



SPECIFICATION DOCUMENT

Project: 21529B – CERD Development – Tywyn

Location: Tywyn Blockstone OS Grid Reference SH57250168

Mileage and ELR: DJP 089m 1056yds 48.00chs

Client: Amco Giffen

Scope of this Document: Topographical Survey & Ground Investigation Requirements

CW Document Reference No: 21529B-SPE-002

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 extension of rock armour, 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.
- Extents of rock faces / wall / cuttings, including rock armour levels
- Average water levels (Where possible)

Survey Extents:

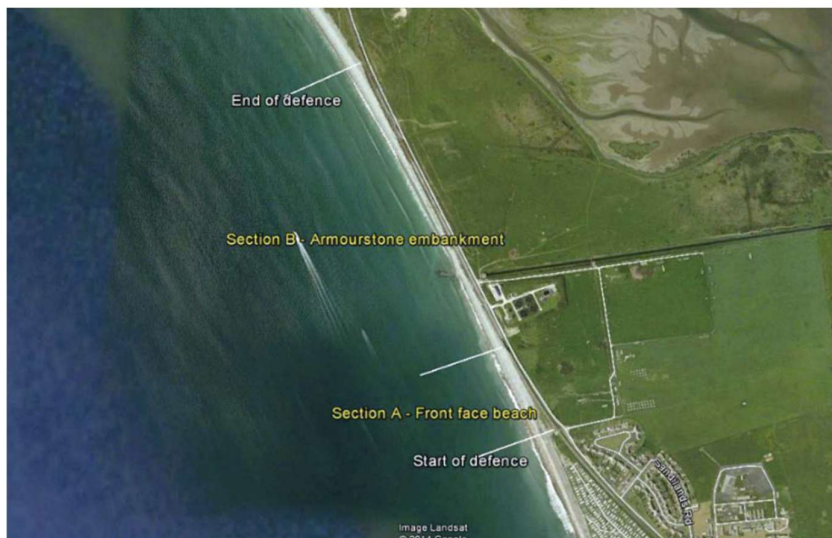


Figure 1 – Survey Extents

Figure 1 shows the chainage extents provided from the CRT documents, covering an approximate 1.26km length chainage. 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, however it is envisaged a possession will not be required.

Ground Investigation Requirements:

Introduction

The following document provides a ground investigation specification for works to be carried out at Tywyn Sea Wall 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 Tywyn has been identified by Network Rail for renovation, as it was assessed in 2014 and significant number of defects was recorded that is directly attributable to the wave action, weather conditions, and coastal processes.

The sea defence structure is located adjacent to the DJP railway line, situated 1 to 4m behind the crest. The sea defence is approximately 1250m long and was designed to protect the Cambrian Coast Railway.

The structure comprises two main sections of armour stone of different sizes. Between 89m 0770yds and 89m 1034yds it comprises a shingle beach and informal rock armour protection alongside the track. From 89m 1034yds to 90m 0308yds it comprises a rock armour embankment fronted by a shingle beach. Rock armour is constructed from approximately 5-6 tonnes of armour stones, with some approaching 11t. In some locations, redundant concrete bridge units have been placed onto the rock armour.

An option selection report (5191937-ATK-REP-CIV-RP-C-00001) 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. Therefore, it has been agreed by RAM and the Project Team to develop Option 1 with further reductions to the scope. The key outputs for the chosen option are:

- Extend rock armour between 89m 1034yds and 89m 072yds;
- Replenish rock armour where low or deficient; and
- Address any outstanding defects scored 12 or above in the latest Detailed Examination and the Coastal Asset Condition Survey Report referenced in Annex 1.

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-00001.

To enable the design of the above works, it is required that investigations are carried out to ascertain the existing ground conditions at the locations of replenishment and extension of rock armour.

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

Name of Contract

CERD Development

Name of Investigation Supervisor

To be confirmed by AMCO GIFFEN.

Site Description

The sea defence structure is located adjacent to the DJP railway line, situated 1 to 4m behind the crest. The sea defence is approximately 950m long and was designed to protect the Cambrian Coast Railway. Sea defence is located between ELR DJP 89m 0770yds and 90m 0308yds. OS Grid reference for the site is SH 57261 01658 and the nearest postcode is LL36 9AU.



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 structure comprised of rock armour.

Scope of the Investigation

The scope of the ground investigation is as follows:

- 6no Windowless Samples to a minimum of 5 m in depth, at 250m centres along the length of the sea defence. These shall be carried out on at beach level immediately adjacent to the rock armour. All Windowless sample positions are to be commenced with a hand dug inspection pit to a depth of no less than 1.2m.
- 6no Dynamic Probes (DPSH) adjacent to Windowless sample locations. These shall be carried out to a depth of 8m or refusal;
- 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 BGS online viewer shows historical ground investigation information is available, primarily located along the railway, approximately 1.3km south of the defence.

The bedrock geology underlying the site, as shown on the BGS online viewer, primarily comprises of the Ty'rGawen Mudstone Formation described as "predominately mudstones with subordinate siltstones and sandstones, locally tuffaceous, with a distinctive phosphatic mudstones". This geology is found underlying the beach and adjacent railway line between the northern extent of the defences and approximately 550 m to the south of the defences.

At the northern end of the site, an approximately 100 m wide strip of differing geology is anticipated. This comprises the Fron Newydd Member, described as "black pyritic mudstones with abundant phosphate nodules. Oolites are observed to be common in nodules but less common in the matrix, with localised developments of pure oolitic ironstone".

To the north of the defences, the geology changes into the Offrwm Volcanic Formation, described as "thick- to thinly-bedded, locally welded, felsic ash-flow tuffs, subordinate rhyolitic lavas and dark grey mudstones". An Unnamed Igneous Intrusion is present to the north of the Offrwm Volcanic Formation.

The BGS online viewer shows that the superficial geology encountered on and surrounding the site is varied;

- Storm Beach deposits located along the coastline, running the entire extent of the defences comprising "shingle, sand, silt and clay; may be bedded or chaotic; beach deposits may be in the form of dunes, sheets or banks; in association with the marine environment".



- Blown sand located at two locations along the railway line in the northern half of the site comprising of “sand that has been transported by wind, or sand consisting of predominately wind-blown particles”.
- Alluvium covers most of the site and surrounding area and comprises of “clay, silt, sand and gravel. It is the unconsolidated detrital material deposited by a river, stream or another body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta, or as a cone or fan at the base of a mountain slope”.
- Till covers the southern extent of the defences and comprises of “diamicton of Devensian age”.

Mining and Mineral Extraction

No records of historical coal mining near the site. Two abandoned coal mine entries are located south of Tywyn, approximately 2.5km from the southern extent of the defences. The Felin-Llyn Pair lead mine exists to the southeast of Tywyn approximately 4.5km from the southern extent of the defences. Although no mines have been identified close to the existing defences.

Hydrogeology

The entire site is underlain by a Secondary B aquifer. Located to the north of the defences is a Secondary A aquifer.

Hydrology

The site has a history of flooding and now consequently has a series of sea defences located along the coastline protecting the Cambrian Coast Railway which runs approximately 1-4 m behind the defences.

The Afon Dysynni is a river in mid-Wales which has its mouth located in the Cardigan Bay area of the Irish Sea, approximately 3.5 km to the northwest of Tywyn. Approaching its mouth, the Afon Dysynni enters an estuary and forms Broad Water Lagoon with a salt marsh (Morfa Gwyllt) located to the south which is frequently flooded. A canal runs east-west from the coast, just south of Broad Water Lagoon, before diverting to follow the route of the Afon Dysynni to the northeast.

Underground Drainage and Seepage

No evidence of seepage through the existing defences has been identified. Historical maps show underground drains located around the disused running track located to the east of the railway line and extending south into Morfa Gwyllt. Additional drains are observed running perpendicularly from the canal across Morfa Gwyllt towards Broad Water Lagoon to the north and the village of Tywyn to the south. The presence of underground drains within the salt marsh will need to be considered prior to any remediation works undertaken.

Flooding

The village of Tywyn has been identified as an area likely affected by rising sea levels in future years. In January 2014 storm surges hit northern Wales causing flooding. Overall, the village of Tywyn was



relatively unaffected but the Cambrian Coast Railway line that runs along the coastline adjacent to the existing defences was largely washed away, leaving one train stranded.

The Natural Resources Wales online long term flood risk maps have identified areas across the site and the surrounding area at a high, medium and low risk of flooding from rivers and seas. This shows most of the south Gwynedd coastline as at a high risk of coastal flooding.

Multiple small areas of low to medium risk of surface water flooding have been identified adjacent to the existing defences. However, most are located within Morfa Gwyllt or following the route of underground drains so appear to be of limited concern.

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.

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. All exploratory hole positions shall be scanned using appropriate detection equipment prior to the commencement of drilling and at 300mm intervals while excavating.

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.

All unavoidable damage shall be reinstated by the Contractor.

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.

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

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.

Percussion Boring / Dynamic Sampling

Provisionally the percussion boring will be carried out using a dynamic 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.

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

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 samples shall be taken once groundwater has been encountered and monitored for a period of no less than 20 minutes. Groundwater shall be sampled once encountered in all positions.

In-Situ Testing Particular Restrictions/Relaxations

DCP testing (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

Groundwater strikes should be monitored during drilling, allowing for a 20min rise, and measures again at the end of the borehole / end of shift.

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;



- 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
WS01-WS06	Windowless sample	To refusal (min 5m)	Evenly spaced along the length of sea defence structure.
DCP01-DCP06	Dynamic Probing (DPSH – Super Heavy)	To refusal (min 8m)	Location adjacent to that of corresponding WS

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

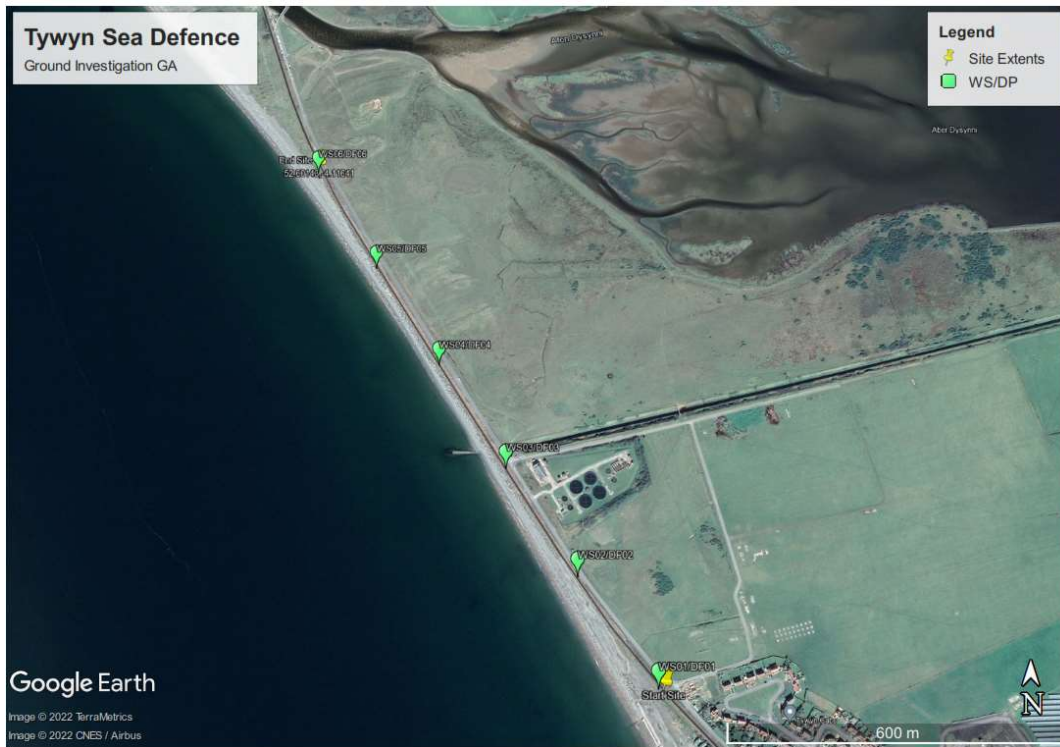


Figure 1 – Tywyn Sea Defence. Proposed GI works location plan.