100 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 200 year risk of river flooding
0	on site	1 in 75 year risk of river flooding
0	on site	1 in 75 year risk of river flooding
0	on site	1 in 75 year risk of river flooding
1	E	1 in 1000 year risk of river flooding
1	N	1 in 200 year risk of river flooding
14	S	1 in 1000 year risk of river flooding
24	S	1 in 200 year risk of river flooding

Distance	Direction	Risk
27	S	1 in 100 year risk of river flooding
28	NE	1 in 1000 year risk of river flooding
31	S	1 in 1000 year risk of river flooding
35	NE	1 in 1000 year risk of river flooding
36	N	1 in 1000 year risk of river flooding
43	N	1 in 200 year risk of river flooding
43	S	1 in 1000 year risk of river flooding
44	N	1 in 1000 year risk of river flooding
44	S	1 in 100 year risk of river flooding

6.3 JBA Surface (Pluvial) Water Flooding

Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

Surface Water (pluvial) flooding will usually be a result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

What is the risk of pluvial flooding at the study site?	Highly Significant

Guidance: The site has been assessed to be at a Highly Significant Risk of surface water (pluvial) flooding. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 75 year rainfall event to a depth of greater than 1m.

This data is provided by JBA Risk Management, © Jeremy Benn Associates Limited 2008-2019

The following pluvial (surface water) flood risk records within 50m of the study site are shown on the JBA Surface Water Flooding Map:

Distance	Direction	Risk
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	High
0	on site	Highly Significant
0	on site	Low to Moderate

Distance	Direction	Risk
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low to Moderate
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low

Distance	Direction	Risk
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Low
0	on site	Moderate
0	on site	Significant
0	on site	Significant
0	on site	Significant
0	on site	Significant
0	on site	Significant
5	W	High
10	W	Significant

6.4 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site?	Yes
What is the susceptibility to Groundwater Flooding in the search area based on the underlying geological conditions?	Potential for groundwater flooding at surface
Does this relate to Clearwater Flooding or Superficial Deposits Flooding?	Superficial Deposits Flooding

6.5 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result?	High

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

6.6 BGS Geological Indicators of Flooding

Are there any geological indicators of flooding within 250m of the study site?	Yes

This dataset identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. This assessment does not take account of any man-made factors such as flood protection schemes, and the data behind the report are purely geological.

Distance (m)	Direction	Description
Distance (m)	Direction	Description
0	on site	Higher flood potential from the sea: the first areas to experience the effects of coastal flooding.

6.7 JBA Reservoir Failure Impact Modelling

Is the property located in an area identified as being at potential risk in the event of a reservoir failure?	No

JBA Risk Management have modelled the flooding impact from 1,700 reservoirs in the UK, should there be a catastrophic failure of a reservoir wall or embankment.

Guidance: None required

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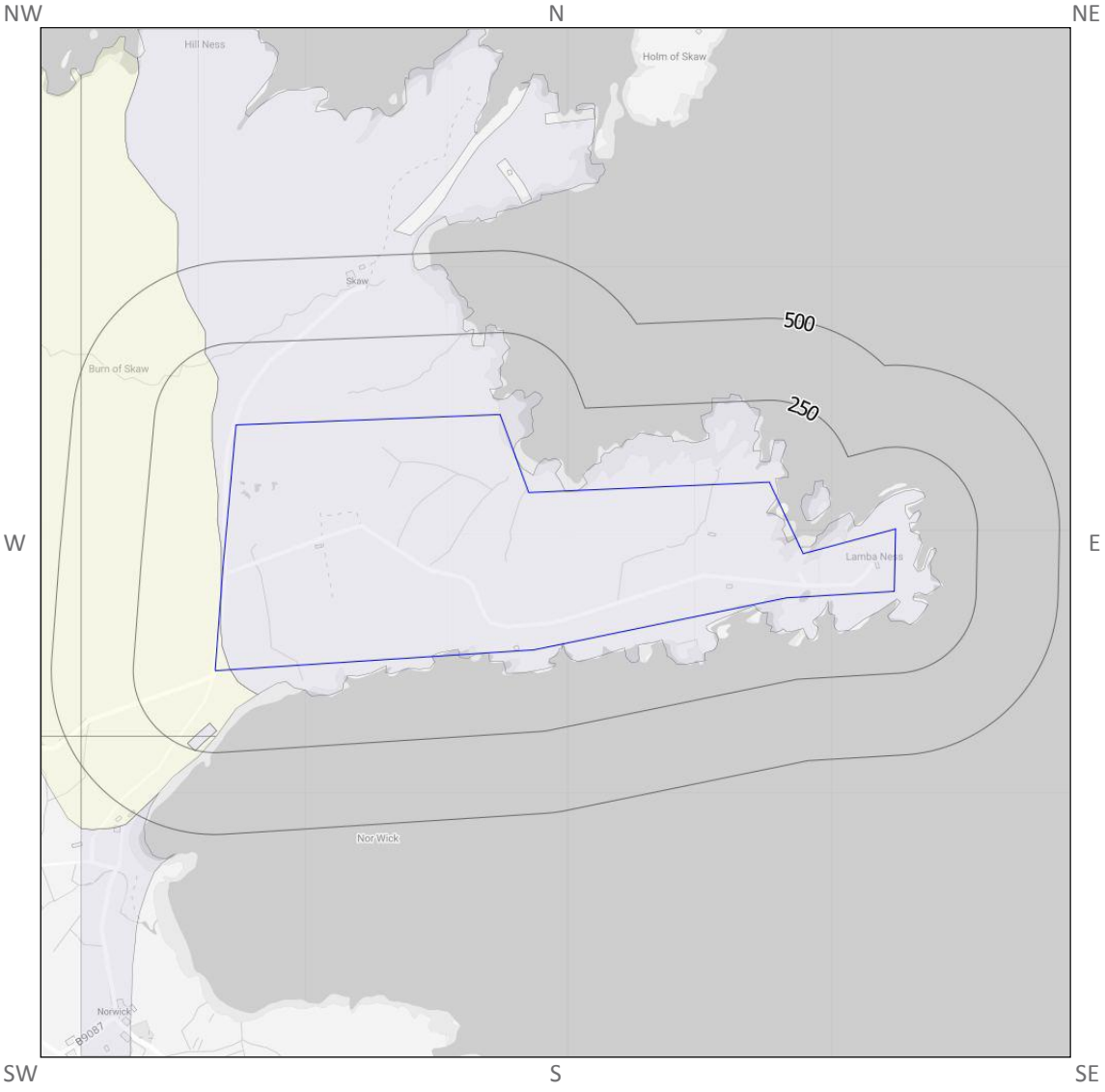
7 Mining

Mining, Extraction & Natural Cavities



Mining, Extraction & Natural Cavities

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Non-coal Mining (BGS records)

- Rare
- Highly Unlikely
- Unlikely
- Likely
- Highly Likely

- Site Centre
- Search Buffers (m): 250, 500

- Historical Mining (Historical Ordnance Survey records)
- Natural Cavity records (PBA)
- Mining Cavity records (PBA)

7.1 Historical Mining

This dataset is derived from Groundsure unique Historical Land-use Database that are indicative of mining or extraction activities.

Are there any Historical Mining areas within 1000m of the study site boundary?	No

Database searched and no data found.

7.2 Coal Mining

Database searched and no data found.

7.3 Johnson Poole and Bloomer

Are there any JPB Mining areas within 1000m of the study site boundary?	No

Database searched and no data found.

7.4 Non-Coal Mining

The following non-coal mining information is provided by the BGS:

ID	Distance (m)	Direction	Name	Rating	Commodity	Assessment of likelihood
1	0	on site	Not available	Rare	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
2	0	on site	Not available	Highly Unlikely	Vein Mineral	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered

ID	Distance (m)	Direction	Name	Rating	Commodity	Assessment of likelihood
3	52	NE	Not available	Highly Unlikely	Vein Mineral	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
4	161	S	Not available	Highly Unlikely	Vein Mineral	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
5	201	S	Not available	Rare	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
6	201	S	Not available	Highly Unlikely	Vein Mineral	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered

ID	Distance (m)	Direction	Name	Rating	Commodity	Assessment of likelihood
7	408	W	Not available	Rare	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered
8	412	SW	Not available	Highly Unlikely	Vein Mineral	Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered
9	455	SW	Not available	Rare	Vein Mineral	Sporadic underground mining of restricted extent may have occurred. Potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered

7.5 Non-Coal Mining Cavities

This dataset provides information from the Peter Brett Associates (PBA) mining cavities database (compiled for the national study entitled “Review of mining instability in Great Britain, 1990” PBA has also continued adding to this database) on mineral extraction by mining.

Are there any Non-Coal Mining cavities within 1000m of the study site boundary?	No

Database searched and no data found.

7.6 Natural Cavities

This dataset provides information based on Peter Brett Associates natural cavities database.

Are there any Natural Cavities within 1000m of the study site boundary?	No

Database searched and no data found.

7.7 Brine Extraction

This data provides information from the Coal Authority issued on behalf of the Cheshire Brine Subsidence Compensation Board.

Are there any Brine Extraction areas within 1000m of the study site boundary?	No

Database searched and no data found.

7.8 Gypsum Extraction

This dataset provides information on Gypsum extraction from British Gypsum records.

Are there any Gypsum Extraction areas within 1000m of the study site boundary?	No

Database searched and no data found.

7.9 Tin Mining

This dataset provides information on tin mining areas and is derived from tin mining records. This search is based upon postcode information to a sector level.

Are there any Tin Mining areas within 1000m of the study site boundary?	No

Database searched and no data found.

7.10 Clay Mining

This dataset provides information on Kaolin and Ball Clay mining from relevant mining records.

Are there any Clay Mining areas within 1000m of the study site boundary?	No

Database searched and no data found.

8 Natural Hazards Findings

Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m to account for the scale of mapping used to derive the information within this database (1:50,000 scale). The data is included in tabular format. The following information has been found:

8.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site?	Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazards
Ground conditions predominantly low plasticity. No special actions required to avoid problems due to shrink-swell clays. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with shrink-swell clays.

8.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site?	Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping.

Hazards
Significant potential for slope instability with relatively small changes in ground conditions. Avoid large amounts of water entering the ground through pipe leakage or soak-aways. Do not undercut or place large amounts of material on slopes without technical advice. For new build – consider the potential and consequences of ground movement during excavations, or consequence of changes to loading or drainage. For existing property – probable increase in insurance risk is likely due to potential natural slope instability after changes to ground conditions such as a very long, excessively wet winter.

8.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site?	Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping.

Hazards
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

8.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site?	Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping

Hazards

Hazards
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

8.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site?	Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping.

Hazards
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

8.6 Running Sand

What is the maximum Running Sand* hazard rating identified on the study site?	High

The following natural subsidence information provided by the British Geological Survey is not represented on mapping.

Hazards
Very significant potential for running sand problems. Avoid large amounts of water entering the ground, for example through pipe leakage or soak-always. Do not dig (deep) holes into saturated ground without technical advice. For new build – consider the consequences of soil and groundwater conditions during and after construction. Possible extra cost during construction. For existing property – possible increase in insurance risk from running sand, for instance ions due to water leakage, high rainfall events or flooding.

8.7 Radon Potential

Maximum radon potential at the study site	The property is in a Radon Affected Area, as between 1 and 3% of properties are above the Action Level

The Radon Potential Dataset is the definitive map of Radon Affected Areas in Great Britain and Northern Ireland, created jointly by Public Health England (PHE) and the BGS using long-term radon measurements made in over 479,000 homes across Great Britain and 23,000 homes across Northern Ireland (without affecting householders' confidentiality), combined with geological map data. The findings of this dataset supercede any findings derived from the generalised Indicative Atlas of Radon.

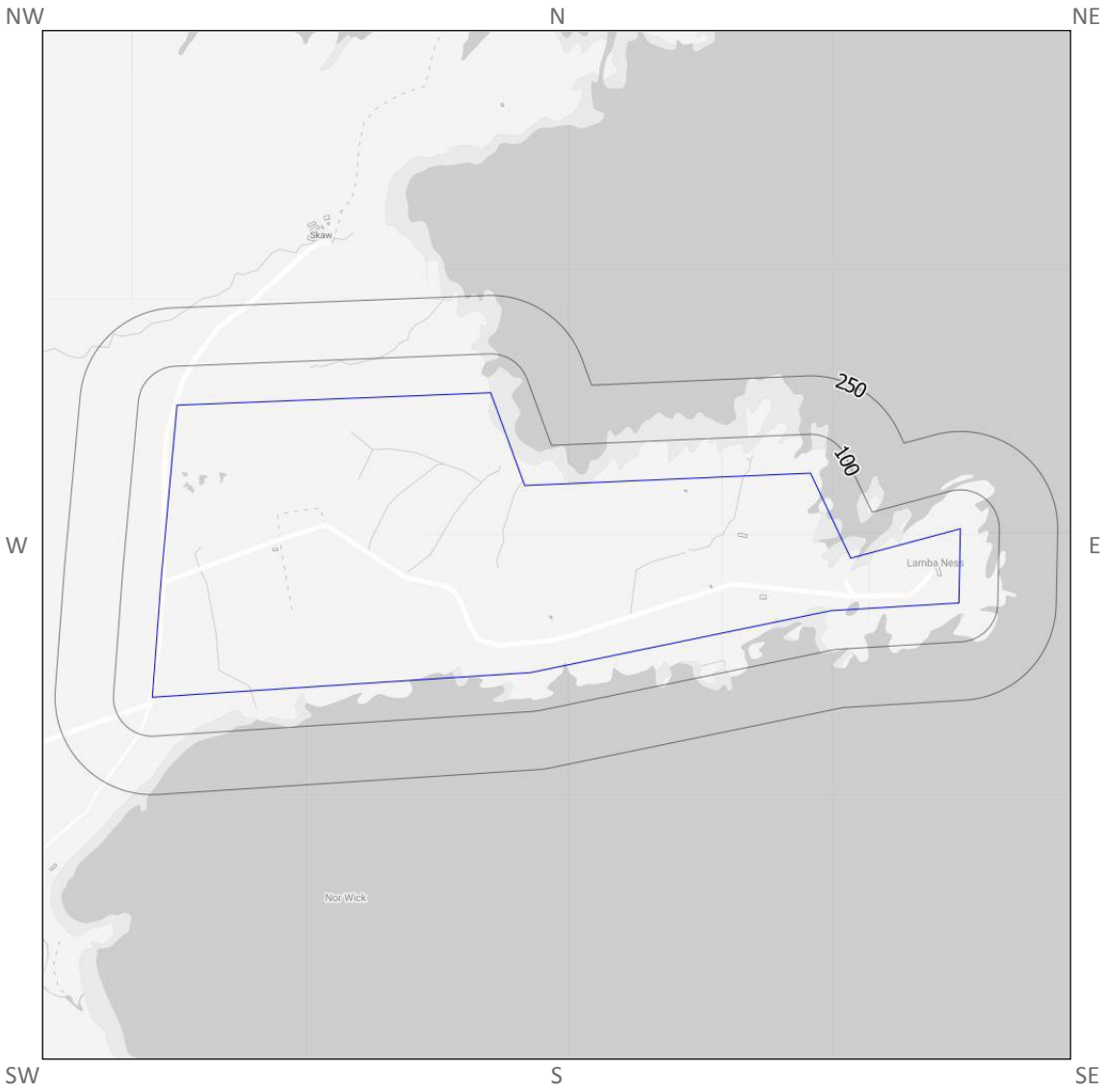
8.8 Radon Protective Measures

Radon protection measures required for new properties or extensions to existing properties	Basic radon protective measures are necessary.

The responses given on the level of radon protective measures required are based on a joint radon potential dataset from Public Health England (PHE) and the British Geological Survey (BGS). Basic radon protective measures need to be installed for new dwellings or extensions to existing dwellings in Scotland where more than 1% but less than 3% of homes are estimated to exceed the Action Level. The joint PHE-BGS radon potential data forms the basis for the Building Research Establishment guidance on radon protective measures for new dwellings (BR211 2015).

9 Borehole Records

Borehole Records Map



Borehole Records Map

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Site Centre

100
250
Search Buffers (m)

BGS Recorded Boreholes

9.1 Borehole Records

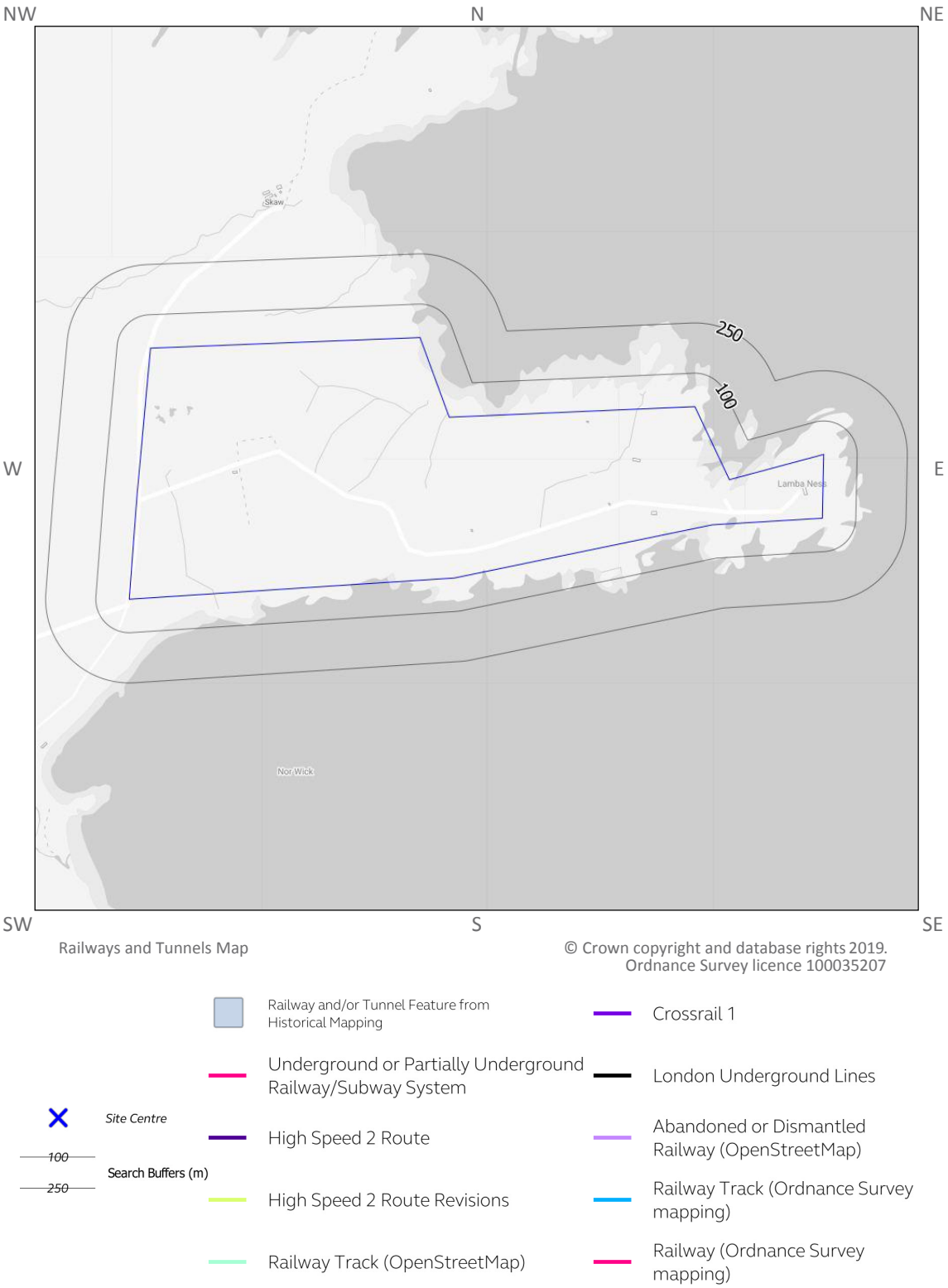
The systematic analysis of data extracted from the BGS Borehole Records database provides the following information.

Records of boreholes within 250m of the study site boundary	0

Database searched and no data found.

10 Railways and Tunnels

Railways and Tunnels Map



Railways and Tunnels Map

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Railway and/or Tunnel Feature from Historical Mapping

Underground or Partially Underground Railway/Subway System

High Speed 2 Route

High Speed 2 Route Revisions

Railway Track (OpenStreetMap)

Crossrail 1

London Underground Lines

Abandoned or Dismantled Railway (OpenStreetMap)

Railway Track (Ordnance Survey mapping)

Railway (Ordnance Survey mapping)

Site Centre

Search Buffers (m)

100

250

10.1 Tunnels

This data is derived from OpenStreetMap and provides information on the possible locations of underground railway systems in the UK - the London Underground, the Tyne & Wear Metro and the Glasgow Subway.

Have any underground railway lines been identified within the study site boundary?	No
Have any underground railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

This data is derived from Ordnance Survey mapping and provides information on the possible locations of railway tunnels forming part of the UK overground railway network.

Have any other railway tunnels been identified within the site boundary?	No
Have any other railway tunnels been identified within 250m of the site boundary?	No

Any records that have been identified are represented on the Railways and Tunnels Map.

10.2 Historical Railway and Tunnel Features

This data is derived from Groundsure's unique Historical Land-use Database and contains features relating to tunnels, railway tracks or associated works that have been identified from historical Ordnance Survey mapping.

Have any historical railway or tunnel features been identified within the study site boundary?	No
Have any historical railway or tunnel features been identified within 250m of the study site boundary?	No

Database searched and no data found.

Any records that have been identified are represented on the Railways and Tunnels Map.

10.3 Historical Railways

This data is derived from OpenStreetMap and provides information on the possible alignments of abandoned or dismantled railway lines in proximity to the study site.

Have any historical railway lines been identified within the study site boundary?	No
Have any historical railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

Note: multiple sections of the same track may be listed in the detail above

Any records that have been identified are represented on the Railways and Tunnels Map.

10.4 Active Railways

These datasets are derived from Ordnance Survey mapping and OpenStreetMap and provide information on the possible locations of active railway lines in proximity to the study site.

Have any active railway lines been identified within the study site boundary?	No
Have any active railway lines been identified within 250m of the study site boundary?	No

Database searched and no data found.

10.5 Railway Projects

These datasets provide information on the location of large scale railway projects High Speed 2 and Crossrail 1 .

Is the study site within 5km of the route of the High Speed 2 rail project?	No
Is the study site within 500m of the route of the Crossrail 1 rail project?	No

Further information on proximity to these routes, the project construction status and associated works can be obtained through the purchase of a Groundsure HS2 and Crossrail 1 Report.

The route data has been digitised from publicly available maps by Groundsure. The route as provided relates to the Crossrail 1 project only, and does not include any details of the Crossrail 2 project, as final details of the route for Crossrail 2 are still under consultation.

11 Soil Chemistry

11.1 Estimated Background Soil Chemistry

For further information on how this data is calculated and limitations upon its use, please see the Groundsure Geo Insight User Guide, available on request.

Records of background estimated soil chemistry potentially within the study site boundary:	58

The BGS Estimated Ambient Background Soil Chemistry dataset has been developed at a 1:50,000 scale, and hence any records found within 50m of the site are displayed within this table as potentially being present on site. Please note, if the search area is in an urban area, then As, Cd, Cr, Ni and Pb concentrations are likely to be significantly higher than indicated by the estimated ambient background concentrations.

Distance (m)	Direction	Sample Type	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Chromium (Cr) (mg/kg)	Nickel (Ni) (mg/kg)	Lead (Pb) (mg/kg)	Bioaccessible lead (mg/kg)
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg

Distance (m)	Direction	Sample Type	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Chromium (Cr) (mg/kg)	Nickel (Ni) (mg/kg)	Lead (Pb) (mg/kg)	Bioaccessible lead (mg/kg)
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg

Distance (m)	Direction	Sample Type	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Chromium (Cr) (mg/kg)	Nickel (Ni) (mg/kg)	Lead (Pb) (mg/kg)	Bioaccessible lead (mg/kg)
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	45 - 60 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
3	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
5	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	45 - 60 mg/kg	<100 mg/kg	<60 mg/kg
4	W	Sediment	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
1	W	Sediment	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
1	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
19	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
17	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
21	SW	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
2	S	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
27	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
20	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
23	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
37	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
34	SW	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
20	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
16	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg

Distance (m)	Direction	Sample Type	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Chromium (Cr) (mg/kg)	Nickel (Ni) (mg/kg)	Lead (Pb) (mg/kg)	Bioaccessible lead (mg/kg)
14	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
8	W	Sediment	<15 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
25	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
28	SE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
17	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
44	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
50	E	Sediment	15 - 25 mg/kg	<1.8 mg/kg	>180 mg/kg	30 - 45 mg/kg	<100 mg/kg	<60 mg/kg
19	N	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
38	SW	Sediment	<15 mg/kg	<1.8 mg/kg	90 - 120 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
48	NW	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
42	NE	Sediment	15 - 25 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
0	on site	Sediment	<15 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
28	N	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
30	W	Sediment	<15 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
17	N	Sediment	<15 mg/kg	<1.8 mg/kg	120 - 180 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
28	NW	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg
42	NW	Sediment	<15 mg/kg	<1.8 mg/kg	60 - 90 mg/kg	15 - 30 mg/kg	<100 mg/kg	<60 mg/kg

11.2 Estimated Urban Soil Chemistry

Records of urban estimated soil chemistry potentially within the study site boundary.	0

Database searched and no data found.

11.3 Measured Urban Soil Chemistry

Records of urban measured soil chemistry within 500m of the study site boundary:	0

Database searched and no data found.

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Appendix 9.2 AECOM Drainage Strategy

Shetland Space Centre
Drainage Strategy

Project Number: 60617516

December 2020

Quality information

Prepared by	Checked by	Verified by	Approved by
			

Revision History

Revision	Revision date	Details	Authorized	Name	Position

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Table of Contents

1. Introduction

The proposed Shetland Space Centre (SSC) is located to the east of Holsens Road on the headland of Lamba Ness on the island of Unst, Shetland and is indicated on drawing 60617516-ACM-XX-00-DR-CE-0092(-). In addition to the main site, there will be a Launch and Control Centre based at the existing Saxa Vord Resort approximately 3km south-west of the SSC.

Access to the SSC and Saxa Vord sites will be via. the existing road network where public road improvement works will also be carried out to accommodate construction\site traffic. A section of new road is also proposed to link Northdale and Holsens Road.

2. Site description

The main site extends east from the unclassified Holsens Road to the headland of Lamba Ness. Large coastal cliffs form the perimeter of the peninsula, some extending to a height of approximately 50m above sea level. The peninsula covers an area of approximately 185 hectares and was previously utilised by RAF Skaw as an early warning radar station during WW2.

The ground levels across the site fall from west to east, with the ground levels at the access to the site on Holsten Road starting at approximately 65m above ordnance datum (m AOD) and falling to approximately10mAOD at its lowest point before rising again to approximately 30m AOD at the eastern tip.

To the west of the site, the land rises steeply to the Ward of Norwick at approximately 186m AOD and then on again to the present RAF Radar Station at Saxa Vord which is at a level of approximately 285m AOD.

The eastern area of the site slopes from south to north and the western higher ground from north to south.

The site has several short watercourses which discharge to the cliff edges, and numerous man made ditches associated with agricultural and former RAF activities. There are also small areas of standing water typically in the areas of peaty soils.

An existing drainage analysis has been carried out and is shown on drawing 60617516-ACM-XX-00-DR-CE-0065(-) in Appendix A of this report

The site is generally covered in rough grass with the superficial geology predominantly comprising of glacial till. These deposits vary in lithology and are typically poorly sorted sandy, silty clay with possible laminated sand layers and coarse granular material. There is an area of blown sand approximately half way along the peninsula. Where the top of the cliff faces are exposed, a thin layer of superficial material overlies the exposed rock.

Based on the site investigation study, the area comprises thin superficial soils overlying rock with some local areas of peat deposits particularly on flat lying areas to the western side of the site. It is also expected that made ground associated with the historic development across the site will be present is areas previously developed.

The bedrock geology is formed from the Skaw Intrusion – a Porphyritic Microgranite which can be described as a medium-grained intrusive igneous rock with several dyke intrusions of North Britain Siluro-Devonian Calc-Alkaline Lamprophyre. There is a fault recorded approximately ¾ of the way along the peninsula.

Saxa Vord – Launch Control and Range Control Centres

Saxa Vord consist of a mixture of private\public dwellings surrounded by fields used mainly for sheep grazing.

It is intended to use an existing former brewery building on the south side of the Valsgarth Road for these activities

3. Drainage strategy

Surface Water

Launch Site

The main site will consist of three launch pads with associated support areas consisting of Administration, Assembly, TEL and ancillary buildings located throughout the site together with a Satellite Tracking Area, all of which will interlinked by new or upgraded access roads.

Due to the distances between each area, localised strategies will be adopted for each and is described in detail below. All of the site is drained by small watercourses directly to the sea at various locations. No attenuation is therefore proposed for any of the new works.

A site layout drawing 60617516-ACM-XX-00-DR-CE-0037(N) is contained in Appendix A of this report

Launch Pad Areas – Launch Pads 1, 2, & 3

General

The launch pad areas will consist of a central launch area with commodities (gasses) and fuel and control areas either side to provide separation.

The operations strategy for Space Centre and its components is described in detail in the Environmental Statement and this drainage strategy follows these requirements for both normal daily operations and launch operations.

Fuels and gasses are not permanently stored at these locations and will be brought to the launch pad site from external storage in ISO haulage road containers. The fuel and gas containers will remain on their trailers to allow fuelling and de fuelling. Tractor units will not be parked at these locations after delivery.

Some small containerised facilities will be off loaded onto the ground at the control area. These are for electrical and mechanical support together with local welfare for staff carrying out preparatory work.

The launch pads are designed to suit multi-user requirements, in particular the provision of flame pit and launch deluge water for some launches.

Launch Pad Construction

The launch area will comprise of a concrete slab with a flame pit and surrounded on three sides by an upstand wall to contain any immediate deluge water if required by the user during launch. The slab will be constructed with falls towards the launch pit and any surface water will discharge into this pit which in turn connects into a culvert. This method gathers the surface water from the pad and deluge water for treatment.

This flame deflection culvert below the launch pad is sloped such that all surface and deluge water from the launch pad will fall towards the launch pit as indicated on drawings 60617516-ACM-XX-00-DR-CE-0054(B), 0060(C) and 0072(A).

During non-operational periods the launch pit surface water outlet will discharge to the surface water drainage via a manhole into a filter trench or ditch before discharging to a sea outfall.
The discharge manhole will have a penstock valve which will permit the surface water during fuelling and deluge water during launch operations to be diverted to an interceptor/storage tank for collection for off site treatment.

The associated Storage and Control areas will be drained as follows:

Launch Pad Control Area

Surface water run-off from the Control Area will discharge into drainage channels or into a ditch\filter trench before discharging to a sea outfall.

Launch Pad Fuel Storage Area

This area will store Fuel mainly RP-1 Kerosene). The area will have a contained concrete surface laid to falls into the drainage system. Due to the risk of spillages the channels will discharge into full retention alarmed interceptor before discharging into either a filter drain or drainage ditch.

The interceptor capacity will be sized to accommodate a tanker cell burst into the system (700 litres)

Launch Pad Commodities Storage Area

This area will store mainly gasses in liquified and gaseous form (Oxygen Nitrogen)

The area will have a compacted stone surface laid to falls into the drainage system.

Drainage will discharge into either a filter drain or drainage ditch.

Launch pad general spaces

Areas between the Launch Pad and the Storage and Control Areas will be drained via. a series of filter trenches or ditches.

TEL Buildings

Roof drainage, surrounding roads and granular surfaced hardstanding areas will discharge into an adjacent filter trench system to provide SuDS treatment prior to discharging into the existing ditch system Where no existing ditches are present, new ditches will be formed to tie into the existing outfalls to the sea.

Satellite Tracking Area

The Satellite Tracking Area will consist of four concrete pad areas surrounded by security fencing. Satellite dishes are not understood bring any risk of contamination however basic SuDS has been provided
Surface water drainage from each pad will be in the form of filter trenches to provide SuDS treatment which will discharge into the existing ditch system via new filter drains and ditches

Administration Gate house, Assembly Buildings, Hazardous Store and Pyro Store.

Roof drainage from the Administration building and the Assembly buildings will be drained separately to yards and roads. Surface water from these will be passed through rainwater harvesting tanks to provide grey water for toilets and other non-potable uses.

Surrounding roads and granular surfaced hardstandings areas will discharge into an adjacent filter trench system to provide SuDS treatment prior to discharging into the existing ditch system Where no existing ditches are present, new ditches will be formed to tie into the existing outfalls to the sea.

Hazardous Store and Pyro Store buildings are small, and roofs will discharge direct to the filter trenches and adjacent ditches.

Foul drainage Launch site.

There is no permanent foul drainage on the site available for use.

Permanent facilities will be provided in the following buildings, Gate house, Administration building, Assembly Buildings (2) and TEL Building

Facilities from the Gate house, Administration building, assembly buildings (2) will be collected together through a small drainage network initially to a sewerage storage tank which will be emptied as required.

The development of buildings will be phased in line with the programme and will only be in use during launch cycles. It is not considered feasible to use septic tanks or small treatment works for these early phases until adequate and consistent flows would support small treatment works for this area

For the TEL building a limited number of personnel will be active during preparations for launches. Provision has been made for this sewerage to be drained to a single tank which will be emptied as required.
When the launch cadence increases and adequate and consistent flows are available, a septic tank is proposed to be added with filter distribution pipework and final discharge to existing drainage ditches.

Temporary welfare facilities will be provided at each launch pad when in use. These will consist of portable cabins with toilet tanks which will be emptied as required.

Saxa Vord Launch control and range control centre

The Launch and Control Centre will be located within the existing Saxa Vord Resort and it is the intention to utilise the existing foul and surface water systems for our drainage strategy.

Surface Water

We understand that the existing surface water system discharges into a soakawav to the west of the resort however further investigation will be required to determine the precise arrangement. Any surface water discharge to the existing system will be at a similar rate as existing to ensure the existing system is not surcharged.

Foul Drainage

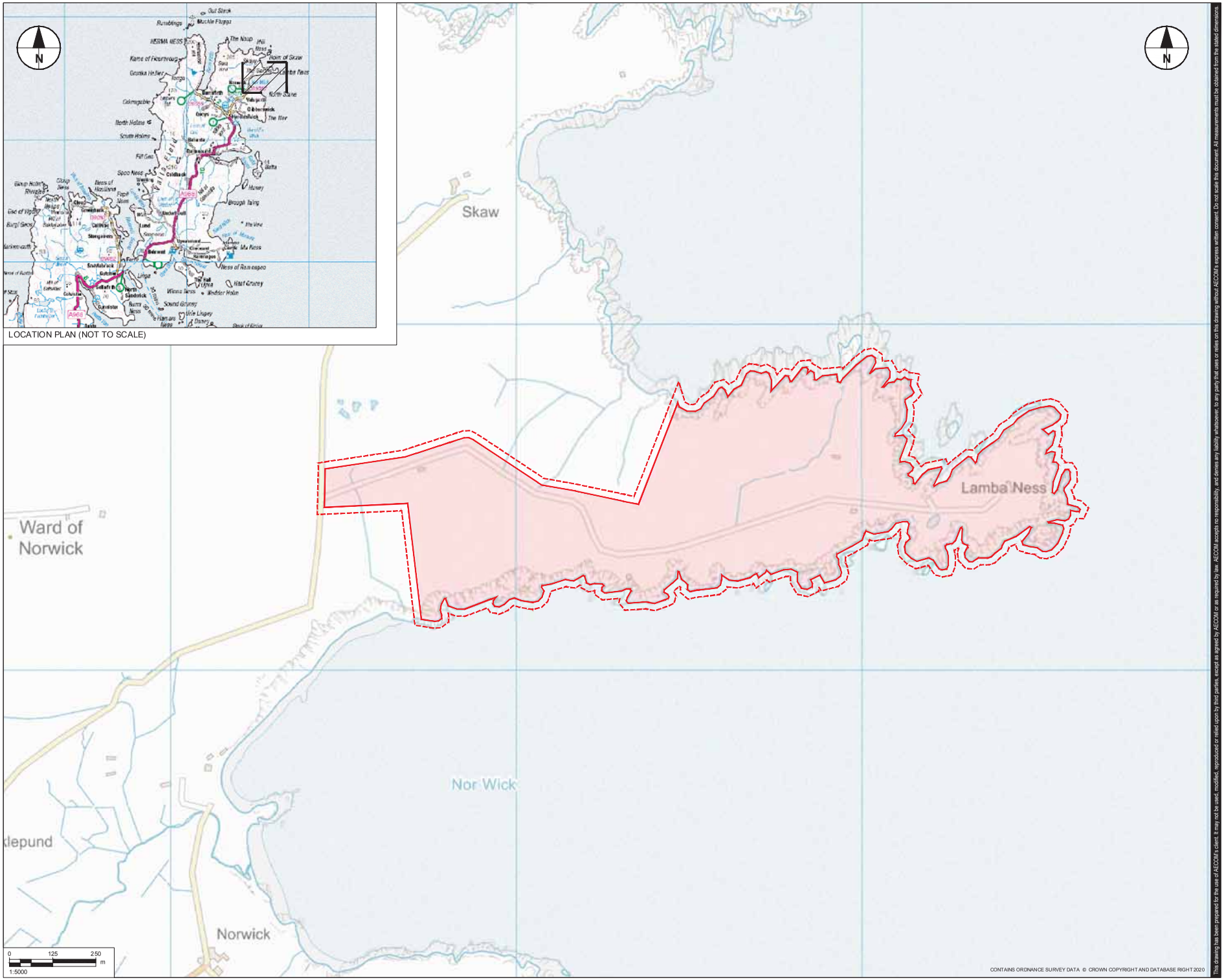
The existing foul drainage system consists of a private\public gravity fed piped system discharging into a 48 m3 holding tank at Clibberswick, situated approximately 1.1km south-east of Saxa Vord. The tank, which has an overflow which discharges to a sea outfall, is regularly emptied by Shetland Islands Council, with the contents taken to the sewage treatment works in Lerwick for disposal. Further investigation is required to determine the design parameters for this tank to determine whether the foul discharge rates from the proposed Launch and Control Centre can be accommodated by the existing system. Where it is found that the existing system cannot accommodate the additional flows, then a cesspool or septic tank will be considered to accommodate the excess flows.

Foul drainage will be from permanent toilets within the buildings, draining to an external cesspool tank with tanker removal at regular intervals. If a more permanent facility is needed later, then a septic tank could be added draining to the ground.

Appendix A

A.1	Drawing 60617516/0092(-)	Planning Application Site Boundary
A.2	Drawing 60617516/0065(-)	Existing Watercourses and Drainage Ditches
A.3	Drawing 60617516/0037(N)	Overall Site Plan
A.4	Drawing 60617516/0057(C)	Assembly \ Storage Area – Drainage Strategy
A.5	Drawing 60617516/0066(A)	Satellite Tracking Area – Drainage Strategy
A.6	Drawing 60617516/0056(C)	Transport Holding Building – Drainage Strategy
A.7	Drawing 60617516/0054(B)	Launch Pad 1 - Drainage Strategy
A.8	Drawing 60617516/0072(A)	Launch Pad 2 - Drainage Strategy
A.9	Drawing 60617516/0060(C)	Launch Pad 3 - Drainage Strategy

LOCATION PLAN (NOT TO SCALE)



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PROPOSED VERTICAL LAUNCH SPACE PORT AT LAMBA NESS, UNST, SHETLAND

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Notes

PLANNING APPLICATION SITE BOUNDARY
SITE AREA = 80.8 HECTARES

20m OFFSET FROM PLANNING APPLICATION SITE BOUNDARY

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

PLANNING APPLICATION SITE BOUNDARY

Sheet Number

60617516-ACM-XX-00-DR-CE-0092

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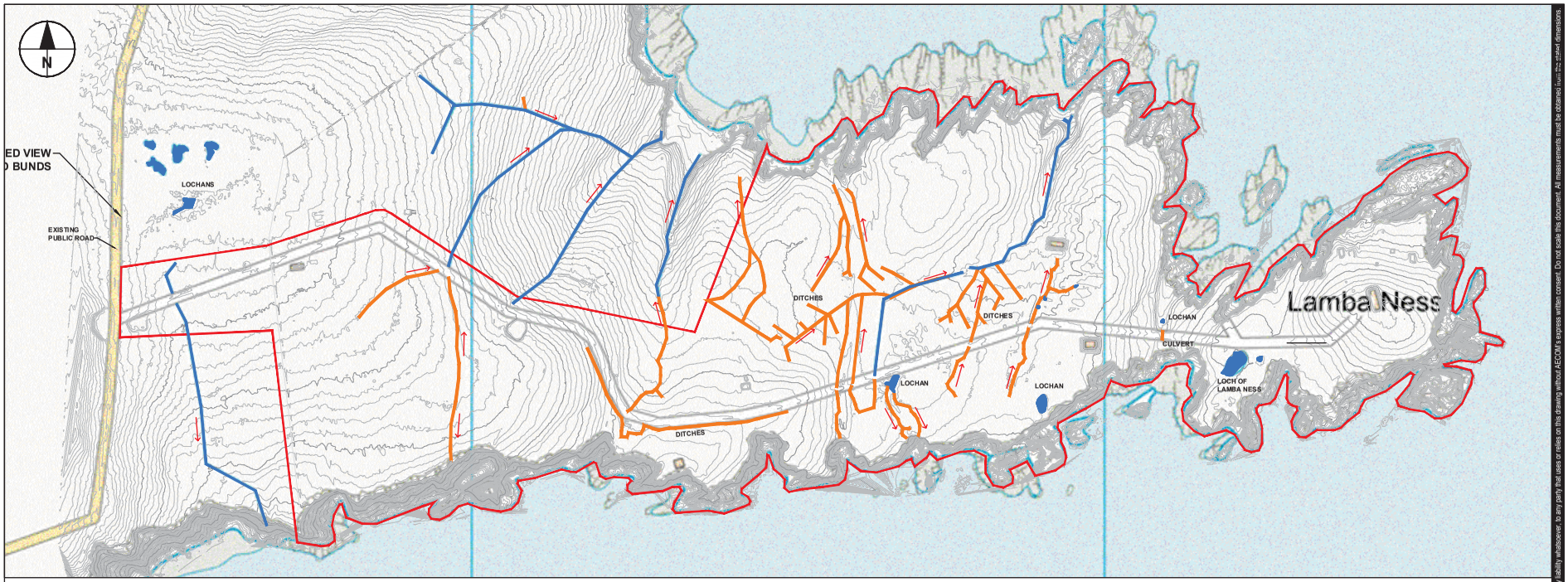

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Notes

LEGEND

- WATERCOURSE (AS INDICATED ON OS MAPS)
- DITCHES
- DIRECTION OF FLOW
- LOCHAN
- PLANNING APPLICATION SITE BOUNDARY

LOCATION OF EXISTING WATERCOURSES AND DITCHES TAKEN FROM ORDNANCE SURVEY INFORMATION AND REVIEW OF SATELLITE AND DIGITAL MAP IMAGERY. FURTHER INVESTIGATION WILL BE REQUIRED ON-SITE TO DETERMINE THE ACCURACY OF THIS DRAWING.

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
A	04.12.20	PLANNING SITE BOUNDARY REVISED	DR/CGY/CGY
-	27.08.20	FIRST ISSUE	DR/CGY/CGY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

EXISTING WATERCOURSES AND DRAINAGE DITCHES

Sheet Number

60617516-ACM-XX-00-DR-CE-0065

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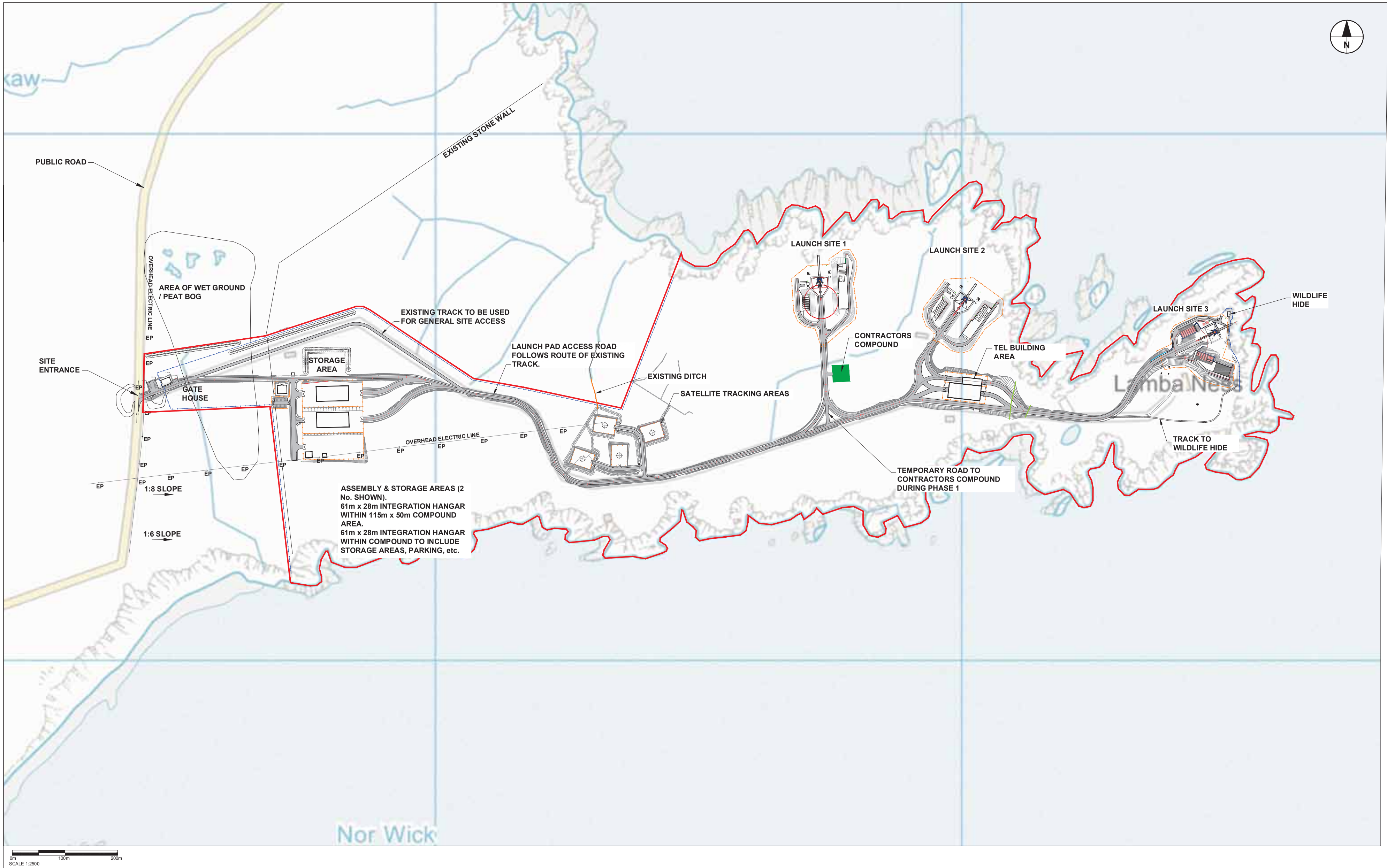

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Notes

- PLANNING APPLICATION SITE BOUNDARY
- PROPOSED 2.44m HIGH SITE BOUNDARY FENCE
- PROPOSED 2.4m HIGH COMPOUND \ LAUNCH PAD SECURITY FENCE

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ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
N	17.12.20	ASSEMBLY AND STORAGE AREA NOTE REVISED	DR/CGY/CGY
M	15.12.20	GUARD HOUSE RENAMED GATE HOUSE	DR/CGY/CGY
L	03.12.20	DRAINAGE CONNECTION TO EXISTING DITCH SYSTEM REVISED AT SATELLITE TRACKING AREA	DR/CGY/CGY
K	02.12.20	REVISED SITE LAYOUT	DR/CGY/CGY
J	09.11.20	TEL BUILDING AREA ROADS REVISED	DR/CGY/CGY
H	02.11.20	ROAD CUT/FILL SLOPES UPDATED	DR/CGY/CGY
G	14.10.20	INTEGRATION HANGAR SIZES REVISED	DR/CGY/CGY
F	29.09.20	REVISED SITE LAYOUT	DR/CGY/CGY
E	08.09.20	REVISED SITE LAYOUT	DR/CGY/CGY
D	27.08.20	REVISED SITE LAYOUT	DR/CGY/CGY
C	05.03.20	REVISED SITE LAYOUT	EP/CGY/CGY
B	27.02.20	REVISED SITE LAYOUT	EP/CGY/CGY
A	18.02.20	FENCING ADDED AND ROADS AMENDED	GMcE/CGY/CGY

Key Plan

Purpose Of Issue
FOR PLANNING

Project Number
60617516

Sheet Title
OVERALL SITE PLAN

Sheet Number
60617516-ACM-XX-00-DR-CE-0037

Scale: 1:2500@A0 **Rev:** N

Project Management Initials: Designer: MMcF Checked: DR Approved: DR ISO A0 841mm x 1189mm

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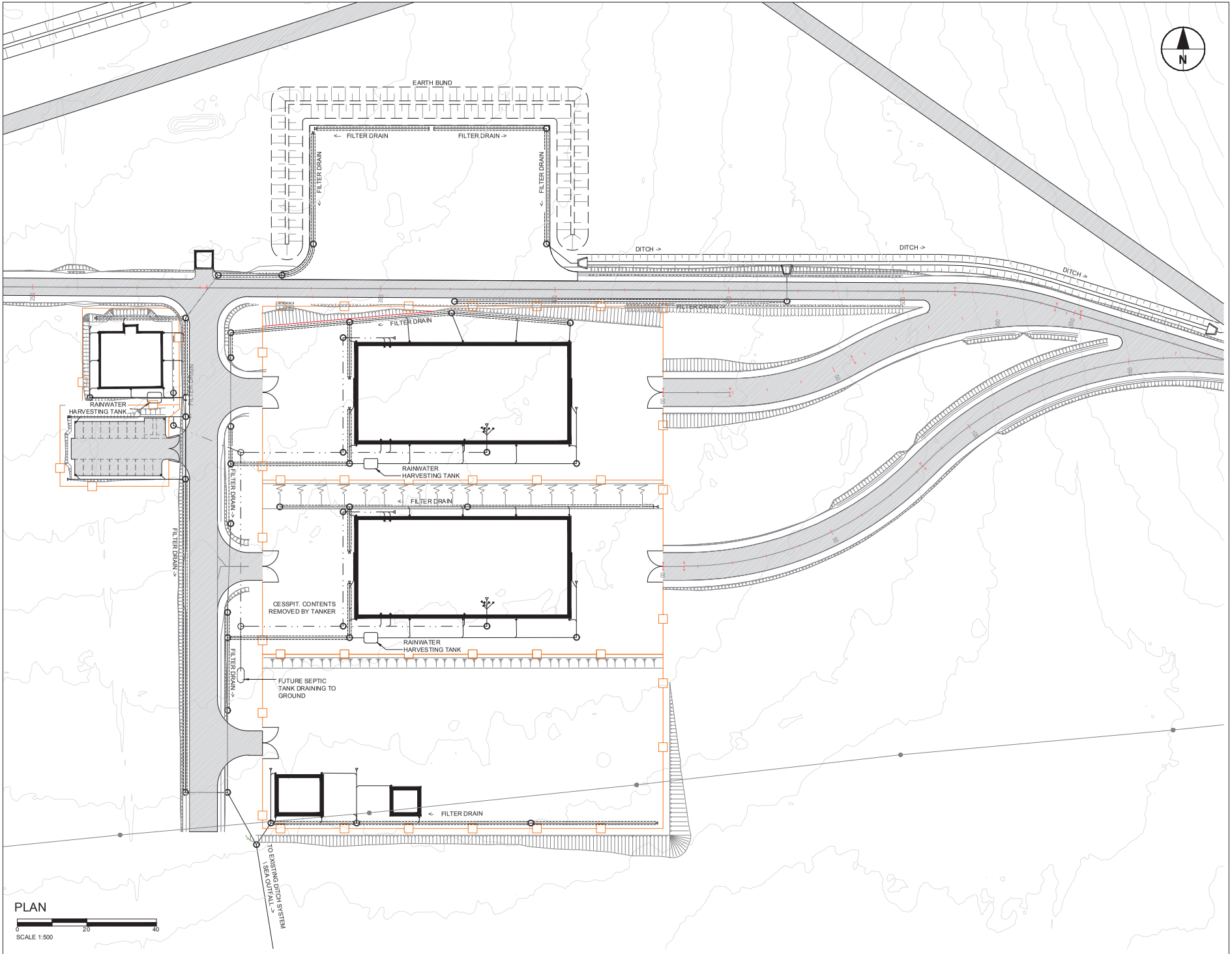

PLAN

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SCALE 1:500

LAYOUT PLAN
Scale 1:500

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Notes

LEGEND

- PROPOSED SURFACE WATER
- PROPOSED FILTER DRAIN
- PROPOSED HEADWALL AND DITCH
- PROPOSED FOUL WATER
- PROPOSED MANHOLE (SURFACE WATER)
- PROPOSED MANHOLE (FOUL WATER)
- PROPOSED RODDING EYE

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
C	02.12.20	UPDATED TO REFLECT REVISED LAYOUT	DR/CGY/CGY
B	09.11.20	UPDATED TO REFLECT REVISED LAYOUT	DR/CGY/CGY
A	14.10.20	UPDATED TO REFLECT REVISED LAYOUT	DR/CGY/CGY
-	27.08.20	FIRST ISSUE	DR/CGY/CGY

Key Plan

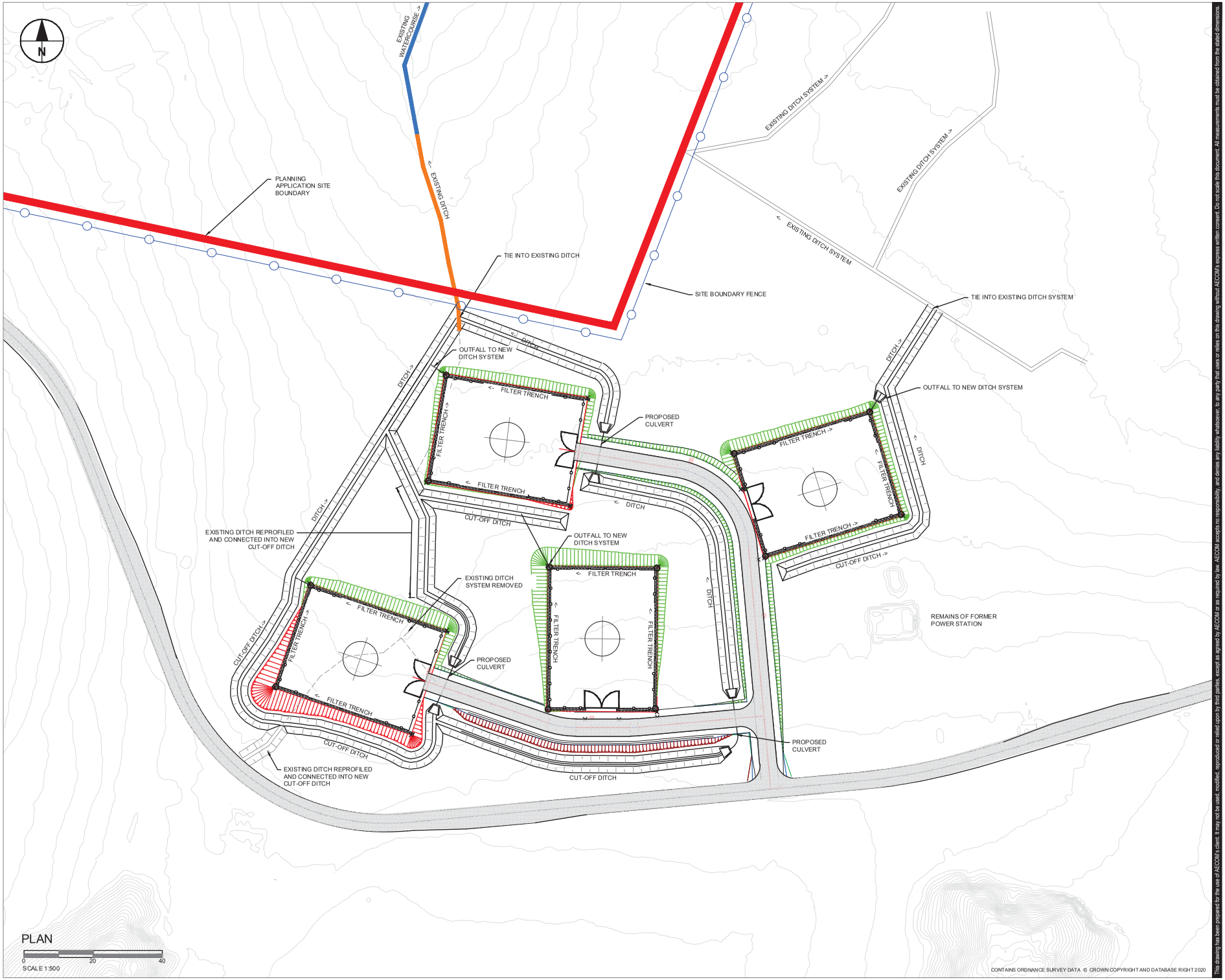
Purpose Of Issue
FOR PLANNING

Project Number
60617516

Sheet Title
ASSEMBLY AND STORAGE AREA
PROPOSED DRAINAGE
STRATEGY

Sheet Number
60617516-ACM-XX-00-DR-CE-0057

Scale: 1:500 **Rev:** C



PLAN

SCALE 1:500

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Project Management Initials: Designer: DR Checked: CGY Approved: CGY ISO A1 594mm x 841mm

AECOM

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Notes

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- PROPOSED HEADWALL AND DITCH
- EXISTING DITCH SYSTEM
- PROPOSED MANHOLE (SURFACE WATER)
- PROPOSED RODDING EYE

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
A	03.12.20	TIE-IN ARRANGEMENT REVISED	DR/CG/YCGY
-	27.08.20	FIRST ISSUE	DR/CG/YCGY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

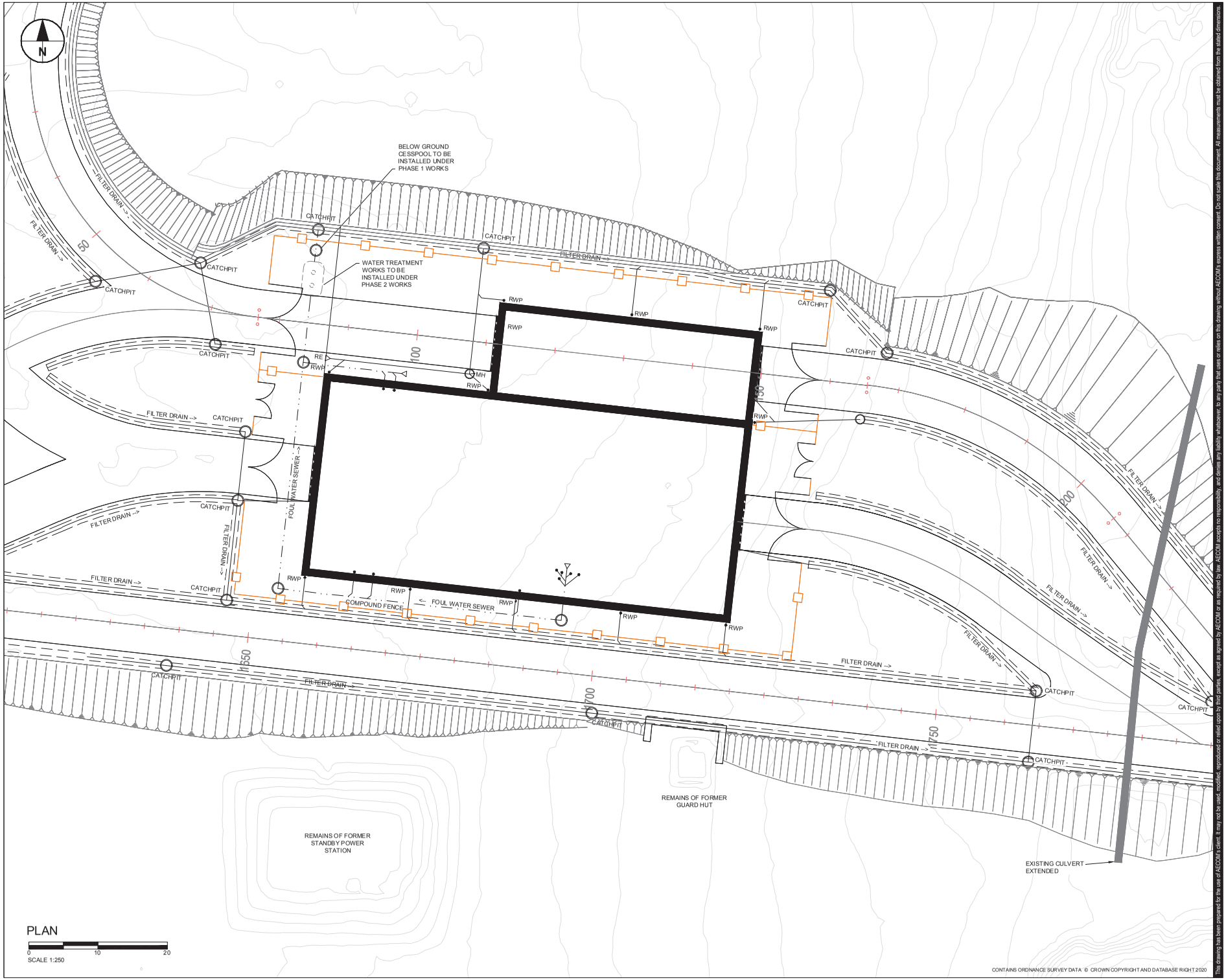
Sheet Title

SATELLITE TRACKING AREA DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0066

Scale: 1:500 **Rev:** A



PLAN

SCALE 1:250

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Project Management Initials: Designer: DR Checked: CGY Approved: CGY ISO A1 594mm x 841mm

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- PROPOSED SURFACE WATER DRAINAGE CHANNEL

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
C	20.11.20	EXISTING CULVERT EXTENDED	DRC/GY/CGY
B	09.11.20	LAYOUT UPDATED	DRC/GY/CGY
A	14.10.20	SITE LAYOUT REVISED	DRC/GY/CGY
-	23/07/20	FIRST ISSUE	DRC/GY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

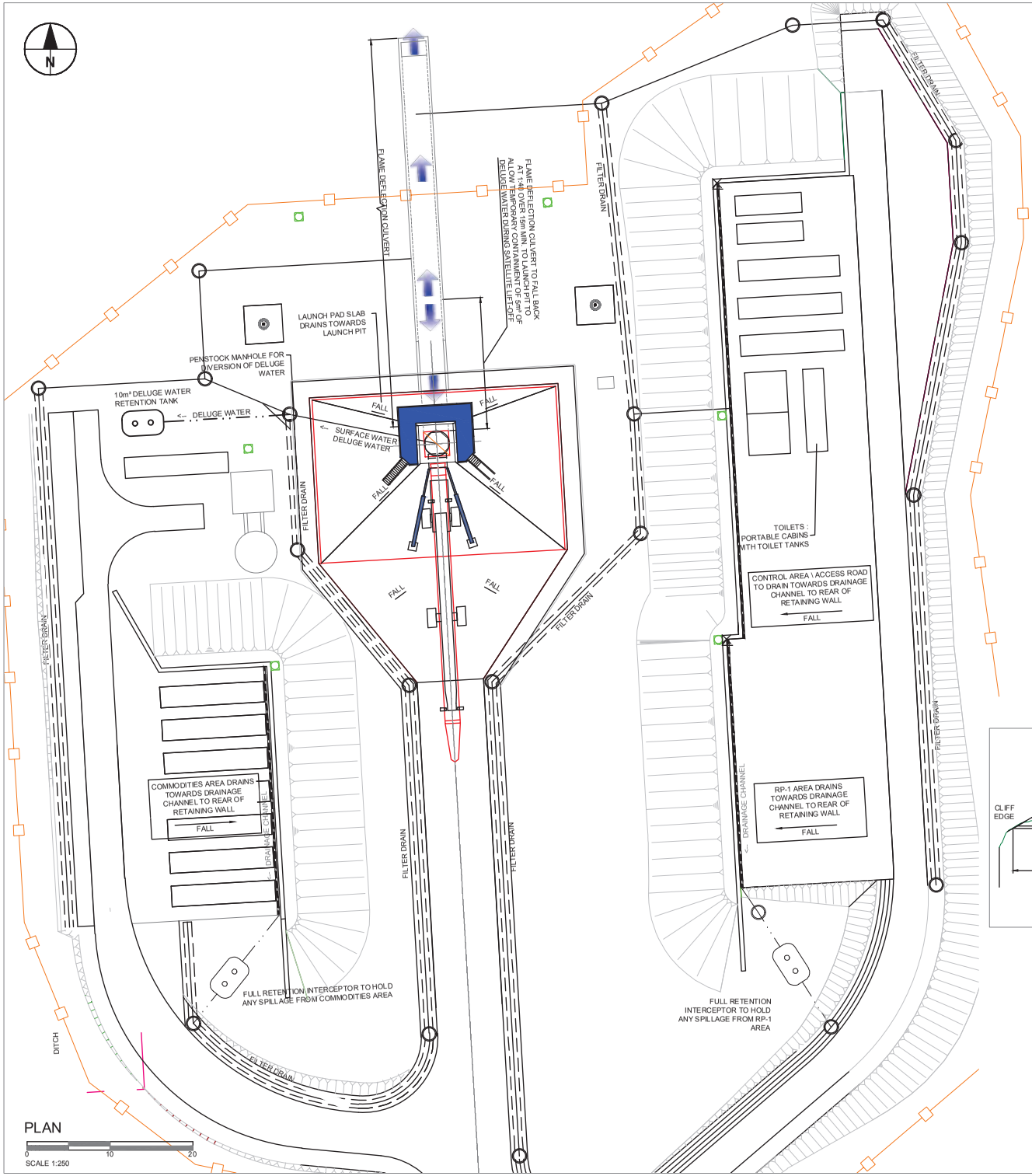
Sheet Title

TRANSPORT HOLDING BUILDING DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0056

Scale: 1:250 **Rev:** C



PLAN

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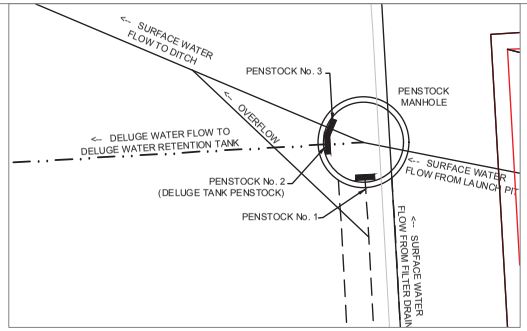

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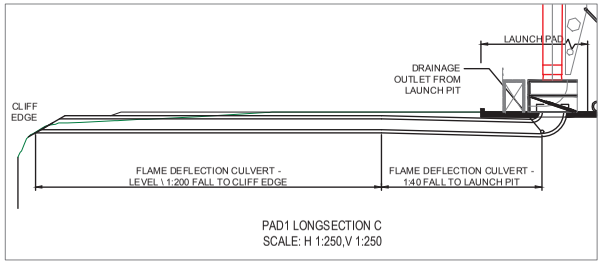
SATELLITE LAUNCH	CLOSED	OPEN	CLOSED



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- PROPOSED MANHOLE (FOUL WATER)
- PROPOSED RODDING EYE
- PROPOSED SURFACE WATER DRAINAGE CHANNEL
- PROPOSED FOUL WATER DRAINAGE CHANNEL

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
B	02.12.20	LEGEND REVISED	DRC/GY/CGY
A	14.10.20	REVISED TO REFLECT LATEST LAYOUT FOR CDR1	DRC/GY/CGY
-	13.07.20	REVISED FOR LAUNCH PAD 1 ONLY	DRC/GY/CGY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

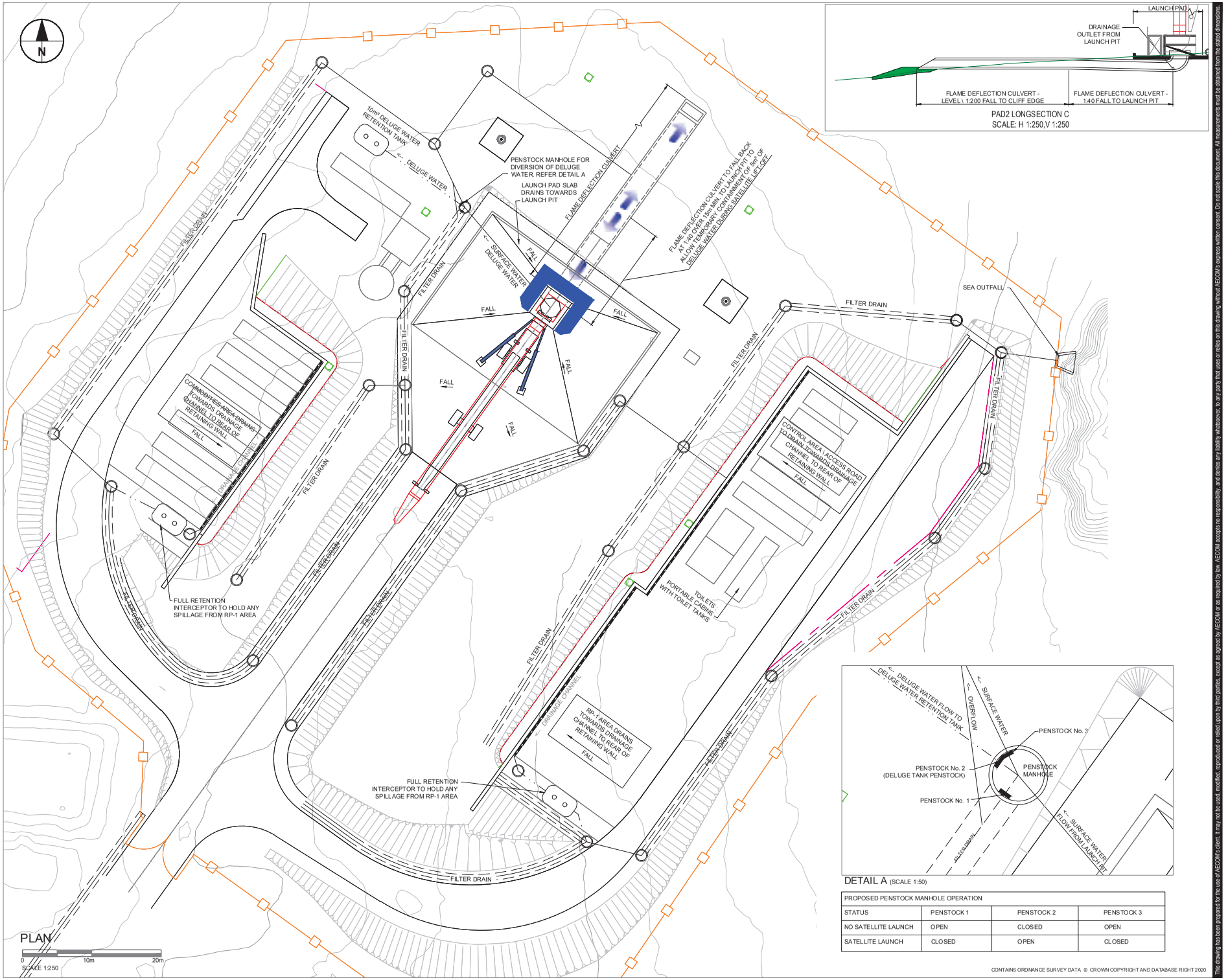
LAUNCH PAD 1
DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0054

Scale: 1:250 OR AS SHOWN **Rev:** B

ISO A1 594mm x 841mm
Project Management Initials: Designer: DR Checked: CGY Approved: CGY
Last saved by: DAVID.RENNIE(2020-12-03) Last Plotted: 2020-12-14
Filename: \\EU.AECOMNET.COM\EMEA\UK\UKED1\1JOBS\PR-448851_SSC_ENVIRONMENTAL_STUDY\900_CAD_GIS\910_CAD\DCD\60617516-ACM-XX-00-DR-CE-0054.DWG



PROPOSED PENSTOCK MANHOLE OPERATION			
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SATELLITE LAUNCH	CLOSED	OPEN	CLOSED

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Approved: CGY
Checked: CGY
Designer: DR
Project Management Initials:
Last Plotted: 2020-12-14
Last saved by: DAVID.RENNIE(2020-12-04)
Filename: \\EU.AECOMNET.COM\EMEA\UK\UKED1\JOBS\PR-448851_SSC_ENVIRONMENTAL_STUDY\900_CAD_GIS\910_CAD\DCO\DB\60617516-ACM-XX-00-DR-CE-0072.DWG

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- PROPOSED FOUL WATER DRAINAGE CHANNEL

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
A	02.12.20	LEGEND REVISED	DRC/GY/CGY
-	14.10.20	1st ISSUE	DRC/GY/CGY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

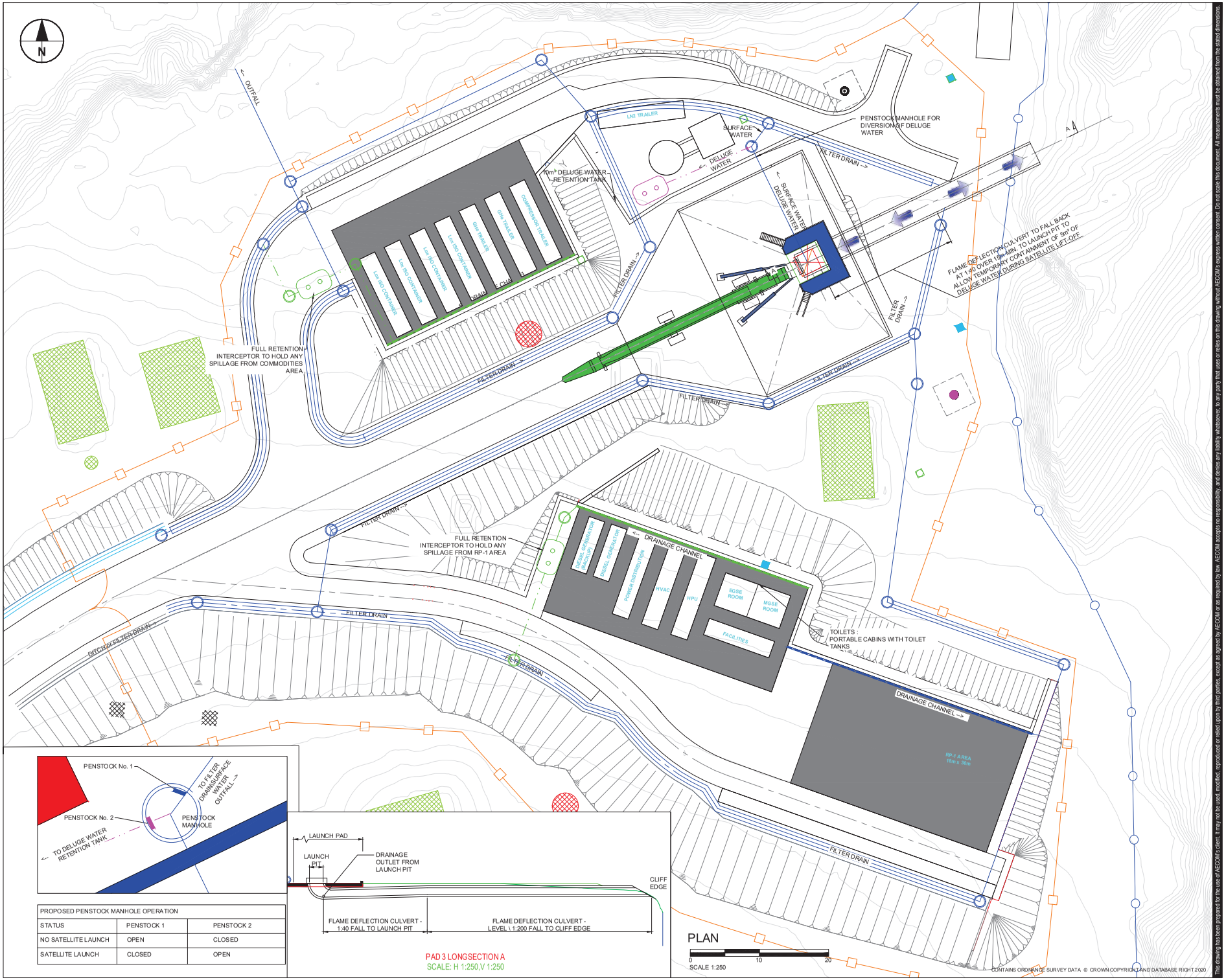
Sheet Title

LAUNCH PAD 2
DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0072

Scale: 1:250 OR AS SHOWN **Rev:** A



PROPOSED PENSTOCK MANHOLE OPERATION		
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SATELLITE LAUNCH	CLOSED	OPEN

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- PROPOSED MANHOLE (FOUL WATER)
- PROPOSED RODDING EYE
- PROPOSED SURFACE WATER DRAINAGE CHANNEL
- PROPOSED FOUL WATER DRAINAGE CHANNEL

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
C	02.12.20	LEGEND REVISED	DR/CG/YCGY
B	09.11.20	REVISED LAYOUT	DR/CG/YCGY
A	16.10.20	REVISED LAYOUT	DR/CG/YCGY
-	27.08.20	FIRST ISSUE	DR/CG/YCGY

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

LAUNCH PAD 3
DRAINAGE STRATEGY

Sheet Number

60617516-ACM-XX-00-DR-CE-0060

Scale: 1:250 **Rev:** C

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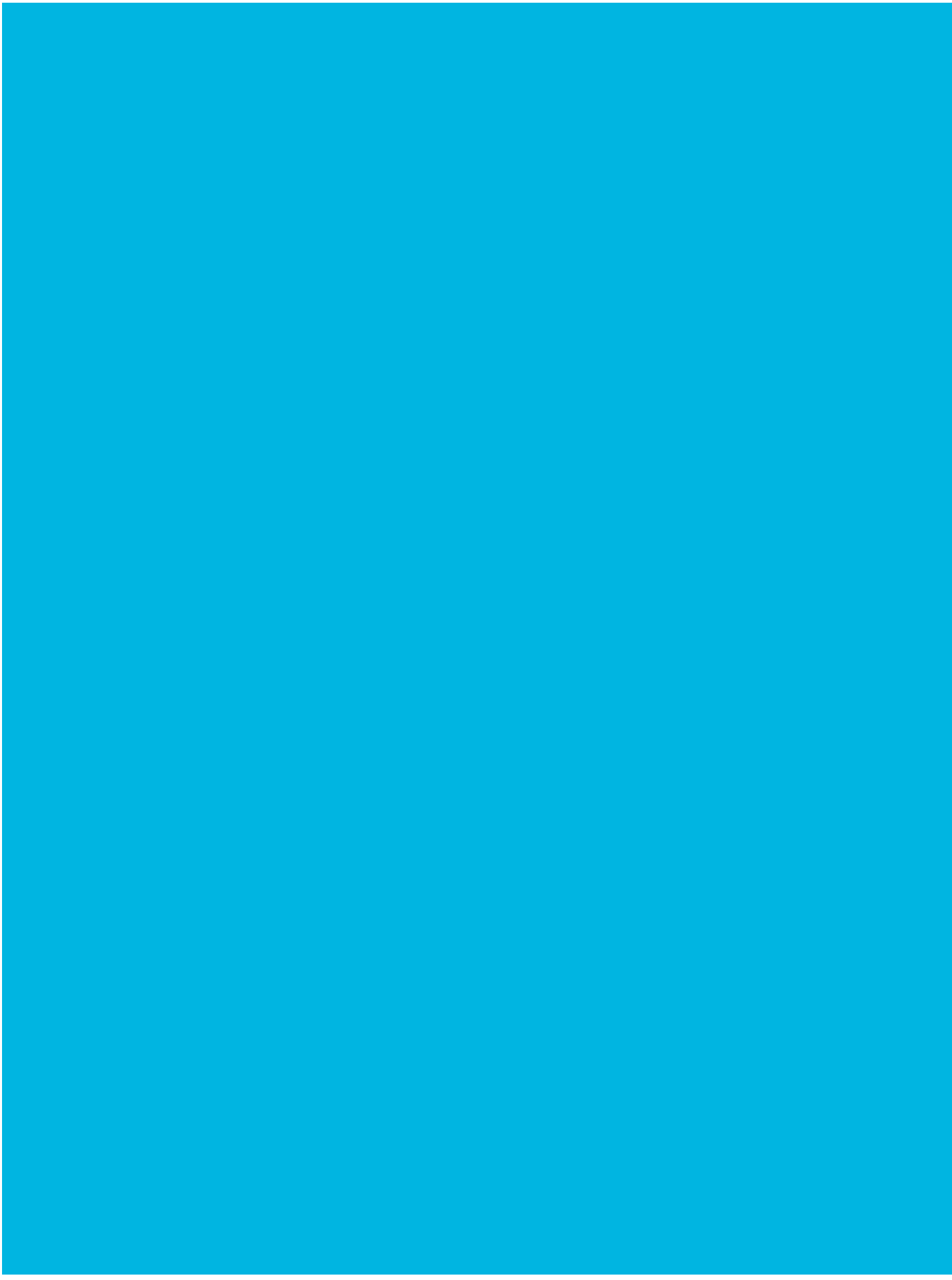
Project Management Initials: Designer: DR Checked: CGY Approved: CGY ISO A1 594mm x 841mm



Appendix 9.3 AECOM Ground Investigations Factual Report

SHETLAND SPACE CENTRE

Preliminary Ground Investigation Report

Shetland Space Centre

Document Reference Number : 60617516-ACM-XX-00-RP-CE-0002

11 December 2020

Quality information

Prepared by	Checked by	Verified by	Approved by
Dave Evans Geotechnical Engineer	Bruce Shearer Geotechnical Engineer	David Raeside Associate	Graham Young Associate

Revision History

Revision	Revision date	Details	Authorized	Name	Position
A	11 Dec 2020	Update following client comments		DR	Associate

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

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Table of Contents

1. Introduction

1.1 Scope and objective of the report

AECOM Infrastructure and Environment UK & Ireland Limited (AECOM) was appointed by Shetland Space Centre (SSC) to undertake a preliminary ground investigation to determine the depth of peat, where present, and the nature of the underlying deposits and depth to bedrock, to assist with the initial understanding of the former RAF Skaw site at Lamba Ness ('site').

The ground conditions encountered at the site are presented herein as factual information within this Ground Investigation Report (GIR). This report has been written in general accordance with the Eurocodes, specifically Eurocode 7 documents BS EN 1997-1: 2004 and BS EN 1997-2: 2007 and their National Annexes. This report summarises the ground conditions and material parameters obtained from laboratory testing and will assist in the design of the infrastructure associated with the proposed Space Centre development.

1.2 Description of Project

Shetland Space Centre propose to develop the site as a launch station for satellites. The site is located at Lamba Ness, near Skaw on the island of Unst, which is part of the archipelago of the Shetland Isles in Scotland.

The development will comprise launch pads and associated infrastructure including Assembly and Administrative buildings.

1.3 Geotechnical category of Project

It is considered that the works associated with the development of the site will be classified within Geotechnical Category 2 in accordance with BS EN 1997-1: 2014 (+A1:2013). This is defined in clause 2.1 of the British Standard as "conventional types of structure and foundation, earthworks and activities, with no exceptional or difficult ground or loading conditions".

2. Description of the Site

2.1 General Description

The area being considered for the Launch Site extends over an area extending to185 hectares on Lamba Ness which was an active RAF Radar Station (RAF Skaw) during World War 2 (WW2). Large coastal cliffs form the perimeter of the peninsula, some extending to a height of approximately 50m above sea level.

The ground levels across the site fall from west to east, with the ground levels at the access to the site starting at approximately 65m above ordnance datum (m AOD) and falling to approximately10mAOD at its lowest point before rising again to approximately 30m AOD at the eastern tip

To the west of the site, the land rises steeply to the Ward of Norwick at approximately 186m AOD and then on again to the present RAF Radar Station at Saxa Vord which is at a level of approximately 285m AOD.

The drift and solid geology across the site comprise the following:

- Drift geology – the superficial deposits comprise topsoil/peat overlying a glacial till which is described as a poorly sorted sandy, silty clay with possible laminated sand layers and coarse granular material.
- Solid geology – bedrock comprises a medium-grained intrusive igneous rock (Porphyritic Microgranite – Skaw Intrusion) with several dyke intrusions.

The site location is shown on drawing 60617516-ACM-XX-00-DR-CE-0097 contained within Appendix A.

2.2 Site Designation

The former RAF base on Lamba Ness is a Scheduled Monument (**Scheduled Monument Skaw, radar station Ref - SM13097)** which comprises the remains of a Second World War Chain Home radar station. The station is spread over two sites, a main and a reserve site, with over 50 buildings and structures reflecting its core early warning function and with supporting infrastructure and domestic blocks. The radar complex is the furthest north of its type in the United Kingdom.

As the site is a Scheduled Monument consent was required from Historic Environment Scotland (HES) prior to undertaking any intrusive ground investigation works. During the site works, there was an archaeological watching brief during the excavation for each of the trial pits and all pits and probe locations were restricted so they did not encroach on sensitive areas of potential archaeological interest.

2.3 Unexploded Ordnance

As the site was an active RAF Radar Station during WW2 it was the target for bombing raids from the German Lufwaffe. Records exist of the site being attacked and bombs being dropped and craters have been identified across the site. Prior to the intrusive investigation, a Detailed Desk Study was undertaken by Zetica, a specialist UXO company.

Whilst the site was known to have been bombed the records obtained during the Desk Study indicated that the risk level across the site was low and the intrusive works were able to progress with staff undergoing a “UXO Awareness Briefing” prior to commencing the works.

3. Ground Investigation

3.1 Summary of Site Work

The preliminary ground investigation comprised 42 machine excavated trial pits and 304 peat probes. The site works were conducted during the period between Tuesday 27th October and Wednesday 4th November 2020. A team of AECOM Engineering Geologists were accompanied on site by an Archaeologist from AOC Archaeology who undertook a watching brief on the site works.

The identification of peat across the site has been based on the "Guidance on Developments on Peatland – Site Surveys" produced by the Scottish Government, SEPA, SNH and the James Hutton Institute (2014) which defines organic soils as follows;

- **Peaty** (or organo-mineral soils) : a soil with a surface organic layer less than 0.5m deep;
- **Peat** : a soil with a surface organic layer greater than 0.5m deep which has an organic matter content of more than 60%;
- **Deep Peat** : a peat soil with a surface organic layer greater than 1.0m deep

The locations of individual exploratory holes and probes are shown on drawings 60617516-ACM-XX-00-DR-CE-0093 to 0096 which are contained within Appendix A.

3.2 Trial Pitting

Trial pits were excavated using a tracked excavator provided and operated by a local contractor. The following table provides details of the depths achieved and the position of each pit. Some of the pits were not completed during the site works to prevent disturbance of archaeological features or due to poor ground conditions, as indicated.

Trial pit logs for each of the excavated pits are included in Appendix B. Photographs from each of the pits are included within Appendix C.

Table 1 : Summary of Trial Pits

Trial Pit ID	Depth of Peaty Topsoil / Peat (m bgl)	Final Depth of Pit (m bgl)	National Grid Coordinates		
			Eastings	Northings	Comments
TP01	NA	NA	465703.8	1215510.2	Cancelled due to archaeology
TP02	0.4	0.4	465776.6	1215464.4	
TP03	0.5	0.5	465776.8	1215505.6	
TP04	0.25	0.25	465794.3	1215574.5	
TP05	0.5	0.5	465844.1	1215451.4	
TP06	0.33	0.33	465862.8	1215517.7	
TP07	0.38	0.38	465900.1	1215505.8	
TP08	0.44	0.44	465912.1	1215551.9	
TP09	0.2	0.6	465987.3	1215513.9	
TP10	0.7	0.83	466133.8	1215491.8	
TP11	0.68	0.68	466197.8	1215439.8	
TP12	1.03	1.66	466273.6	1215361.8	
TP13	0.4	2.03	466362.9	1215327.8	
TP14	0.3	1.4	466352.4	1215389.9	
TP15	0.33	2.2	466340.7	1215437.2	
TP16	0.5	1.4	466401.5	1215373.7	

Trial Pit ID	Depth of Peaty Topsoil / Peat (m bgl)	Final Depth of Pit (m bgl)	National Grid Coordinates		Comments
			Eastings	Northings	
TP17	0.6	1.87	466385.6	1215428.9	
TP18	0.4	1.36	466538.1	1215372.7	
TP19	NA	NA	466739.1	1215438.0	Cancelled due to soft/wet ground
TP20	1.63	1.82	466737.9	1215459.4	
TP21	1.16	2.0	466709.6	1215543.3	
TP22	1.2	2.2	466732.1	1215618.2	
TP23	1.1	1.15	466696.1	1215663.1	
TP24	0.6	1.0	466751.6	1215663.9	
TP25	0.8	1.2	466692.3	1215714.8	
TP26	0.8	1.3	466739.3	1215697.2	
TP27	0.6	0.6	466724.7	1215734.3	
TP28	1.38	1.38	466850.1	1215469.6	
TP29	1.4	1.9	466903.2	1215508.9	Terminated due to field drain
TP30	1.7	2.2	466890.1	1215546.5	
TP31	2.1	2.1	466995.3	1215592.6	
TP32	0.9	1.2	467022.2	1215628.5	
TP33	NA	NA	466950.3	1215662.3	Cancelled due to archaeology
TP34	1.8	1.8	466986.1	1215713.1	
TP35	NA	NA	467020.3	1215706.4	Combined
TP36	0.5	0.5	467048.9	1215672.4	
TP37	NA	NA	466950.2	1215517.3	Cancelled due to archaeology
TP38	0.5	1.17	466996.3	1215509.1	
TP39	NA	NA	467018.2	1215487.7	Cancelled due to archaeology
TP40	0.5	1.06	467121.5	1215460.1	
TP41	0.35	1.05	467229.7	1215453.3	
TP42	0.37	1.17	467292.0	1215480.5	Terminated on exposed archaeology
TP43	0.3	0.45	467337.5	1215552.3	
TP44	0.2	0.92	467416.2	1215586.7	
TP45	0.1	0.88	467417.1	1215615.6	
TP46	0.3	0.9	467494.7	1215562.9	
TP47	0.4	1.04	467416.2	1215586.7	
TP48	0.4	1.2	467467.4	1215623.9	

3.3 Peat Probes

Peat probing was undertaken across selected areas of the site on a 25m grid. The probe was pushed through the peat to refusal or where there was a recognisable change in stiffness in the ground or granular material could be felt scraping against the probe.

Details of the location of each probe and the estimated depth of peat encountered is contained within Table 4 contained within Appendix D.

3.4 Laboratory Testing

The geotechnical and chemical laboratory testing was undertaken on samples of peat and underlying soil (substrate) obtained from the trial pits and comprised the following:

- 32 No. Moisture Content;
- 18 No. Particle Size Distribution;
- 18 No. Particle Size Distribution with sedimentation;
- 18 No. Atterberg Limits;
- 14 No. Bulk Density;
- 14 No. pH;
- 14 No. Organic Matter (Loss on Ignition);
- 9 No. Suite A Chemical (pH, Sulphate).

Results from the laboratory testing are summarised below with the full set presented in Appendix E.

Table 2 : Summary of Lab Test results for Peat

Exploratory Hole	Sample Depth (m bgl)	Moisture Content (%)	Bulk Density (Mg/m^3)	Dry Density (Mg/m^3)	pH	Loss on Ignition (%)
TP02	0.4	197	1.06	0.36	4.5	42.7
TP06	0.3	355	1.05	0.23	5.5	49.7
TP20	1.0	667	1.07	0.14	5.0	87.4
TP21	0.5	920	1.07	0.11	5.6	60.3
TP23	0.9	449	1.07	0.19	5.3	33.0
TP24	0.3	138	1.1	0.46	4.8	72.8
TP27	0.3	188	1.2	0.42	4.9	27.3
TP29	1.2	823	1.14	0.12	5.1	91.4
TP30	0.4	748	1.06	0.13	5.0	91.7
TP31	0.4	742	1.05	0.12	5.0	88.3
TP32	0.3	321	1.15	0.25	5.0	75.6
TP34	0.3	769	1.06	0.12	4.8	91.9
TP42	0.2	195	1.03	0.35	5.4	36.4
TP48	0.3	206	1.05	0.34	5.6	35.1

Table 3 : Summary of Lab Test results for Substrate

Exploratory Hole	Sample Depth (m bgl)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	pH	Sulphate (SO4)
TP13	2.0	22				-	-
TP14	0.6	30				6.1	0.06
TP15	0.5	54				-	-
	1.1	29				4.4	0.49
TP16	1.05	31					
TP17	1.1	17				3.7	0.96
	1.8	20				-	-
TP21	1.3	39				4.2	1.03
TP22	2.0	28				-	-
TP25	1.0	29				-	-
TP26	1.0	21				5.2	0.1
TP30	2.0	46				-	-
TP32	1.0	38				5.7	0.03
TP38	0.8	26				5.8	0.1
TP42	0.6	40				-	-
TP44	0.5	37				6.3	0.05
TP46	0.8	29				-	-
TP47	0.7					6.0	0.07
TP48	0.7	29				-	-

The results from the Atterberg Limits testing which includes Liquid & Plastic Limit and Plasticity Index values have still to be received. Once these are obtained, soil descriptions for the substrate may need to be revised.

4. Ground Conditions

4.1 General Summary

At the western extent of the site towards the entrance, a peaty topsoil was encountered which extended to depths of between 0.2 and 0.5m bgl and directly overlies bedrock. This extends to include the area for the proposed Assembly and Storage areas.

Towards the middle of site, around the proposed Satellite Tracking Areas and Launch Pads 2 and 3 in the lower areas, the peat increases in depth and is underlain by a (wind blown) sand with a further thin layer of peat beneath it. This peat layer is intermittent and may have been missed in a couple of pits as it may have appeared as a smear from the surface peat on the bucket. Beneath this peat lens is generally a very clayey sand and gravel which in turn overlies bedrock. The peaty topsoil/peat at the proposed Satellite Tracking Area is generally extends to a depth of approximately 0.5m and deepens to the east at the location of Launch Pads 1 and 2 where deep peat is located to a maximum depth of 2.2m, as identified in the trial pits and to an estimated depth of 2.75m in the peat probes.

Further east, towards the end of the peninsula and up onto higher ground, it changes back to a peaty topsoil extending to depths between 0.1 and 0.4m bgl over a substrate comprising a weathered residual soil of the granite bedrock.

4.2 Peaty Topsoil / Peat / Deep Peat

The peaty topsoil encountered in both the western and eastern sections of the site generally comprised a sandy gravelly peaty topsoil with rootlets in the upper surface and cobbles and boulders at its base on weathered bedrock. The acrotelmic peat can be considered to be within the peaty topsoil generally extending to a depth of approximately 0.3m bgl.

The peat and deep peat encountered within the trial pits was generally described as being a very soft to soft dark brown amorphous PEAT and can be considered as being catotelmic. With reference to the Von Post Scale of Humification, peat was assessed to range from H6 to H8 with field moisture contents of B2 to B3. This is indicative of a moderately/highly decomposed to very highly decomposed peat with a low to moderate field moisture content.

The extent of Peat and Deep Peat identified within the central area of the site, around proposed Launch Sites 1 and 2, has been shown on drawing 60617516-ACM-XX-00-DR-CE-0098 which is contained within Appendix A.

4.3 Substrate

In the vicinity of the proposed Assembly Building, the substrate underlying the peat generally comprised a soft very sandy very gravelly CLAY/SILT with cobbles and boulders or a gravelly SAND with cobbles and boulders. Several trial pits encountered both the clay/silt deposits and the sand deposits. Typically, clay would sit beneath the peat with typical thickness of 0.6m from 0.3-1mbgl. Sand was encountered directly beneath the peat or beneath the clay/silt and was of varying thicknesses of 0.3-1.3m and encountered at depths of 0.3-0.9m, the sand contained occasional peat lenses and typically overlay suspected bedrock but in some instances was founded upon another layer of the clay/silt.

The substrate in the area of Launch Pad 1 varies, with some pits recording deposits of soft sandy gravelly CLAY from depths of 1.16-2m bgl and others recording gravelly clayey fine to coarse sand or sands and gravels from 0.6-1.3m bgl. In one instance, these coarser deposits grade with depth to a soft very sandy very gravelly SILT with a small peat lens before terminating on bedrock at 2mbgl.

Substrate in the area of Launch Pad 2 is similar to that encountered at Launch Pad 1 with peat found to be sat on sandy gravelly clay from depths of 0.5-1.6m bgl or sandy silty gravel from depths of 1.7-2.2m bgl.

The underlying material beneath Launch Pad 3 typically comprises of a soft gravelly sandy clay ranging in depth from 0.1-0.47m bgl, which occasionally overlies a small granular layer typically described as sandy clayey GRAVEL or gravelly clayey SAND encountered between depths of 0.3-0.6m bgl. In all trial pits, in this area, the base material before termination on weathered bedrock is a believed to be a residual soil of weathered granite typically described as very soft very sandy very gravelly CLAY or SILT and encountered between depths of 0.3-1.2m bgl.

4.4 Bedrock

Each of the trial pits were terminated on bedrock, likely a weathered Microgranite of the Skaw Granite Formation that forms the peninsula. Depth encountered ranges from 0.2-2.2m bgl.

Appendix A - Drawings

Date: 07/12/2020
Approved: DR
Checked: NS
Drawn: MLS
Revision: 1

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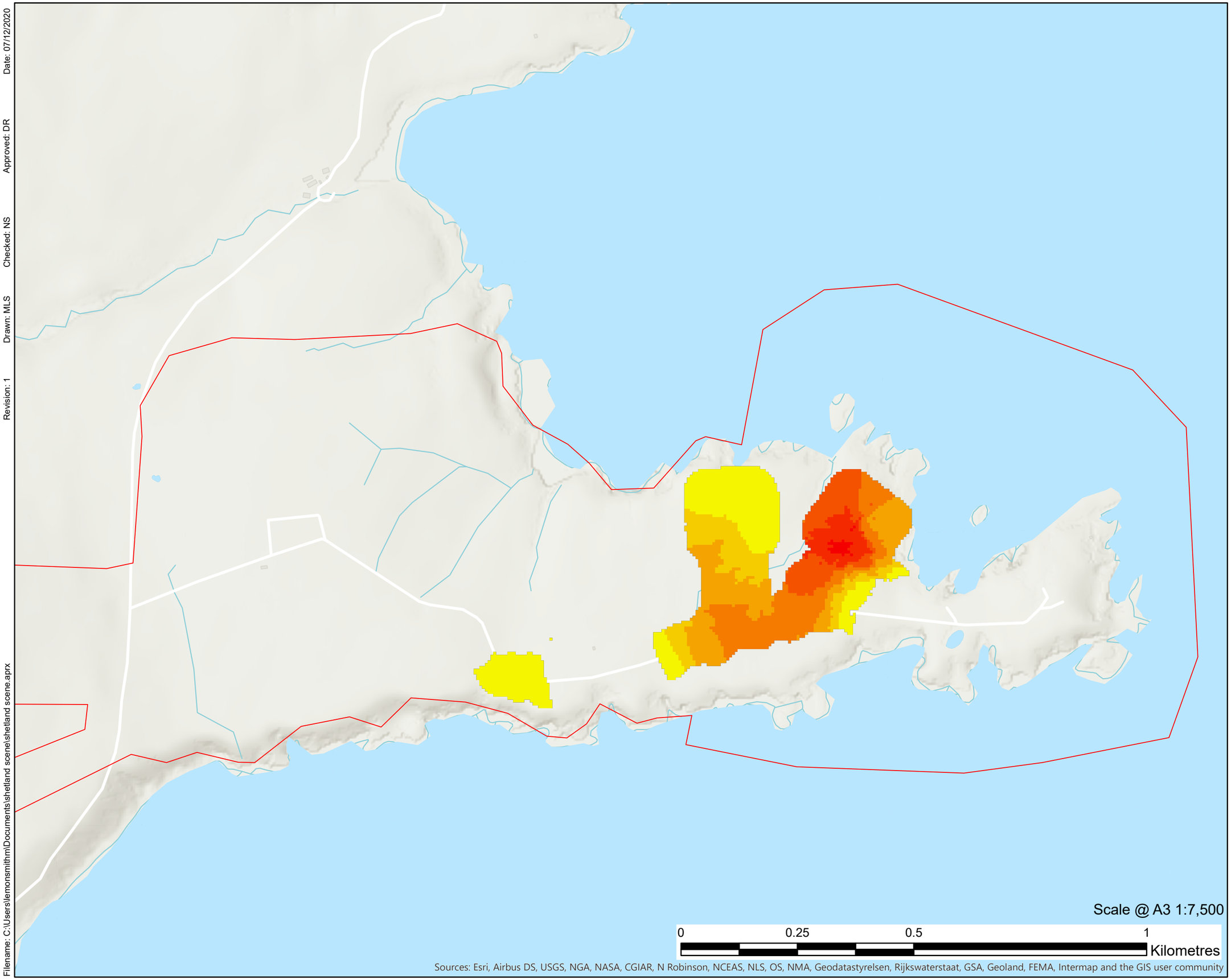

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PROJECT

Shetland Space Centre

CLIENT

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LEGEND

- Redline Application Boundary

Peat Depth (m)

0.51 - 0.75	Peat
0.76 - 1.00	
1.01 - 1.25	Deep Peat
1.26 - 1.50	
1.51 - 1.75	
1.76 - 2.00	
2.01 - 2.25	

NOTES

ISSUE PURPOSE

FOR PLANNING

PROJECT NUMBER

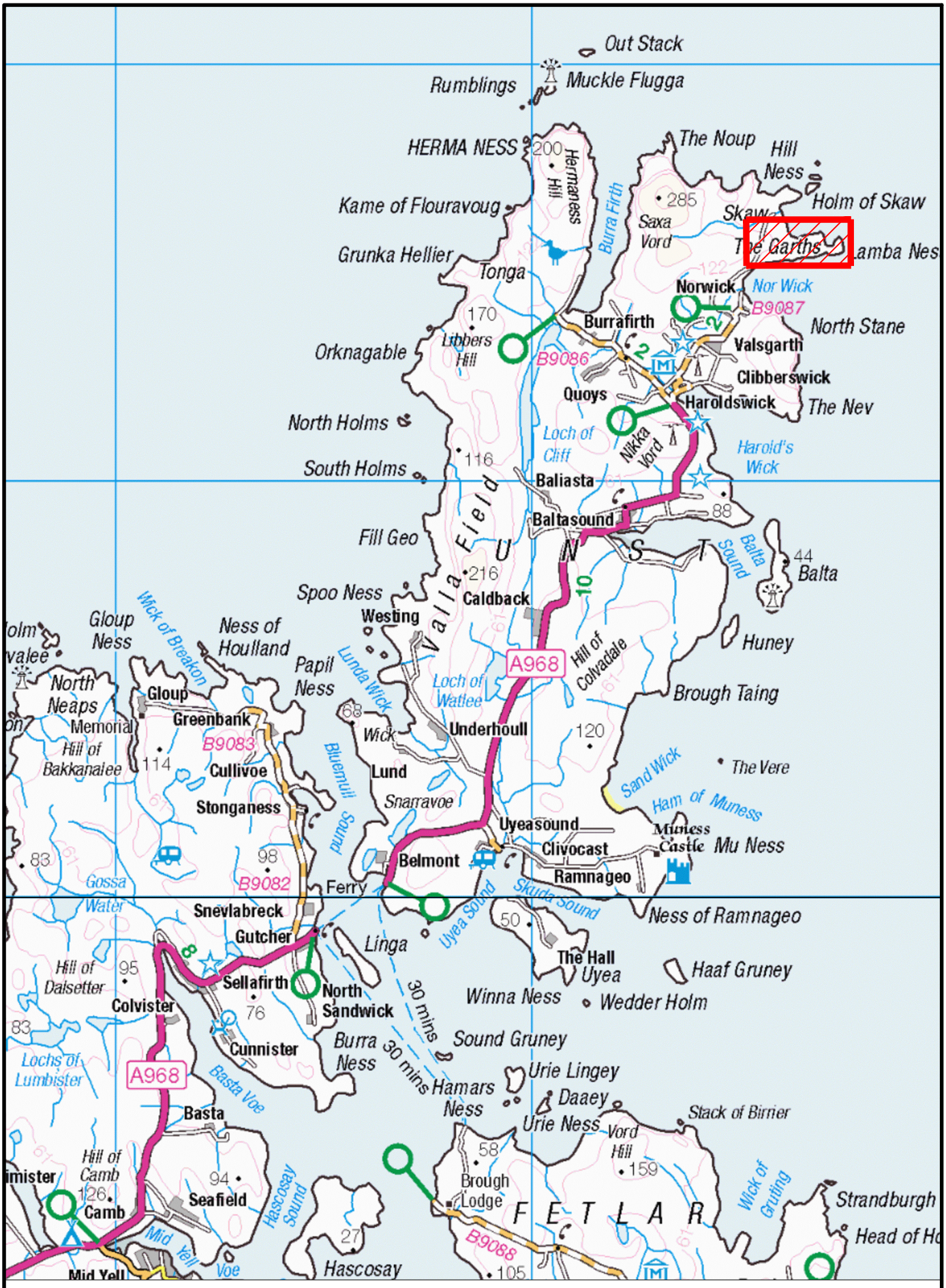
60617516

SHEET TITLE

Peat Depth Plan

SHEET NUMBER

60617516-ACM-XX-00-DR-CE-0098



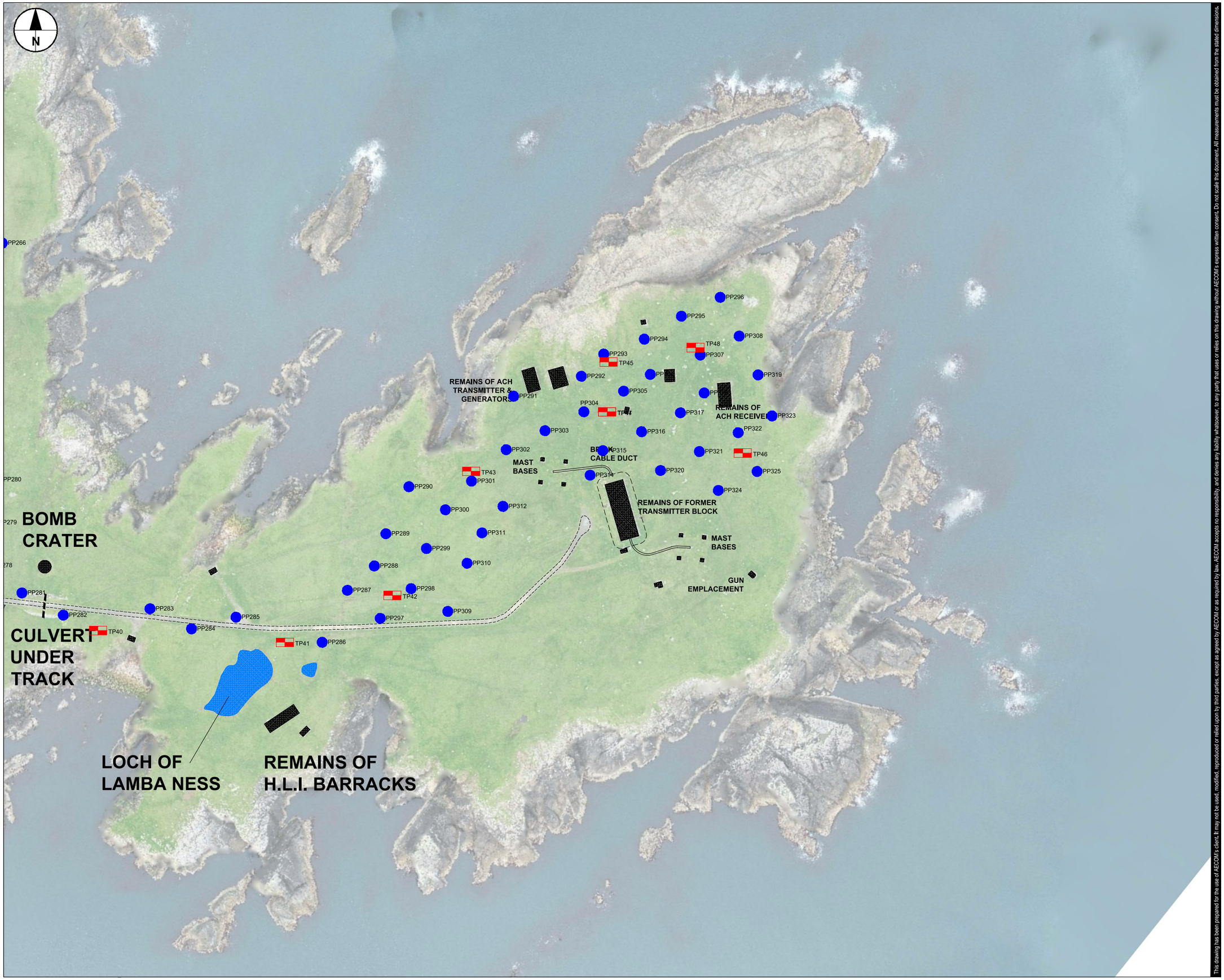
SITE LOCATION

Issue Status: FOR PLANNING

SHETLAND SPACE CENTRE
SITE LOCATION PLAN
SKAW, UNST
DRAWING NUMBER: 60617516-ACM-XX-00-DR-CE-0097

SHETLAND SPACE CENTRE

AECOM



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Notes

LEGEND
- PEAT PROBE
- TRIAL PIT
- 5m BOUNDARY AROUND HISTORIC STRUCTURES

Scale
0 10 20 40 80m

Original Size (A1) 1:1000 @ A1 1:2000 @ A3

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
B	10/12/20	UPDATED TO AS DUG LOCATIONS	BS/DR/DR
A	15/10/20	FIRST ISSUE	BS/DR/DR

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

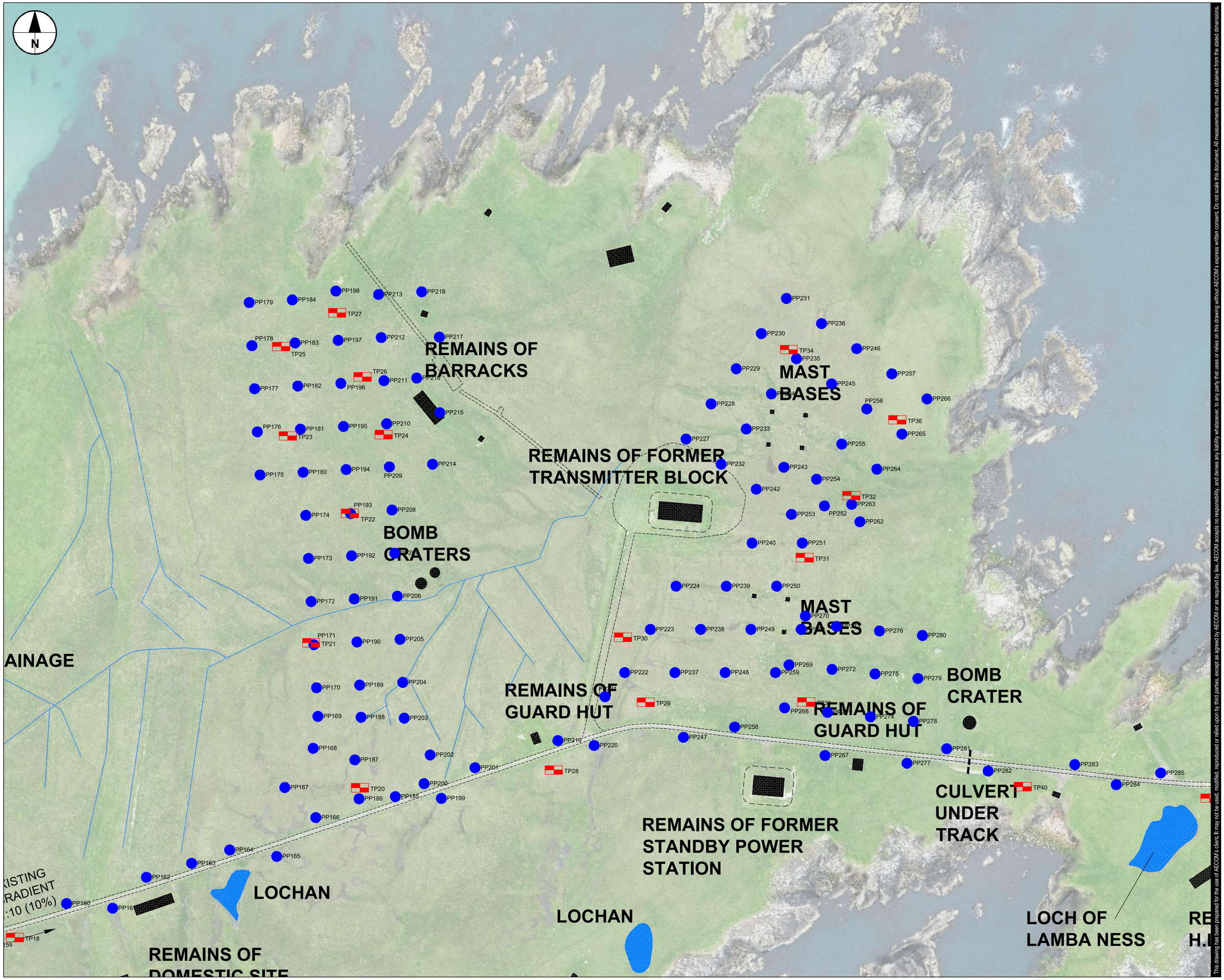
Sheet Title

PRELIMINARY GROUND INVESTIGATION FINAL LAYOUT SHEET 4 OF 4

Sheet Number

60617516-ACM-XX-00-DR-CE-0096

Scale: 1:1,000 **Rev:** B



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Notes

LEGEND
- PEAT PROBE
- TRIAL PIT
- 5m BOUNDARY AROUND HISTORIC STRUCTURES

Scale
0 10 20 40 80m

Original Size (A1) 1:1000 @ A1 1:2000 @ A3

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
B	10/12/20	UPDATED TO AS DUG LOCATIONS	BS/DR/DR
A	15/10/20	FIRST ISSUE	BS/DR/DR

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

PRELIMINARY GROUND INVESTIGATION FINAL LAYOUT SHEET 3 OF 4

Sheet Number

60617516-ACM-XX-00-DR-CE-0095

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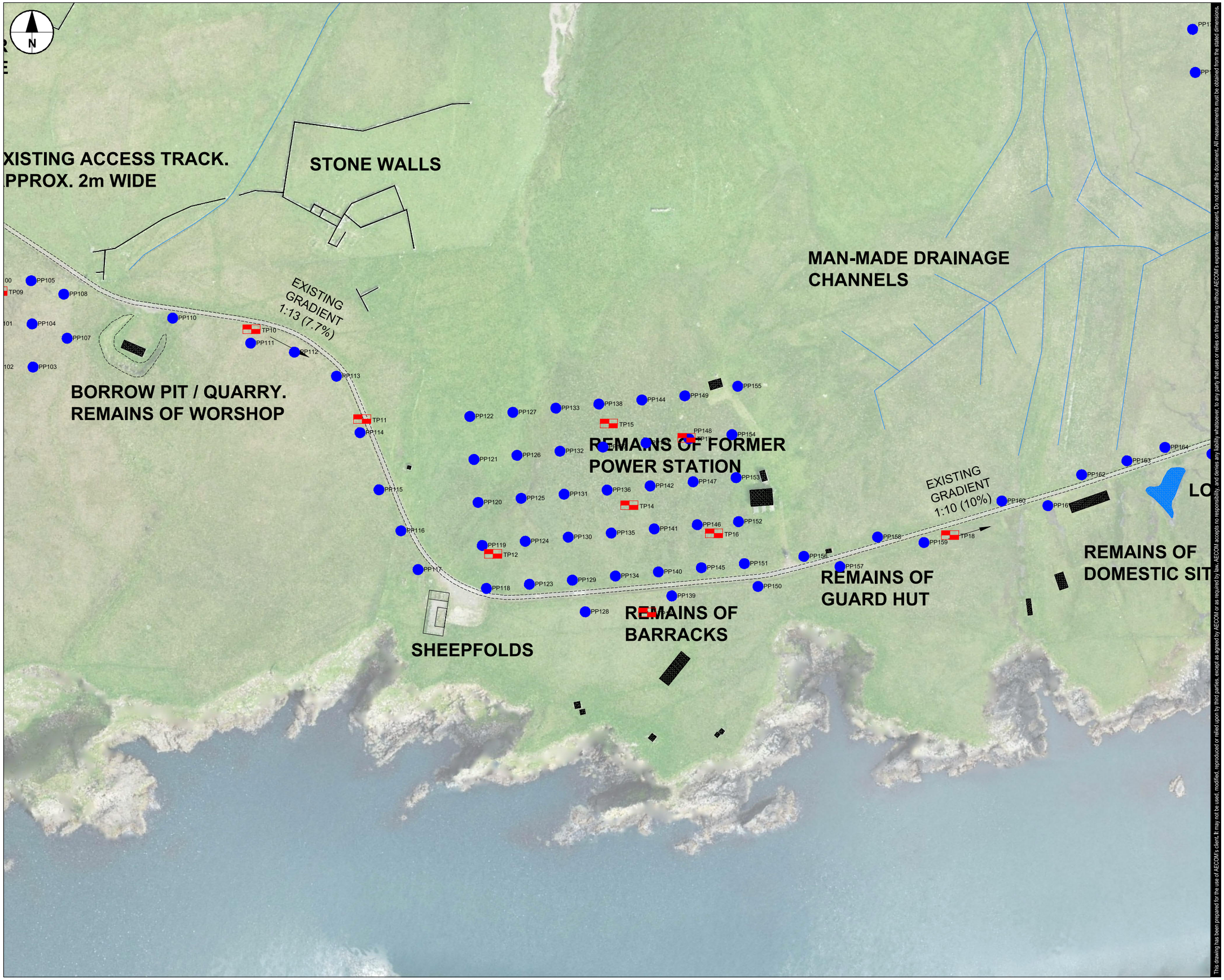

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Notes

LEGEND
- PEAT PROBE
- TRIAL PIT
- 5m BOUNDARY AROUND HISTORIC STRUCTURES

Scale
0 10 20 40 80m

Original Size (A1) 1:1000 @ A1 1:2000 @ A3

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
B	10/12/20	UPDATED TO AS DUG LOCATIONS	BD/DR/DR
A	15/10/20	FIRST DRAFT	BS/DR/DR

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

PRELIMINARY GROUND INVESTIGATION FINAL LAYOUT SHEET 2 OF 4

Sheet Number

60617516-ACM-XX-00-DR-CE-0094

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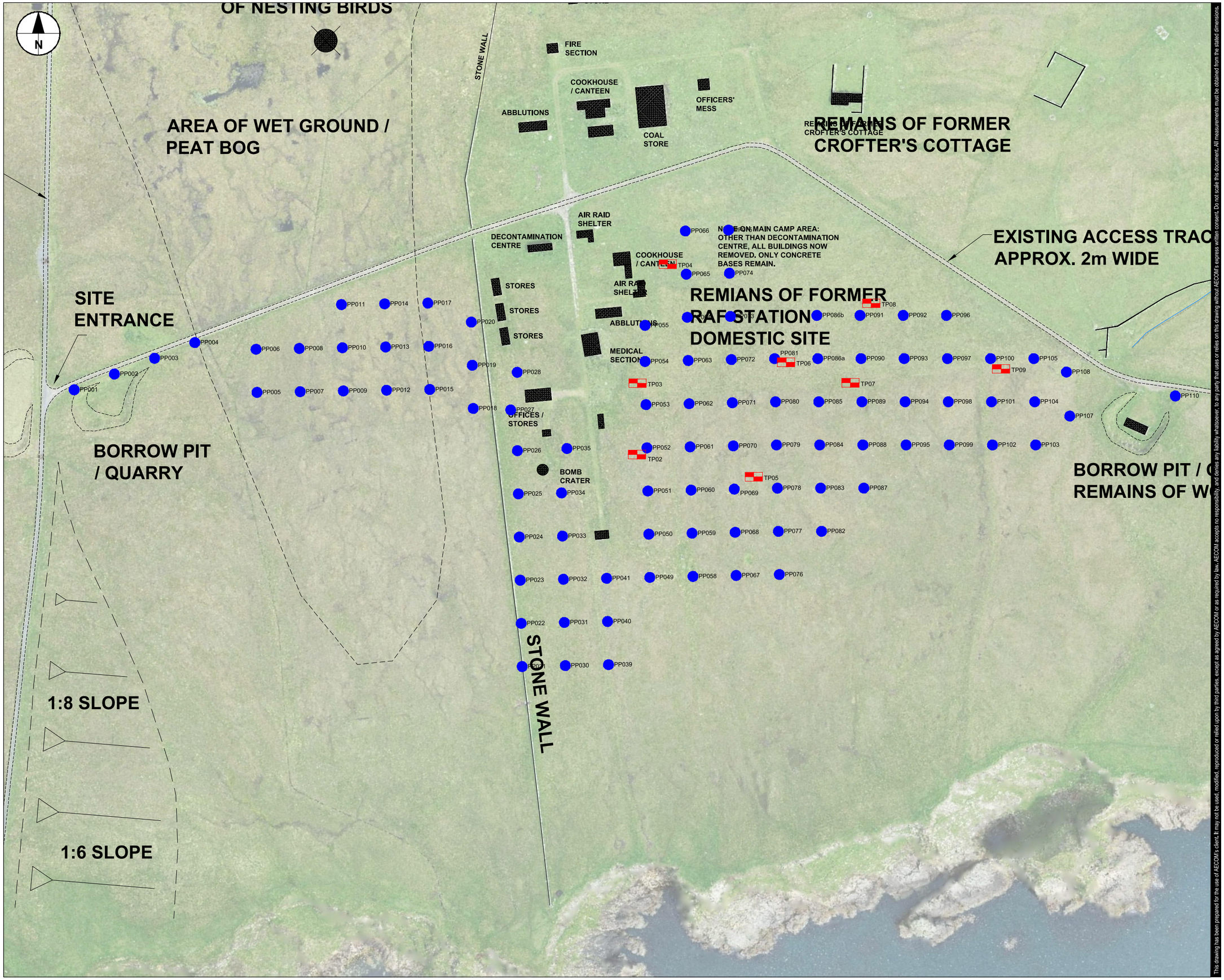

Project Management Initials: Designer: BS Checked: DR Approved: DR ISO A1 594mm x 841mm

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- TRIAL PIT
- 5m BOUNDARY AROUND HISTORIC STRUCTURES

Scale
0 10 20 40 80m

Original Size (A1) 1:1000 @ A1 1:2000 @ A3

ISSUE/REVISION

Rev	Date	Description	Drn/Chk/Appr
B	10/12/20	UPDATED TO AS DUG LOCATIONS	BS/DR/DR
A	15/10/20	FIRST DRAFT	BS/DR/DR

Key Plan

Purpose Of Issue

FOR PLANNING

Project Number

60617516

Sheet Title

PRELIMINARY GROUND INVESTIGATION FINAL LAYOUT SHEET 1 OF 4

Sheet Number

60617516-ACM-XX-00-DR-CE-0093

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Appendix B - Trial Pits Logs

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP02

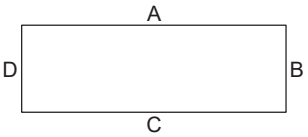
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.4	D/D1					(0.40) 0.40	Very soft dark brown sandy gravelly peaty TOPSOIL with cobbles and boulders of microgranite, up to 0.15m in size. Von Post H6 B2	
							Weathered bedrock **Trial pit terminated at 0.40m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Termination due to suspected weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP03

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.50)	Very soft peaty TOPSOIL with some gravel. Angular cobbles and boulders up to 0.4m in size. Von Post H6 B2	
						0.50	Weathered bedrock **Trial pit terminated at 0.50m**	

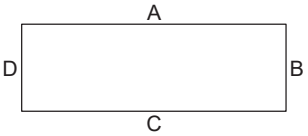
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



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Status:	Contractor: AECOM	Northing: 1215505.60m		End: 27/10/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:57

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP04

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						0.25	Very soft dark brown peaty TOPSOIL with distinct rootlets and angular cobbles and boulders up to 0.35m. Von Post H6 B2	
							Weathered bedrock **Trial pit terminated at 0.25m**	

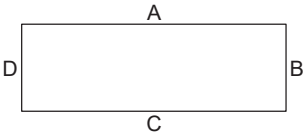
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:57

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP05

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.50)	Very soft dark brown sandy, gravelly amorphous PEAT with some rootlets, cobbles and boulders of microgranite up to 0.3m. Von Post H7 B2	
						0.50	Weathered bedrock **Trial pit terminated at 0.50m**	

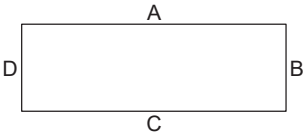
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:58

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP06

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.33)	Very soft dark brown clayey peaty TOPSOIL with cobbles and boulders of microgranite up to 0.5m. Von post H7 B2	
						0.33	Weathered bedrock **Trial pit terminated at 0.33m**	

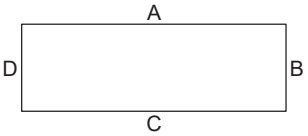
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 465862.80m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215517.70m		End: 27/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:58

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP07

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.38)	Very soft dark brown peaty TOPSOIL with abundant roots. Some cobbles and boulders of microgranite up to 0.4m. Von Post H7 B2	
						0.38	Weathered bedrock **Trial pit terminated at 0.38m**	

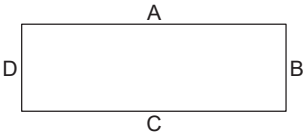
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 465900.10m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215505.80m		End: 27/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:59

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

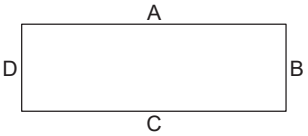
TP08

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.44)	Very soft dark brown slightly gravelly amorphous PEAT with cobbles and boulders up to 0.3m. Von post H7 B2	
						0.44	Weathered bedrock **Trial pit terminated at 0.44m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 465912.10m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215551.90m		End: 27/10/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:13:59

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP09

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					0.20	Very soft dark brown sandy gravelly peaty TOPSOIL with cobbles and boulders of microgranite up to 0.4m. Von post H7 B2	
						(0.40)	Weathered microgranite with amorphous peat filling cavities	
						0.60	Weathered bedrock **Trial pit terminated at 0.60m**	

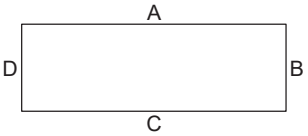
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 465987.30m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215513.90m		End: 27/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:00

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP10

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.30) 0.30	Very soft dark brown sandy gravelly amorphous PEAT with cobbles and boulders of microgranite up to 0.5m. Minor rootlets. Von post H7 B2	
0.5	D/D1					(0.40) 0.70	No rootlets	
						0.83	Fine to coarse SAND and fine to coarse GRAVEL of microgranite (weathered bedrock)	
							Weathered bedrock **Trial pit terminated at 0.83m**	

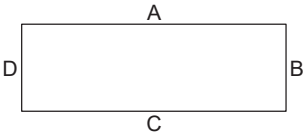
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466133.80m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215491.80m		End: 27/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:01

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP11

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.68)	Very soft dark brown sandy gravelly amorphous PEAT with rootlets and cobbles and boulders of microgranite up to 0.5m. Von post H7 B2	
						0.68	Weathered bedrock **Trial pit terminated at 0.68m**	

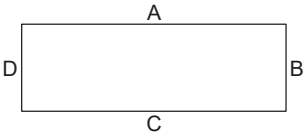
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466197.80m	Not surveyed	Start: 27/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215439.80m		End: 27/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:01

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP12

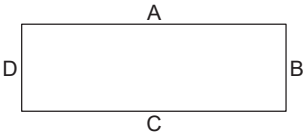
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(1.03)	Very soft dark brown amorphous PEAT with rootlets throughout and a very strong odour. Von Post H7 B2	
1						1.03		
1.2	B/B1					(0.63)	Soft grey very sandy very gravelly CLAY with occasional rootlets and cobbles and boulders up to 1.1m	
						1.66		
							Suspected boulders/weathered bedrock **Trial pit terminated at 1.66m**	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected boulders/weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466273.60m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215361.80m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:02

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP13

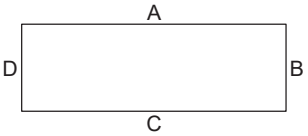
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.40) 0.40	Very soft dark brown peaty TOPSOIL with abundant rootlets. Von Post H6 B2	
						(0.60) 1.00	Light grey very slightly gravelly fine to coarse SAND with rare rootlets	
1						1.16	Soft dark grey very sandy very gravelly CLAY. Sand and Gravel are both fine to coarse	
						1.40	Fine to coarse SAND and GRAVEL within a BOULDER layer, boulders up to 0.3m	
2 2.0	B/B1					(0.63) 2.03	Brown gravelly very sandy SILT with cobbles, gravel is fine to coarse	
							Suspected weathered bedrock **Trial pit terminated at 2.03m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Trial pit terminated due to heavy digging, 10 minutes for 3cm

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466362.90m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215327.80m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:03

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP14

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.30) 0.30	Very soft dark brown peaty TOPSOIL with abundant rootlets. Von Post H7 B2	
0.6	B/B1					(1.10) 1.40	Light brown slightly gravelly silty fine to coarse SAND with rare rootlets. Gravel is fine	
							Suspected weathered bedrock/boulders **Trial pit terminated at 1.40m**	

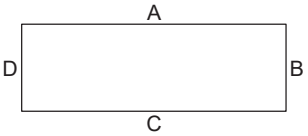
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466352.40m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215389.90m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:03

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP15

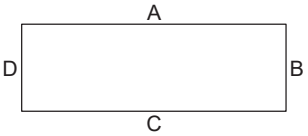
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.33)	Very soft dark brown peaty TOPSOIL with rootlets. Von Post H7 B2	
						0.33		
0.5	B/B1					(0.57)	Slightly gravelly silty SAND. Gravel is fine	
						0.90		
1.1	B/B2					(1.30)	Light grey slightly gravelly silty SAND with rare rootlets. Gravel is fine. Becoming more gravelly with depth	
						2.20		
							Suspected weathered bedrock/boulders **Trial pit terminated at 2.20m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Trial pit moved 10m as buried service encountered

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466340.70m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215437.20m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:04

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP16

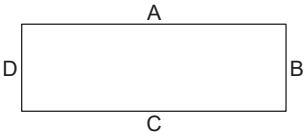
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.50) 0.50	Very soft dark brown peaty TOPSOIL with rootlets. Von post H7 B2	
						(0.29) 0.79	Light grey slightly gravelly fine to coarse SAND, gravel is fine	
						0.84	PEAT lens	
1 1.1	B/B1					(0.56) 1.40	Silty Sand and GRAVEL	
							Terminated due to weathered bedrock/boulders **Trial pit terminated at 1.40m**	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to weathered bedrock/boulders

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466401.50m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215373.70m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

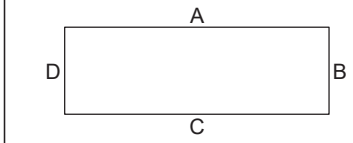
Record of Trial Pit

TP17

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.60)	Very soft dark brown amorphous PEAT with rootlets. Von Post H7 B2	
						0.60		
						0.76	Dark grey slightly gravelly fine to coarse SAND with occasional rootlets. Gravel is fine to coarse	
						0.86	Peat lens	
1.1	B/B1					(0.34)	Gravelly very silty SAND as above. Gravel is find to medium.	
						1.20		
						1.30	Peat lens	
1.8	B/B2					(0.57)	Silty fine to coarse SAND and fine to coarse GRAVEL. Some cobbles and boulders up to 0.2m	
						1.87		
							Suspected weathered bedrock/ boulders	
							Trial pit terminated at 1.87m	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466385.60m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215428.90m		End: 28/10/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:05

2019 AECOM www.AECOM.com

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP18

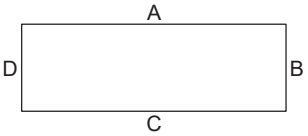
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.40) 0.40	Very soft dark brown peaty TOPSOIL with rare rootlets. Von Post H6 B2	
						(0.96) 1.36	Light grey slightly gravelly fine to coarse SAND with rare rootlets. Gravel is fine	
							Weathered bedrock **Trial pit terminated at 1.36m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466538.10m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215372.70m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:07

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP20

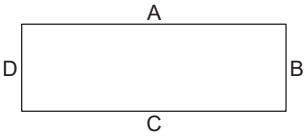
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
1 1.0	D/D1					(1.63)	Very soft dark brown amorphous PEAT, rootlets common to 0.2m. Von Post H9 B3	Very strong organic odour
						1.63	Soft grey sandy gravelly CLAY. Sand and gravel are both fine to coarse. Some cobbles and boulders present up to 0.5m, boulder @ 1.6m depth measuring 1.2m	
						1.82	Terminated on suspected bedrock **Trial pit terminated at 1.82m**	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging, 5 minutes for 5cm

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466737.90m	Not surveyed	Start: 28/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215459.40m		End: 28/10/2020	Sheet 1 of 1

2019 AECOM www.AECOM.com

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP21

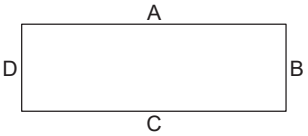
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.5	D/D1					(1.16)	Very soft dark brown amorphous PEAT with rootlets to 0.2. Von Post H7 B3	Very strong organic odour
						1.16		
1.3	B/B1					(0.84)	Silty very gravelly fine to coarse SAND. Gravel fine to medium	
						2.00		
							Suspected weathered bedrock/boulders **Trial pit terminated at 2.00m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected weathered bedrock/boulders

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466709.60m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215543.30m		End: 30/10/2020	Sheet 1 of 1

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP22

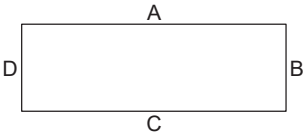
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.4	D/D1					(1.20)	Very soft dark brown amorphous PEAT with rootlets to 30cm. Von Post H6 B3	
						1.20		
						(0.30)	Dark grey slightly gravelly clayey fine to coarse SAND with cobbles and boulders up to 0.6m. Gravel is fine to coarse	
						1.50		
						1.55	Peat lens	
2.0	B/B1					(0.65)	Dark grey SAND as above, increasing in clay content, to become a very sandy very gravelly CLAY. Silt, sand and gravel is fine to coarse.	
						2.20		
							Terminated on suspected bedrock **Trial pit terminated at 2.20m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to very heavy digging and lack of progress

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466732.10m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215618.20m		End: 30/10/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:08

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:09

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

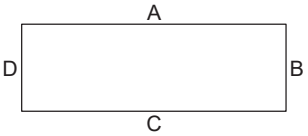
Record of Trial Pit

TP23

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.9	D/D1					(1.10)	Very soft dark brown amorphous PEAT with rootlets to 0.1m. Von Post H7 B2	
						1.10		
						1.15	Dark grey slightly clayey fine to coarse SAND and fine to coarse GRAVEL of microgranite Weathered bedrock/boulders **Trial pit terminated at 1.15m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466696.10m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215663.10m		End: 30/10/2020	Sheet 1 of 1

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP24

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.60) 0.60	Very soft dark brown amorphous PEAT with rootlets to 0.2m. Von Post H7 B2	
						(0.40) 1.00	Light grey gravelly fine to coarse SAND. Gravel is fine	
							Suspected weathered bedrock/boulders **Trial pit terminated at 1.00m**	

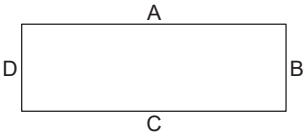
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466751.60m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215663.90m		End: 30/10/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:10

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

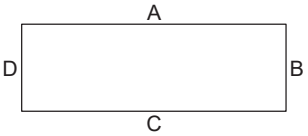
TP25

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.80) 0.80	Very soft dark brown amorphous PEAT with rootlets up to 0.2m. Von Post H7 B2	
1 1.0	B/B1					(0.40) 1.20	Silty fine to coarse SAND and fine to coarse GRAVEL	
							Weathered bedrock/boulders **Trial pit terminated at 1.20m**	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466692.30m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215714.80m		End: 30/10/2020	Sheet 1 of 1

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP26

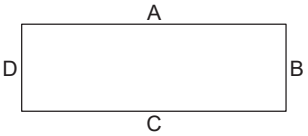
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.80)	Very soft dark brown amorphous PEAT, rootlets to 0.2m. Von Post H7 B2	
						0.80		
1.1	B/B1					(0.50)	Dark brown very sandy silty fine to coarse GRAVEL with cobbles and boulders up to 0.3m. Sand is fine to coarse	
						1.30	Terminated on suspected weathered bedrock/boulders **Trial pit terminated at 1.30m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected weathered bedrock/boulders

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466739.30m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215697.20m		End: 30/10/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:11

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

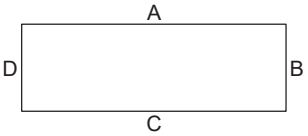
TP27

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.60)	Very soft dark brown amorphous PEAT with rootlets. Von post H6 B2	
						0.60	Weathered bedrock **Trial pit terminated at 0.60m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside``vator`

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466724.70m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215734.30m		End: 30/10/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:11

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:12

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

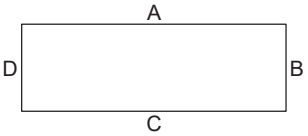
TP28

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(1.38)	Very soft dark brown amorphous PEAT with rootlets to 0.1m. Von post H6 B3	
						1.38	Weathered bedrock/boulders **Trial pit terminated at 1.38m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466850.10m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215469.60m		End: 30/10/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:12

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

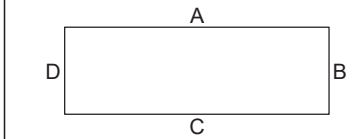
Record of Trial Pit

TP29

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
1.2	D/D1					(1.40) 1.40	Very soft dark brown amorphous PEAT with rootlets to 0.3m. Von post H7 B3	
						(0.50) 1.90	Light grey very sandy very gravelly CLAY, both sand and gravel are fine to coarse. Boulders up to 1.6m	
							Trial pit terminated at 1.90m	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator



Exploratory hole logs should be read in conjunction with corresponding Key Sheets.

Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466903.20m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215508.90m		End: 30/10/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:13

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP30

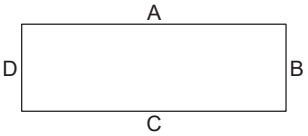
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.4	D/D1					(1.70)	Very soft dark brown amorphous PEAT with rootlets to 0.2m. Von Post H7 B3	
						1.70		
2.0	B/B1					(0.50)	Very sandy silty fine to coarse GRAVEL. Sand is fine to coarse	
						2.20	Suspected weathered bedrock **Trial pit terminated at 2.20m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to very heavy digging, possible weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466890.10m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215546.50m		End: 02/11/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:14

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP31

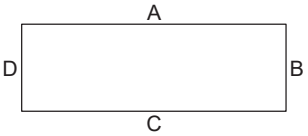
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.4	D/D1					(2.10)	Very soft dark brown amorphous PEAT with rootlets to 0.15m. Von Post H7 B3	
						2.10	Weathered bedrock/boulders of microgranite **Trial pit terminated at 2.10m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on weathered bedrock/boulders of microgranite

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466995.30m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215592.60m		End: 02/11/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:14

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP32

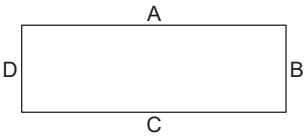
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.90)	Very soft dark brown amorphous PEAT with rootlets to 0.1m. Von Post H7 B2	
						0.90		
1 1.0	B/B1					(0.30)	Very silty fine to coarse SAND and fine to coarse gravel.	
						1.20	Suspected weathered bedrock **Trial pit terminated at 1.20m**	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging, likely bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467022.20m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215628.50m		End: 02/11/2020	Sheet 1 of 1

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP34

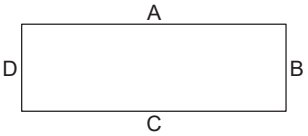
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(1.80)	Very soft dark brown amorphous PEAT with rootlets to 0.1m. Von Post H7 B3	
						1.80	Weathered bedrock **Trial pit terminated at 1.80m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466986.10m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215713.10m		End: 02/11/2020	Sheet 1 of 1

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Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:15

Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP36

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						(0.50)	Very soft dark brown peaty TOPSOIL. Von Post H7 B2	
0.5	D/D1					0.50	Suspected weathered bedrock **Trial pit terminated at 0.50m**	

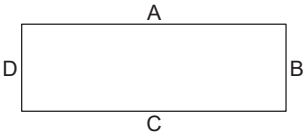
1

2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467048.90m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215672.40m		End: 02/11/2020	Sheet 1 of 1

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

AECOM

Record of Trial Pit

TP38

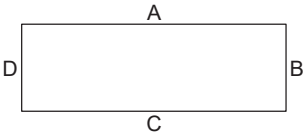
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.50) 0.50	Very soft dark brown peaty TOPSOIL with rootlets to 0.1m. Von Post H7 B2	
0.8	B/B1					(0.67) 1.17	Silty fine to coarse SAND and fine to medium gravel	
							Suspected weathered bedrock **Trial pit terminated at 1.17m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging, possibly weathered bedrock and boulders

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 466996.30m	Not surveyed	Start: 30/10/2020	AGS
Status:	Contractor: AECOM	Northing: 1215509.10m		End: 30/10/2020	Sheet 1 of 1

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Contract No: 60617516

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Record of Trial Pit

TP40

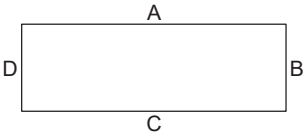
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.50) 0.50	Peaty TOPSOIL. Von post H7 B3	
0.7	B/B1					(0.56) 1.06	Soft to firm grey and orange sandy gravelly CLAY with cobbles and boulders of microgranite up to 0.4m. Sand and Gravel are both fine to coarse. Sand, gravel, cobbles and boulders all of Mircogranite. Likely residual soil of granite (kaolinisation)	
							Suspected weathered bedrock **Trial pit terminated at 1.06m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging in boulders. Likely weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467121.50m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215460.10m		End: 02/11/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:17

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Record of Trial Pit

TP41

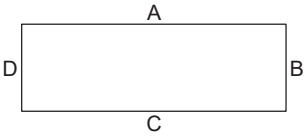
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.35) 0.35	Very soft dark brown peaty TOPSOIL with roots to 0.1m. Von Post H6 B3	
0.8	B/B1					(0.70) 1.05	Soft grey and orange, very sandy very gravelly CLAY with boulders up to 0.4m of microgranite. Sand and gravel are both fine to coarse of microgranite	
							Suspected weathered bedrock **Trial pit terminated at 1.05m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected bedrock/boulders

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467229.70m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215453.30m		End: 02/11/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:17

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Client: Shetland Space Centre

Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

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Record of Trial Pit

TP42

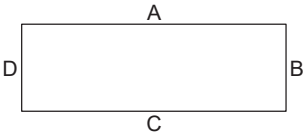
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.37)	Very soft dark brown peaty TOPSOIL. Von Post H7 B2	
						0.37		
						0.50	Dark grey very gravelly very clayey fine to coarse SAND with boulders of microgranite	
0.6	B/B1					(0.67)	Soft orange very gravelly very sandy SILT with boulders up to 0.4m of microgranite. Both sand and gravel are fine to coarse and of microgranite	
						1.17	Suspected weathered bedrock	
							Trial pit terminated at 1.17m	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated in suspected weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467292.00m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215480.50m		End: 02/11/2020	Sheet 1 of 1

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Project: Shetland Space Centre, Preliminary Ground Investigation, Unst, Sheltand.

Contract No: 60617516

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Record of Trial Pit

TP43

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.30) 0.30	Peaty TOPSOIL. Von Post H7 B2	
0.4	B/B1					0.45	Soft orange sandy gravelly CLAY with cobbles and boulders up to 0.3m. Sand and gravel are both fine to coarse. Sand, gravel, cobbles and boulders all of microgranite	
							Trial pit terminated at 0.45m	

1

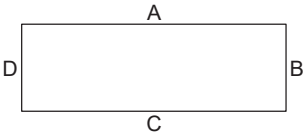
2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Trial pit terminated due to unearthing archeology at 0.4m

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467337.50m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215552.30m		End: 02/11/2020	Sheet 1 of 1

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Contract No: 60617516

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Record of Trial Pit

TP44

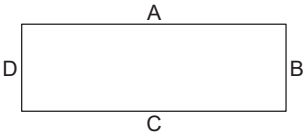
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						0.20	Peaty TOPSOIL. Von post H7 B3	
						0.40	Soft grey gravelly sandy CLAY. Both sand and gravel are fine to coarse	
0.5	B/B1					0.48	Grey very sandy clayey fine to coarse GRAVEL with boulders up to 0.4m. Sand is fine to coarse	
						(0.44)	Very sandy very gravelly SILT. Sand and gravel both fine to coarse.	
						0.92	Suspected weathered bedrock **Trial pit terminated at 0.92m**	
1								
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467416.20m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215586.70m		End: 02/11/2020	Sheet 1 of 1

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Record of Trial Pit

TP45

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
						0.10	Peaty TOPSOIL. Von post H7 B2	
0.3	B/B1					(0.37) 0.47	Soft brown sandy gravelly CLAY with cobbles and boulders up to 0.1. Sand and gravel are both fine to coarse	
						0.56	Grey sandy slightly clayey GRAVEL with boulders up to 0.2m	
						(0.32) 0.88	Soft orange sandy gravelly CLAY with cobbles and boulders up to 0.4m of microgranite. Sand and gravel are both fine to coarse and of microgranite.	
							Suspected weathered bedrock **Trial pit terminated at 0.88m**	

1

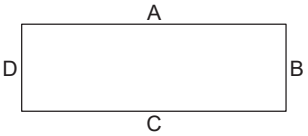
2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging, suspected weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467417.10m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215615.60m		End: 02/11/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:20

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Record of Trial Pit

TP46

Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.30) 0.30	Peaty TOPSOIL. Von Post H7 B3	
						0.40	Dark grey very gravelly clayey fine to coarse SAND with boulders up to 0.2m. Gravel is fine to coarse	
0.8	B/B1					(0.50) 0.90	Very soft orange very sandy very gravelly SILT with cobbles and boulders up to 0.4m. Sand and gravel are both fine to coarse. Sand, gravel, cobbles and boulders are all of microgranite	
							Suspected weathered bedrock **Trial pit terminated at 0.90m**	

1

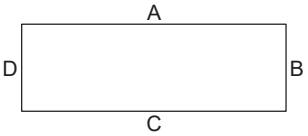
2

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected weathered bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467494.70m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215562.90m		End: 02/11/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:21

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Record of Trial Pit

TP47

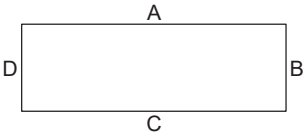
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.2	D/D1					(0.40)	Very soft dark brown peaty TOPSOIL. Von Post H7 B3	
						0.40		
						0.50	Dark grey sandy clayey fine to coarse GRAVEL. Sand is fine to coarse	
0.7	B/B1					(0.54)	Soft orange sandy gravelly CLAY with boulders up to 0.3m. Sand and gravel both fine to coarse. Sand, gravel and boulders all of microgranite	
1						1.04		
							Suspected weathered bedrock	
							Trial pit terminated at 1.04m	
2								

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated on suspected bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467416.20m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215586.70m		End: 02/11/2020	Sheet 1 of 1

Style: AGS4_AECOM_ENV_TP File: \\SWUKADMIN\GLASGOW-ADMIN\ELS SCOTLAND AND N IRELAND\RUSSELL OLD\1. JOBS\GE GINT\GE GINT.GPJ Printed: 10/12/2020 17:14:21

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Contract No: 60617516

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Record of Trial Pit

TP48

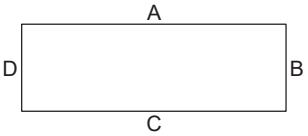
Samples & in situ Tests			Water Level	Strata				
Depth	Type/ No.	Test Results		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	Visual/Olfactory Observations
0.3	D/D1					(0.40) 0.40	Very soft dark brown peaty TOPSOIL. Von post H7 B2	
						0.60	Grey sandy clayey fine to coarse GRAVEL. Sand is fine to coarse	
0.7	B/B1					(0.60) 1.20	Very gravelly very silty fine to coarse SAND. Gravel is fine to coarse	
							Terminated due to heavy digging on suspected bedrock **Trial pit terminated at 1.20m**	

GENERAL REMARKS

Logged by: David Evans
Checked by: David Raeside
Equipment: Tracked excavator

Terminated due to heavy digging on suspected bedrock

Exploratory hole logs should be read in conjunction with corresponding Key Sheets.



Logged by:	Equipment:	Coordinates (OS NGR):	Ground Level:	Date:	
Checked by:		Easting: 467467.40m	Not surveyed	Start: 02/11/2020	AGS
Status:	Contractor: AECOM	Northing: 1215623.90m		End: 02/11/2020	Sheet 1 of 1

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Appendix C - Trial Pit Photographs

Shetland Space Centre

Trial Pit 2

Shetland Space Centre

Trial Pit 3

Shetland Space Centre

Trial Pit 4

Shetland Space Centre

Trial Pit 5

Shetland Space Centre

Trial Pit 6

Shetland Space Centre

Trial Pit 7

Shetland Space Centre

Trial Pit 8

Shetland Space Centre

Trial Pit 9

Shetland Space Centre

Trial Pit 10

Shetland Space Centre

Trial Pit 11

Shetland Space Centre

Trial Pit 12

Shetland Space Centre

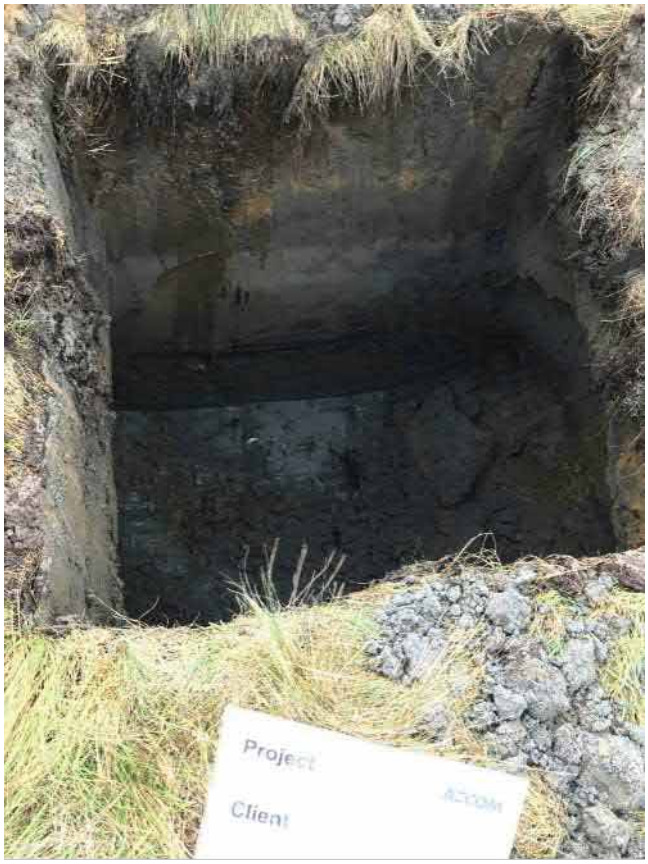
Trial Pit 13

Shetland Space Centre

Trial Pit 14

Shetland Space Centre

Trial Pit 15



Shetland Space Centre

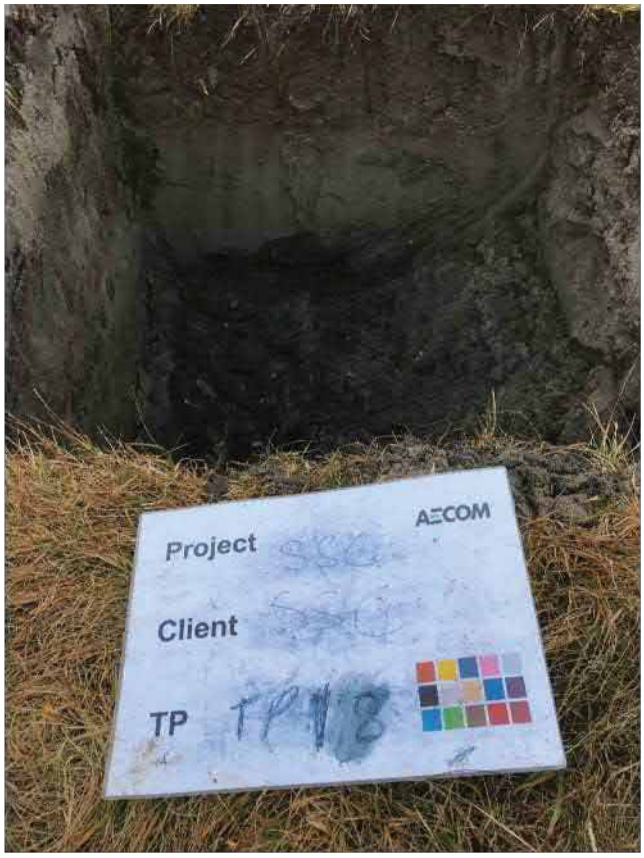
Trial Pit 16

Shetland Space Centre

Trial Pit 17

Shetland Space Centre

Trial Pit 18



Shetland Space Centre

Trial Pit 20

Shetland Space Centre

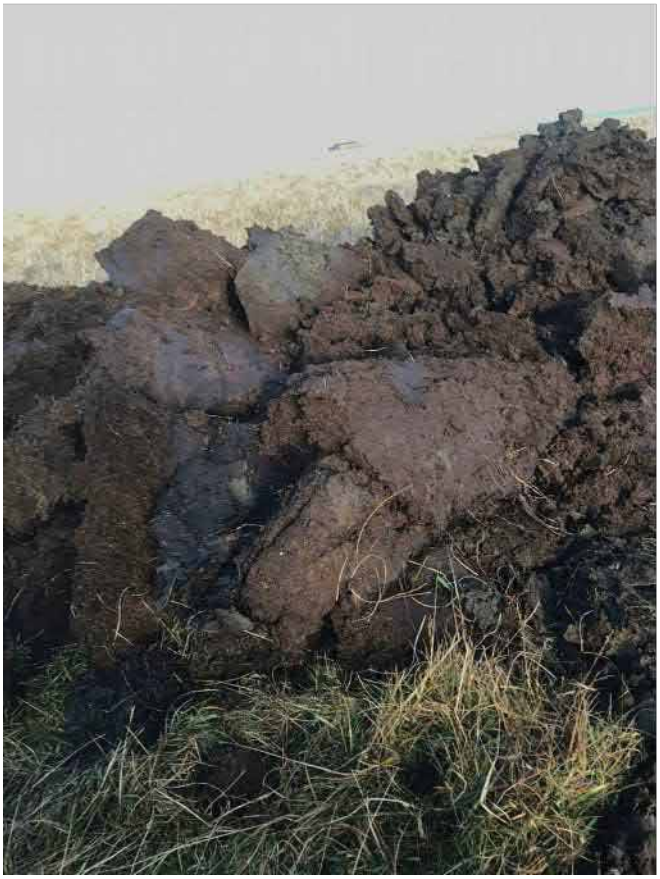
Trial Pit 21

Shetland Space Centre

Trial Pit 22

Shetland Space Centre

Trial Pit 23



Shetland Space Centre

Trial Pit 24

Shetland Space Centre

Trial Pit 25

Shetland Space Centre

Trial Pit 26

Shetland Space Centre

Trial Pit 27

Shetland Space Centre

Trial Pit 28

Shetland Space Centre

Trial Pit 29

Shetland Space Centre

Trial Pit 30

Shetland Space Centre

Trial Pit 31

Shetland Space Centre

Trial Pit 32

Shetland Space Centre

Trial Pit 34

Shetland Space Centre

Trial Pit 36

Shetland Space Centre

Trial Pit 38

Shetland Space Centre

Trial Pit 40

Shetland Space Centre

Trial Pit 41

Shetland Space Centre

Trial Pit 42

Shetland Space Centre

Trial Pit 43

Shetland Space Centre

Trial Pit 44

Shetland Space Centre

Trial Pit 45

Shetland Space Centre

Trial Pit 46

Shetland Space Centre

Trial Pit 47

Shetland Space Centre

Trial Pit 48

Appendix D - Peat Probe Results

Peat Probing Measurements [27/10/2020 - 03/11/2020]

Sheet Number	Peat Probe Location	Easting	Northing	Peat Thickness [m]	Notes
1	1	465450.79	1215501.81	0.25	
1	2	465474.07	1215510.92	0.15	
1	3	465497.35	1215520.04	0.25	
1	4	465520.63	1215529.15	0.45	
1	5	465556.62	1215500.30	0.55	
1	6	465556.06	1215525.29	0.65	
1	7	465581.61	1215500.73	0.65	
1	8	465581.06	1215525.72	0.45	
1	9	465606.61	1215501.15	0.5	
1	10	465606.06	1215526.14	0.45	
1	11	465605.50	1215551.14	0.4	
1	12	465631.60	1215501.57	0.4	
1	13	465631.05	1215526.57	0.25	
1	14	465630.50	1215551.56	0.35	
1	15	465656.60	1215502.00	0.4	
1	16	465656.05	1215526.99	0.35	
1	17	465655.50	1215551.99	0.5	
1	18	465681.79	1215491.00	0.4	
1	19	465681.24	1215516.00	0.35	
1	20	465680.69	1215540.99	0.325	
1	21	465710.09	1215341.59	0.4	
1	22	465709.54	1215366.58	0.5	
1	23	465708.99	1215391.58	0.6	
1	24	465708.44	1215416.57	0.5	
1	25	465707.89	1215441.57	0.5	
1	26	465707.34	1215466.56	0.5	
1	27	465703.46	1215490.14	0.5	
1	28	465707.23	1215511.94	0.5	
1	29			-	Cancelled
1	30	465735.08	1215342.14	0.4	
1	31	465734.53	1215367.13	0.3	
1	32	465733.98	1215392.13	0.35	
1	33	465733.43	1215417.12	0.3	
1	34	465732.88	1215442.11	0.45	
1	35	465736.01	1215467.83	0.3	
1	36			-	Cancelled
1	37			-	Cancelled
1	38			-	Cancelled
1	39	465760.08	1215342.69	0.25	
1	40	465759.53	1215367.68	0.25	
1	41	465758.98	1215392.68	0.3	
1	42			-	Cancelled
1	43			-	Cancelled
1	44			-	Cancelled
1	45			-	Cancelled
1	46			-	Cancelled
1	47			-	Cancelled
1	48			-	Cancelled
1	49	465783.97	1215393.23	0.65	
1	50	465783.42	1215418.22	0.45	
1	51	465782.87	1215443.22	0.25	
1	52	465782.32	1215468.21	0.5	
1	53	465781.77	1215493.20	0.3	5m south of fence
1	54	465781.21	1215518.20	0.15	
1	55	465781.20	1215539.10	0.25	
1	56			-	Cancelled
1	57			-	Cancelled

1	58	465808.96	1215393.78	0.4	
1	59	465808.41	1215418.77	0.35	
1	60	465807.86	1215443.77	0.55	
1	61	465807.31	1215468.76	0.3	
1	62	465806.76	1215493.75	0.25	9m south of fence
1	63	465806.21	1215518.75	0.15	
1	64	465805.66	1215543.74	0.45	
1	65	465805.10	1215568.74	0.15	
1	66	465804.55	1215593.73	0.3	
1	67	465833.96	1215394.33	0.3	crater between 67 and 68
1	68	465833.41	1215419.32	0.3	
1	69	465832.86	1215444.32	0.5	
1	70	465832.31	1215469.31	0.25	
1	71	465831.75	1215494.31	0.35	
1	72	465831.20	1215519.30	0.4	
1	73	465830.65	1215544.29	0.45	
1	74	465830.10	1215569.29	0.4	
1	75	465829.55	1215594.28	0.15	
1	76	465858.95	1215394.88	0.25	
1	77	465858.40	1215419.87	0.35	
1	78	465857.85	1215444.87	0.35	
1	79	465857.30	1215469.86	0.4	
1	80	465856.75	1215494.86	0.4	
1	81	465856.20	1215519.85	0.4	
1	82	465883.41	1215419.88	0.2	
1	83	465882.85	1215444.88	0.2	
1	84	465882.30	1215469.88	0.3	
1	85	465881.75	1215494.88	0.35	
1	86A	465881.20	1215519.88	0.2	
1	86B	465880.65	1215544.88	0.4	
1	87	465907.86	1215444.88	0.3	
1	88	465907.31	1215469.88	0.25	
1	89	465906.76	1215494.88	0.3	
1	90	465906.21	1215519.88	0.2	
1	91	465905.66	1215544.88	0.2	
1	92	465930.66	1215544.88	0.4	
1	93	465931.21	1215519.88	0.35	
1	94	465931.76	1215494.88	0.25	
1	95	465932.32	1215469.88	0.45	
1	96	465955.67	1215544.88	0.2	
1	97	465956.22	1215519.88	0.15	
1	98	465956.77	1215494.88	0.2	
1	99	465957.32	1215469.88	0.3	
1	100	465981.23	1215519.88	0.15	TP09 in between 100 and 101
1	101	465981.78	1215494.88	0.2	
1	102	465982.33	1215469.88	0.3	
1	103	466007.33	1215469.88	0.2	
1	104	466006.78	1215494.88	0.1	
1	105	466006.23	1215519.88	0.25	
1	106			-	Cancelled
1	107	466027.05	1215486.58	0.25	
1	108	466025.12	1215512.10	0.2	
2	109			-	Cancelled (in quarry)
2	110	466088.14	1215498.23	0.2	
2	111	466133.29	1215483.74	0.25	South of TP10
2	112	466158.61	1215478.55	0.25	
2	113	466182.95	1215464.61	0.15	
2	114	466196.60	1215431.93	0.35	South of TP11
2	115	466207.55	1215398.87	0.35	
2	116	466220.27	1215375.11	0.55	
2	117	466230.17	1215352.64	0.5	
2	118	466269.73	1215341.76	0.7	

2	119	466267.34	1215366.64	0.75	
2	120	466264.94	1215391.53	0.35	
2	121	466262.55	1215416.41	0.2	
2	122	466260.15	1215441.30	0.2	
2	123	466294.61	1215344.15	0.65	
2	124	466292.22	1215369.04	0.65	
2	125	466289.83	1215393.92	0.55	
2	126	466287.43	1215418.81	0.25	
2	127	466285.04	1215443.69	0.2	
2	128	466326.95	1215328.21	0.5	
2	129	466319.50	1215346.54	0.45	
2	130	466317.11	1215371.43	0.5	
2	131	466314.71	1215396.31	0.4	
2	132	466312.32	1215421.20	0.4	
2	133	466309.92	1215446.08	0.5	Final telegraph pole 5m east
2	134	466344.38	1215348.93	0.4	
2	135	466341.99	1215373.82	0.45	
2	136	466339.60	1215398.70	0.45	
2	137	466337.20	1215423.59	0.6	
2	138	466334.81	1215448.47	0.4	
2	139	466377.05	1215337.39	0.6	
2	140	466369.27	1215351.33	0.45	
2	141	466366.88	1215376.21	0.4	
2	142	466364.48	1215401.10	0.45	
2	143	466362.09	1215425.98	0.4	Concrete base 10m south
2	144	466359.69	1215450.87	0.45	
2	145	466394.15	1215353.72	0.45	
2	146	466391.76	1215378.60	0.45	
2	147	466389.37	1215403.49	0.45	
2	148	466386.97	1215428.37	0.45	
2	149	466384.58	1215453.26	0.5	
2	150	466426.95	1215342.89	0.45	
2	151	466419.04	1215356.11	0.65	
2	152	466415.66	1215380.43	0.4	
2	153	466414.25	1215405.88	0.45	
2	154	466411.86	1215430.77	0.55	
2	155	466415.22	1215458.78	0.45	7m east of track
2	156	466453.46	1215360.30	0.4	
2	157	466474.38	1215354.35	0.4	
2	158	466496.16	1215371.47	0.3	
2	159	466523.00	1215368.33	0.4	
2	160	466568.05	1215392.35	0.3	
2	161	466594.71	1215389.64	0.45	
2	162	466614.28	1215407.56	0.4	North side of road
3	163	466640.46	1215415.64	0.3	North side of road
3	164	466662.46	1215423.39	0.8	Strong, organic odour
3	165	466689.71	1215419.63	1.3	Strong, organic odour
3	166	466712.33	1215442.12	1.5	
3	167	466694.39	1215459.54	1.65	
3	168	466710.81	1215482.21	1.6	
3	169	466713.52	1215500.71	1.3	
3	170	466712.75	1215517.27	1.1	
3	171	466711.19	1215542.23	0.9	
3	172	466709.64	1215567.18	1.1	
3	173	466708.09	1215592.13	1.25	
3	174	466706.53	1215617.08	0.95	
3	175	466680.03	1215640.48	1	
3	176	466678.47	1215665.43	1	
3	177	466676.92	1215690.38	0.65	
3	178	466675.36	1215715.33	0.4	
3	179	466673.80	1215740.28	0.6	
3	180	466704.98	1215642.03	1.15	

3	181	466703.43	1215666.98	0.95	
3	182	466701.87	1215691.94	0.65	
3	183	466700.31	1215716.89	0.5	
3	184	466698.75	1215741.84	0.3	
3	185	466758.36	1215454.25	1.25	
3	186	466737.34	1215453.01	1.7	27m between 186 and 187
3	187	466734.90	1215475.53	1.1	
3	188	466738.51	1215500.20	1	
3	189	466737.70	1215518.83	1	
3	190	466736.14	1215543.78	0.9	
3	191	466734.59	1215568.73	0.85	
3	192	466733.04	1215593.68	1	
3	193	466732.43	1215618.07	1	
3	194	466729.93	1215643.59	0.75	
3	195	466728.38	1215668.54	0.8	
3	196	466726.82	1215693.49	0.65	
3	197	466725.26	1215718.44	0.5	
3	198	466723.96	1215746.96	0.6	
3	199	466784.97	1215453.23	1.1	
3	200	466774.95	1215461.76	1.65	17m between 200 and 202 4m between 200 and road
3	201	466804.48	1215470.96	1	
3	202	466778.50	1215478.38	1.2	17m between 200 and 202
3	203	466763.51	1215499.69	1.3	
3	204	466762.65	1215520.38	1	
3	205	466761.10	1215545.33	1.3	
3	206	466759.54	1215570.28	0.65	
3	207	466757.99	1215595.24	0.85	
3	208	466756.44	1215620.19	0.6	
3	209	466754.88	1215645.14	0.65	
3	210	466753.33	1215670.09	0.45	
3	211	466751.77	1215695.04	0.65	
3	212	466750.21	1215719.99	0.6	
3	213	466748.66	1215744.95	0.7	
3	214	466779.83	1215646.70	0.55	
3	215	466784.10	1215676.52	0.45	
3	216	466770.72	1215696.57	0.4	
3	217	466783.84	1215720.27	0.45	
3	218	466773.61	1215746.50	0.55	
3	219	466852.39	1215486.71	1.1	
3	220	466873.41	1215483.86	1.3	Taken west of stream as area was flooded.
3	221	466879.69	1215512.09	1.65	
3	222	466891.09	1215526.06	2	
3	223	466905.97	1215551.06	1.8	
3	224	466920.86	1215576.06	2	
3	225			-	Cancelled
3	226			-	Cancelled
3	227	466926.60	1215661.27	1.2	
3	228	466941.14	1215681.61	1.6	
3	229	466955.67	1215701.95	0.6	
3	230	466970.21	1215722.29	1.55	
3	231	466984.74	1215742.63	1.65	
3	232	466946.95	1215646.73	1.75	
3	233	466961.48	1215667.07	2.6	
3	234	466976.01	1215687.42	0.8	
3	235	466990.55	1215707.76	2.15	
3	236	467005.08	1215728.10	2	
3	237	466920.19	1215526.06	2	Only 18m apart to avoid archaeological interest
3	238	466935.07	1215551.06	1.65	
3	239	466949.95	1215576.06	1.85	

3	240	466964.83	1215601.06	1.3	
3	241			-	Cancelled
3	242	466967.29	1215632.20	2.45	
3	243	466983.24	1215644.93	2.75	
3	244			-	Cancelled
3	245	467010.89	1215693.22	2.5	
3	246	467025.42	1215713.56	1.7	
3	247	466925.10	1215488.60	0.7	
3	248	466949.28	1215526.06	0.75	Only 21m apart to avoid archaeological interest
3	249	466964.16	1215551.06	1.1	
3	250	466979.04	1215576.06	1.8	
3	251	466993.93	1215601.06	1.9	Only 11m apart to avoid archaeological interest
3	252	467006.71	1215622.54	2.1	
3	253	466987.63	1215617.67	2.5	
3	254	467002.16	1215638.01	2.15	
3	255	467016.70	1215658.35	1.25	
3	256	467031.23	1215678.69	1.2	
3	257	467045.76	1215699.03	0.55	
3	258	466954.75	1215494.53	0.4	
3	259	466978.38	1215526.06	0.5	
3	260	466993.26	1215551.06	1.9	
3	261			-	Cancelled
3	262	467027.27	1215613.38	2.25	
3	263	467022.50	1215623.47	1.55	
3	264	467037.04	1215643.81	0.3	
3	265	467051.57	1215664.15	0.5	
3	266	467066.11	1215684.50	0.4	
3	267	467007.06	1215478.05	0.5	Moved 30m east to avoid archaeological site
3	268	466983.64	1215505.66	0.45	
3	269	466986.25	1215530.53	0.5	
3	270	466995.74	1215558.80	0.55	
3	271	467008.50	1215503.05	0.45	
3	272	467011.11	1215527.91	0.4	
3	273	467013.72	1215552.77	0.4	
3	274	467033.36	1215500.43	0.6	
3	275	467035.97	1215525.30	0.25	
3	276	467038.58	1215550.16	0.2	
3	277	467054.47	1215473.56	0.4	
3	278	467058.22	1215497.82	0.2	
3	279	467060.84	1215522.69	0.3	
3	280	467063.45	1215547.55	0.15	
3	281	467077.50	1215481.95	0.25	
3	282	467101.45	1215469.09	0.1	
4	283	467151.65	1215472.79	0.2	
4	284	467175.65	1215461.14	0.3	
4	285	467201.37	1215467.91	0.4	
4	286	467251.27	1215453.36	0.35	
4	287	467265.90	1215483.46	0.55	
4	288	467281.49	1215497.55	0.45	
4	289	467288.14	1215516.20	0.15	
4	290	467301.50	1215543.41	0.15	
4	291	467362.08	1215595.80	0.25	
4	292	467401.31	1215607.35	0.05	
4	293	467414.26	1215620.20	0.1	
4	294	467437.71	1215628.83	0.15	
4	295	467459.20	1215642.11	0.3	
4	296	467481.67	1215653.07	0.2	
4	297	467284.91	1215467.23	0.35	
4	298	467302.74	1215484.38	0.25	

4	299	467311.64	1215507.65	0.15	
4	300	467322.63	1215530.05	0.15	
4	301	467337.74	1215546.65	0.25	
4	302	467357.80	1215564.86	0.25	
4	303	467380.27	1215575.82	0.1	
4	304	467402.74	1215586.77	0.1	
4	305	467425.76	1215598.74	0.2	
4	306	467441.21	1215608.43	0.15	
4	307	467470.16	1215619.64	0.15	
4	308	467492.63	1215630.60	0.15	
4	309	467323.99	1215471.22	0.3	
4	310	467335.13	1215499.10	0.15	
4	311	467343.76	1215516.69	0.25	
4	312	467355.95	1215532.03	0.15	
4	313			-	Cancelled
4	314	467406.36	1215550.08	0.05	
4	315	467413.70	1215564.30	0.1	
4	316	467436.17	1215575.26	0.3	
4	317	467458.64	1215586.22	0.15	
4	318	467472.41	1215597.69	0.1	
4	319	467503.58	1215608.13	0.1	
4	320	467447.13	1215552.79	0.15	
4	321	467469.60	1215563.74	0.3	
4	322	467492.07	1215574.70	0.25	
4	323	467511.66	1215584.39	0.15	
4	324	467480.55	1215541.27	0.3	
4	325	467503.03	1215552.23	0.15	

Appendix E - Laboratory Test Results (provisional)

TERRA TEK
SITE INVESTIGATION & LABORATORY SERVICES

AECOM
-

For the attention of David Raeside

Report No: A13753
Issue No 01

LABORATORY TEST REPORT

Project Name	**SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION**		
Project Number	**A13753**	Date samples received	13/11/2020
Your Ref		Date written instructions received	17/11/2020
Purchase Order	ALQ/02575	Date testing commenced	18/11/2020

Please find enclosed the results as summarised below

Figure / Table	Test Quantity	Description	ISO 17025 Accredited
	33	Summary of Geotechnical Tests	See Sheets
	23	Client Specified Suite - Soil	Yes
	18	Atterberg Limit (to follow)	Yes
	18	Particle Size Distribution	Yes
	~	Notes on Laboratory Procedures	n/a

Remarks : Interim results.

Issued by : C Donnelly Date of Issue : 05/12/2020

Approved Signatories : CD 05/12/2020

D McGiff (Laboratory Coordinator), C Loudon (Quality Manager), C Donnelly (Laboratory Supervisor), I McMillan (Site Supervisor)

Key to symbols used in this report
S/C : Testing was sub-contracted

Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
The results reported relate to samples received in the laboratory only.
All results contained in this report are provisional unless signed by an approved signatory
This report should not be reproduced except in full without the written approval of the laboratory.
Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory.
The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw
our report if we have not received cleared funds in accordance with our standard terms and conditions
Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation.
Feedback on the this report may be left via our website www.terratek.co.uk/contact-us

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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification							Atterberg limits						Density		Total Stress				
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
TP02	0.40		T	182697	Brown fibrous PEAT	197		~	~	~		~	1.06	0.36	~	~	~	
TP06	0.30		T	182698	Brown fibrous PEAT	355		~	~	~		~	1.05	0.23	~	~	~	
TP13	2.00		B	182702	Brown gravelly very silty SAND with cobbles. Gravel is fine to coarse	22		~	~	~		~	~	~	~	~	~	PSD
TP14	0.60		B	182703	Brown slightly gravelly silty SAND. Gravel is fine	30		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP15	0.50		B	182704	Brown slightly gravelly silty SAND. Gravel is fine	54		~	~	~		~	~	~	~	~	~	PSD
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	See individual report sheets

Originator	Checked & Approved
CD	CD 05/12/2020

SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification						Atterberg limits						Density		Total Stress				
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
TP15	1.10		B	182705	Brown slightly gravelly silty SAND. Gravel is fine	29		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP16	1.05		B	182706	Brown silty SAND and GRAVEL. Gravel is fine to coarse	31		~	~	~		~	~	~	~	~	~	PSD
TP17	1.10		B	182707	Brown gravelly very silty SAND. Gravel is fine to medium	17		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP17	1.80		B	182708	Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse	20		~	~	~		~	~	~	~	~	~	PSD
TP20	1.00		T	182709	Brown fibrous PEAT	667		~	~	~		~	1.07	0.14	~	~	~	Chemistry
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Checked & Approved
CD	CD 05/12/2020

SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification						Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description		Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP21	0.50		T	182710	Brown fibrous PEAT	920		~	~	~		~	1.07	0.11	~	~	~	Chemistry
TP21	1.30		B	182711	Brown silty very gravelly SAND. Gravel is fine to medium	39		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP22	2.00		B	182713	Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse	28		~	~	~		~	~	~	~	~	~	PSD
TP23	0.90		T	182714	Brown fibrous PEAT	449		~	~	~		~	1.07	0.19	~	~	~	Chemistry
TP24	0.30		T	182715	Brown fibrous PEAT	138		~	~	~		~	1.10	0.46	~	~	~	Chemistry
Notes	Opinions and interpretations are outside the scope of UKAS accreditation					Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
					UKAS Accredited Test Y/N	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Checked & Approved
CD	CD 05/12/2020

SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification							Atterberg limits						Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	
TP25	1.00		B	182716	Brown silty SAND and GRAVEL. Gravel is fine to coarse	29		~	~	~		~	~	~	~	~	~	PSD
TP26	1.00		B	182718	Brown silty very sandy fine to coarse GRAVEL with cobbles	21		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP27	0.30		T	182719	Brown fibrous PEAT	188		~	~	~		~	1.20	0.42	~	~	~	Chemistry
TP29	1.20		T	182720	Brown fibrous PEAT	823		~	~	~		~	1.14	0.12	~	~	~	Chemistry
TP30	0.40		T	182721	Brown fibrous PEAT	748		~	~	~		~	1.06	0.13	~	~	~	Chemistry
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Checked & Approved
CD	CD 05/12/2020

SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP30	2.00		B	182722	Brown silty very sandy fine to coarse GRAVEL with cobbles	46		~	~	~		~	~	~	~	~	~	PSD
TP31	0.40		T	182723	Brown fibrous PEAT	742		~	~	~		~	1.05	0.12	~	~	~	Chemistry
TP32	0.30		T	182724	Brown fibrous PEAT	321		~	~	~		~	1.05	0.25	~	~	~	Chemistry
TP32	1.00		B	182725	Brown very silty SAND and GRAVEL with cobbles. Gravel is fine to coarse	38		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP34	0.30		T	182726	Brown fibrous PEAT	769		~	~	~		~	1.06	0.12	~	~	~	Chemistry
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Checked & Approved
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SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP38	0.80		B	182729	Brown silty SAND and GRAVEL. Gravel is fine to medium	26		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP42	0.20		T	182734	Brown fibrous PEAT	195		~	~	~		~	1.03	0.35	~	~	~	Chemistry
TP42	0.60		B	182735	Brown very gravell very sandy SILT. Gravel is fine to medium	40		~	~	~		~	~	~	~	~	~	PSD
TP44	0.50		B	182738	Brown very silty SAND and GRAVEL. Gravel is fine to coarse	37		~	~	~		~	~	~	~	~	~	PSD Chemistry
TP46	0.80		B	182741	Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse	29		~	~	~		~	~	~	~	~	~	PSD
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Checked & Approved
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SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: AECOM

Engineer:

Contract No A13753

~ Indicates test not carried out

Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP47	0.70		B	182743	Brown gravelly sandy CLAY. Gravel is fine	~		~	~	~		~	~	~	~	~	~	Chemistry
TP48	0.30		T	182744	Brown fibrous PEAT	206		~	~	~		~	1.05	0.34	~	~	~	Chemistry
TP48	0.70		B	182745	Brown very silty very gravelly SAND. Gravel is fine to coarse	29		~	~	~		~	~	~	~	~	~	PSD
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

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SUMMARY OF GEOTECHNICAL TESTS

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: Aecom

Engineer:

Contract No A13753

Sample Identification				Lab Sample ID	pH	Sulphate (soluble in 2:1 water extract) as SO4	Loss on Ignition
Hole	Depth m	Sample Ref	Sample Type			g/l	%
TP02	0.40		T	182697	4.5	~	42.7
TP06	0.30		T	182698	5.5	~	49.7
TP14	0.60		B	182703	6.1	0.06	~
TP15	1.10		B	182705	4.4	0.49	~
TP17	1.10		B	182707	3.7	0.96	~
TP20	1.00		T	182709	5.0	~	87.4
TP21	0.50		T	182710	5.6	~	60.3
TP21	1.30		B	182711	4.2	1.03	~
TP23	0.90		T	182714	5.3	~	33.0
TP24	0.30		T	182715	4.8	~	72.8
Limits of Detection					~	0.01	0.1
Terra Tek Analysis Method					TP019	TP169	TP042
Accreditation M=Mcerts U=UKAS N=No accreditation					M	M	M

Originator	Checked & Approved
DAB	S. Langman 02/12/2020

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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: Aecom

Engineer:

Contract No A13753

Sample Identification				Lab Sample ID	pH	Sulphate (soluble in 2:1 water extract) as SO4	Loss on Ignition
Hole	Depth m	Sample Ref	Sample Type			g/l	%
TP26	1.00		B	182718	5.2	0.10	~
TP27	0.30		T	182719	4.9	~	27.3
TP29	1.20		T	182720	5.1	~	91.4
TP30	0.40		T	182721	5.0	~	91.7
TP31	0.40		T	182723	5.0	~	88.3
TP32	0.30		T	182724	5.0	~	75.6
TP32	1.00		B	182725	5.7	0.03	~
TP34	0.30		T	182726	4.8	~	91.9
TP38	0.80		B	182729	5.8	0.10	~
TP42	0.20		T	182734	5.4	~	36.4
Limits of Detection					~	0.01	0.1
Terra Tek Analysis Method					TP019	TP169	TP042
Accreditation M=Mcerts U=UKAS N=No accreditation					M	M	M

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DAB	S. Langman 02/12/2020

BRE SUITE

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION

Client: Aecom

Engineer:

Contract No A13753

Sample Identification				Lab Sample ID	pH	Sulphate (soluble in 2:1 water extract) as SO4	Loss on Ignition
Hole	Depth m	Sample Ref	Sample Type			g/l	%
TP44	0.50		B	182738	6.3	0.05	~
TP47	0.70		B	182743	6.0	0.07	~
TP48	0.30		T	182744	5.6	~	35.1
Limits of Detection					~	0.01	0.1
Terra Tek Analysis Method					TP019	TP169	TP042
Accreditation M=Mcerts U=UKAS N=No accreditation					M	M	M

Originator	Checked & Approved
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Version 058 - 10/06/2013
1260 - PSD TP13 02.00 B - A13753-182702.xls : Sample ID 182702

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP13
Engineer		Sample Ref	
		Depth (m)	2.00
		Sample Type	B

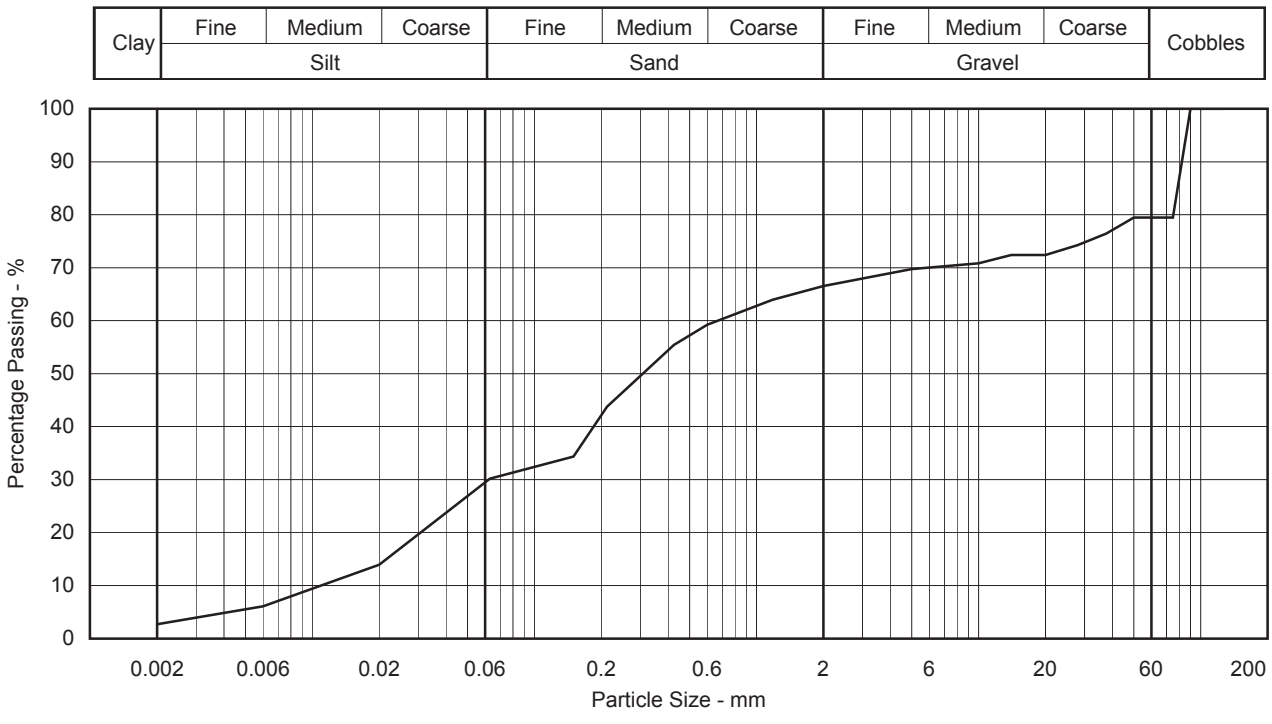
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	79
63.0 mm	79
50.0 mm	79
37.5 mm	76
28.0 mm	74
20.0 mm	72
14.0 mm	72
10.0 mm	71
6.30 mm	70
5.00 mm	70
3.35 mm	68
2.00 mm	67
1.18 mm	64
600 µm	59
425 µm	55
300 µm	50
212 µm	44
150 µm	34
63 µm	30
20 µm	14
6 µm	6
2 µm	3

Non Engineering Description
Brown gravelly very silty SAND with cobbles. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	20.5
Gravel	12.9
Sand	37.5
Silt	26.3
Clay	2.7

Particle Diameter - mm	
D100	90
D60	0.67
D10	0.011
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	60.9

Notes
Sedimentation sample not pre-treated



Originator	Checked & Approved
DW	CD 05/12/2020

PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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Lab Project No A13753 : 05/12/2020 09:48:08

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP14
Engineer		Sample Ref	
		Depth (m)	0.60
		Sample Type	B

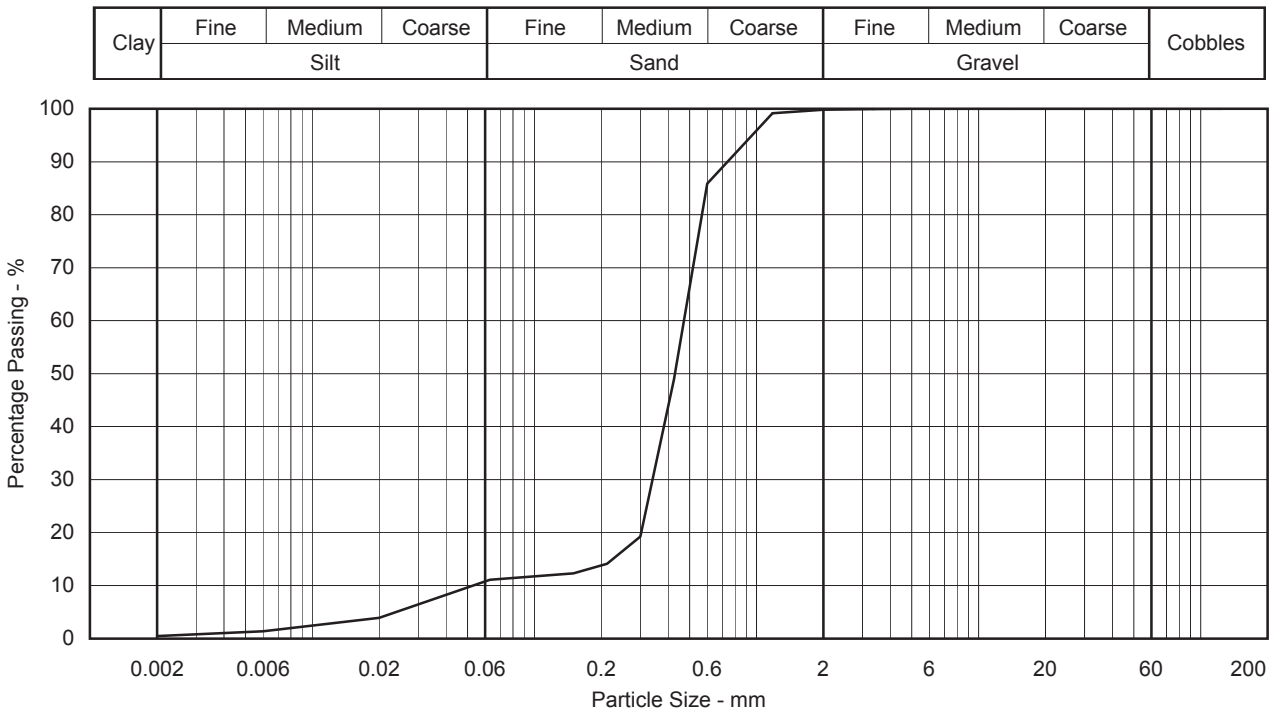
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	99
600 µm	86
425 µm	49
300 µm	19
212 µm	14
150 µm	12
63 µm	11
20 µm	4
6 µm	1
2 µm	0

Non Engineering Description
Brown slightly gravelly silty SAND. Gravel is fine

Sample Proportions - %	
Cobbles	0.0
Gravel	0.2
Sand	89.3
Silt	10.2
Clay	0.4

Particle Diameter - mm	
D100	5.0
D60	0.47
D10	0.053
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	8.9

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP15
Engineer		Sample Ref	
		Depth (m)	0.50
		Sample Type	B

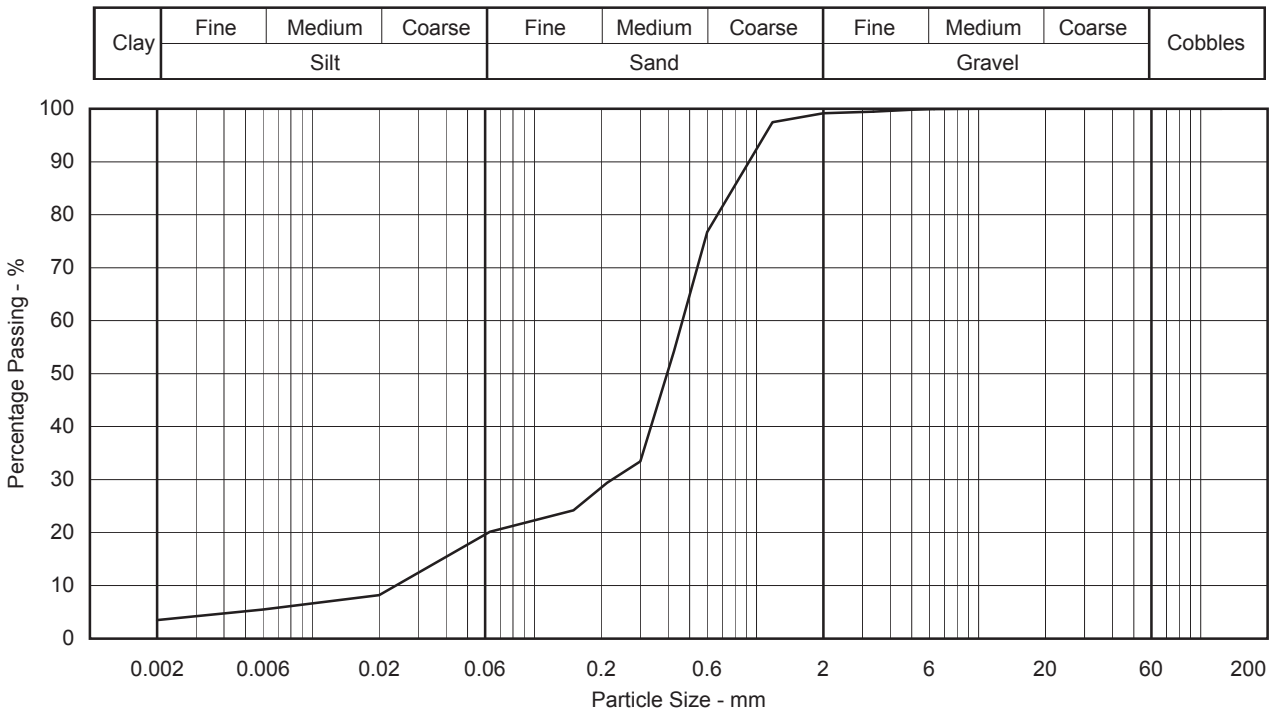
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	99
2.00 mm	99
1.18 mm	97
600 µm	77
425 µm	54
300 µm	33
212 µm	29
150 µm	24
63 µm	20
20 µm	8
6 µm	5
2 µm	3

Non Engineering Description
Brown slightly gravelly silty SAND. Gravel is fine

Sample Proportions - %	
Cobbles	0.0
Gravel	0.9
Sand	79.9
Silt	15.8
Clay	3.4

Particle Diameter - mm	
D100	10
D60	0.46
D10	0.024
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	19.2

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

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TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP15
Engineer		Sample Ref	
		Depth (m)	1.10
		Sample Type	B

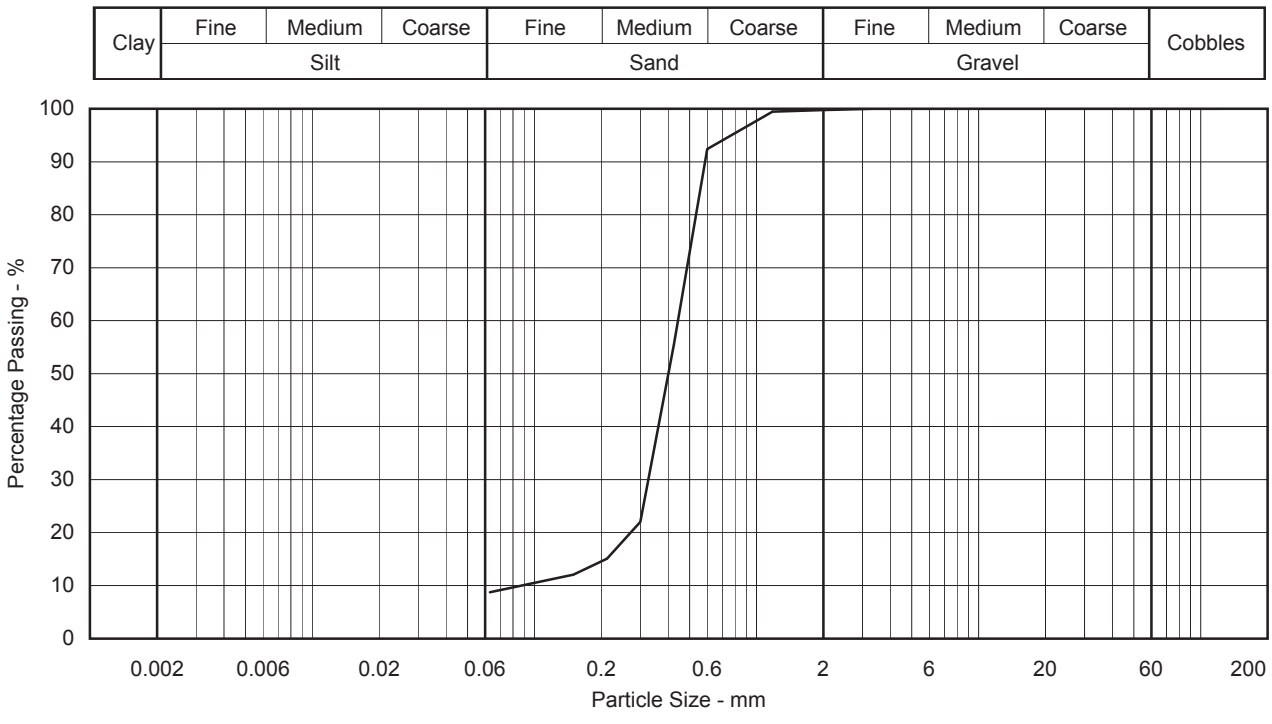
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	99
600 µm	92
425 µm	56
300 µm	22
212 µm	15
150 µm	12
63 µm	9

Non Engineering Description
Brown slightly gravelly silty SAND. Gravel is fine

Sample Proportions - %	
Cobbles	0.0
Gravel	0.2
Sand	91.1
Silt & Clay	8.7

Particle Diameter - mm	
D100	3.4
D60	0.44
D10	0.088
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	5.0

Notes



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PARTICLE SIZE DISTRIBUTION

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1260 - PSD TP16 01.05 B - A13753-182706.xls : Sample ID 182706

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP16
Engineer		Sample Ref	
		Depth (m)	1.05
		Sample Type	B

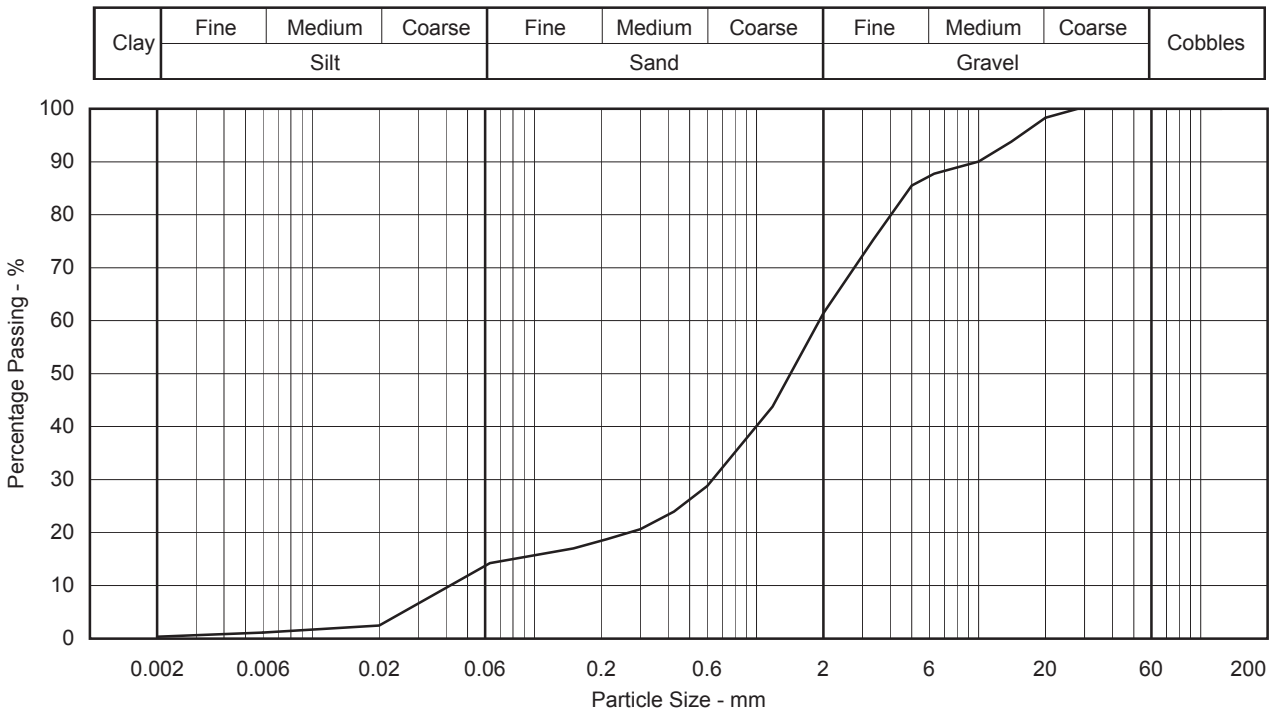
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	98
14.0 mm	94
10.0 mm	90
6.30 mm	88
5.00 mm	86
3.35 mm	75
2.00 mm	61
1.18 mm	44
600 µm	29
425 µm	24
300 µm	21
212 µm	19
150 µm	17
63 µm	14
20 µm	2
6 µm	1
2 µm	0

Non Engineering Description
Brown silty SAND and GRAVEL. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	0.0
Gravel	38.6
Sand	48.0
Silt	13.1
Clay	0.3

Particle Diameter - mm	
D100	28
D60	1.9
D10	0.042
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	45.2

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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Lab Project No A13753 : 05/12/2020 09:48:18

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP17
Engineer		Sample Ref	
		Depth (m)	1.10
		Sample Type	B

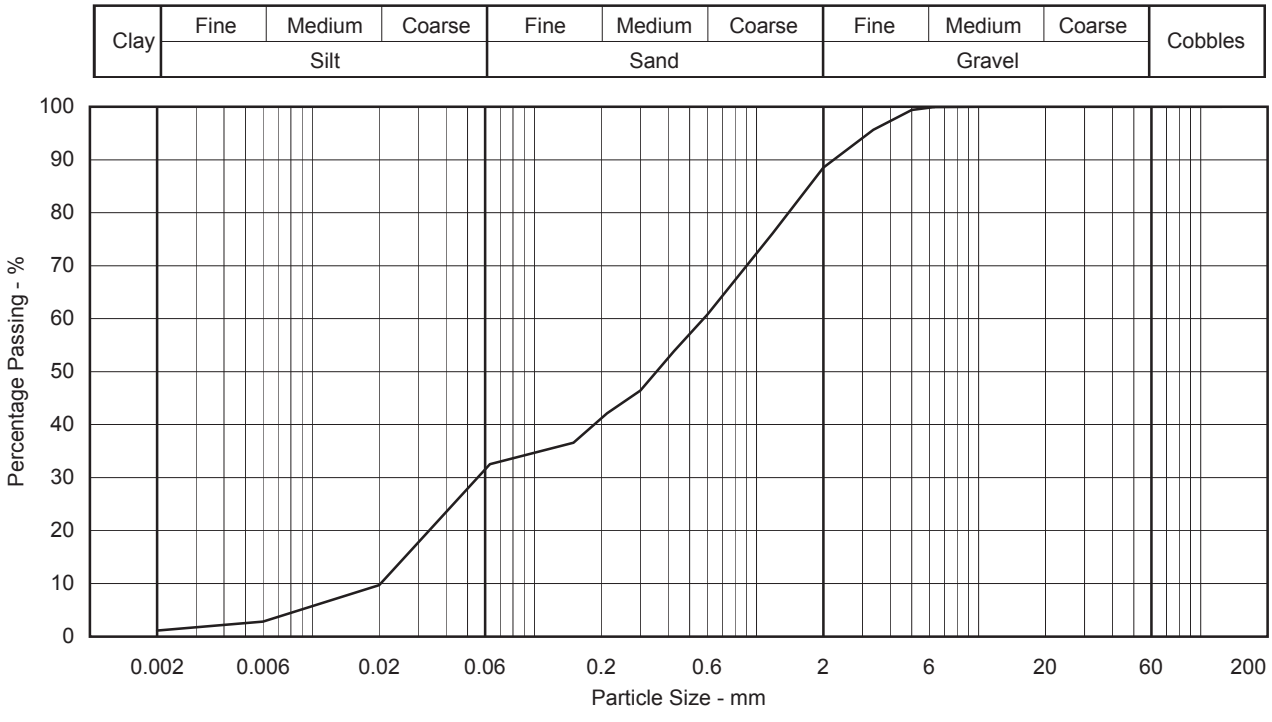
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	99
3.35 mm	96
2.00 mm	89
1.18 mm	76
600 µm	61
425 µm	54
300 µm	46
212 µm	42
150 µm	37
63 µm	33
20 µm	10
6 µm	3
2 µm	1

Non Engineering Description
Brown gravelly very silty SAND. Gravel is fine to medium

Sample Proportions - %	
Cobbles	0.0
Gravel	11.5
Sand	57.6
Silt	29.8
Clay	1.1

Particle Diameter - mm	
D100	10
D60	0.58
D10	0.020
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	29.0

Notes
Sedimentation sample not pre-treated



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BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP17
Engineer		Sample Ref	
		Depth (m)	1.80
		Sample Type	B

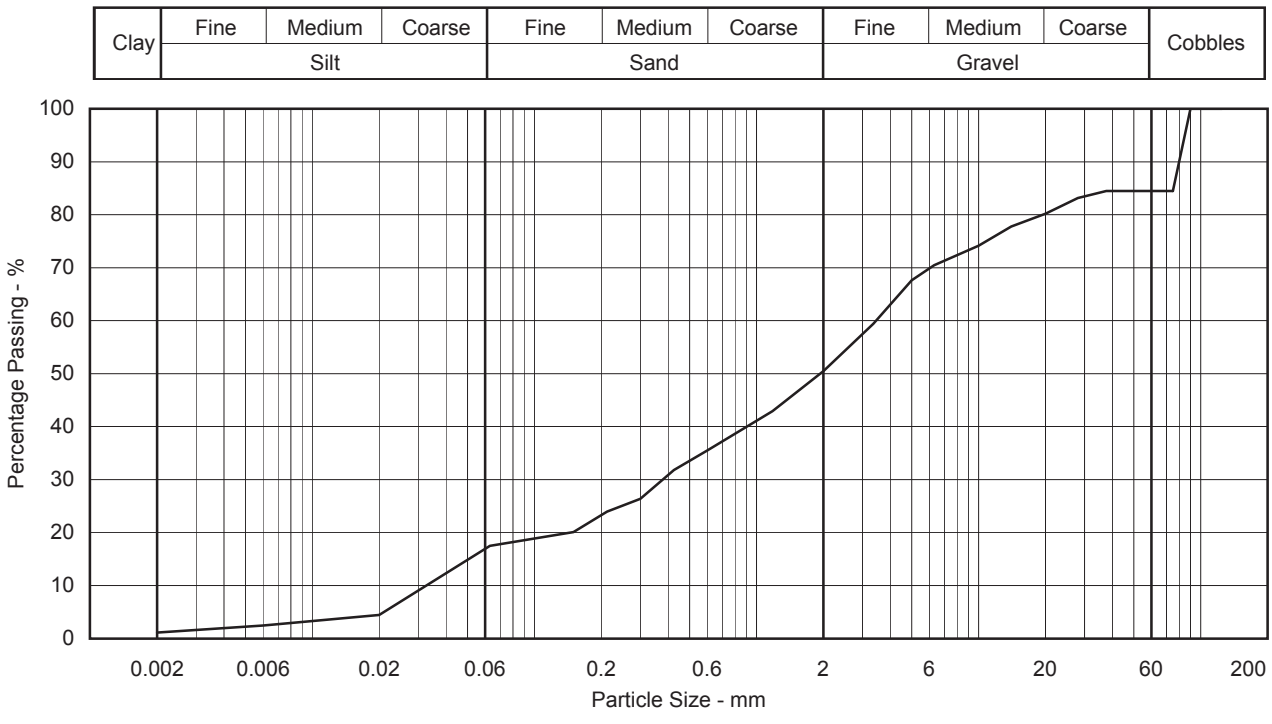
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	84
63.0 mm	84
50.0 mm	84
37.5 mm	84
28.0 mm	83
20.0 mm	80
14.0 mm	78
10.0 mm	74
6.30 mm	70
5.00 mm	68
3.35 mm	59
2.00 mm	50
1.18 mm	43
600 µm	35
425 µm	32
300 µm	26
212 µm	24
150 µm	20
63 µm	17
20 µm	4
6 µm	2
2 µm	1

Non Engineering Description
Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	15.5
Gravel	34.0
Sand	33.9
Silt	15.5
Clay	1.1

Particle Diameter - mm	
D100	90
D60	3.4
D10	0.033
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	103.0

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP21
Engineer		Sample Ref	
		Depth (m)	1.30
		Sample Type	B

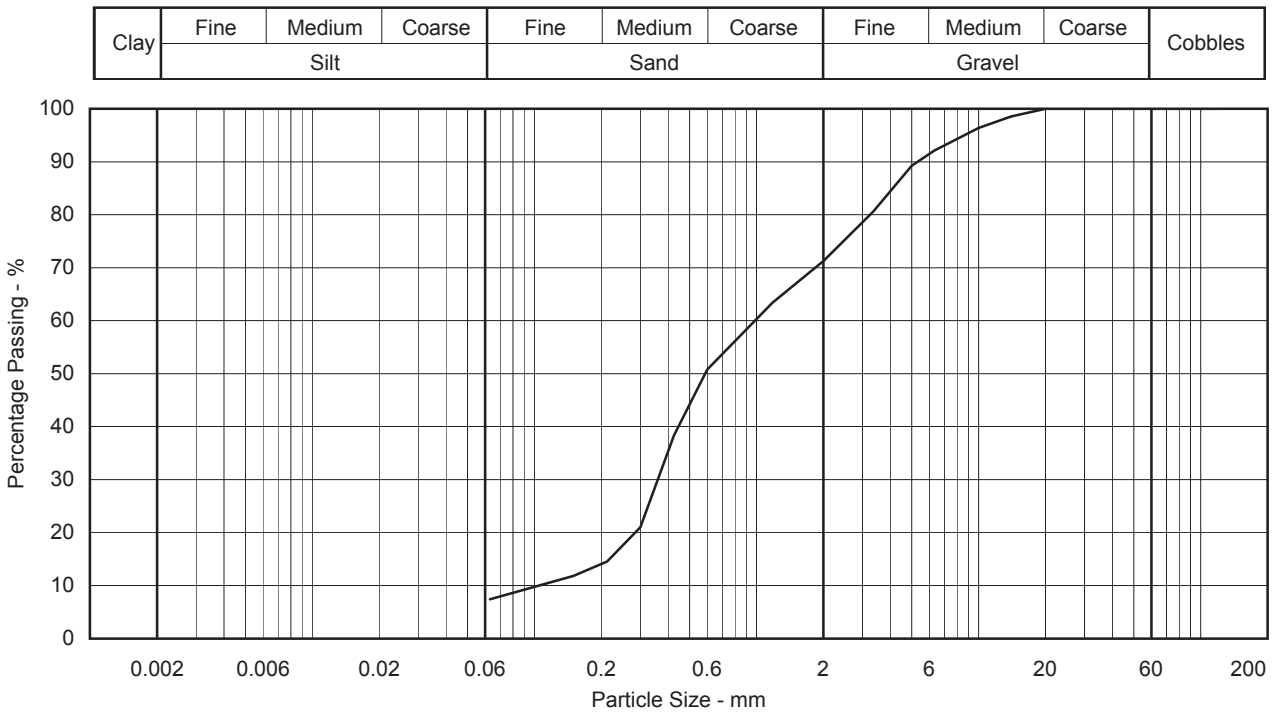
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	99
10.0 mm	96
6.30 mm	92
5.00 mm	89
3.35 mm	81
2.00 mm	71
1.18 mm	63
600 µm	51
425 µm	38
300 µm	21
212 µm	14
150 µm	12
63 µm	7

Non Engineering Description
Brown silty very gravelly SAND. Gravel is fine to medium

Sample Proportions - %	
Cobbles	0.0
Gravel	28.7
Sand	63.9
Silt & Clay	7.3

Particle Diameter - mm	
D100	20
D60	0.98
D10	0.11
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	8.9

Notes



Originator	Checked & Approved
DW	CD 05/12/2020

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP22
Engineer		Sample Ref	
		Depth (m)	2.00
		Sample Type	B

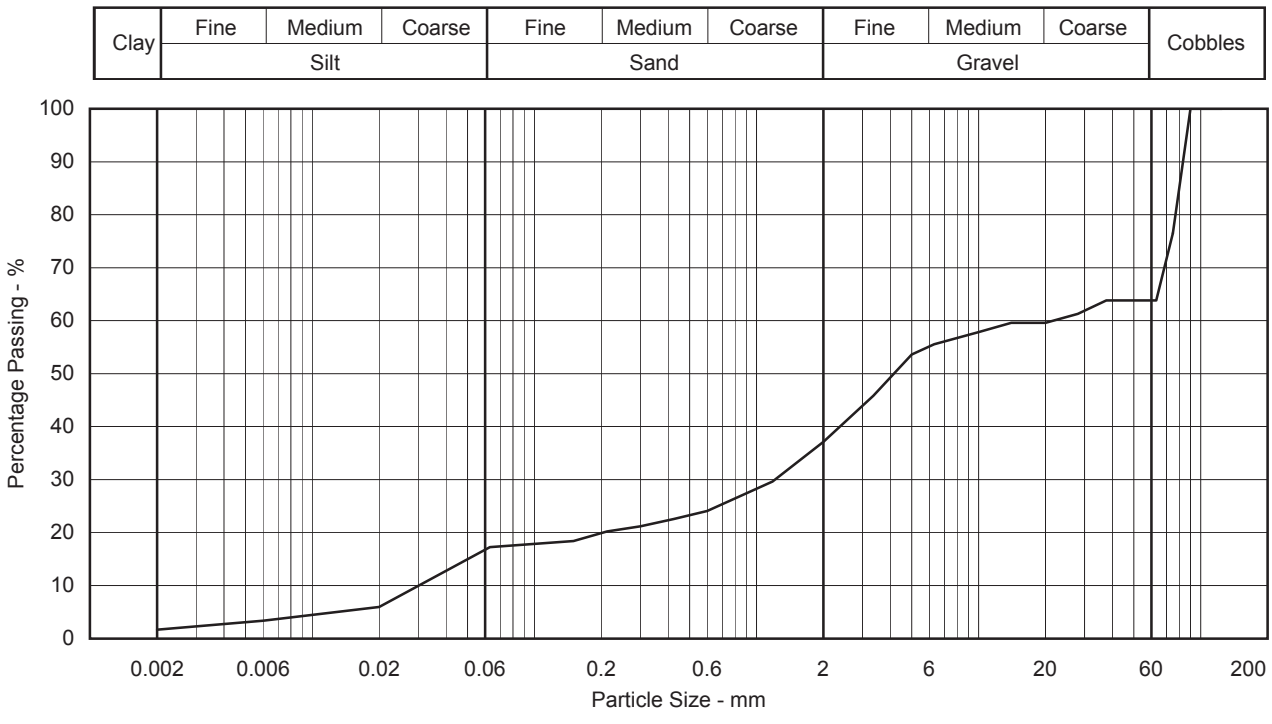
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	76
63.0 mm	64
50.0 mm	64
37.5 mm	64
28.0 mm	61
20.0 mm	60
14.0 mm	60
10.0 mm	58
6.30 mm	56
5.00 mm	54
3.35 mm	46
2.00 mm	37
1.18 mm	30
600 µm	24
425 µm	23
300 µm	21
212 µm	20
150 µm	18
63 µm	17
20 µm	6
6 µm	3
2 µm	2

Non Engineering Description
Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	36.2
Gravel	26.7
Sand	20.6
Silt	14.8
Clay	1.7

Particle Diameter - mm	
D100	90
D60	22
D10	0.030
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	733.3

Notes
Sample does not comply with BS1377 minimum mass requirements Sedimentation sample not pre-treated



Originator	Checked & Approved
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PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP25
Engineer		Sample Ref	
		Depth (m)	1.00
		Sample Type	B

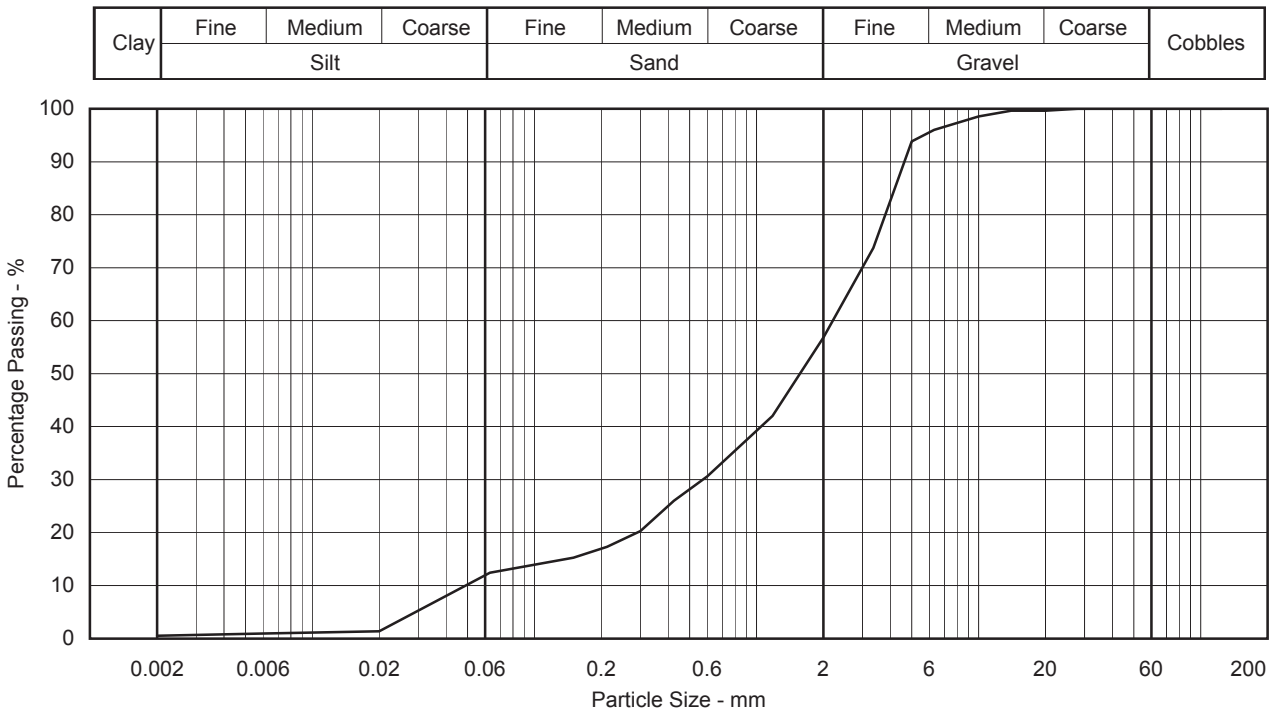
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	99
6.30 mm	96
5.00 mm	94
3.35 mm	74
2.00 mm	57
1.18 mm	42
600 µm	31
425 µm	26
300 µm	20
212 µm	17
150 µm	15
63 µm	12
20 µm	1
6 µm	1
2 µm	0

Non Engineering Description
Brown silty SAND and GRAVEL. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	0.0
Gravel	43.2
Sand	45.2
Silt	11.2
Clay	0.5

Particle Diameter - mm	
D100	28
D60	2.2
D10	0.049
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	44.9

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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Version 058 - 10/06/2013
1260 - PSD TP26 01.00 B - A13753-182718.xls : Sample ID 182718

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP26
Engineer		Sample Ref	
		Depth (m)	1.00
		Sample Type	B

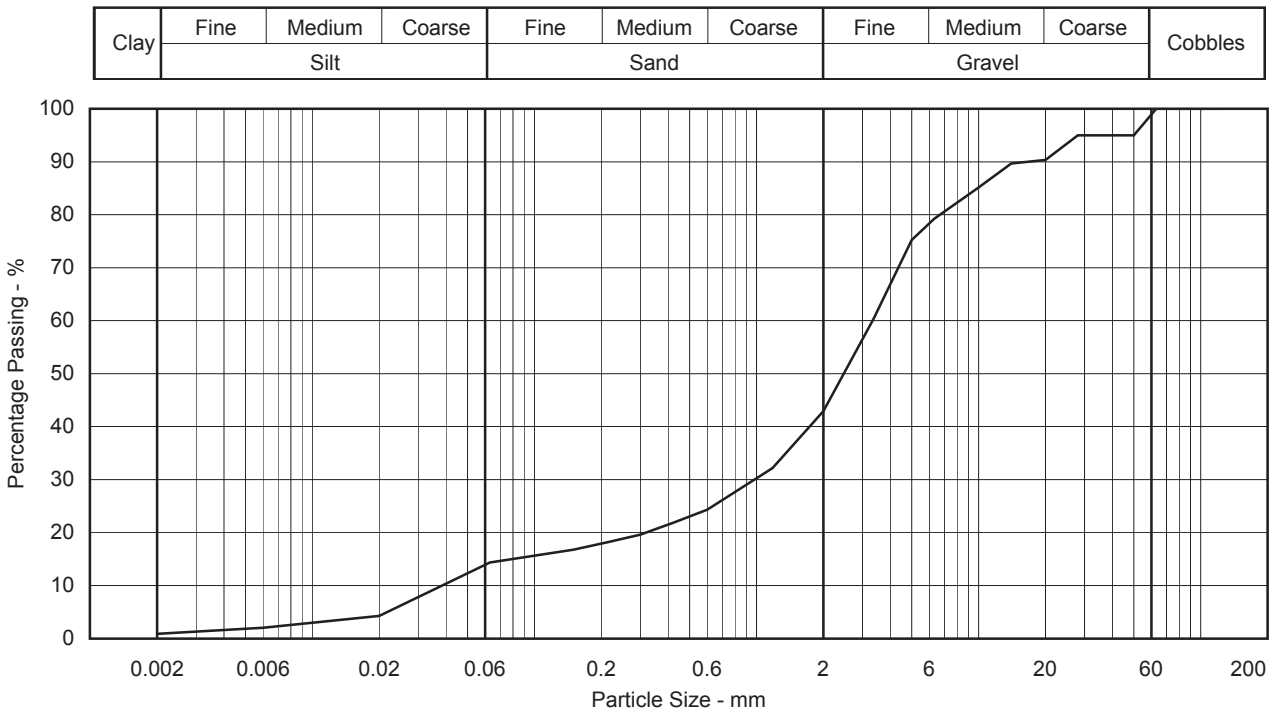
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	95
37.5 mm	95
28.0 mm	95
20.0 mm	90
14.0 mm	90
10.0 mm	85
6.30 mm	79
5.00 mm	75
3.35 mm	60
2.00 mm	43
1.18 mm	32
600 µm	24
425 µm	22
300 µm	20
212 µm	18
150 µm	17
63 µm	14
20 µm	4
6 µm	2
2 µm	1

Non Engineering Description
Brown silty very sandy fine to coarse GRAVEL with cobbles

Sample Proportions - %	
Cobbles	1.2
Gravel	55.9
Sand	29.3
Silt	12.8
Clay	0.9

Particle Diameter - mm	
D100	63
D60	3.3
D10	0.039
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	84.6

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP30
Engineer		Sample Ref	
		Depth (m)	2.00
		Sample Type	B

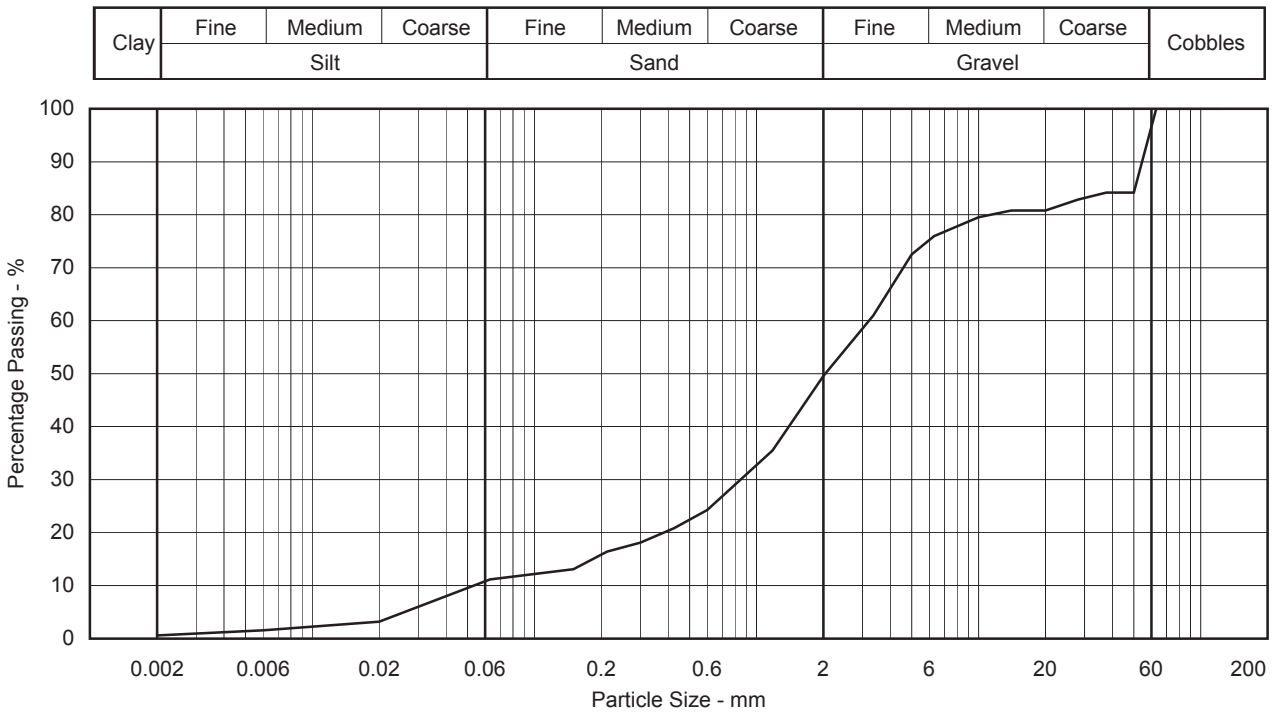
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	84
37.5 mm	84
28.0 mm	83
20.0 mm	81
14.0 mm	81
10.0 mm	80
6.30 mm	76
5.00 mm	72
3.35 mm	61
2.00 mm	50
1.18 mm	35
600 µm	24
425 µm	21
300 µm	18
212 µm	16
150 µm	13
63 µm	11
20 µm	3
6 µm	2
2 µm	1

Non Engineering Description
Brown silty very sandy fine to coarse GRAVEL with cobbles

Sample Proportions - %	
Cobbles	3.7
Gravel	46.8
Sand	39.0
Silt	10.0
Clay	0.6

Particle Diameter - mm	
D100	63
D60	3.2
D10	0.054
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	59.3

Notes
Sample does not comply with BS1377 minimum mass requirements Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP32
Engineer		Sample Ref	
		Depth (m)	1.00
		Sample Type	B

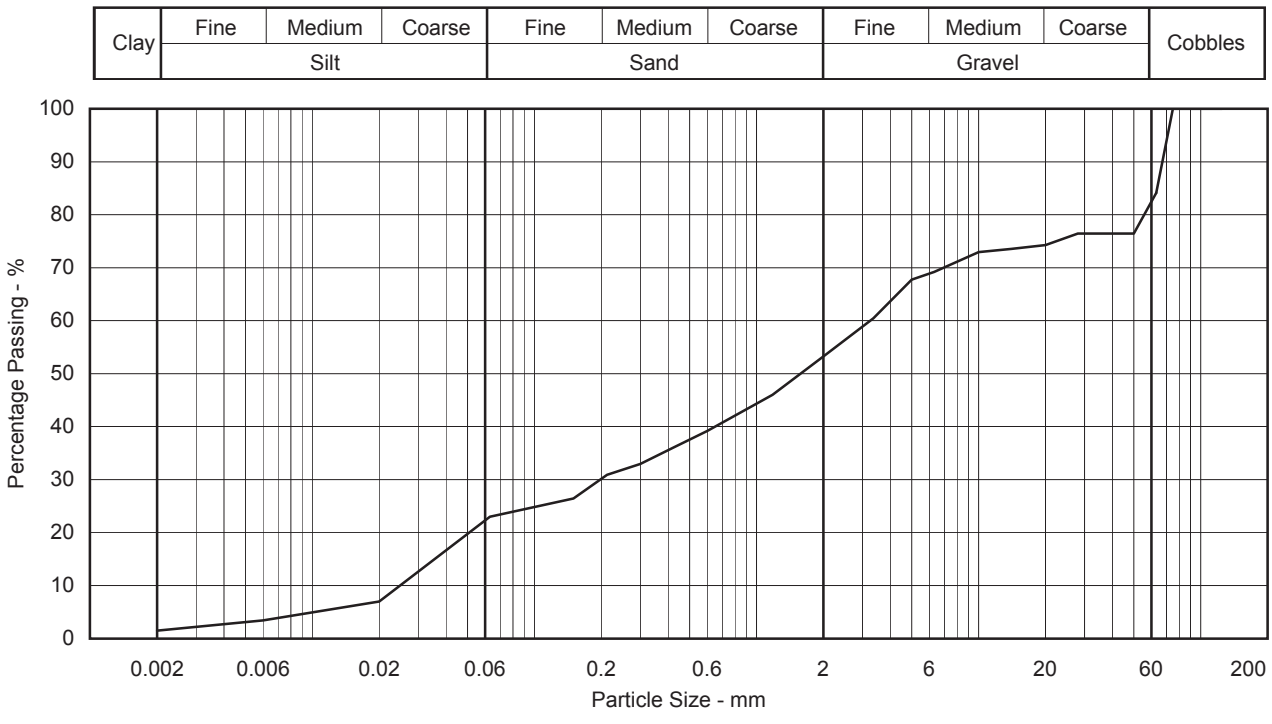
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	84
50.0 mm	76
37.5 mm	76
28.0 mm	76
20.0 mm	74
14.0 mm	74
10.0 mm	73
6.30 mm	69
5.00 mm	68
3.35 mm	60
2.00 mm	53
1.18 mm	46
600 µm	39
425 µm	36
300 µm	33
212 µm	31
150 µm	26
63 µm	23
20 µm	7
6 µm	3
2 µm	1

Non Engineering Description
Brown very silty SAND and GRAVEL with cobbles. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	17.7
Gravel	29.1
Sand	31.4
Silt	20.4
Clay	1.5

Particle Diameter - mm	
D100	75
D60	3.2
D10	0.025
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	128.0

Notes
Sample does not comply with BS1377 minimum mass requirements Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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1260 - PSD TP38 00.80 B - A13753-182729.xls : Sample ID 182726

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP38
Engineer		Sample Ref	
		Depth (m)	0.80
		Sample Type	B

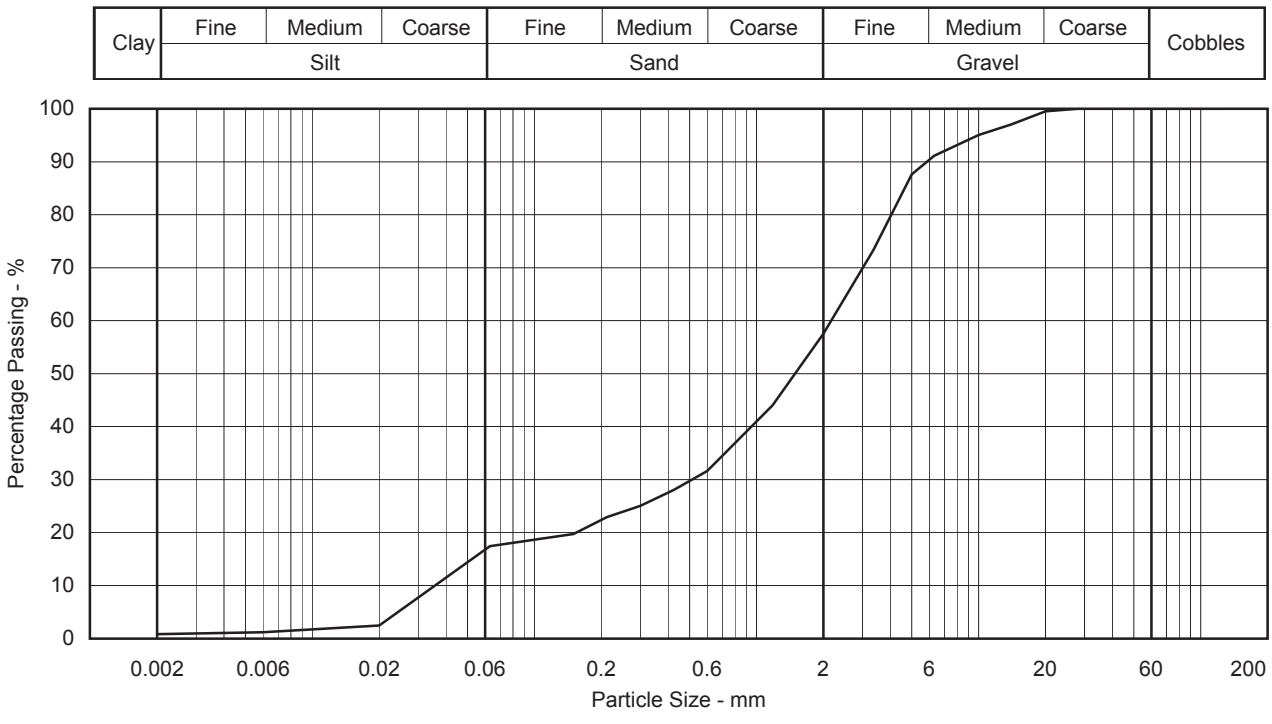
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	97
10.0 mm	95
6.30 mm	91
5.00 mm	88
3.35 mm	73
2.00 mm	58
1.18 mm	44
600 µm	32
425 µm	28
300 µm	25
212 µm	23
150 µm	20
63 µm	17
20 µm	2
6 µm	1
2 µm	1

Non Engineering Description
Brown silty SAND and GRAVEL. Gravel is fine to medium

Sample Proportions - %	
Cobbles	0.0
Gravel	42.5
Sand	41.1
Silt	15.6
Clay	0.8

Particle Diameter - mm	
D100	28
D60	2.2
D10	0.036
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	61.1

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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1260 - PSD TP42 00.60 B - A13753-182735.xls : Sample ID 182735

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP42
Engineer		Sample Ref	
		Depth (m)	0.60
		Sample Type	B

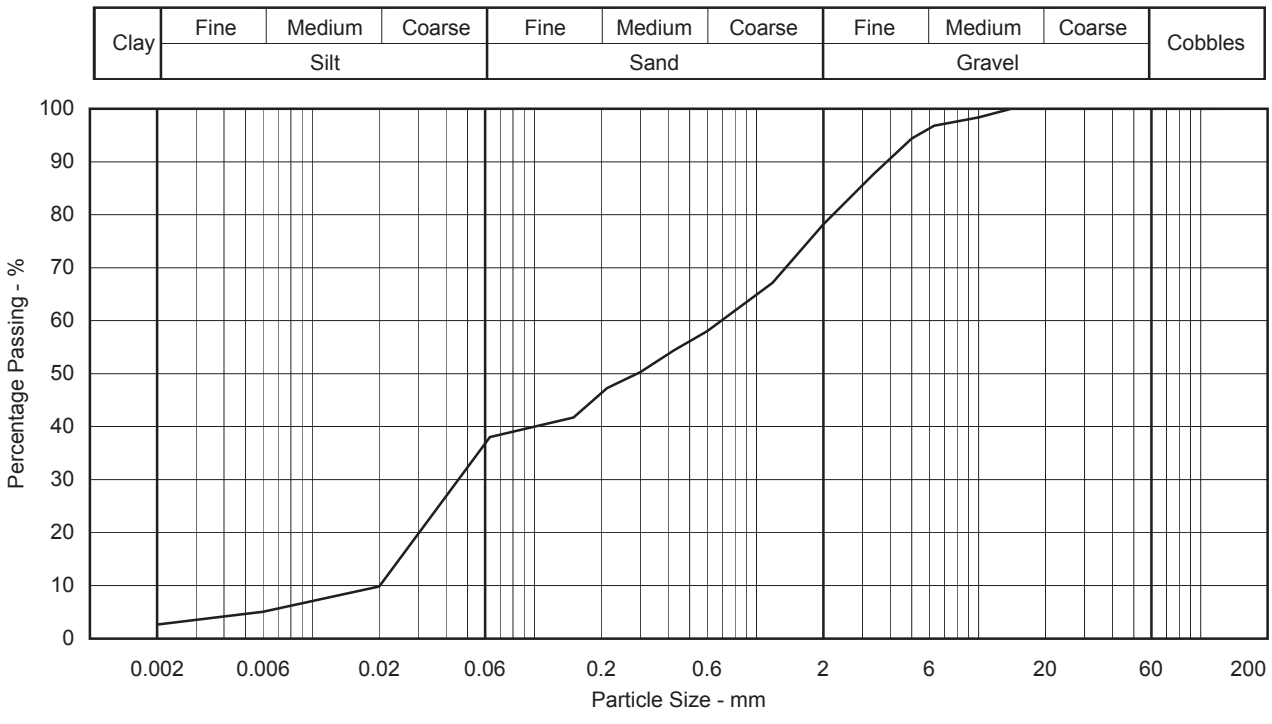
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	98
6.30 mm	97
5.00 mm	94
3.35 mm	88
2.00 mm	78
1.18 mm	67
600 µm	58
425 µm	54
300 µm	50
212 µm	47
150 µm	42
63 µm	38
20 µm	10
6 µm	5
2 µm	3

Non Engineering Description
Brown very gravell very sandy SILT. Gravel is fine to medium

Sample Proportions - %	
Cobbles	0.0
Gravel	21.8
Sand	42.1
Silt	33.4
Clay	2.6

Particle Diameter - mm	
D100	14
D60	0.70
D10	0.020
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	35.0

Notes
Sedimentation sample not pre-treated



Originator	Checked & Approved
DW	CD 05/12/2020

PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP44
Engineer		Sample Ref	
		Depth (m)	0.50
		Sample Type	B

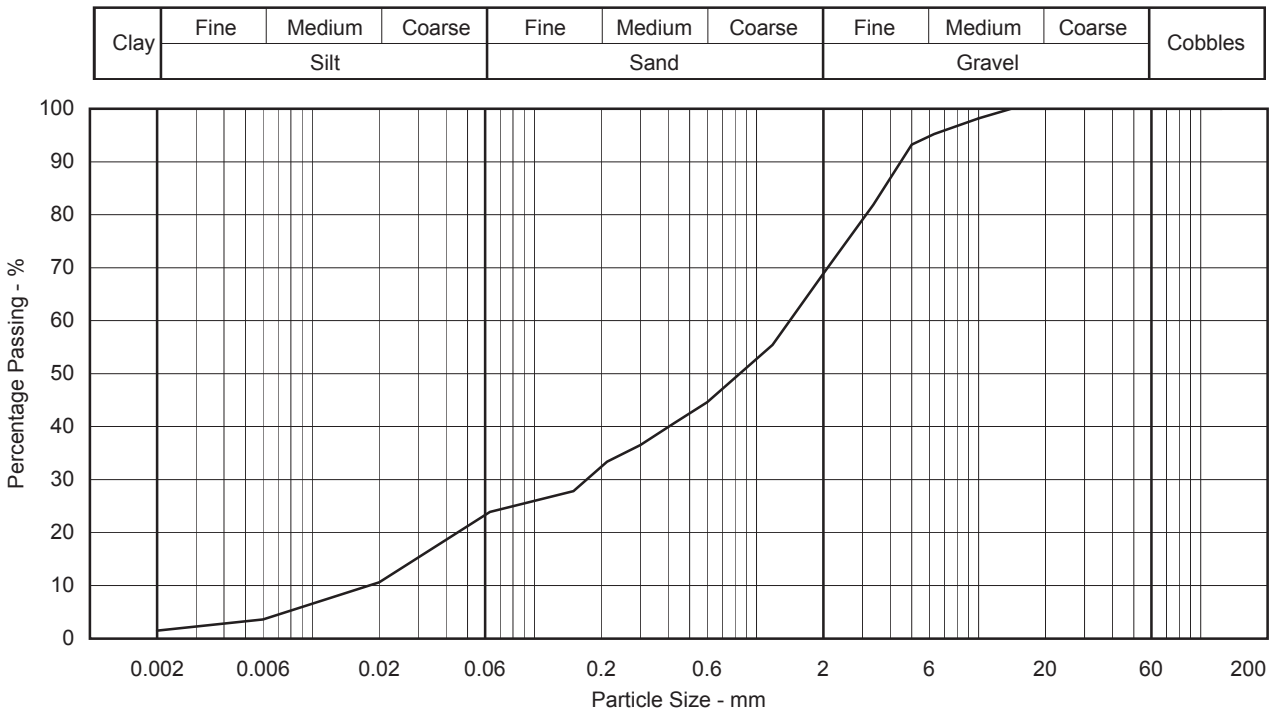
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	98
6.30 mm	95
5.00 mm	93
3.35 mm	82
2.00 mm	69
1.18 mm	55
600 µm	45
425 µm	41
300 µm	36
212 µm	33
150 µm	28
63 µm	24
20 µm	11
6 µm	4
2 µm	1

Non Engineering Description
Brown very silty SAND and GRAVEL. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	0.0
Gravel	31.1
Sand	46.0
Silt	21.5
Clay	1.5

Particle Diameter - mm	
D100	14
D60	1.4
D10	0.018
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	77.8

Notes
Sedimentation sample not pre-treated



Originator	Checked & Approved
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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP46
Engineer		Sample Ref	
		Depth (m)	0.80
		Sample Type	B

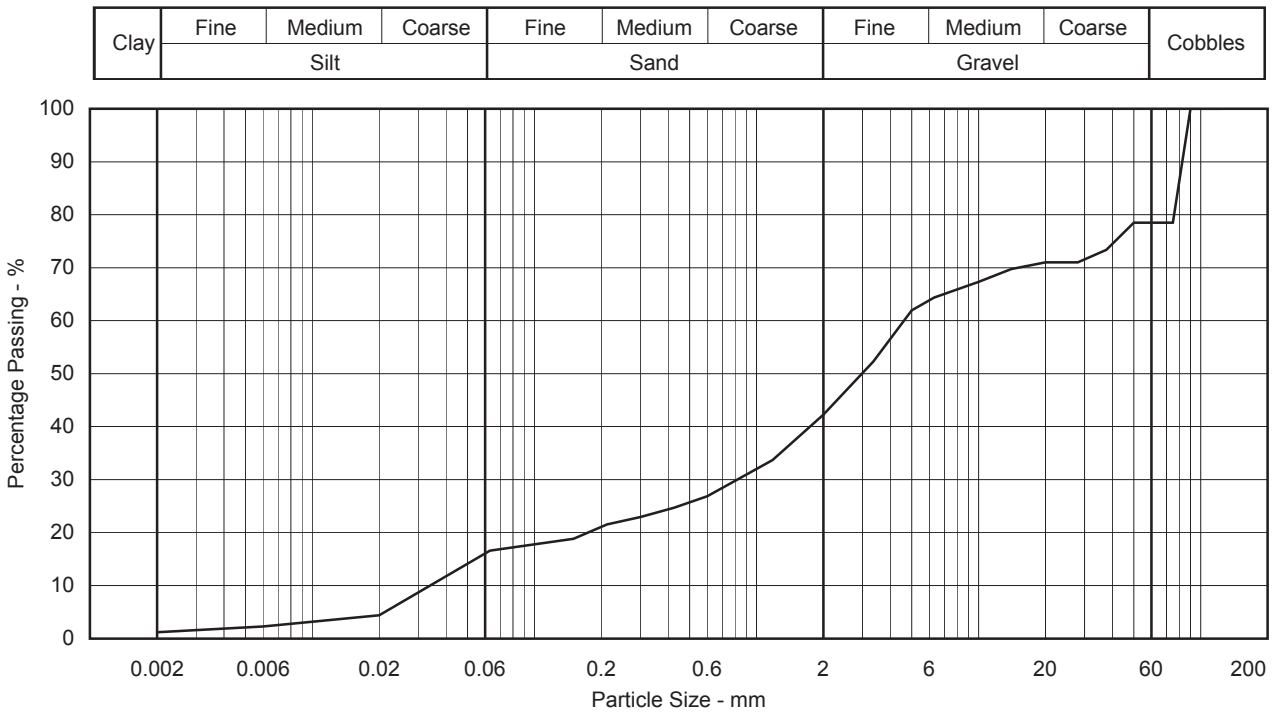
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	79
63.0 mm	79
50.0 mm	79
37.5 mm	73
28.0 mm	71
20.0 mm	71
14.0 mm	70
10.0 mm	67
6.30 mm	64
5.00 mm	62
3.35 mm	52
2.00 mm	42
1.18 mm	34
600 µm	27
425 µm	25
300 µm	23
212 µm	22
150 µm	19
63 µm	17
20 µm	4
6 µm	2
2 µm	1

Non Engineering Description
Brown silty SAND and GRAVEL with cobbles. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	21.5
Gravel	36.3
Sand	26.5
Silt	14.6
Clay	1.1

Particle Diameter - mm	
D100	90
D60	4.6
D10	0.034
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	135.3

Notes
Sedimentation sample not pre-treated



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PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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1260 - PSD TP48 00.70 B - A13753-182745.xls : Sample ID 182745

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	SHETLAND SPACE CENTRE - PRELIMINARY INVESTIGATION	**Contract No**	**A13753**
Client	AECOM	Hole	TP48
Engineer		Sample Ref	
		Depth (m)	0.70
		Sample Type	B

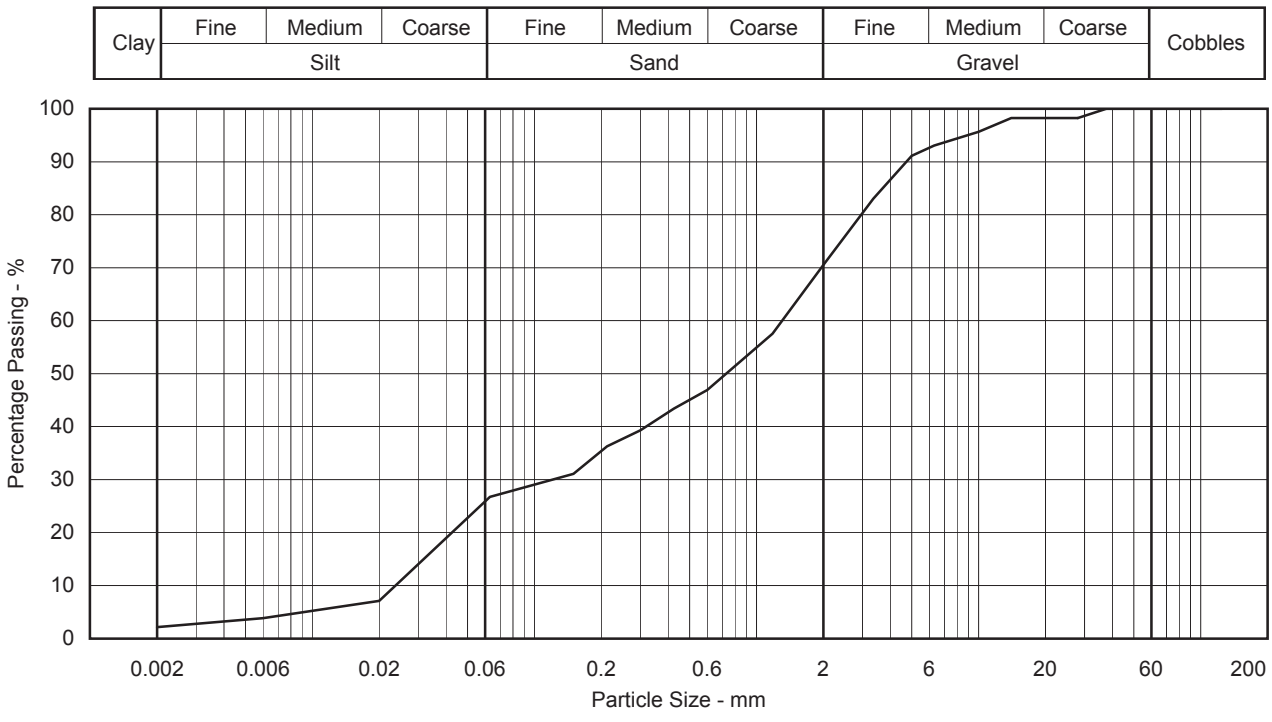
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	98
20.0 mm	98
14.0 mm	98
10.0 mm	96
6.30 mm	93
5.00 mm	91
3.35 mm	83
2.00 mm	71
1.18 mm	58
600 µm	47
425 µm	43
300 µm	39
212 µm	36
150 µm	31
63 µm	27
20 µm	7
6 µm	4
2 µm	2

Non Engineering Description
Brown very silty very gravelly SAND. Gravel is fine to coarse

Sample Proportions - %	
Cobbles	0.0
Gravel	29.5
Sand	45.2
Silt	23.2
Clay	2.1

Particle Diameter - mm	
D100	38
D60	1.3
D10	0.024
Uniformity Coefficient (SHW series 600, Table 6/1, footnote 5)	54.2

Notes
Sedimentation sample not pre-treated



Originator	Checked & Approved
DW	CD 05/12/2020

PARTICLE SIZE DISTRIBUTION

BS1377:Part 2:1990 Clause 9.2 - Wet Sieving
BS1377:Part 2:1990 Clause 9.4 - Sedimentation by Pipette

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Lab Project No A13753 : 05/12/2020 09:48:50

TERRA TEK
Site Investigation & Laboratory Services

NOTES ON LABORATORY PROCEDURES

Samples of soil and rock taken during the site works are examined in the laboratory and assessments of their characteristics used to supplement field observations, and in-situ and laboratory test results, in the preparation of the borehole records. Preparation and testing is carried out to the requirements of British or other international Standards where applicable, or otherwise in accordance with good practice. UKAS accredited tests are indicated thus : (U). All other tests reported or opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

LABORATORY TESTING (SOILS)	STANDARD
CLASSIFICATION TESTS	
Determination of moisture content (U)	BS 1377 : Part 2 : 1990, Section 3.2
Determination of liquid limit (U)	BS 1377 : Part 2 : 1990, Section 4.2 and 4.3
Determination of plastic limit and plasticity index (U)	BS 1377 : Part 2 : 1990, Section 5
Determination of bulk density (U)	BS 1377 : Part 2 : 1990, Section 7.2
Determination of particle density (U)	BS 1377 : Part 2 : 1990, Section 8.2 and 8.3
Sieve analysis (wet or dry sieving) (U)	BS 1377 : Part 2 : 1990, Section 9.2 and 9.3
Sedimentation analysis (pipette or hydrometer) (U)	BS 1377 : Part 2 : 1990, Section 9.4 and 9.5

CHEMICAL AND CONTAMINATION TESTS

An extensive range of UKAS and MCERTS chemical and contamination test procedures is available for the identification and quantification of levels of contamination in the ground. Selection of the test methodology and suite of contaminants to be determined is based upon site history, conditions revealed in the course of the investigation, and intended future use. Procedures are described and referenced as appropriate in the text of this report.

COMPACTION RELATED TESTS	
Determination of dry density/moisture content relationship (U)	BS 1377 : Part 4 : 1990, Section 3
Determination of minimum & maximum density	BS 1377 : Part 4 : 1990, Section 4
Determination of moisture condition value (MCV) (U)	BS 1377 : Part 4 : 1990, Section 5
Determination of MCV/moisture content relationship (U)	BS 1377 : Part 4 : 1990, Section 5
Determination of California Bearing Ratio (U)	BS 1377 : Part 4 : 1990, Section 7
CONSOLIDATION AND STRENGTH TESTS	
Determination of one-dimensional consolidation properties (U)	BS 1377 : Part 5 : 1990, Section 3
Determination of shear strength by direct shear (small shearbox) (U)	BS 1377 : Part 7 : 1990, Section 4
Determination of shear strength by direct shear (large shearbox) (U)	BS 1377 : Part 7 : 1990, Section 5
Determination of undrained shear strength in triaxial compression (U)	BS 1377 : Part 7 : 1990, Section 8 and 9
Determination of shear strength with pore water pressure measurements (U)	BS 1377 : Part 8 : 1990
Hand Shear Vane (U)	NZ Geotechnical Society Inc Aug 2001
AGGREGATE TESTS	
Particle size distribution (U)	BS 812 : Part 103 : 1985, Section 103.1
Particle size distribution (U)	BS EN 933-1 : 2012
Flakiness Index (U)	BS EN 933-3 : 2012
Ten percent fines value (dry and soaked) (U)	BS 812 : Part 111 : 1990
Resistance to fragmentation by Los Angeles method (U)	BS EN 1097-2 : 2010

LABORATORY TESTING (ROCKS)

The laboratory testing of rock specimens has not reached the degree of standardisation achieved for soils testing. A wide range of test procedures are described in the relevant literature. All these methods are to a greater or lesser degree unique to particular contexts (ie, relative to a specific rock type or individual project design requirements).

TEST	
Determination of point load strength (U)	ISRM Commission on Testing Methods, 1985
End preparation of Rock Specimens (U)	ASTM Testing method D4543-08
Determination of unconfined compressive strength (U)	ISRM Commission on Testing Methods, 1985
Determination of unconfined compressive strength (U)	ASTM Testing method D7012-14
Determination of dry density and porosity (U)	ISRM Commission on Testing Methods, 1985
Determination of water content (U)	ISRM Commission on Testing Methods, 1985
Slake Durability Index (U)	ISRM Commission on Testing Methods, 1985

LABORATORY TESTING (CONCRETE)

Samples of conrete taken during the site works are examined in the laboratory and testing is carried out to the requirements of British or other international Standards where applicable, or otherwise in accordance with good practice.

CONCRETE RELATED TESTS

Determination of unconfined compressive strength
Determination of shape, dimensions and other requirements for specimens and moulds
Estimated Actual Strength & Estimated Potential Strength

SOIL DESCRIPTION

Laboratory (non-engineering) soil descriptions are generally given in accordance with Clause 41 of BS 5930 : 1999