



SPECIFICATION DOCUMENT

Project: 21529B – CERD Development – Llanaber

Location: Llanaber OS Grid Reference SH598179

Mileage and ELR: DJP 101m 51ch – 102m 58ch

Client: Amco Giffen

Scope of this Document: Topographical Survey & Ground Investigation Requirements

CW Document Reference No: 21529B-SPE-003

Address:

Crouch Waterfall, The Barn, Elms Farm, Hobb Lane, Warrington, WA4 5LS

Design Brief:

Works for this scheme include remediation works to the Rock armour where low or deficient and repair of the wall were required as part of the CERD development.

Topographic Survey Requirements:

Methodology:

- The survey shall be carried out to an accuracy of Band 3 +/- 25mm as per Network Rail standard NR/L2/TRK/3100 issue 5, using a Drone UAV survey.
- National Grid Coordinates supplied for those points as well as the local grid xyz values.
- Surveyed heights (levels) shall be orthometric and quoted in metres above the national height datum published by the national mapping agency.
- The surveyor shall provide permanent survey control markers not more than 50m apart – all control points shall be inter visible by two other control points and part of the continuous survey control to demonstrate accuracy and residual redundancy.
- The surveyor shall locate permanent markers for survey control as required for the survey at the surveyor's discretion.
- The surveyor shall use his/her discretion to select the most appropriate marker type for all survey control points.

Provisions:

- 3D Topographic Survey Drawing in AutoCAD .dwg or Microstation.dgn format.
- 3D Point cloud data in .pod format suitable for use in Microstation or .rcs format suitable for use in AutoCAD/Revit and WebPointCloud (online point cloud viewer).
- Site wide 2D Orthophotos as jpeg images and .jgw files suitable for viewing as raster images backgrounds in AutoCAD and Microstation.
- ProjectWise integration is assumed to be required.
- It is assumed there is no requirement for snakegrid conversions.

General Information / Topographical survey Requirements:

- Boundary wall routes, plus boundary fencing as required.
- Closest running rail.
- Any vegetation and services such as manholes.
- Bases and other infrastructure in place.
- Any significant or irregular undulations to be surveyed where possible.
- Extent of walkway and capping stones at the base of the wall
- Extents of rock faces / wall / cuttings, including rock armour levels
- Average water levels (Where possible)

Survey Extents:

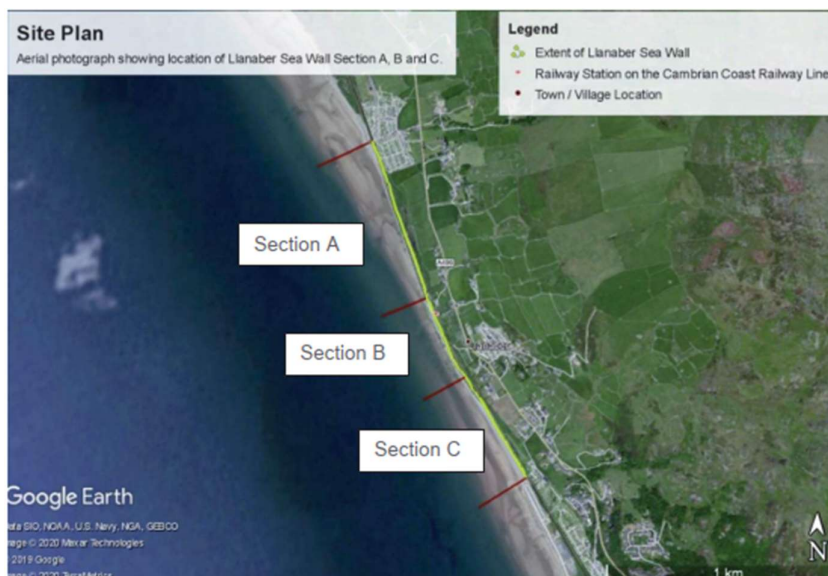


Figure 1 – Survey Extents

Figure 1 shows the chainage extents provided from the CRT documents, covering an approximate 1.79km length. The survey required shall cover this area. The adjacent rail track does require capturing, Confirmation of easements for undertaking drone surveys to be confirmed around the track, a possession may be required.



Ground Investigation Requirements:

Name of Contract

CERD Development

Name of Investigation Supervisor

To be confirmed by AMCO GIFFEN.

Introduction

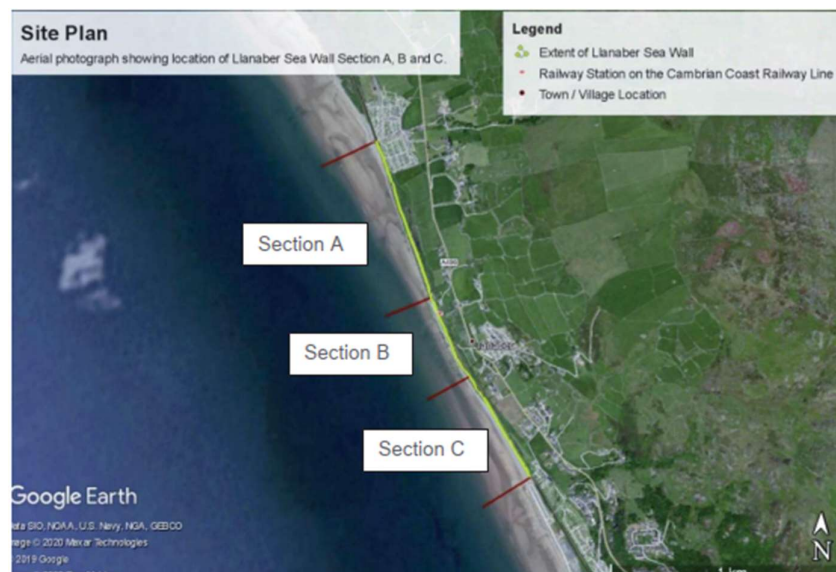
The following document provides a ground investigation specification for works to be carried out at Llanaber Sea Defences in the context of the renovation requirements set out by NR and detailed within CRT document reference NR-IP-EN-2155-A01.

The existing sea defence at Llanaber has been identified by Network Rail for renovation, as it was assessed in 2014 and significant sections were found to be in a Poor condition due to a number of defects attributable to the wave, weather conditions and coastal processes.

The sea defence structure is located 2 to 5m in front of the Cambrian Coast railway line between Tal-y-bont and Barmouth, and extends for a total length of 1422m with an average height of 9.85m AOD.

The sea defence comprises three main sections with varying construction types:

- Sea Wall A, a rock armour embankment (102m 18ch – 102m 58ch), approximately 860m in length;
- Sea Wall B, a sloping concrete sea wall (101m 70ch – 102m 16ch), approximately 420m in length;
- And Sea Wall C, a steep cobble beach (101m 51ch – 101m 70ch), approximately 510m in length.





The Coastal Asset Condition Survey Report states that Sections A & C are in fair condition without any critical defects, while Section B is in poor condition with several defects that threatens the longevity of the structure.

An option selection report (5191937-ATK-REP-CIV-RP-C-00003) has been undertaken which evaluates a number of possible solutions. The option selection report recommends Option 2 which is outside the scope of planned works. It has been agreed by RAM and the Project Team to develop Option 1. The key outputs for the chosen option are:

- Refurbish the concrete revetment wall to original condition;
- Drill and grout voided areas within the concrete revetment;
- Replenish rock armour where low or deficient;
- And extend the length of rock armour.

Further details on the defects present at this structure can be found in the most recent examinations reports, the Coastal Asset Condition Survey Report (JBA 2014), or the GRIP 3 Option Selection Report 5191937-ATK-REP-CIV-RP-C-00003.

To enable the design of the above works, it is required that ground investigations are carried out to determine the existing ground conditions at the locations of repair.

The Specification shall be the UK Specification for Ground Investigation, Second Edition, as published by ICE Publishing in 2012.

Site Description

The existing sea defence structures are located adjacent to the to the DJP railway line, approximately 2 to 5m in front of the crest. The sea defence is approximately 1450m in length with an average height of 9.85m AOD across its length. It was designed to protect the Cambrian Coast Railway. The sea defence is located between Tal-y-bont and Barmouth, extending between ELR: DJP 101m 70.25ch and 102m 58ch. The OS Grid Reference for the site is SH 5989 1790, and the nearest postcode is LL42 1AZ.

Main Works Proposed and Purpose of Contract

The purpose of the Contract and investigation is to gather geotechnical information which shall be used to inform the design of renovation measures for the existing sea defence structures.

Scope of the Investigation

The scope of the ground investigation is as follows:

- 5no Windowless Samples to a minimum of 5 m in depth, at 360m centres along the length of the sea defence. These shall be carried out on at beach level immediately adjacent to the sea defence structure. All Windowless sample positions are to be commenced with a hand dug inspection pit to a depth of no less than 1.2m;
- 10no. Dynamic Probes (DPSH) at 180m centres, adjacent to Windowless sample locations where relevant. These shall be carried out to a depth of 10m or refusal;



- 40no. concrete cores through the existing sea wall in Section B. Cores shall be carried out in pairs at 20m centres along the length of the wall, each pair shall consist of one core at mid-height (horizontal) and another at the base with a 45° inclination downwards. These shall be 100mm diameter cores to a maximum length of 2.0m;
- Laboratory testing of selected samples;
- Logging and reporting to BS EN 1997-1 and BS5930-2015;
- Only a factual report is required.

Working hours and access arrangements are to be confirmed by AMCO GIFFEN.

Geology and Ground Conditions

The underlying geology of the site has been determined from the BGS online viewer, which shows the following bedrock strata to be present on site:

- Paleogene and Neogene Rock – The northwest extent of the site is underlain by undifferentiated rock formed of silt and clay;
- Llanbedr Formation – located further south, comprised of interbedded mudstone and siltstone;
- Rhinog Formation – further south, comprised of sandstone and mudstone;
- Harlech Grits Group – the south west corner beneath the shingle beach, comprised of sandstone, siltstone and mudstone.

Superficial geology is also present on site, as follows:

- Marine Beach Deposits – comprising shingle, sand, silt and clay;
- Storm Beach Deposits – comprising a ridge of coarse materials including gravels, cobbles and boulders;
- Blown Sand – pre-dominantly wind-blown sand particles;
- Till – comprised of diamicton.

The BGS online viewer at time of viewing does not have borehole records in the local area.

Mining and Mineral Extraction

There are no records of historic coal mining or other mine workings near the existing defences.

Hydrogeology

The majority of the site is underlain by a low productivity aquifer. The north of the site, underlain by the Paleogene and Neogene rocks, is designated as a moderately productive aquifer.

Hydrology

The site has a history of flooding from the Irish Sea and now consequently has a series of sea defences located along the coastline protecting the Cambrian Coast Railway.

The Afon Mawddach is a large river with many significant tributaries. The catchment area is bound to the east by the Aran Fawddwy massif and to the west and north by the Harlech dome, forming a watershed just south of Llyn Trawsfynydd. Approaching the coast, the Afon Mawddach enters a wide



estuary from Dolgellau to its mouth at Barmouth, entering the Irish Sea under the railway bridge located there.

3 small streams flow roughly east-west towards Llanaber Sea Wall, with outfalls located at the northern extent of the defences through Caerddaniel Caravan Site, just to the south of Llanaber Railway Station, and at the southern extent of the defences where they tie into the privately-owned defences.

Underground Drainage and Seepage

No evidence of seepage through the existing defences has been identified.

Flooding

The site has a history of storm surges resulting in flooding along the coast, despite the construction of sea defences protecting Llanaber prior to 1901.

In January 2014 northern Wales was hit by a storm surge, leaving Llanaber and other surrounding villages seriously affected by the coastal flooding, with the railway remaining closed for 5 months while repairs were made.

Natural Resources Wales identified areas of flood warning and flood alert near the town of Barmouth. Areas of low, medium and high risk of surface water flood risk have been identified to the north and south of Llanaber sea defences, with areas of low and high risk of flooding from rivers and seas identified at the northern extent of the defences.

Unexploded bomb risk

An unexploded bomb (UXO) risk map indicates that the area is of low UXO risk, having 15 bombs per 1000 acres or less.

General Requirements

CDM (2015) regulations apply to the Contract.

The Contractor shall carry out all work to ISO 9001 or a similarly approved quality management system.

The level of staffing provided by the Contractor shall be commensurate with the works being carried out. An experienced ground engineer shall be present on site full-time for the duration of the site-works; this engineer will be responsible for the supervision of all site activities, logging of exploratory holes, taking samples and photographs and the provision of daily records and preliminary logs.

Appropriate hygiene and welfare facilities shall be provided on site by the Contractor; the Contractor shall not use available public facilities. The Contractor shall detail any assumptions or requirements (e.g. availability of on-site power, space required for facilities) in their return.

Dates for mobilisation to site and commencement of the site-works are to be confirmed with AMCO GIFFEN.



Working hours are to be confirmed with AMCO GIFFEN. The challenges of working in a tidal environment should be considered.

Access arrangements and permits to work to be confirmed by AMCO GIFFEN.

Although it is not expected that Sentinel requirements or Network Rail safe systems of work are necessary, it is for the Contractor to ascertain these requirements and provide appropriately qualified staff members to carry out the works.

Suitable safe systems of work are to be agreed with the Client to allow safe access to the work site and adjacent to open water. Investigations are to be coordinated with tide times, taking especial consideration to access and egress to and from GI locations.

The Contractor is responsible for the security of site during the works, and their work sites will need to be fenced off. No exploratory holes are to be left open overnight. Any plant left on site overnight shall be appropriately secured to deny access to the public.

Contamination is not known to be present on site. However, as the site is located adjacent to an active railway, the possibility of contamination being present cannot be discounted. The Contractor shall take appropriate measures to safeguard their plant and employees, surrounding personnel and the environment from the spread of any contamination as a result of drilling activities. The Contractor shall decontaminate all drilling equipment on completion of each exploratory hole and on completion of the site works.

No services information has been provided to the Designer. The Contractor should take all necessary actions to avoid damaging any existing services.

The Contractor is responsible for the disposal of all waste (including contaminated arisings and groundwater) generated as a result of the works, including the sampling and testing of all waste materials.

All unavoidable damage shall be reinstated by the Contractor.

The Contractor is responsible for reinstating the site to its previous condition following the completion of site-works.

The Contractor is responsible for the disposal of all waste (including contaminated arisings and groundwater) generated as a result of the works, including the sampling and testing of all waste materials.

All exploratory hole positions are to be surveyed in by the Contractor to a vertical and horizontal accuracy of 0.05m. Position and levelling information are to be provided to National Grid and Ordnance Datum respectively.

Sufficient photos to show the condition of the whole of the site prior to the start of the site-works and an analogous set on completion of the investigation are to be provided.



Dynamic Sampling

Dynamic sampling shall be undertaken using a windowless sampling rig. The Contractor is free to determine the drilling methodology and the starting diameter for the borehole such that drilling, sampling and testing can be carried out to the scheduled depth while suitable sampling and testing is undertaken.

The maximum period for chiselling / slow boring / excavation through hard strata shall be 30 minutes, following which the Investigation Supervisor shall be contacted for instruction.

Water shall not be added during drilling except where required to facilitate drilling in granular strata. The maximum period of chiselling shall be 30 minutes. Following this period, instruction from the Investigation Supervisor shall be sought.

Concrete Coring

Concrete cores are to be 100mm in diameter, to a maximum length of 2.0m. Cores shall be taken in pairs at 20m centres along the length of the wall; each pair of cores shall consist of one core mid-height of the structure driven horizontally, and one core at the base inclined 45° downwards.

The concrete cores shall be logged on site and stored for the duration of the project should the need for testing arise. Fill materials behind the wall should be included in the log and sampled where suitable. Any voids identified should likewise be included in the log.

Reinstatement of cored locations shall be carried out with non-shrink cementitious grout of C40/50 grade.

Sampling and Monitoring during Intrusive Investigation

In Windowless sample holes, 1no bulk and 1no disturbed samples shall be taken at 1m intervals or at any change in strata.

In hand dug inspection pits, 1no bulk and 1no disturbed sample shall be taken at 0.5m intervals or at any change in strata, whichever is smaller.

Groundwater strikes should be recorded and monitored during drilling for 20mins. Groundwater level shall be measured again at the end of the borehole / end of shift. Groundwater shall be sampled once encountered in all positions.

In-Situ Testing Particular Restrictions/Relaxations

SPT testing shall be carried out in all window sample boreholes in accordance with BS EN ISO 22476-3. The first SPT shall be undertaken at the base of the hand-dug pit and at 1.0m intervals to completion.

Dynamic Probing (Super Heavy Dynamic Probing – DPSH) is to be carried out in accordance with BS EN ISO 22476-2.



Hand Shear Vane testing is to be carried out in suitable cohesive material to BS EN ISO 22476-9 or BS EN 1997-2 and NS to BS EN 1997-2.

Instrumentation Particular Restrictions/Relaxations

Not required.

Instrumentation Monitoring and Sampling Particular Restrictions/Relaxations

Not required.

Daily Records Particular Restrictions/Relaxations

Raw data comprising drillers logs shall be provided to the Investigation Supervisor within 24 hours of the completion of each shift.

Draft engineering logs shall be provided to the Investigation Supervisor within 3 working days of completion of each position, along with a laboratory testing schedule detailing samples taken and the depth at which they were taken.

Logging and reporting will be in accordance with BS 5930:2015. Descriptions are to include, where relevant:

- Soil name and constituents;
- Colour;
- Structure;
- Strength, consistency and / or relative density;
- Moisture content;
- Soil plasticity, sensitivity and dilatancy;
- Note of any minor constituents / contamination;

Geotechnical Laboratory Testing Particular Restrictions/Relaxations

A geotechnical laboratory testing schedule shall be provided to the Investigation Supervisor alongside the draft engineering log.

Geotechnical testing is likely to comprise, but is not limited to the following tests:

- Natural moisture content;
- Atterberg limit tests;
- BRE Digest 1: 2005 Concrete Aggressivity Suite – Suite B;
- Quick Undrained Triaxial Compression.

All laboratories used shall be UKAS accredited.

Geoenvironmental Laboratory Testing Particular Restrictions/Relaxations

No geoenvironmental testing of soil or rock samples apart from that already noted is required. However, the Contractor should be aware for the potential for contaminated material to be present.



If visual, olfactory or other evidence suggests the presence of contamination, suitable environmental samples are to be taken.

Reporting Particular Restrictions/Relaxations

Only a Ground Investigation Report (Factual Report) is required. A Geotechnical Design Report (GDR) is not required.

Draft engineers/drillers log to be provided to the designer within 3 days of completion of the site-works. (handwritten is fine)

A draft version of the report is to be produced within 10 working days of the completion of site-works. The Contractor shall allow 5 working days for the Investigation Supervisor to review this draft and return comments. Following receipt of comments, the Contractor shall issue the final Ground Investigation Report within 5 working days.

1 No. digital (pdf) copy of the final ground investigation report is to be provided.

The final report is to be accompanied with a complete AGS file (AGS 4.0) containing all exploratory hole, in-situ and laboratory test data.

Key programme dates are as follows:

Activity	Timeframe
Mobilisation period	To be confirmed with AMCO GIFFEN
Site-works period	To be confirmed with AMCO GIFFEN
Submission of Draft Report	2 calendar weeks following completion of site works
Return of comments	1 calendar week following draft submission
Submission of Final Report	1 calendar week following receipt of comments

Schedule of works

Hole No.	Type	Scheduled Depth (m)	Remarks
WS001-WS005	Windowless sample	To refusal (min 5m)	Evenly spaced approximately every 360m along the length of sea defence structures.
DCP001-DCP010	Dynamic Probing (DPSH – Super Heavy)	To refusal (min 10m)	Evenly spaced approximately every 180m along the length of the sea defence structures, located adjacent to that of corresponding WS where applicable.
CC001-CC020	100mm diameter horizontal concrete cores	Maximum 2.0m length	Evenly spaced approximately every 20m along the length of the concrete sea wall (Section B). 20no. pairs of cores, upper core labelled A, lower core labelled B.

The below figure presents an indicative location plan for the proposed GI works.



Figure 1a – Llanaber Sea Defence – North. Proposed GI works location plan.



Figure 1b – Llanaber Sea Defence – South. Proposed GI works location plan.