

Millom Iron Line

Flood Risk Assessment

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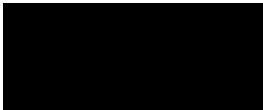
Site Address: Hodbarrow Nature Reserve, Millom, Cumbria

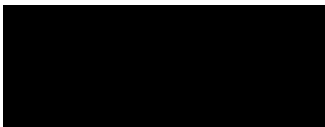
Control Sheet

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P01	First Issue	CJS	AJR	06/03/2023
P02	Site Boundary Revision	CJS	AJR	01/06/2023
P03	Rework of boundaries and Visitors Centre proposals	GW/PT	GW	07/04/2025

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- Appendix B – Topographic Survey
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1.0 Introduction

1.1 Project Background

Curtins was instructed by Cumberland Council via Story Contracting to undertake a Flood Risk Assessment (FRA) for the development of Hodbarrow Nature Reserve, Millom. The nearest post code is LA18 4EN and the site is centred on National Grid Reference (NGR) 317429mE 478489mN. What3Words reference: rebounder.named.graphic.

The report provides information on the nature of flood risk at the site and follows Government guidance with regards to development and flood risk and is based on currently available information.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Curtins shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins.

1.2 Scope of Assessment

The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency (EA) for Flood Risk Assessments as outlined in the Communities and Local Governments Planning Policy Guidance to the National Planning Policy Framework (NPPF)¹.

The redline site area is approximately 57.71 hectares (ha) and confirms the full extent of the application site as indicated on drawing 289-LYR-XX-ZZ-DWG-L-1001 by Layer Studio is provided in Appendix A.

Following scrutiny of the Environment Agency (EA) flood zone maps it has been identified that the site boundary falls across three flood risk classifications.

- Flood Zone 1 (FZ1) (Low probability of flooding from Rivers and Sea). Land having a less than 0.1% (1 in 1000) annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
- Flood Zone 2 (FZ2) (Medium probability of flooding Rivers and Sea). Land having between a 1% AEP (1 in 100) and 0.1%AEP (1 in 1,000) annual probability of river flooding; or land having

¹ https://assets.publishing.service.gov.uk/media/67aafe8f3b41f783cca46251/NPPF_December_2024.pdf

between a 0.5% AEP (1 in 200) and 0.1% AEP (1 in 1,000) annual probability of sea flooding. (Land shown in light blue on the Flood Map)

- Flood Zone 3 (FZ3) (High probability of flooding from Rivers and Sea). Land having a 1% AEP (1 in 100) or greater annual probability of river flooding; or Land having a 0.5%AEP (1 in 200) or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map).

A FRA is required to accompany a planning application, as the site is both is larger than 1ha and lies in part within FZ2 and FZ3. The FRA is required to address all sources of potential flood risk and take into account the management of surface water run-off. The FRA should also consider the impact of climate change both to and from development proposals.

The National Planning Policy Framework (NPPF) was published on 27th March 2012, revised on the 24th July 2018 and updated on the 19th February 2019, 20th July 2021, 20th December 2023 and 12 December 2024, replacing all previous national planning policy documents. Chapter 14² of the NPPF address the challenge of climate change, flooding and coastal change.

Paragraph 181 of the current NPPF makes Sustainable Urban Drainage Systems (SuDS) a requirement for the determination of planning applications for 'major' developments, unless there is clear evidence that this would be inappropriate.

SuDS will therefore be a requirement on this site as the site is considered to be 'major' development by the Town and Country Planning Order 2015 as total proposed development floor space is 1000m² or more.

The assessment will:

- Investigate all potential risks of flooding to the site,
- Consider the impact the development may have elsewhere with regards to flooding.
- Consider proposals to mitigate any potential risk of flooding determined to be present.

This report reviews the following information:

- Architects' Site Layout Proposals
- Environment Agency Flood Map for Planning (FMfP).
- Environment Agency Product 4 Data
- Environment Agency Extreme Sea Levels Data
- Environment Agency North West Region – Cumbrian Tidal Areas Benefitting from Defences Revisited, July 2013.
- Environment Agency Risk of Flooding from Surface Water (RoFSW).

²<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>

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- UK Government Long Term Flood Risk Information for reservoir flooding.
 - Environment Agency historic flood maps.
 - North West England and North Wales Shoreline Management Plan SMP2, February 2011.
 - Cumbria Coastal Strategy, Cumbria County Council, 2020
 - Cumberland Council Local Flood Risk Management Strategy, adopted September 2022.
 - Cumberland Council Flood Investigation (Section 19) Reports.
 - Cumberland, Council Copeland Local Plan 2013-2028, adopted December 2013
 - Cumberland Council Copeland Emerging Local Plan, The Copeland Local Plan 2021-2038: Examination, submitted September 2022.
 - Copeland Borough Council Strategic Level 1 Flood Risk Assessment (SFRA), dated October 2021.
 - Ground level data taken from Environment Agency 1m resolution Light Detection and Ranging (LiDAR) data.
 - Drawing 289-LYR-XX-ZZ-DWG-L-1000 GA | Site Masterplan
 - Drawing P10913/amr sheets 2 to 6 (Topographic Survey).

2.0 Development Proposals

2.1 Proposed Development

The General Arrangement Site Masterplan, drawing 289-LYR-XX-ZZ-DWG-L-1000 by Layer Studio is provided in Appendix A.

The overall proposed development comprises:

Erection of visitors centre with café/shop, group room, staff/volunteer, toilet facilities and car park; consolidation, repair and installation of interpretive sculpture to Towsey Hole Windmill; refurbishment of existing Tern Island hide; new bird hides, pathways, gateway features and street furniture; enhancement of wildlife habitats; associated landscaping and drainage infrastructure; and maintenance of byway with restricted vehicular access.

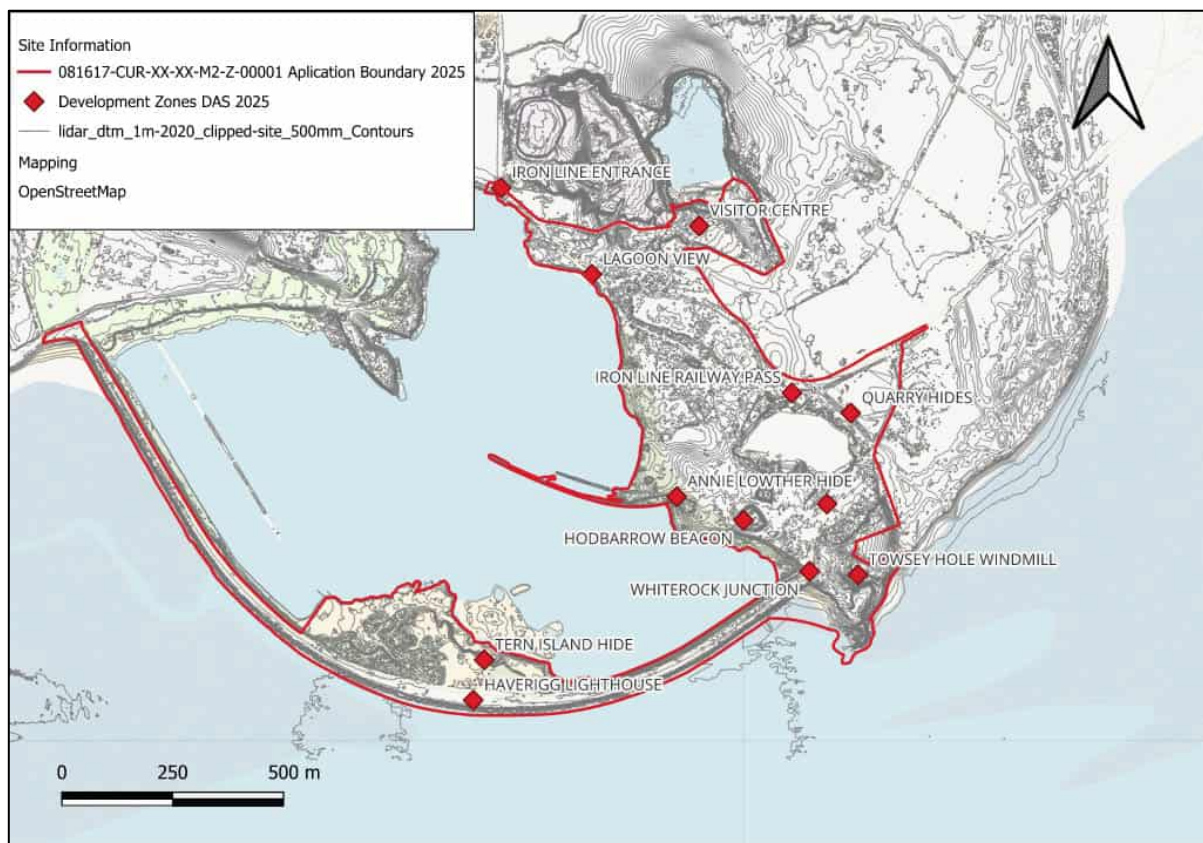


Figure 2-1: Location of landmarks and key spaces

In respect to the Visitors Centre, the approximate building footprint has been measured from the Architect's Plan as 380m². The Finished Floor Level (FFL) is proposed at **14.50mAOD**, allowing for a shallow ramped access from existing ground levels in the northeast quadrant. Car parking to the west

and northwest quadrants is to be tiered in concentric arc, rising away from the building, rising from 14.50mAOD to 16.60AOD.

In respect to the other elements of the development, no significant changes to existing ground levels are envisaged by the proposals.

2.2 Vulnerability

On the basis of the development proposal and reference to NPPF Annex 3 and Planning Practice Guidance Table 2 (PPF Reference ID: 7-079-20220825), the vulnerability classification of the Visitors Centre will constitute a Less Vulnerable classification: Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure.

The proposed Car Parks also falls within the Less Vulnerable classification.

In respect to the other elements of the development proposals within the site, these fall within Water-compatible development: *Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.*

2.3 Estimated Lifecycle of Development

The current EA guidance on planning flood risk suggests a design life of non-residential development of at least 75 years. This is presumed for the purpose of this FRA.

3.0 Site Characterisation

3.1 Site Location

The site lies approximately 0.6km south of the town of Millom and 0.8km east of the village of Haverigg on the northwest of the Duddon Estuary in southwest Cumbria. The nearest post code is LA18 4EN and the site is centred on National Grid Reference (NGR) 317429mE 478489mN.

What3Words reference: rebounder.named.graphic. Figure 3-1 below shows the site in the context of its siting within the local area.

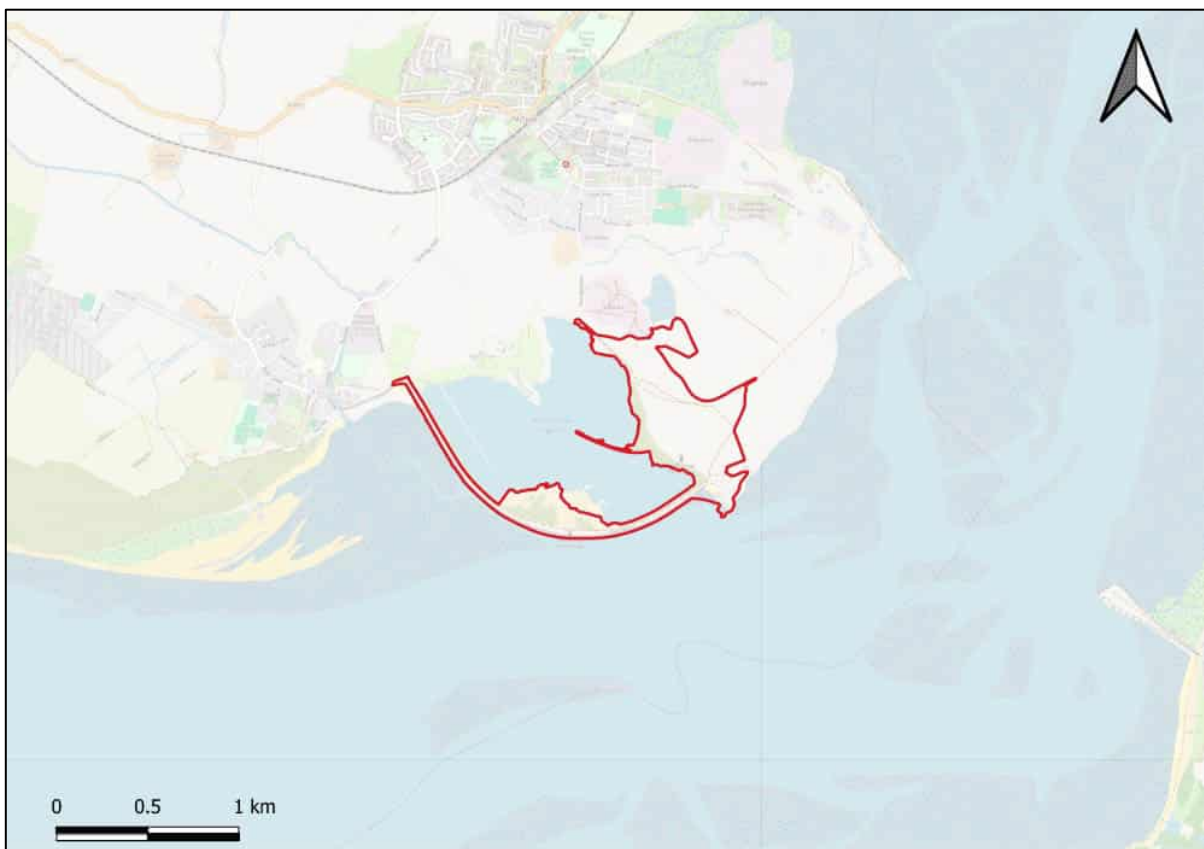


Figure 3-1: Site Location Plan

3.2 Site Description

Hodbarrow Nature Reserve is a brownfield site, situated on the former Hodbarrow Iron Mine, which was closed in 1968. In its entirety, the Hodbarrow Reserve is approximately 105ha in size, broadly comprising two large waterbodies, the lagoon, large areas of dense scrub, grassland, the sea wall, sand dunes, sandy and rocky beaches and bare rock. The development site itself is located partly within and around the Reserve, with the site of the proposed Iron Line Visitors Centre and associated

car park lies adjacent to the north-east of Hodbarrow Nature Reserve, outside of the reserve (and designated site) boundaries.

A substantial amount of rubble and slag remains across the site, from the historic iron mine and associated buildings, now demolished. Four substantial structures remain on the reserve: a concrete bird hide situated near the lagoon island on the sea wall, a steel lighthouse on the sea wall opposite the bird hide, the original stone lighthouse in the south-west of the reserve and the remains of a stone windmill in the south of the reserve. A byway open to all traffic (BOAT) runs from Mainsgate Road across the reserve to the south-east, before turning to the south-west and extending along the sea wall to Haverigg caravan park. The BOAT is in a poor condition along much of its length, with many potholes and deep ruts across its surface. In addition to the BOAT, there are numerous formal and informal paths across the reserve, created by walkers and cyclists, most of which are unsurfaced.

3.3 Topography

A topographic survey was undertaken of the site in July 2022 by amrGeomatics, provided as drawing P10913/amr Sheets 2 to 6 in Appendix B. Figure 3-2 provides a visualisation of the site topography.

The eastern side of the site is undulating, with levels between 22mAOD and 4mAOD. The location proposed for the New Visitors Centre is at around 13.7mAOD. Levels around the Lagoon are around 5.5mAOD to 6.0mAOD along its eastern landward boundary. The sea wall, separating the Estuary from the Lagoon ranges in level generally between 9.7mAOD to 10.6mAOD.

Recent LiDar drone survey information confirms similar topography in early 2025.

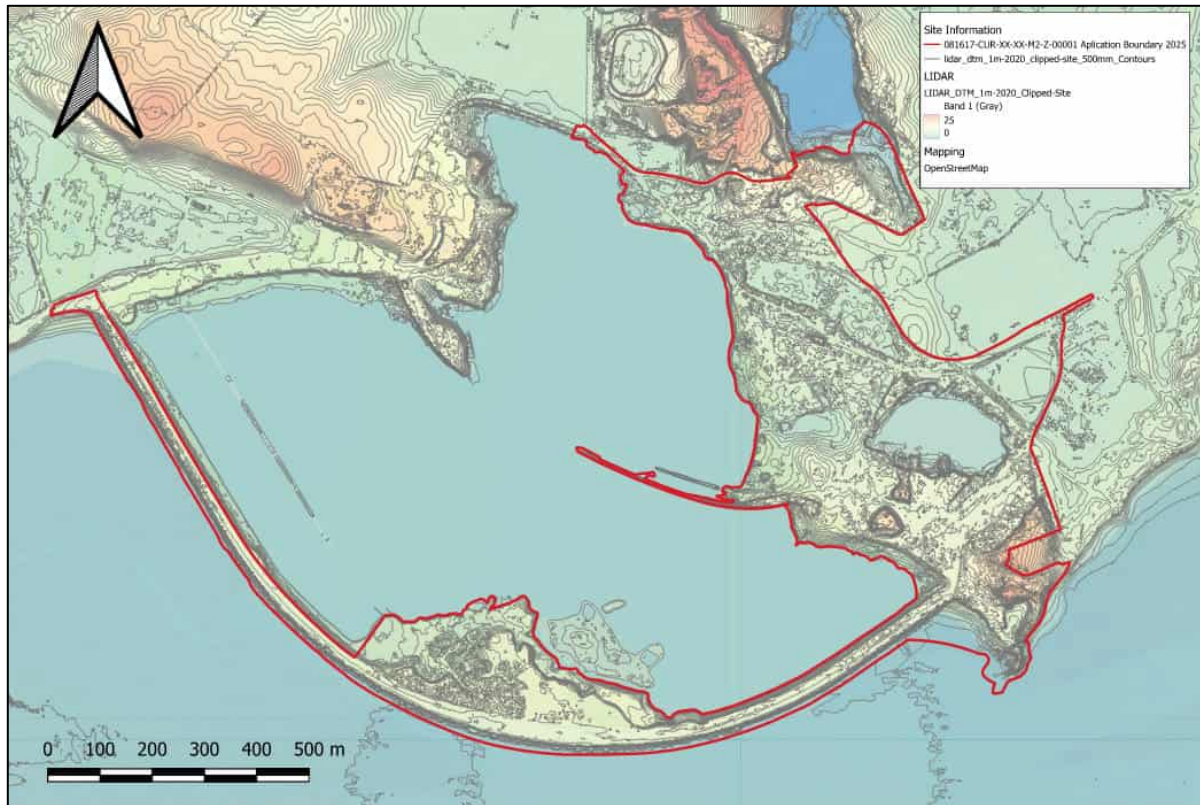


Figure 3-2: Site Topography Heat Map

3.4 Waterbodies

The following waterbodies have been identified within and vicinity of the site:

- Hodbarrow Lagoon lies adjacent to the site boundary, to the west and north.
- The Duddon Estuary lies adjacent to the site boundary, to the south and west.
- Redhills Quarry (disused and flooded) lies immediately north of the site (control water body by use of a private (Cumberland Council) pumping station and treatment plant (methane stripping).
- Haverigg Pool (Main River) lies approximately 350m to the west of the site.
- The Irish Sea lies 2.5km to the southwest of the site.

3.5 Geology and Hydrogeology

The British Geological Survey (BGS)³ map for the site indicates the site is underlain by the following geological sequence:

³ British Geological Survey, GeolIndex Onshore, Superficial Deposits and Bedrock Geology, 1:50,000.

Table 3-1: BGS Geological Sequence

Geological Unit	Classification	Description	Aquifer Classification
Artificial Ground	INFILLED GROUND WORKED GROUND MADE GROUND	Infilled Ground is an area where the pre-existing land surface has been excavated (Worked Ground) and subsequently partially or wholly backfilled (Made Ground). Composition: variable, e.g. a backfilled quarry, landfill. Worked Ground is an area where the land surface (natural or artificial) has been lowered as a result of man-made excavations. The purpose of the excavation is unspecified. Composition: void Made Ground is an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits. The purpose of the made ground is unspecified	
Superficial Deposits	RAISED MARINE DEPOSITS - SAND AND GRAVEL (RESTRICTED TO THE EASTERN EXTREMITY OF THE SITE)	Raised marine and coastal zone deposits are isostatically uplifted marine and coastal zone deposits which crop out in part above high water mark. Variable lithology. Gravel (shingle), sand, silt and clay; commonly charged with organic debris (plant and shell).	
Solid Geology	RED HILL LIMSTONE FORMATION	Carbonate bioclastic, intraclastic and peloidid grainstones, coarse-grained and virtually structureless following bioturbation.	Secondary A Comprise permeable layers that can support local water supplies and may form an

Geological Unit	Classification	Description	Aquifer Classification
	MARTIN LIMSTONE FORMATION	Mainly carbonate Mudstones, but with significant grainstones, locally cross-bedded, and oolites in upper part; ranges from peritidal to marine. Extensively dolomitized	important source of base flow to rivers.
	LOW FURNESS BASAL FORMATION	Conglomerate, Sandstones siltstones and mudstones subordinate evaporites, presumed of terrigenous origin in lower Duddon Conglomerates part of limestones and siltstones mostly red with interbedded conglomerates; all resumed of marine origin.	
	ARUNDIAN SUBSTAGE – ARUNDIAN SUBSTAGE	At base, mid to dark grey Even-bedded carbonate grainstones and packstones; middle part, dark grey thinly bedded packstones and Packstones with many shaly interbeds; upper part, even bedded packstones and grainstones.	

There are no Groundwater Source Protection Zones (SPZ)⁴ within 2km of the site.

Groundwater vulnerability has been assessed as high risk; the site is situated on a Productive Bedrock and Secondary Superficial Aquifer which has well connected fractures, contributing to a high pollutant speed and a dilution of >550mm/year. There is low soluble rock risk in relation to groundwater vulnerability.

No groundwater abstractions are listed within 1km of the site.

⁴ Source Protection Zones (SPZs) are defined around large and public potable groundwater abstraction sites.

3.6 Existing Drainage

Few existing drainage features/services have been identified within the site boundary.

Two shallow watercourses, a single gully with its culvert crossing into a low-level wet land area have been found very close to Redhills Quarry. These features appear linked to the Household Waste Recycling Centre access drainage system. Ultimately the north east portion of the site (and the Visitors Centre site) discharges into Redhills Quarry (via overland or limited below ground).

It is understood that formal surface water drainage is provided from the disused Redhills Quarry by means of a private (Cumberland Council) pumping station and treatment plant (methane stripping) offsite discharging flow at a controlled rate to United Utilities Wastewater Treatment Works (WwTW) outfall/discharge pipe approximately 1km to the northeast, ultimately discharging to the Duden Estuary.

Short sections of the BOAT, where it forms part of the regular highway network and caravan park access network, are formally constructed in bound materials and are appropriately lit and drained. Several gullies are evident.

United Utilities Sewer Records indicate Millom is well served by the public sewer system; the closest public sewer to the site is located offsite within Mainsgate Road, approximately 270m to the north of the entrance to the site.

3.7 Other Existing Utilities

A public utility search has not been undertaken for the site.

4.0 Planning Policy

4.1 National Planning Policy

Paragraph 170 of the NPPF⁵ states that:

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.

Paragraph 181 of the NPPF states that:

When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that: a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location; b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate; d) any residual risk can be safely managed; and e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

4.2 Local Planning Policy and Guidance

The Copeland Local Plan⁶, adopted December 2013, falls under the umbrella title of the Local Development Framework. The Core Strategy (CS) and Development Management Policies (DMP) sets out the overall strategic direction for planning by providing policies to guide decisions on planning applications over the period to 2025.

The CS and DMP Document contains a set of development management policies for the local planning authority area of Copeland, within the Cumberland Unitary Authority. When a planning application is submitted, the Authority uses development management policies (planning policies) alongside other policies in the Core Strategy to help it assess whether the application should be granted planning permission.

The relevant CS and DMP Policies to flood risk are identified as:

- Policy ENV1 - Flood Risk and Risk Management

⁵ <https://www.gov.uk/government/publications/national-planning-policy-framework--2> (February 2025)

⁶ https://www.copeland.gov.uk/sites/default/files/attachments/copeland_local_plan_2013_2028.pdf

Policy ENV1 – Flood Risk and Risk Management

The Council will ensure that development in the Borough is not prejudiced by flood risk through:

- A. Permitting new build development only on sites located outside areas at risk of flooding, with the exception of some key sites in Whitehaven.
- B. Ensuring that developments on important regeneration sites in Whitehaven Town Centre and Harbourside and Pow Beck Valley are designed to address the existing levels of flood risk without increasing flood risk elsewhere.
- C. Ensuring that new development does not contribute to increased surface water run-off through measures such as Sustainable Drainage Systems, where these are practical. Where they are not this should be achieved by improvements to drainage capacity.
- D. Supporting measures to address the constraints of existing drainage infrastructure capacity and avoiding development in areas where the existing drainage infrastructure is inadequate.
- E. Support for new flood defence measures to protect against both tidal and fluvial flooding in the Borough, including appropriate land management as part of a catchment wide approach.

Individual development proposals will be assessed with regard to Development and Flood Risk under Policy DM24.

- **Policy ENV2 – Coastal Management**

Policy ENV2 – Coastal Management

To reinforce the Coastal Zone's assets and opportunities the Council will:

- A. Promote the developed coast as a destination for leisure, culture and tourism, with strong links to Whitehaven Harbour / town centre in the north and to Millom in the south.
- B. Maximise opportunities along the undeveloped coast for tourism and outdoor recreation through support for the North West Coastal Trail and Colourful Coast projects.
- C. Support the management of more of the undeveloped coast for biodiversity.
- D. Support energy generating developments that require a coastal location along the undeveloped coast, provided that the potential impacts on biodiversity, landscape and heritage assets are carefully assessed against the benefits. Where negative impacts are likely these must be mitigated against and compensated for.
- E. Protect the intrinsic qualities of the St Bees Head Heritage Coast in terms of development proposals within or affecting views from the designation. At the same time encourage schemes which assist appropriate access to and interpretation of the Heritage Coast area.
- F. Work with partners to manage the risks associated with coastal erosion and flooding and ensure that all new development is located outside areas identified as being at risk either now or in future phases of the Shoreline Management Plan.

- DM24 Development Proposals and Flood Risk

Policy DM24 – Development Proposals and Flood Risk

Where a proposed development is likely to be at risk from flooding or increases risk of flooding elsewhere, a Flood Risk Assessment (FRA) will be required to be submitted as part of the planning application.

Development will not be permitted where it is found that:

- There is an unacceptable risk of flooding; or
- The development would increase the risk of flooding elsewhere; or
- The development would cause interference with or loss of access to a watercourse and the benefits of the development do not outweigh the risks of flooding.

Where a development requires the provision of additional flood defence and mitigation works, any costs, including maintenance, should be met by the developer.

4.3 Local Plan 2021 – 2038

The Cumberland Local Plan 2021 – 2038 Local Plan addendum document, and all associated submission documents are stated by the council to be sent to the Secretary of State in September 2022 for Public Examination by an independent Planning Inspector. The Inspector is to assess the draft and the evidence during the remainder of 2022, with a view that the Local Plan would be adopted in March 2023.

At the time of preparing this Flood Risk Assessment, the Cumberland Local Plan has not been adopted.

A review of draft policies in respect to flood risk has been undertaken. ENV1 is to be replaced by DS8 and DS9, ENV2 is to be replaced by N4, N8 and T2 and, DM24 is to be replaced by DS5 and DS8. No significant changes in policy respect to flood risk have been identified.

4.4 Site Specific NPPF Flood Risk Categorisation

To assess the NPPF flood risk classification for the site, the first step is to inspect both the EA web-based flood mapping data for flooding from rivers and sea and the Local Planning Authority SFRA (where available) and surface water and reservoirs. The rivers and sea flood map is used to inform planning of a sites Flood Zone(s); however, the surface water and reservoir flood maps should also be used to identify other flood risks.

From the Environment Agency flooding from rivers and seas map, presented later, it can be seen that a large area of the site is classified as Flood Zone 1 (FZ1) (Low Probability: Land having a less than 0.1% (1 in 1000) annual probability of river or sea flooding). However, the redline boundary within the east and south of the proposed development area encroaches into land designated as FZ3 (High

Probability: Land having a 1% (1 in 100-yr) or greater annual probability of river flooding; or Land having a 0.5% (1 in 200-yr) or greater annual probability of sea flooding (Land shown in dark blue on the Flood Map).

The site is also in an area that has some protection from flood defences. Flood defences reduce the probability of flooding from a particular source (a river or the sea) but do not completely remove the risk. They can fail or a flood could happen which is larger than the one the defence is designed to protect against.

From the detailed maps provided in the Strategic Flood Risk Assessment for Cumberland (formerly Copeland Borough Council), the site is confirmed to lie in Flood Zone 3a.

For the purpose of this assessment, the site is classified as being in FZ3a.

4.5 Site Specific Flood Zone Compatibility

The proposals for the development site fall within the following category:

- 'Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'more vulnerable' class; and assembly and leisure' and 'Car Parks'.
- 'Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.'

These development types are classed as 'Less Vulnerable' and 'Water Compatible' respectively in the Flood Risk Vulnerability Classification with reference to NPPF Table 2⁷.

The Visitors Centre and associated Car Park site is located within Flood Zone 1, for which 'Less Vulnerable' development is deemed to be appropriate. The other elements of the development proposal are deemed water compatible. Table 4-1 below, reproduced from Table 3⁸ of the NPPF technical guidance shows the development compatibility within Flood Zones.

⁷ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#Table-2-Flood-Risk-Vulnerability-Classification>

⁸ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575184/Table_3_-_Flood_risk_vulnerability_and_flood_zone_compatibility_.pdf

Table 4-1: NPPF Flood Risk Vulnerability Classification (reproduced from Table 3⁸)

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate.

✗ Development should not be permitted.

Notes

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* * " In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test

It is anticipated that the lifespan of the development will be 75 years (as non-residential). If planning approved in 2025, the "lifetime" will be to 2100.

5.0 Assessment of Flood Risk

5.1 Sources of Flood Risk

This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The approach to assessing flood risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.

5.2 Environment Agency Online Flood Map for Planning

The Environment Agency (EA) provide an online map that identifies flood zone locations for planning purposes. An extract of this can be seen in Figure 5-1.

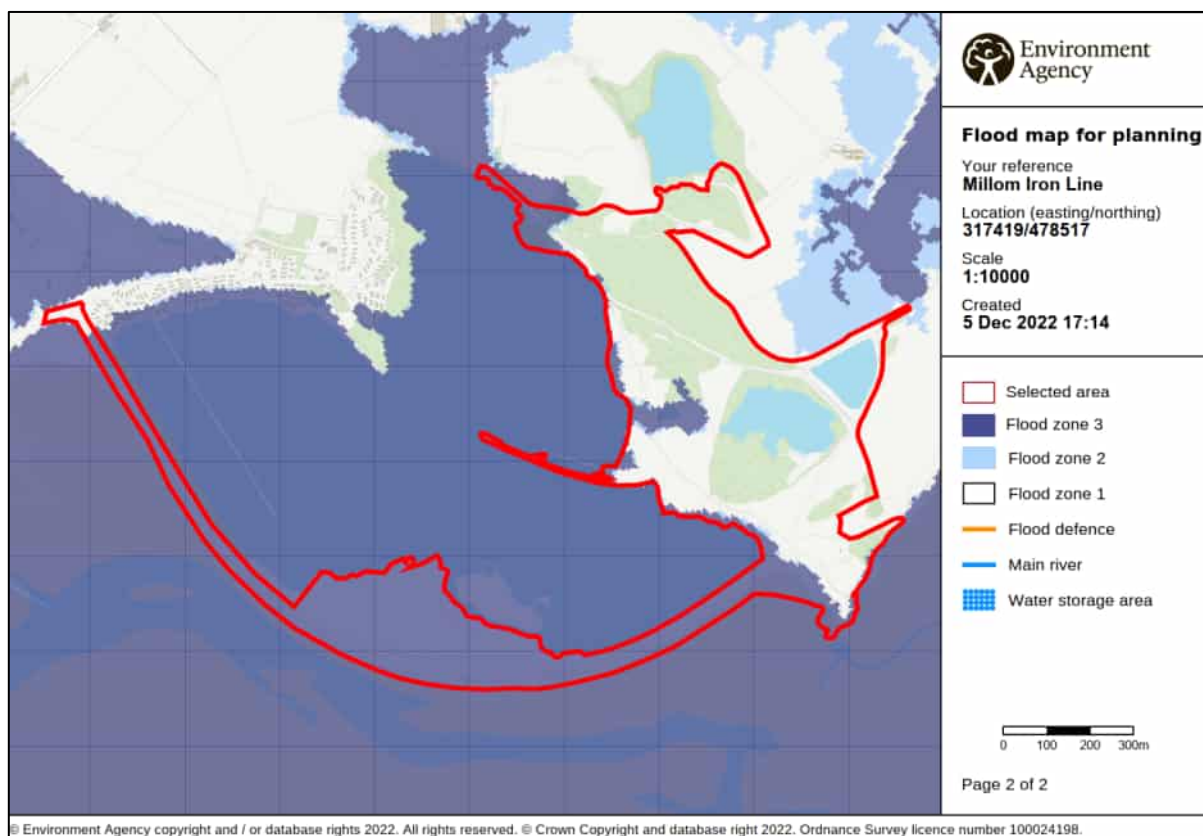


Figure 5-1: Environment Agency Flood Map for Planning (Rivers and Sea)

From the Environment Agency flooding from rivers and sea map:

- Zone 1 Low Probability: Land having a less than 0.1% (1 in 1,000) annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

- Zone 2 Medium Probability: Land having between a 1% (1 in 100) and 0.1% (1 in 1,000) annual probability of river flooding; or land having between a 0.5% (1 in 200) and 0.1% (1 in 1,000) annual probability of sea flooding. (Land shown in light blue on the Flood Map).
- Zone 3a High Probability: Land having a 1% (1 in 100-yr) or greater annual probability of river flooding; or Land having a 0.5% (1 in 200-yr) or greater annual probability of sea flooding (Land shown in dark blue on the Flood Map).

The flood map also contains the following information, where present:

- Flood defences built in the last five years to protect against river floods with a 1% (1 in 100-yr) chance of happening each year, together with some natural or constructed entities which retain, store or channel water and which may protect against smaller floods.
- Areas benefiting from flood defences - areas that benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100-yr) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200-yr) chance of happening each year. If the defences were not there, these areas would flood.

It can be seen from the mapping that the part of the site is located within the dark blue shading noted on the drawing key as Flood Zone 3, the 1% (1 in 100-yr) annual probability flood outline, suggesting the site is at **HIGH** risk of river flooding.

The east of the site, proposed for the Visitors Centre is located entirely within Flood Zone 1.

In addition to the Flood Map for Planning, the Environment Agency has provided Product 4 Data; Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models (including model extent, information on one or more specific points, flood levels, flood flows). The data is provided in Appendix C as: below.

- Map 1: Flood Zones – confirming the extent of Tidal Flood Zone 2 and Flood Zone 3.
- Map 2: 0.1% AEP (1 in 1000-yr) Undefended Tidal Flood Extent and selected flood levels.
- Map 3: 0.5% AEP (1 in 200-yr) Undefended Tidal Flood Extent and selected flood levels.
- Map 4: 0.5% AEP (1 in 200-yr) Undefended + Climate Chance (+600mm Sea Level Rise).
- Map 5: 0.1% AEP (1 in 1000-yr) Defended Tidal Flood Extent and selected flood levels.
- Map 6: 0.5% AEP (1 in 200-yr) Defended Tidal Flood Extent and selected flood levels.
- Map 7: 0.5% AEP (1 in 200-yr) Defended + Climate Chance (+600mm Sea Level Rise).

The EA data is provided from the Cumbrian Tidal 2012 2D modelling project and represents the most up-to date data available.

In respect to the Flood Zones, the Product 4 data confirms that the proposed Visitors Centre and associated Car Park lies within Flood Zone 1

In respect to the Visitors Centre and associated Car Park, the adjacent modelled flood levels are as follows:

- 0.1% AEP Undefended – 4.49mAOD
- 0.5% AEP Undefended – 6.28mAOD
- 0.5% AEP Undefended +CC – 6.93mAOD
- 0.1% AEP Defended – No flood risk in the vicinity.
- 0.1% AEP Defended – No flood risk in the vicinity.
- 0.5% AEP Defended +CC – 6.34mAOD

The proposed Finished Floor Level (FFL) of the Visitors Centre is to be set at 14.50mAOD, and therefore some 7.57m above the highest modelled tidal level of 6.93mAOD, relating to the 0.5% AEP (1 in 200-yr) plus climate change.

In respect to the landmarks and key spaces within the proposed development boundary, see Figure 2-1 above, surveyed levels indicate at these locations indicate only the Quarry Hides and Lagoon View are at risk of flooding. Table 5-1 below shows the predicted flood depths based on EA modelled flood levels and surveyed ground levels.

Table 5-1: Modelled Flood Depths at Landmarks and Key Spaces

Reference Number	Description	Easting	Northing	Surveyed Ground Level (mAOD)	Modelled Flood Depth (m)					
					0.1% AEP Undefended	0.5% AEP Undefended	0.5% AEP Undefended + CC	0.1% AEP Defended	0.5% AEP Defended	0.5% AEP Defended + CC
1	WELCOME BUILDING	317902	478988	13.7	-	-	-	-	-	-
2	HODBARROW BEACON	318002	478324	16.58	-	-	-	-	-	-
3	TOWSEY HOLE WINDMILL	318260	478201	19.43	-	-	-	-	-	-
4	HAVERIGG LIGHTHOUSE	317392	477918	9.1	-	-	-	-	-	-
5	TERN ISLAND HIDE	317417	478009	10.1	-	-	-	-	-	-
6	ANNIE LOWTHER HIDE	317851	478377	10.31	-	-	-	-	-	-
7	QUARRY HIDES	318244	478566	5.71	0.78	0.52	1.22	-	-	-
8	LAGOON VIEW	317660	478879	6.88	-	-	0.05	-	-	-
9	IRON LINE ENTRANCE	317660	478879	8.85	-	-	-	-	-	-
10	IRON LINE RAILWAY PASS	318110	478611	7.147	-	-	-	-	-	-
11	WHITEROCK JUNCTION	318151	478209	10.88	-	-	-	-	-	-

Though not a formal flood defence, the outer lagoon wall (the BOAT) provides a tidal defence from the Estuary level to approximately 9.7mAOD. This is reflected by the defended scenario model results. However, in respect to planning and flood risk, EA guidance states assessment and any required mitigation is undertaken against the undefended scenario.

In respect to flood risk from Rivers and Sea, it is concluded that the risk to the proposed Visitors Centre is LOW and will remain LOW when considering the impacts of climate change (sea level rise).

Similarly, the development proposals for the Landmarks and Key Spaces, except for the Quarry Hides and Lagoon View, is LOW and will remain LOW when considering the impacts of climate change (sea level rise).

Measures to mitigate flood risk from River and Tidal flooding are, where required are proposed in Section 6.

5.3 Flood Defences

The EA has not provided, as part of the Product 4 dataset, a map showing flood defences local to the site. This includes the Flood Wall to Hodbarrow Lagoon. It is concluded therefore that this is not an EA Asset. The responsibility of maintaining this structure will therefore lie with Cumberland Council.

The EA does however provide mapped information on the area considered to be defended by the Flood Wall as an open data layer.

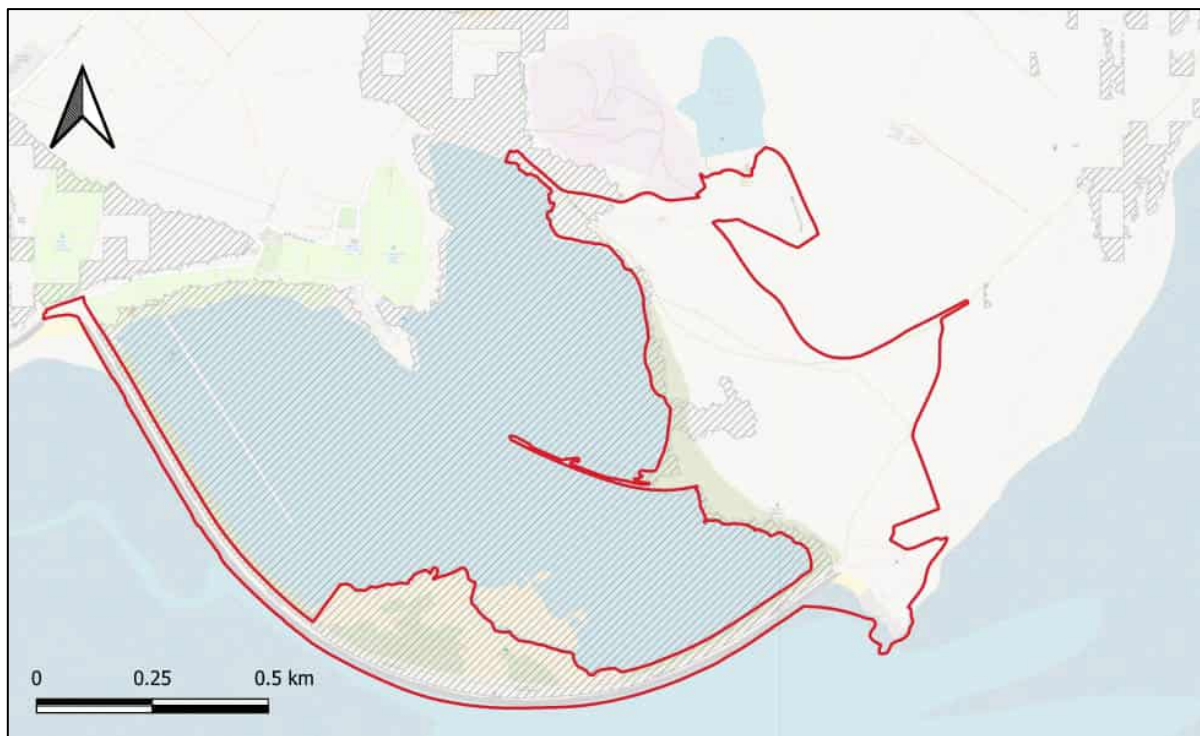


Figure 5-2: Environment Agency Reduction in Risk of Flooding from Rivers and Sea

The area broadly matches the difference between the modelled defended and undefended 0.1% (1 in 1000-yr) extents provided within the Product Data.

The site lies within the coastal zones defined in the Shoreline Management Plan⁹ (SMP2) Cells 11c (Rossall Point to Hodbarrow Point, including the Duddon Estuary) and Cell 11d (Hodbarrow Point to St Bees).

⁹ North West and North Wales Coastal Group, *North West England and North Wales Shoreline Management Plan SMP2 Main SMP2 Document*, Halcrow Group, February 2011.

The SMP indicates 'holding the line' for all major settlements as the policy for most of the undeveloped coast in Copeland is No Active Intervention, which means there is no planned investment in coastal defences on those stretches.

The Cumbria Coastal Strategy¹⁰, produced in April 2020, builds upon the Shoreline Management Plan and sets out how Cumbria County Council will manage the risks of coastal flooding and erosion in the county.

The strategy further divides SMP Cells Sub-cells. Those relevant to the development siter are:

- 11c16.10 Duddon Estuary (Millom Iron Works)
- 11c16.11 Hodbarrow Mains
- 11d1 Hodbarrow Point to Haverigg

Millom Iron Works – current SMP policy is No Active Intervention through allowing existing redundant defences and quay structures to deteriorate.

Hodbarrow Mains - No Active Intervention in the short term, Management Realignment including the construction of set back flood embankments to manage flood risk to flood assets in Millom when flood risk justifies and then Hold the line in beyond this.

Hodbarrow Point to Haverigg - The current Shoreline Management Plan policy is Hold the line for the short term but moving to Managed realignment beyond this.

The Coastal Strategy, whilst continuing to develop acknowledges the shared flood area frontage with policy units 11c16.10, 11c16.11 and 11d1.1. This means that any tidal flooding through this frontage has the potential to affect a wider area. The strategy concludes that it would be appropriate to consider revision of the Shoreline Management Plan policy for the western part of the frontage to hold the line by designating a new policy unit, 11c16.10.1. The proposed policy unit diagram (extracted from the Cumbria Coastal Strategy) is provided as Figure 5-3 below.

¹⁰ <https://www.cumbria.gov.uk/elibrary/Content/Internet/544/17312/43413152620.pdf>

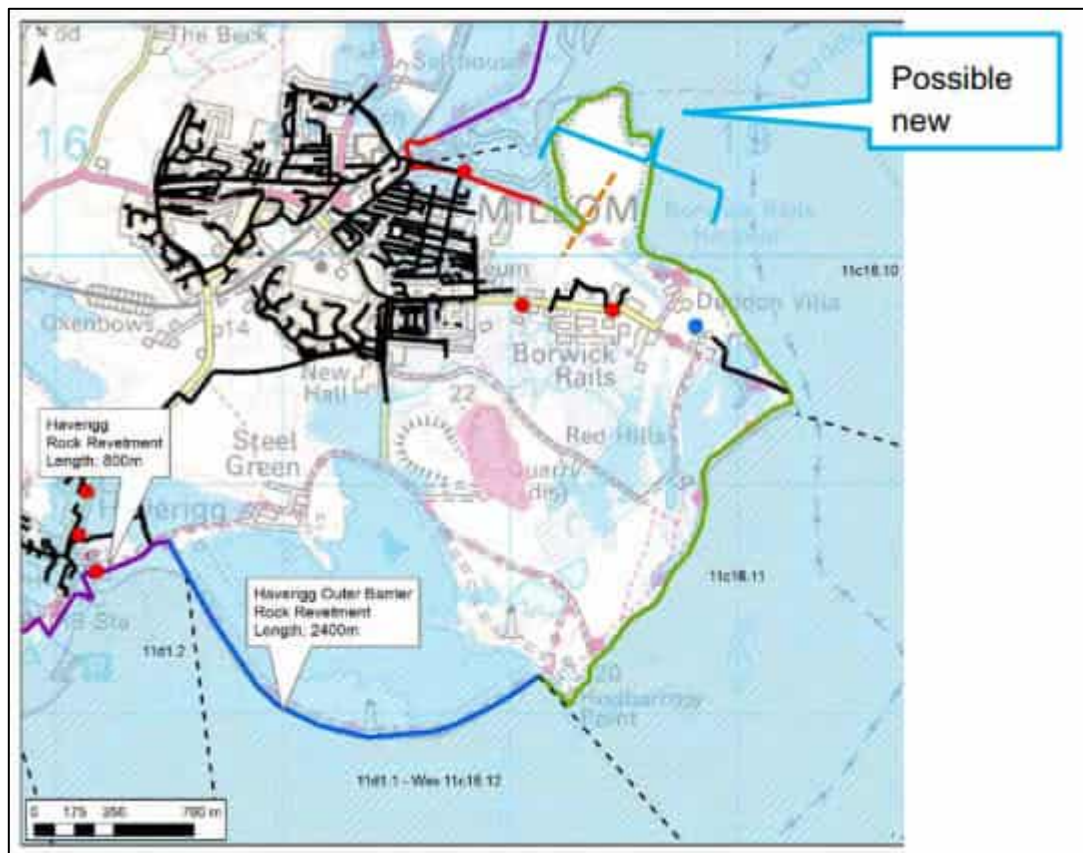


Figure 5-3: Cumbria Coastal Strategy – Proposed Policy Unit 11c16.10.1

In respect to the defence provided by the “Haverigg Outer Barrier”, the Coastal Strategy states *“The Shoreline Management Plan policy suggests realignment may be required during the medium term (20 to 50 years). But given the current good condition and the substantial nature of the armouring the defences may be sustainable beyond 50 years with only minor maintenance and therefore the need for realignment to a set back defence could potentially be deferred beyond 50 years. This could defer the short term need for a more detailed study of the approach to the set back defences, long term implications of future conditions on the barrier and the need for mitigation or replacement of currently protected habitats.”*

Given the SMP2 was published 12 years ago, the timescales quoted suggest realignment may be required between 2031 and 2061. However, subject to appropriate maintenance the lifetime of the barrier could be extended.

In respect to the development proposals, the failure or removal of the barrier would not increase the risk of flooding to the Visitors Centre as this is sited beyond the extent of the undefended flood extents. However, the wider Hodbarrow Reserve would be significantly negatively impacted.

5.4 Environment Agency Surface Water Flood Risk Mapping

Risk of Flooding from Surface Water (RoFSW) map is an assessment of where surface water flooding may occur when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. It includes information about flooding extents and depths. It is produced using national scale modelling and enhanced with compatible, locally produced modelling from lead local flood authorities (LLFAs).

RoFSW is a probabilistic product, meaning that it shows the overall risk, rather than the risk associated with a specific event or scenario. Risk is displayed as one of three likelihood bandings:

- High - greater than or equal to 3.3% chance in any given year (1 in 30)
- Medium - less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
- Low - less than 1% (1 in 100) chance in any given year

The RoFSW also presents the risk which takes account of the following climate change allowances based on the latest UK Climate Projections (UKCP18) from the Met Office, using the Representative Concentration Pathway (RCP) 8.5:

An extract of the Environment Agency flood risk from surface water map showing extent and depths of flooding is shown in Figure 5-4 and with climate change in Figure 5-5.

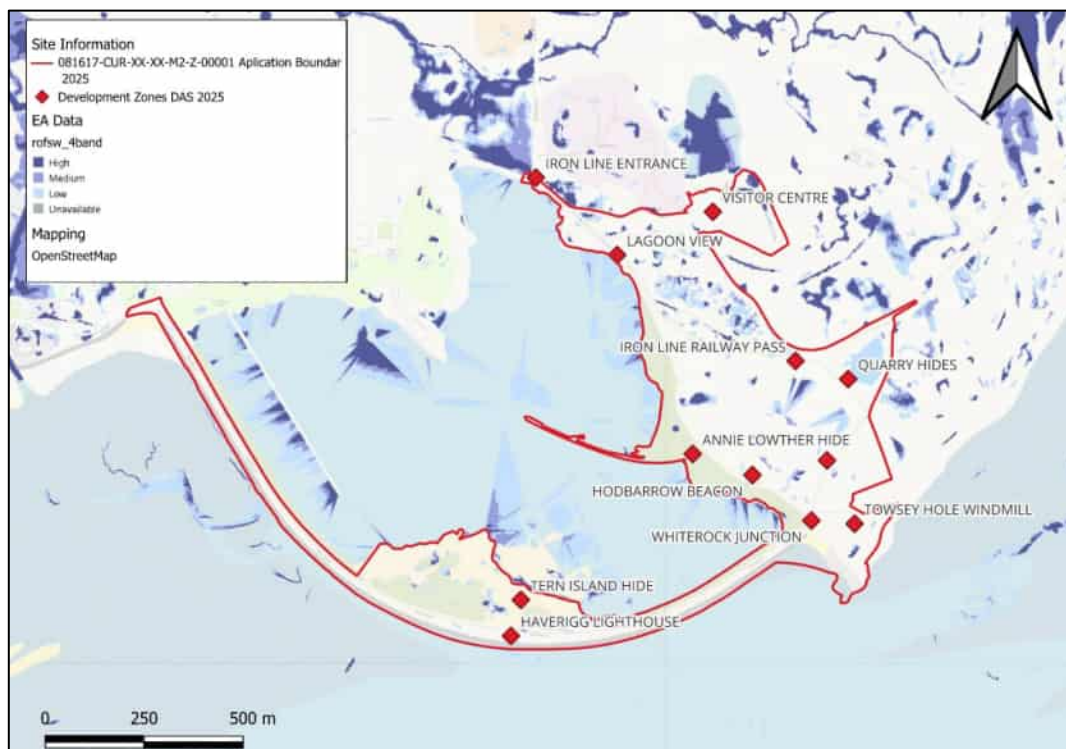


Figure 5-4: Risk of Flooding from Surface Water (Present Day)

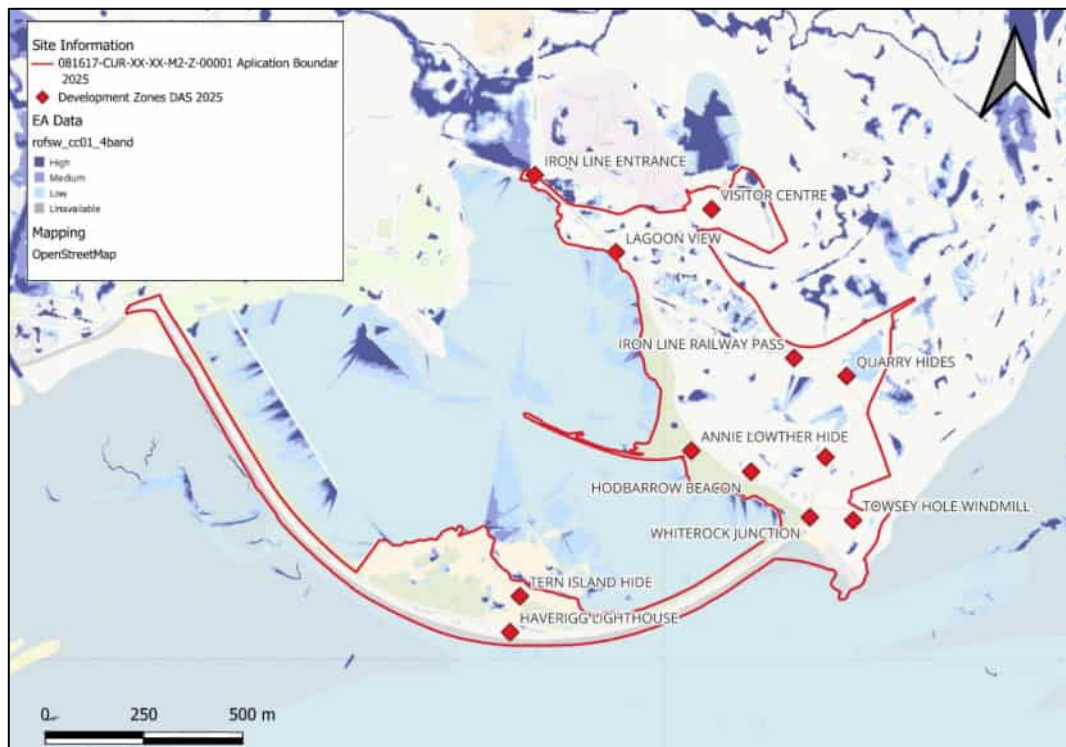


Figure 5-5: Risk of Flooding from Surface Water (between 2040 and 2060)

It can be seen from the maps that discreet locations within the site are shown to be at risk of flooding from surface water. The maps also indicates that these areas are where ponding occurs in low lying areas, and do not form overland flow routes though the site.

In respect to the area proposed for the Visitors Centre building, no flood risk from surface water is predicted.

There is also an area just beyond the north-western site entrance (to the west of Mainsgate Road) where flood risk from surface water during the Low probability scenario may result in flood depths up to 900mm deep with the carriageway. However, no encroachment into the site is predicted.

On this basis, the site overall is considered at **VERY LOW** risk from surface water flooding, for both present day and future climate change scenarios. Given the nature of the site, i.e., a nature reserve, the discreet areas identified as being at risk of flooding from surface water are not considered significant in respect to the development proposals.

Whilst not indicated on the RoFSW mapping, occasional flooding has been reported along the main access road off Mainsgate Lane. It is understood this is due to condition/capacity issues with the culvert crossing the access road, which we understand to discharge water from the former quarry site to the Lagoon. No information on flood depth has been confirmed however, reviewing the topography indicates a flood depth greater than around 300mm would overtop the raised ground to the southwest

of the access road, and flow into the lagoon. Based on current knowledge, the reported flooding of the access road is considered by this assessment to pose a **LOW** risk.

Measures to mitigate flood risk from Surface Water are, where required, proposed in Section 6 and within the accompanying Drainage Strategy.

5.5 Environment Agency Reservoir Flood Risk Mapping

The Environment Agency provide mapping to show flood risk from reservoirs. This is the risk of catastrophic failure and given that the majority of reservoirs in this area are maintained by the Environment Agency, United Utilities or Local Authority the probability of such failure is very low. An extract of the map is shown in Figure 5-6 below.



Figure 5-6: Environment Agency Flood Risk from Reservoirs – Extent of Flooding

The Reservoir Flood Map indicates there is no risk of flooding from this source when there is also flooding from the Duddon Estuary and other contributing watercourses.

Flooding from reservoirs is extremely unlikely. An area is considered at risk if peoples' lives could be threatened in the event of a dam or reservoir failure. Therefore, the site can be considered to be at **VERY LOW** risk from this source. Measures to mitigate flood risk from Reservoirs are, where required are proposed in Section 6.

5.6 Flooding from Groundwater

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike flooding from rivers, the sea, surface water or reservoirs, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in-bank river levels, artificial structures, groundwater rebound, and mine water rebound. Properties with basements or cellars or properties that are located within areas deemed to be susceptible to groundwater flooding are at particular risk. Development within areas that are susceptible to groundwater flooding will generally not be suited to SuDS; however, this is dependent on detailed site investigation and risk assessment at the FRA stage.

The EA's national dataset, Areas Susceptible to Groundwater Flooding (ASStGWF), is a low resolution map which uses four susceptibility categories to show the proportion of a network of 1 km grid squares where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring and is not suitable for planning considerations at a site-specific level. It should only be used as a trigger for further investigation as to the possibility of groundwater flooding.

The ASStGWF is shown on the SFRA Maps. However, these maps are not available at present.

The site is not reported to be at risk by the owners and based on the minimal superficial geology and bedrock of low solubility below, it can therefore be considered to be at **LOW** risk of flooding from this source. Measures to mitigate flood risk from Groundwater, where required, are proposed in Section 6.

5.7 Flooding from Canals and Artificial Waterbodies

There are no canals in the vicinity of the site.

The Lagoon is however considered to be an artificial water body, the water level being largely dependent on direct rainfall, runoff from the local topography and surface water discharge from the holiday parks to the western shoreline. Neither the Environment Agency Flood Map for River and Sea or Surface Water indicate the Lagoon to be a source of flood risk. It is however understood that a pump is installed and managed by the holiday park owners to control the level of the Lagoon.

The disused Redhills Quarry to the north of the site is also considered to be an artificial waterbody. As discussed in Section 3.6, it is understood that water levels in the quarry are controlled by means of

a private pumping station, discharging flow at a controlled rate to United Utilities Wastewater Treatment Works (WwTW) outfall/discharge pipe approximately 1km to the northeast. The Environment Agency Risk of Flooding from surface water map indicates flood risk within the quarry, however, there is no connectivity indicated between this and that indicated in the north-eastern corner of the site.

Based on current understanding of the Artificial Water Bodies adjacent to the site, the risk of flooding from this source is considered **VERY LOW**. Measures to mitigate flood risk from Artificial Waterbodies, where required are proposed in Section 6

5.8 Public Sewers, Highway Drainage Flooding and Infrastructure Failure

No existing drainage services have been identified within the site boundary.

United Utilities Sewer Records indicate Millom is well served by the public sewer system; the closest public sewer to the site is located within Mainsgate Road, approximately 270m to the north of the entrance to the site.

No incidents of flooding within the site, from this source, have been identified by this assessment. Historically however, flooding has occurred within Millom, cited as being associated with the public drainage infrastructure. This is discussed in detail in the following sections.

Surface water drainage infrastructure from the disused Redhills Quarry to the north of the site by means of a private pumping station, discharging flow at a controlled rate to United Utilities Wastewater Treatment Works (WwTW) outfall/discharge pipe approximately 1km to the northeast. No flooding to the site from this source has been identified by this assessment.

Based on current understanding of the drainage systems within and in the vicinity of the site, the risk of flooding from this source is considered **VERY LOW**. Measures to mitigate flood risk from Public Sewers, Highway Drainage Flooding and Infrastructure Failure are, where required are proposed in Section 6 and within the accompanying Drainage Strategy.

5.9 Historic Flooding

The EA has not provided historic flood event maps as part of the Product 4 flood risk data pack for the site, suggesting that there is no record of flooding within the site.

A review of the EA's web-based mapping service¹¹ has been undertaken to confirm any recorded flood event data. Figure 5-7 below shows recorded flood outlines in the vicinity of the site and wider area.

¹¹ <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/RecordedFloodOutlines&Mode=spatial>

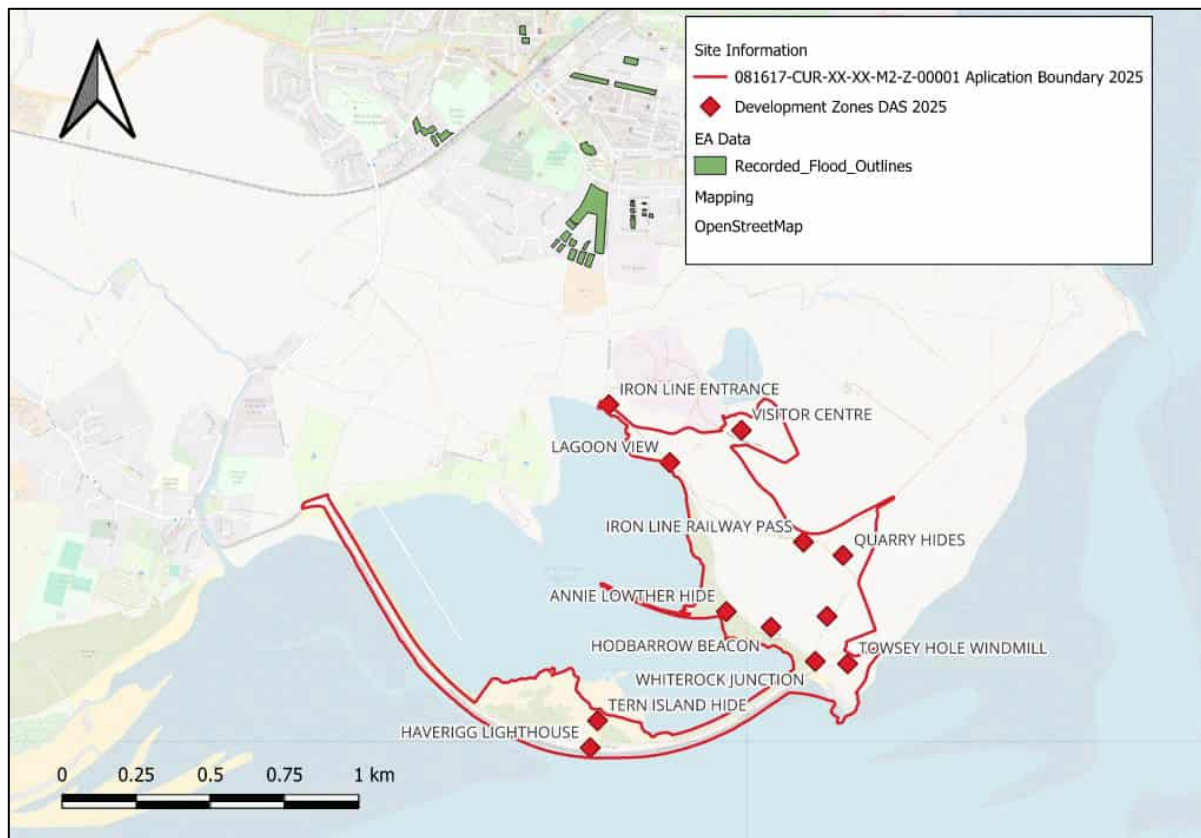


Figure 5-7: Historic Flood Outlines for Millom (Environment Agency)

The metadata attached to the historic flood outlines identify the event to have occurred on 30th September 2017 and the source to be local drainage / surface water.

Under Section 19 of the Flood and Water Management Act 2010, on becoming aware of a flood in its area, a Lead Local Flood Authority (LLFA) must, to the extent that it considers necessary or appropriate, investigate and subsequently publish the results of its investigation.

Cumbria, Cumbria County Council (CCC) undertook such an investigation¹² following the September 2017 flooding in Millom and Haverigg. The areas identified in the subsequent report of January 2018 coincide with those shown on the EA's historic flood outline map.

The report concludes that the cause of the flooding was due to the intense rainfall event overwhelming the drainage assets, however, in some locations it may have been compounded by faults on some of the drainage systems. At the time of the report's draft publication (January 2018) work had already begun to repair identified faults.

¹² <https://cumbria.gov.uk/elibrary/Content/Internet/544/3887/6729/6732/43277185622.pdf>

The report also identified recommended actions to reduce the risk of flooding for the future. These actions are categorised as Community Resilience, Upstream Management, Maintenance and Strengthening Defences.

As referenced in Section 5.4 occasional flooding has been reported along the main access road off Mainsgate Road. The frequency of flooding is not confirmed however, based on current knowledge, the reported flooding of the access road is considered by this assessment to pose a low risk.

Measures to mitigate flood risk associated with historic flooding are, where required, proposed in Section 6 and within the accompanying Drainage Strategy.

5.10 Climate Change

Guidance on the impacts of climate change on flood risk is provided on the GOV.UK website page 'Flood risk assessment: climate change allowances'¹³. This was initially published on the 19th February 2016 and was last updated on 27th May 2022.

The guidance covers the impacts on peak river flow, peak rainfall intensity, sea level rise, offshore wind speed and extreme wave height.

The development lifetime of 75 years and assumed planning approval date of 2025 would mean that climate change must be considered using the 2080's epoch uplifts.

Whilst the EA have provided model results for a climate change scenario, the modelling work was undertaken in 2012 and in respect to sea level rise the climate change results may not reflect current guidance.

In respect to tidal flooding, guidance currently advises the use of the Environment Agency's R&D project, 'Coastal Flood Boundary Conditions for UK Mainland and Islands' (SC060064)¹⁴ alongside Table 1 of its climate change allowances guidance¹⁵ for determining likely tidal levels at the end of lifetime of the development.

The Environment Agency's R&D project, 'Coastal Flood Boundary Conditions for UK Mainland and Islands' (SC060064)¹⁶ provides information on extreme sea levels around the coasts of England, Wales, Scotland and Northern Ireland, along flood levels of priority tidal rivers and estuaries.

A review of the coastal design sea level data has been undertaken to both confirm the current design sea level and for assessment in the impact of climate change using the Duddon Estuary data.

¹³ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

¹⁴ <https://www.data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>

¹⁵ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#sea-level-allowances>

¹⁶ <https://www.data.gov.uk/dataset/73834283-7dc4-488a-9583-a920072d9a9d/coastal-design-sea-levels-coastal-flood-boundary-extreme-sea-levels-2018>

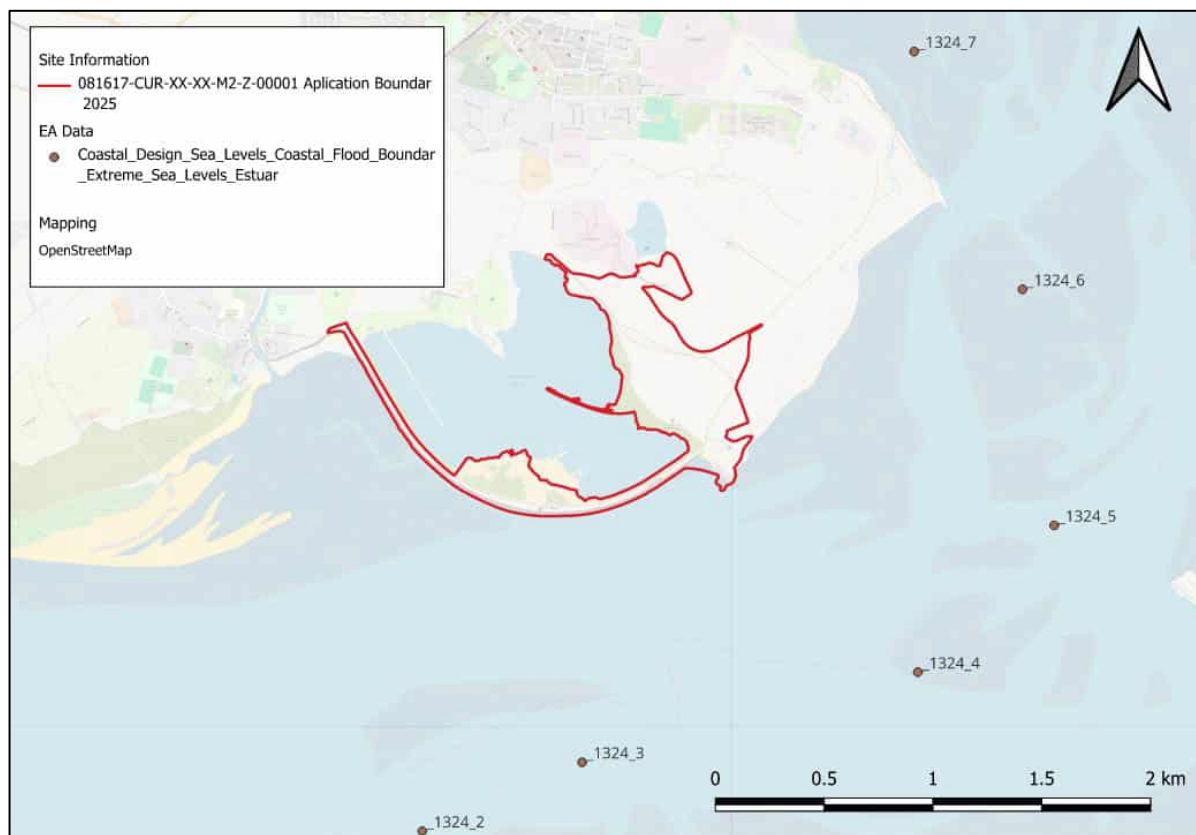


Figure 5-8: Coastal Design Sea Levels - Duddon Estuary Node Locations

The extreme sea levels along the estuary are identified by unique chainage. It is considered that nodes 1324_2 to 1324_6 are relevant to the site, with 1324_4 the most applicable. The 0.5%AEP (1 in 200-yr) extreme tide level ranges from 6.25mAOD to 6.34mAOD.

In respect to tidal flooding, the site location in Millom puts the development within the North West River Basin District. Figure 5-6 below shows details the sea level rise for each epoch.

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
North west	Higher central	4.5 (158)	7.3 (219)	10 (300)	11.2 (336)	1.01
North west	Upper end	5.7 (200)	9.9 (297)	14.2 (426)	16.3 (489)	1.41

Figure 5-9: Sea level allowances by river basin district (extract from Table 2¹⁶)

The climate change flood level in respect to tidal flood risk is taken as the 0.5% AEP (1 in 200-yr) flood level to the end of design life of the Visitors Centre, stated previously as 75 years hence. i.e., to 2100.

Table 5-2 below shows the determined sea level rise and tidal estuary climate change flood levels for both the Higher Central and Upper End scenarios as required by the EA guidance.

Table 5-2: Predicted Sea Level Rise and Climate Change Levels in 2100

Higher Central

Duddon Estuary Node	Base Sea Level 2017 (mAOD)	Total Sea Level Rise between years (mm)					Climate Change Sea Level (2100) (mAOD)
		2017-2035	2036-2065	2066-2095	2096-2100	Total	
1324_2	6.25	81	219	300	56	656	6.91
1324_3	6.27	81	219	300	56	656	6.93
1324_4	6.30	81	219	300	56	656	6.96
1324_5	6.32	81	219	300	56	656	6.98
1324_6	6.34	81	219	300	56	656	7.00

Upper End

Duddon Estuary Node	Base Sea Level 2017 (mAOD)	Total Sea Level Rise between years (mm)					Climate Change Sea Level (2100) (mAOD)
		2017-2035	2036-2065	2066-2095	2096-2100	Total	
1324_2	6.25	102.6	297	426	81.5	907.1	7.16
1324_3	6.27	102.6	297	426	81.5	907.1	7.18
1324_4	6.30	102.6	297	426	81.5	907.1	7.21
1324_5	6.32	102.6	297	426	81.5	907.1	7.23
1324_6	6.34	102.6	297	426	81.5	907.1	7.25

The results of the above Higher Central assessment compare well with the EA's model output data for both the current undefended 0.5% AEP (1 in 200-yr) tidal flood level of 6.28mAOD and the undefended 0.5% AEP (1 in 200-yr) plus climate change (600mm SLR) tidal flood level of 6.93mAOD. These are compared to derived values of 6.30mAOD and 6.96mAOD at Node 1324_4.

The upper end allowance is based on the 95th percentile (confidence limit) and results in a climate change extreme tide level of 7.21mAOD at Node 1324_4.

Considering the closeness of fit between the EA modelled climate change results and the results of the Higher Central assessment using the Coastal Flood Boundary Conditions for UK Mainland and Islands, it is considered stating this figure (**6.96mAOD**) as the appropriate climate change tidal level.

5.11 Design Flood Level

The Environment Agency Flood Risk and Coastal Change Guidance¹⁷ defines the “Design Flood” as

- river flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year); or tidal flooding with a 0.5% annual probability (1 in 200 chance each year); or
- surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year),
- plus an appropriate allowance for climate change.

Of the flood level assessments undertaken, the highest predicted flood levels are those from the EA Product 4 data which considers tidal flood risk:

- 0.5% AEP (1 in 200-yr) Undefended – 6.28mAOD (Flood Zone 3)
- 0.1% AEP 1 in 1000-yr) Undefended – 7.49mAOD (Flood Zone 2)

When considering climate change, for the Tidal Flood Risk, which has been confirmed as the modelled undefended 0.5% AEP (1 in 200-yr) plus 600mm sea level rise for the northwest river basin district, giving a predicted climate change flood level at for the site as:

- 0.5% AEP (1 in 200-yr) plus 600mm – **6.96mAOD (The Design Flood Level)**

5.12 Summary of Flood Risk

From the evidence collated, the main types of flooding that may apply to the proposed development site are as follows:

- Fluvial flooding to the site – **NONE**
- Tidal flooding to the site - **HIGH**
- Reservoir flooding to the site – **NONE**
- Groundwater flooding to the site – **VERY LOW**
- Public Sewers and Drainage flooding to the site – **VERY LOW**
- Surface water flooding to the site – **LOW**
- Surface water flooding from the site – **LOW**
- Historic Flooding – **NONE**
- Canals and Artificial Sources –**VERY LOW**

¹⁷ <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

6.0 Flood Risk Mitigation

6.1 Fluvial / Tidal Flood Risk Mitigation

This assessment has concluded that part of the site is at risk from tidal flooding from the 0.5%AEP plus climate change undefended event.

The development site lies across Flood Zone 1, Flood Zone 2 and Flood Zone 3, with the proposed Visitors Centre and Car Park located in Flood Zone 1. The majority of landmarks and key spaces lie above the predicted climate change flood levels though the wider site lies within Flood Zone 3 and are designated as Water Compatible.

6.2 Finished Floor Level

The EA's standing advice on setting finished ground floor levels for sites in Flood Zone 2 or Flood Zone 3 is that they should be set a minimum of whichever is higher of 300mm above the:

- average ground level of the site
- adjacent road level to the building
- estimated river or sea level.

The estimated flood level is defined as:

- a river flood level with a 1%AEP (1 in 100-yr) or greater annual probability plus an allowance for climate change
- tidal flood level with a 0.5%AEP (1 in 200-yr) annual probability plus an allowance for climate change

Using the EA information, the design flood level has been determined to be:

- 0.5% AEP (1 in 200-yr) plus 600mm – **6.96mAOD**

Finished Floor Levels should, where possible, be a minimum of 300mm above the 0.5%AEP Flood Level, i.e., no lower than **7.26mAOD**

In respect to the Visitors Centre, the proposed finished floor level (FFL) will be set at **14.50mAOD**, marginally above existing ground levels, with shallow gradient ramped access.

6.3 Surface Water Flooding to the site Mitigation

Based on the above assessment, the risk of surface water flooding to the site is considered to be very low.

The Visitors Centre is situated on elevated land. Provided external levels are set to fall away from the building, the risk to the building from surface water is therefore considered very low post development.

Anecdotal flooding of the access road is understood to be the result of a blocked / poorly maintained culvert. Mitigation measures in this location should consider improve maintenance and or replacement of the culvert if found inadequate either hydraulically or structurally.

Provided a surface water drainage scheme is implemented, flood risk from surface water is considered low, post development.

6.4 Surface Water Flooding from the site Mitigation

Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for the critical 1 in 30-year storm event and flood water generated from up to the critical 1 in 100-year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments & services.

In respect to rainfall, the site lies in the South West Lakes Management Catchment. The Environment Agency published climate change allowances¹⁸ for peak rainfall intensities which should be applied to new developments.

The current guidance requires climate change uplifts in peak rainfall must be considered for both the 1% (1 in 100-yr) and 3.3% (1 in 30-yr) annual exceedance probability events.

In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration.

The accompanying Drainage Strategy reviews the surface water discharge options and presents a full design to demonstrate surface water is adequately dealt with from both the Visitors Centre and associated car park.

The other features associated with development proposals do not require additional surface water management in respect to formal drainage, with the exception of the culvert crossing the access road.

6.5 Reservoir Flooding Mitigation

There are reservoirs within the wider vicinity of the site. The EA Flood Risk from Reservoir map indicates the site is not at risk from this source. No specific measures are required at this location to mitigate against reservoir flooding.

¹⁸ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

6.6 Groundwater Flood Mitigation

Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.

The site is considered at very low risk of groundwater flooding based on the evidence from geological data.

External ground levels across the site should fall away from the proposed Visitors Centre and ensure that the creation of low points is avoided (other than those used intentionally for drainage features) in order that in the unlikely event of groundwater flooding, the flood water is safely routed away from the building on site.

Providing the above mitigation measures are imposed, the risk from groundwater flooding would be considered very low post development.

6.7 Public Sewer, Highway Drainage Flooding and Infrastructure Failure Mitigation

Little existing drainage services have been identified within the site boundary.

The nearest public sewers are located 270m to the north of the entrance to the site.

No specific measures are therefore required within the development site to mitigate against flooding from sewers.

Other drainage infrastructure identified within the vicinity of the site relates to the management of the Hodbarrow Lagoon and disused Redhills Quarry. Mitigation measures where if required are discussed in Section 6.8 below.

6.8 Canal and Artificial Waterbodies Flooding Mitigation

There are no canals in the vicinity of the site.

The Lagoon is however considered to be an artificial water body, the water level being largely dependent on direct rainfall, runoff from the local topography and surface water discharge from the holiday parks to the western shoreline. It is understood that a pump is installed and managed by the holiday park owners to control the level of the Lagoon. Similarly, the disused Redhills Quarry to the north of the site is also considered to be an artificial waterbody. Water levels in the quarry are also controlled by means of a private pumping station, discharging flow at a controlled rate to United Utilities Wastewater Treatment Works (WwTW) outfall/discharge pipe approximately 1km to the northeast.

The water levels in both waterbodies are monitored and well controlled. It is therefore unlikely flooding from either source poses a risk, even under a pumping failure scenario. No specific measures are therefore required within the development site to mitigate against flooding from artificial waterbodies.

7.0 Managing Residual Flood Risk

7.1 Residual Risk

Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. In this case, the residual risk is the risk of fluvial flooding to the site and the occupants of the building. The following sections describe how and by whom these risks should be managed for this site.

7.2 Flood Warning

The site lies within an area where both Flood Alerts and Flood Warnings are provided by the Environment Agency. Figure 7-1 below shows the areas covered.

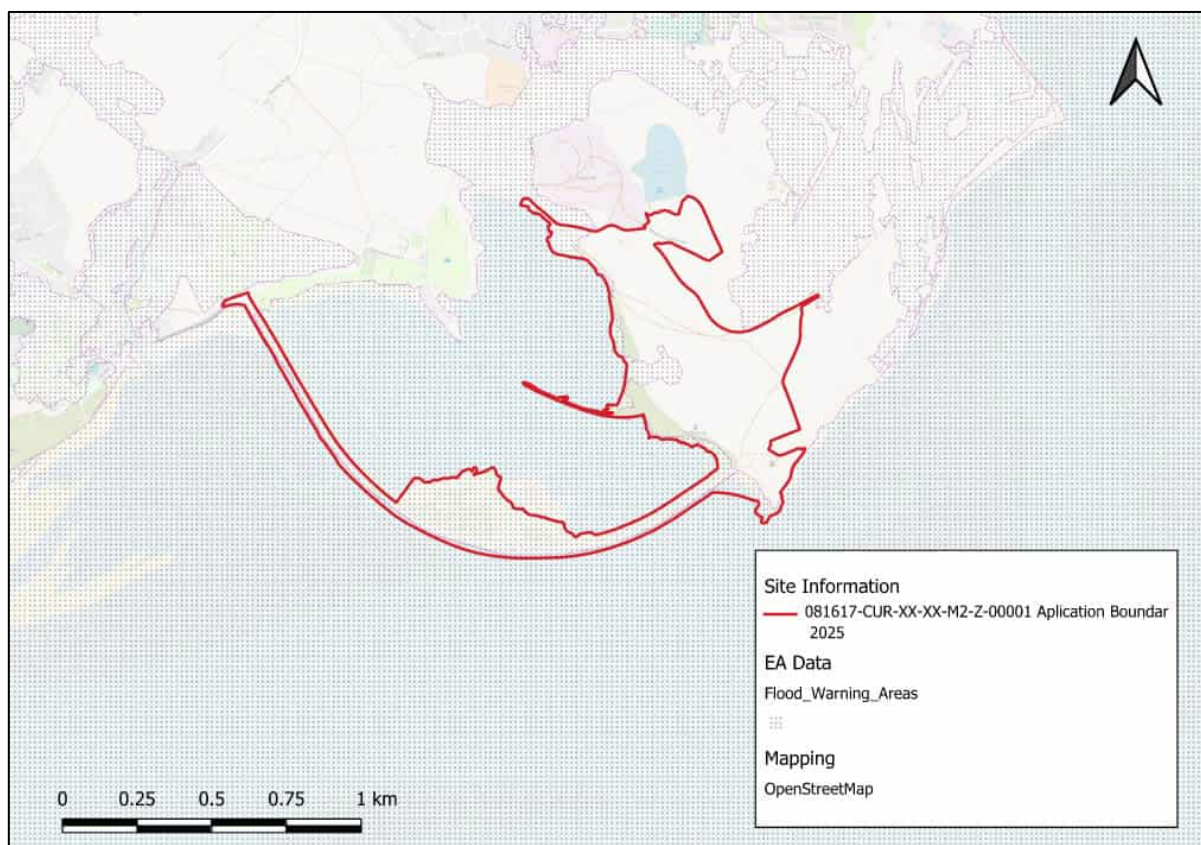


Figure 7-1: Environment Agency Flood Alert and Warning Areas

A Flood Alert is issued to warn people of the possibility of flooding and encourage them to be alert stay vigilant and make early / low impact preparations for flooding. Flood Alerts are issued earlier than Flood Warnings to provide advance notice of the possibility of flooding and may be issued when there is less confidence that flooding will occur in a Food Warning Area.

Flood Warning Areas are geographical areas where flooding is expected to occur and where the EA provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater. Specifically, Flood Warning Areas define locations within the Flood Warning Service Limit that represent a discrete community at risk of flooding. A discrete community is a recognised and named geographical community, which can be an urban area, a significant suburb of a large city or a village or a hamlet. The purpose of Flood Warnings is to alert people that flooding is expected, and they should take action to protect themselves and their property. Flood Warnings are issued when flooding is expected to occur.

The site lies in the Flood Warning Area for the Cumbrian Coastline at Cumbrian coastline at Duddon estuary, between Haverigg, Duddon Bridge, Dunnerholme and A595, Flood Warning Service (FWS) Code 011FWCN4B. The areas at risk include the Duddon Estuary including Haverigg, Port Haverigg Holiday Village, Millom and Millom Marsh.

In order to receive flood alerts and warning, the site owner should register to receive warnings directly from the EA's service.

<https://www.gov.uk/sign-up-for-flood-warnings>

The EA also provide a 24-hr service, **Floodline**, which can be reached by **phone: 0345 988 1188** where advice on how to stay safe during a flood can be obtained.

This information should be prominently displayed within the building and accessible to all occupants.

7.3 Evacuation Plan

A flood warning and evacuation plan is important at any site that has transient occupants (e.g., hostels and hotels, visitor attractions). It is anticipated that as an operational establishment, Hodbarrow Nature Reserve has an appropriate plan in place. It is recommended that this be reviewed at regular intervals as flood risk may change over time.

Whilst the proposed Visitors Centre lies in an area of the site not at risk of flooding, certain parts of the site lie within the Flood Zone 3 and within the EA's Flood Warning area, along with access and egress points to the site.

Should evacuation not be possible, the Visitors Centre will provide a means of safe refuge at ground Finished Floor Level (FFL), set at an elevation of 14.50mAOD, 7.54m above the design flood level.

The Flood Warning, Evacuation / Safe Refuge Plan should be prominently displayed within the Visitors Centre and accessible to all visitors and staff.

8.0 Conclusions and Recommendations

In consideration of the flood risk assessment and outline surface water management strategy for the site, the following conclusions and recommendations are made:

The site has been assessed to lie across Flood Zone 1, Flood Zone 2 and Flood Zone 3 by reference to the Environment Agency Flood Map for Planning. A further review of the Copeland Strategic Flood Risk Assessment confirms the Flood Zone 3 area to be Flood Zone 3a.

The development proposal is for non-residential development. By reference to NPPF Annex 3, the Visitors Centre is to be located in an area of the site designated as Flood Zone 1, is classed as Less Vulnerable and therefore, in accordance with NPPF PPG Table 2 (Reference ID: 7-079-20220825) is concluded to be appropriate within this Flood Zone Flood Zone

The other elements of the proposed development; repair and stabilisation works at Hodbarrow Beacon, repair and stabilisation works at Towsey Hole Windmill, installation of cladding and new living roof to existing bird hide, erection of new bird hides and viewing platforms, creation of new multi-use pathways with signage, gateway features and street furniture, making good of existing byway (BOAT) along sea wall, enhancement of wildlife habitats, and associated access and landscaping are determined to be Water Compatible and therefore, in accordance with NPPF PPG Table 2 (Reference ID: 7-079-20220825) are concluded to be appropriate within all Flood Zones within the site.

The assessment has undertaken a review and quantified the risk of flooding from all sources, and concludes the following risk to and from the site as follows:

- Fluvial flooding to the site – **NONE**
- Tidal flooding to the site - **HIGH**
- Reservoir flooding to the site – **NONE**
- Groundwater flooding to the site – **VERY LOW**
- Public Sewers and Drainage flooding to the site – **VERY LOW**
- Surface water flooding to the site – **LOW**
- Surface water flooding from the site – **LOW**
- Historic Flooding – **NONE**
- Canals and Artificial Sources – **VERY LOW**

With the exception of dealing with surface water flood risk anecdotally reported on the access road, believed to be due to culvert capacity / blockage, no further mitigation is required for other sources of flood risk by this assessment.

In respect to surface water flooding from the site, post-development, a Surface Water Drainage Strategy has been developed as part of the accompanying documents for a planning submission.

Fluvial and Tidal Flood Risk has been assessed on what the EA advise to be the most relevant information to the site.

This assessment concludes that the “Design Flood Level”, including an appropriate allowance for climate change is **6.96mAOD**.

In accordance with current Environment Agency Guidance, Finished Floor Levels should be set, where possible, be a minimum of 300mm above the Design Flood Level,

It is recommended that Finished Floor Levels are set no lower than **7.26mAOD**.

As the proposed finished floor level for the Visitors Centre is set at **14.5mAOD**, the requirements for a minimum level are satisfied.

Appendices

Appendix A – Development Proposals

FURNITURE / BOUNDARIES

- F1.0 - PICNIC TABLE**
Location: Site wide
Material: Corten Steel / Timber / Concrete
- F2.0 - BENCH**
Location: Site wide
Material: Corten Steel / Timber / Concrete
- F2.1 - BENCH (EXISTING)**
Location: Site wide
Material: Timber
- F3.0 - WAYFINDING - SITE NAVIGATION**
Location: Site wide (Review - Final locations T.B.C.)
Material: Corten Steel w/ laser cuttings
- F4.0 - WAYFINDING - ARRIVAL**
Location: Site wide (Review - Final locations T.B.C.)
Material: Corten Steel w/ laser cuttings
- F5.0 - INFO BOARD: ECOLOGY**
Location: Site wide (Review - Final locations T.B.C.)
Material: Corten Steel w/ laser cuttings
- F5.1 - INFO BOARD: MAP LOCATION**
Location: Site wide (Review - Final locations T.B.C.)
Material: Corten Steel w/ laser cuttings
- F5.2 - INFO BOARD: HERITAGE**
Location: Site wide (Review - Final locations T.B.C.)
Material: Corten Steel w/ laser cuttings
- F6.0 - VIEWING SCREEN**
Location: To Hidden Lagoon
Material: Timber
- F7.0 - DOUBLE LEAF GATE**
Location: Road to Welcome Building / HWRC
Material: Subject to future detail
- F7.1 - SINGLE LEAF GATE**
Location: To RSPB BOAT boundary
Material: Subject to future detail
- F8.0 - FEATURE FENCE**
Location: Site wide
Material: Timber
- F8.1 - EXISTING FENCE**
Location: Site wide
Material: Timber
- F9.0 - FEATURE ARTWORK**
Location: Site wide (Review - Final locations T.B.C.)
Refer to Design & Access Statement Chapter 7
- F10.0 - CAR PARK PAY MACHINE**
Location: To Visitor Centre car park
Material: -
- F11.0 - FEATURE CONC BENCH w/ TIMBER TOP**
Location: Site wide
Material: Concrete / Timber
- F12.0 - CYCLE PARKING**
Location: To Haverigg Lighthouse
Material: Concrete
- F13.0 - TIMBER LOGS**
Location: To car parking spaces
Material: Timber
- F14.0 - EV CHARGING LOCATIONS**
Location: To welcome building car park
Material: -
- F15.0 - THRESHOLD DETAIL**
Location: To key thresholds
Material: Corten
- F16.0 - BIRD HIDE**
Location: To Hidden Lagoon / Lagoon
Material: (Review - Final materials T.B.C.)

- NOTES:
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26/03/2025

REVISION HISTORY

DATE	REV	ZONE	DESCRIPTION	CHK
26/03/25	P01		Stage 03 draft issue - for coordination	MDM

KEY

GENERAL INFORMATION

APPLICATION BOUNDARY

HARDWORKS

S1.0 - SELF BINDING GRAVEL WITHOUT EDGINGS EXCEPT ON STEEP GRADIENTS (P)
Location: To primary pedestrian routes
Dims: 15m wide

S2.0 - STONE TO DUST SURFACE (P)
Construction methodology TBC following completion of B.O.A.T. condition survey by Curtins
Assumed: Road planned to min 3m width - pot holes filled - Type 1 dressing with Grano Dust surface finish
Location: To B.O.A.T.
Dims: As existing

S3.0 - TIMBER BOARDWALK (P)
Location: To sand dune raised walkway
Dims: 18m wide w/ low upstand

S4.0 - VEHICULAR MACADAM (V)
Location: Visitor Centre car park / Access Road Trench
Dims: 15m wide trench cover w/ passing places

S5.0 - VEHICULAR ROUTE (MACADAM) (V)
Construction methodology TBC following completion of B.O.A.T. condition survey by Curtins
Assumed: Some resurfacing as per S4.0 specification
Location: To access road from Mainsgate Road to welcome building - existing surface made good
Dims: 48m wide

S6.0 - NATURAL STONE PAVING (P)

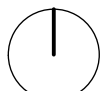
S7.0 - INSITU CONCRETE w/ SMOOTH FINISH (P)
Location: To in ground railway details / Visitor Centre / Hobarrow Lighthouse

S7.1 - INSITU CONCRETE w/ EXPOSED AGGREGATE FINISH (P)
Location: To Visitor Centre / Whiterock Junction

S8.0 - REINFORCED GRAVEL (P)
Location: To Visitor Centre car park / Annie Lowther Hide

S9.0 - RAISED STEEL WALKWAY (P)
Location: To Visitor Centre

SE - SURFACE EXISTING
Location: As noted



STORY



ORIGINATOR



Client

Cumberland Council

Project

The Iron Line
Millom, Cumbria

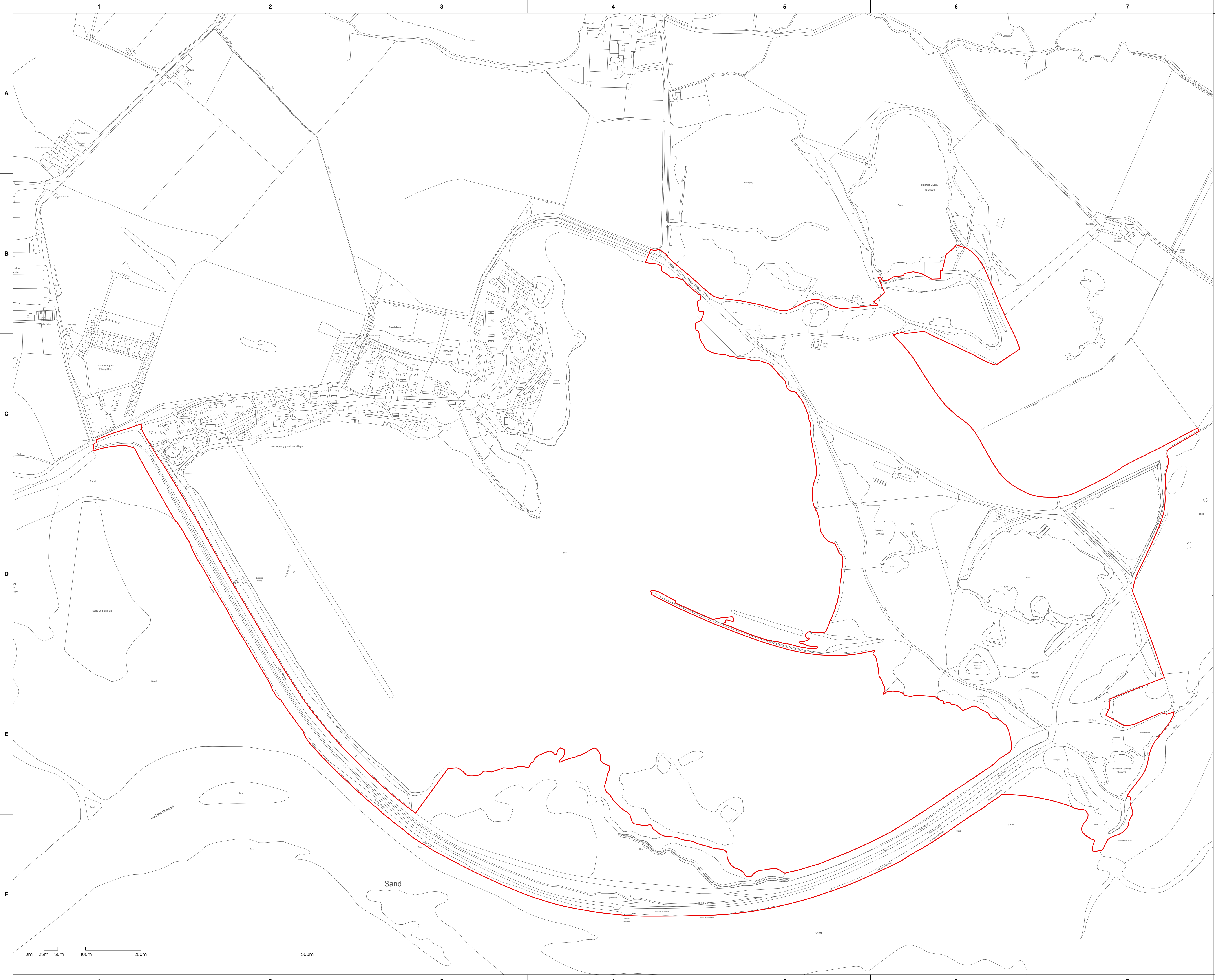
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GA | Site Masterplan

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MDM	CL	1:3000	A1

Project Number	Originator	Volume	Level	File Type	Discipline	Number
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Work Stage	Status	Revision
Stage 3	Planning	P01



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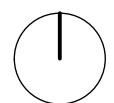
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REVISION HISTORY				
DATE	REV	ZONE	DESCRIPTION	CHK
26/03/25	P01		Stage 03 draft issue - for coordination	MDM

KEY

GENERAL INFORMATION

**STORY**

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Client

Cumberland Council

Project

The Iron Line

Millom, Cumbria

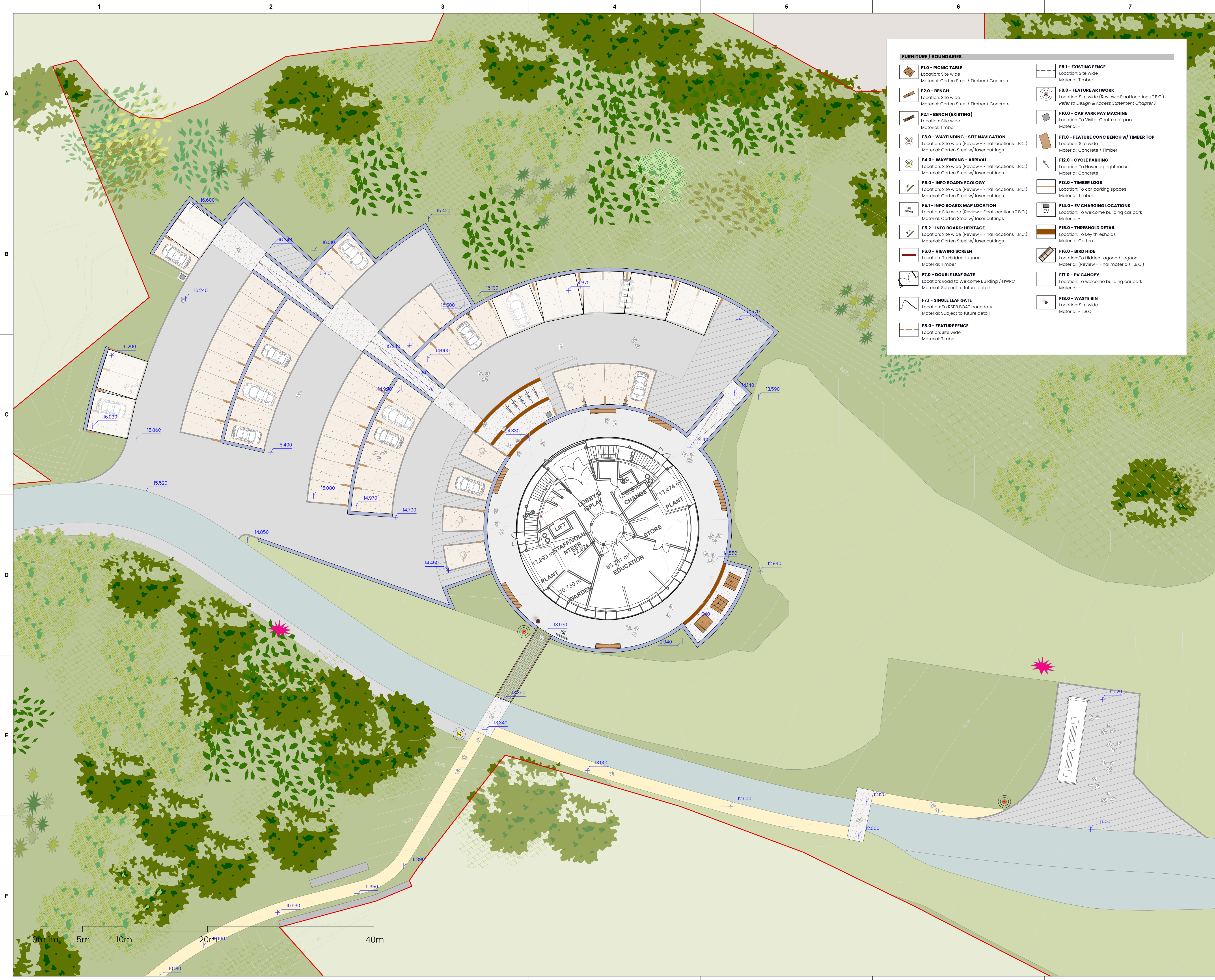
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GA | Application Boundary

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Project Number	Originator	Volume	Level	File Type	Discipline	Number
289	LYR	XX-ZZ-DWG-L-1001				

Work Stage	Status	Revision
Stage 3	Planning	P01



FURNITURE / BOUNDARIES	
F1.0 - PICNIC TABLE Location: Site wide Material: Corten Steel / Timber / Concrete	F8.1 - EXISTING FENCE Location: Site wide Material: Timber
F2.0 - BENCH Location: Site wide Material: Corten Steel / Timber / Concrete	F8.0 - FEATURE ARTWORK Location: Site wide (Review - Final locations T.B.C.) Refer to Design & Access Statement Chapter 7
F2.1 - BENCH (EXISTING) Location: Site wide Material: Timber	F10.0 - CAR PARK PAY MACHINE Location: To Visitor Centre car park Material: -
F3.0 - WAYFINDING - SITE NAVIGATION Location: Site wide (Review - Final locations T.B.C.) Material: Corten Steel w/ laser cuttings	F11.0 - FEATURE CONC BENCH w/ TIMBER TOP Location: Site wide Material: Concrete / Timber
F4.0 - WAYFINDING - ARRIVAL Location: Site wide (Review - Final locations T.B.C.) Material: Corten Steel w/ laser cuttings	F12.0 - CYCLE PARKING Location: To Haverigg Lighthouse Material: Concrete
F5.0 - INFO BOARD: ECOLOGY Location: Site wide (Review - Final locations T.B.C.) Material: Corten Steel w/ laser cuttings	F13.0 - TIMBER LOGS Location: To car parking spaces Material: Timber
F5.1 - INFO BOARD: MAP LOCATION Location: Site wide (Review - Final locations T.B.C.) Material: Corten Steel w/ laser cuttings	F14.0 - EV CHARGING LOCATIONS Location: To welcome building car park Material: -
F5.2 - INFO BOARD: HERITAGE Location: Site wide (Review - Final locations T.B.C.) Material: Corten Steel w/ laser cuttings	F15.0 - THRESHOLD DETAIL Location: To key thresholds Material: Corten
F6.0 - VIEWING SCREEN Location: To Hidden Lagoon Material: Timber	F16.0 - BIRD HIDE Location: To Hidden Lagoon / Lagoon Material: (Review - Final materials T.B.C.)
F7.0 - DOUBLE LEAF GATE Location: Road to Welcome Building / HWRC Material: Subject to future detail	F17.0 - PV CANOPY Location: To welcome building car park Material: -
F7.1 - SINGLE LEAF GATE Location: To RSFB BOAT boundary Material: Subject to future detail	F18.0 - WASTE BIN Location: Site wide Material: - T.B.C
F8.0 - FEATURE FENCE Location: Site wide Material: Timber	

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DATE	REV	ZONE	DESCRIPTION	CHK
26/03/25	P01		Stage 03 draft issue - for coordination	MDM
03/04/25	P02		Updates	MDM

KEY	
GENERAL INFORMATION	
	APPLICATION BOUNDARY
HARDWORKS	
	S1.0 - SELF BINDING GRAVEL WITHOUT EDGINGS EXCEPT ON STEEP GRADIENTS (P) Location: To primary pedestrian routes Dims: 15m wide
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	S5.0 - VEHICULAR ROUTE (MACADAM) (V) Construction methodology TBC following completion of B.O.A.T. condition survey by Curtins Assumed: Some resurfacing as per S4.0 specification Location: To access road from Mainsgate Road to welcome building - existing surface made good Dims: 4.8m wide
	S6.0 - NATURAL STONE PAVING (P) Location: To Towsey Hole Windmill
	S7.0 - INSITU CONCRETE w/ SMOOTH FINISH (P) Location: To in ground railway details / Visitor Centre / Hodborrow Lighthouse
	S7.1 - INSITU CONCRETE w/ EXPOSED AGGREGATE FINISH (P) Location: To Visitor Centre / Whiterock Junction
	S8.0 - REINFORCED GRAVEL (P) Location: To Visitor Centre car park / Annie Lowther Hide
	S9.0 - RAISED STEEL WALKWAY (P) Location: To Visitor Centre
	SE - SURFACE EXISTING Location: As noted

STORY
Cumberland Council

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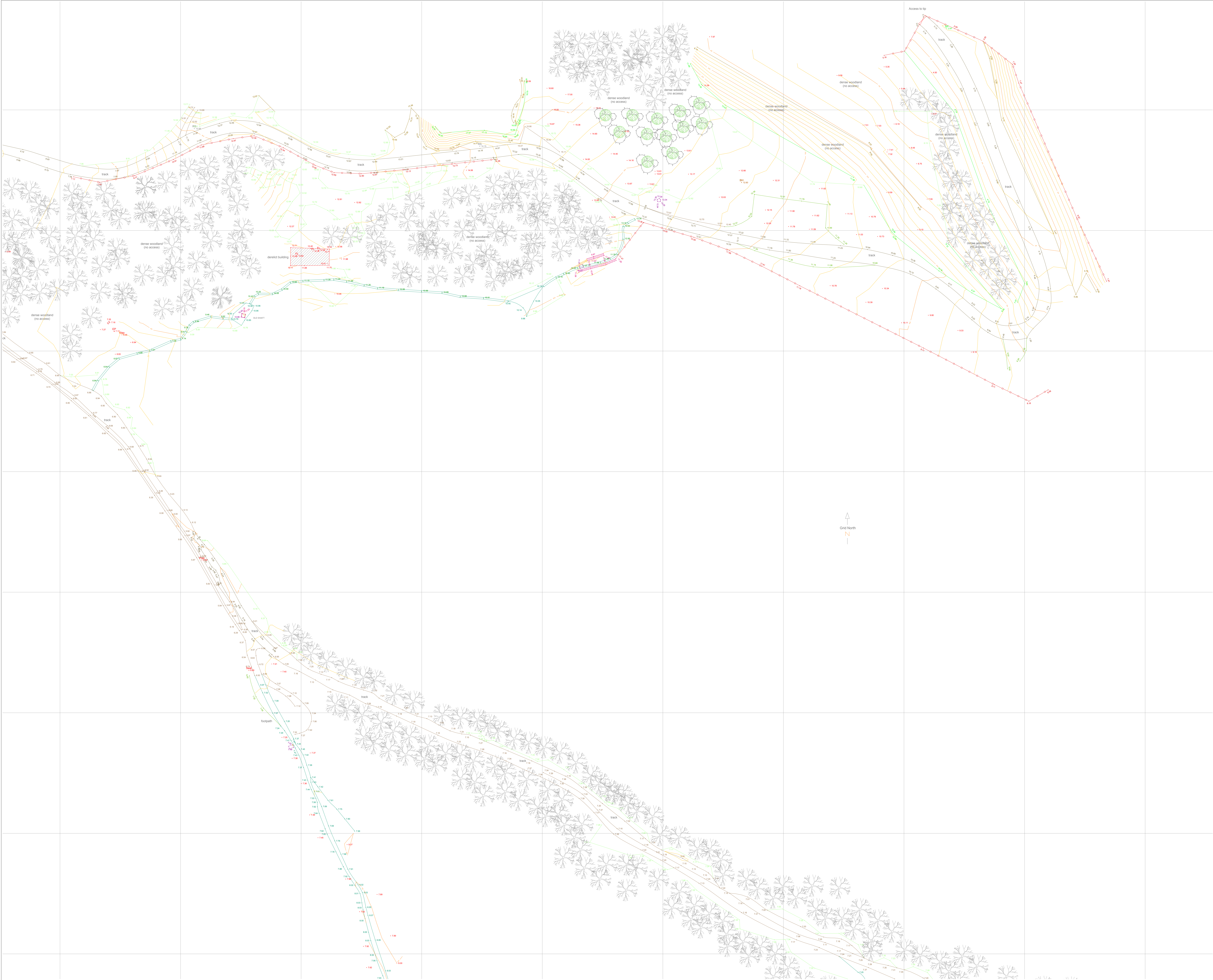
Client
Cumberland Council

Project
The Iron Line
Millom, Cumbria

Drawing Title
GA | Welcome Building 1:200

Created By MDM	Checked By CL	Scale 1:200	Sheet Size A1
Project Number 289	Originator LYR	Volume XX-ZZ-DWG-L-1203	Number
Work Stage Stage 3	Status Planning	Revision P02	

Appendix B – Topographic Survey



Building

Barrier

Bottom of Bank

British Telecom

Concrete

Canopy

Drop Kerb

Drain

Fence

Flower Bed

Fence - Birdsmouth

Foliage

Footpath

Fence - Security

Fence - Wire

Grass

Gate

Hedge

Kerb

Kerb Top

Lake / Pond

Marsh

Overhead Electricity Line

Overhead Telephone Line

Ramp

Sign Post

Tarmac

Top of Bank

Track

Verge

Road Markings

Wall

Contours

Steep Slope

Spot height in metres

Post Box

Borehole

Bus Stop

Cable TV

Electricity Pole

Earth Rod

Fire Hydrant

Floor Level

Flag Pole

Gas Valve

Gas Marker

Gate Post

Gully

Inspection Chamber

Invert Level

Lamp Post

Manhole

Marker

Rodding Eye

Road Sign

Stop Cock

Septic Tank

Survey Station

Sign Post

Stop Valve

Traffic Light

Telegraph Pole

Water Meter

Tree (deciduous)

Tree (coniferous)

Tree (unsurveyed)

Shrub

amrgeomatics

SURVEY STATIONS MARKED WITH ROAD NAILS AND PEGS
WITH COORDINATES RELATING TO OSGB36 NATIONAL GRID

SITE LEVELS MARKED AT STATIONS RELATE TO
ORDNANCE DATUM OSGM15, VIA DIFFERENTIAL GPS.

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Site

"THE IRON LINE"

MILLOM

Drawing

TOPOGRAPHICAL SURVEY

Date07 JULY 2022

Scale1: 500 @ A0

Drawn ByMRH

Drawing No.P10913/amr/2

Subm. 01

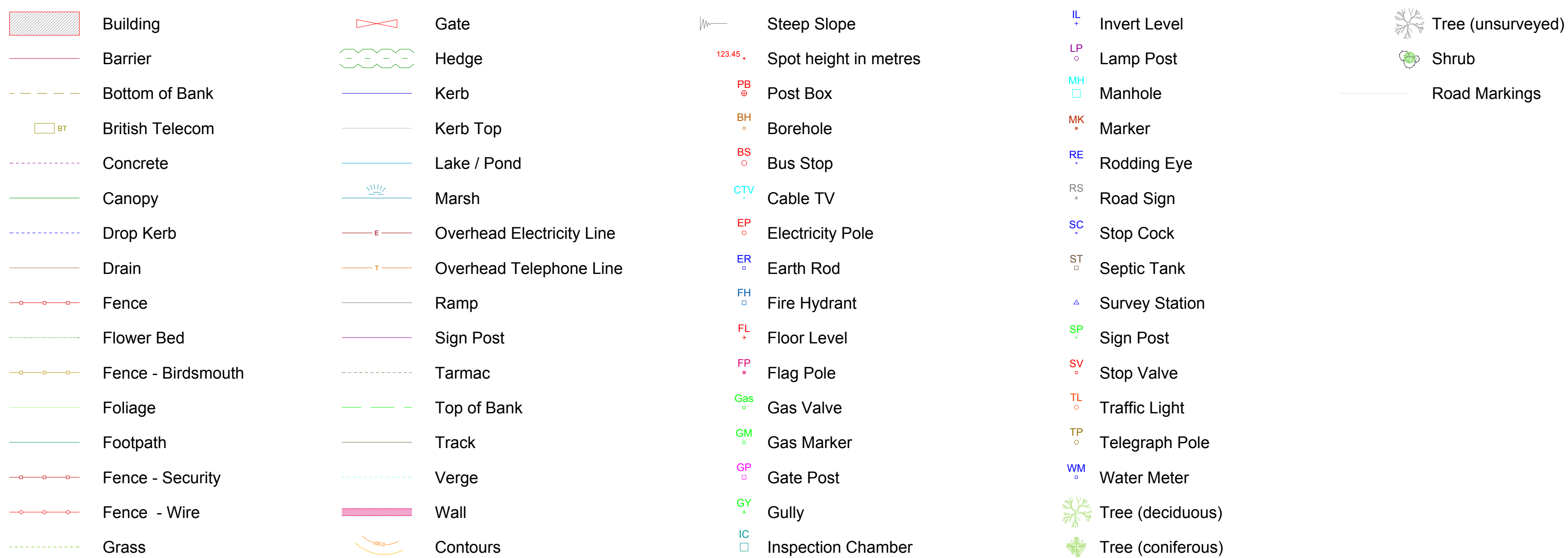
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RICS

Chartered Land Surveyors
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1 Fore Street
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Northumberland
NE46 1ND
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Legend



SURVEY STATIONS MARKED WITH ROAD NAILS AND PEGS
WITH COORDINATES RELATING TO OSGB36 NATIONAL GRID

SITE LEVELS MARKED AT STATIONS RELATE TO
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DRAWING REVISION RECORD

No. Detail	DWG No.	Date	Int
1			
2			
3			
4			

amrGeomatics
Chartered Land
Surveyors
www.amrGeomatics.co.uk

Site	"THE IRON LINE"
------	-----------------

MILLOM

Drawing

TOPOGRAPHICAL SURVEY

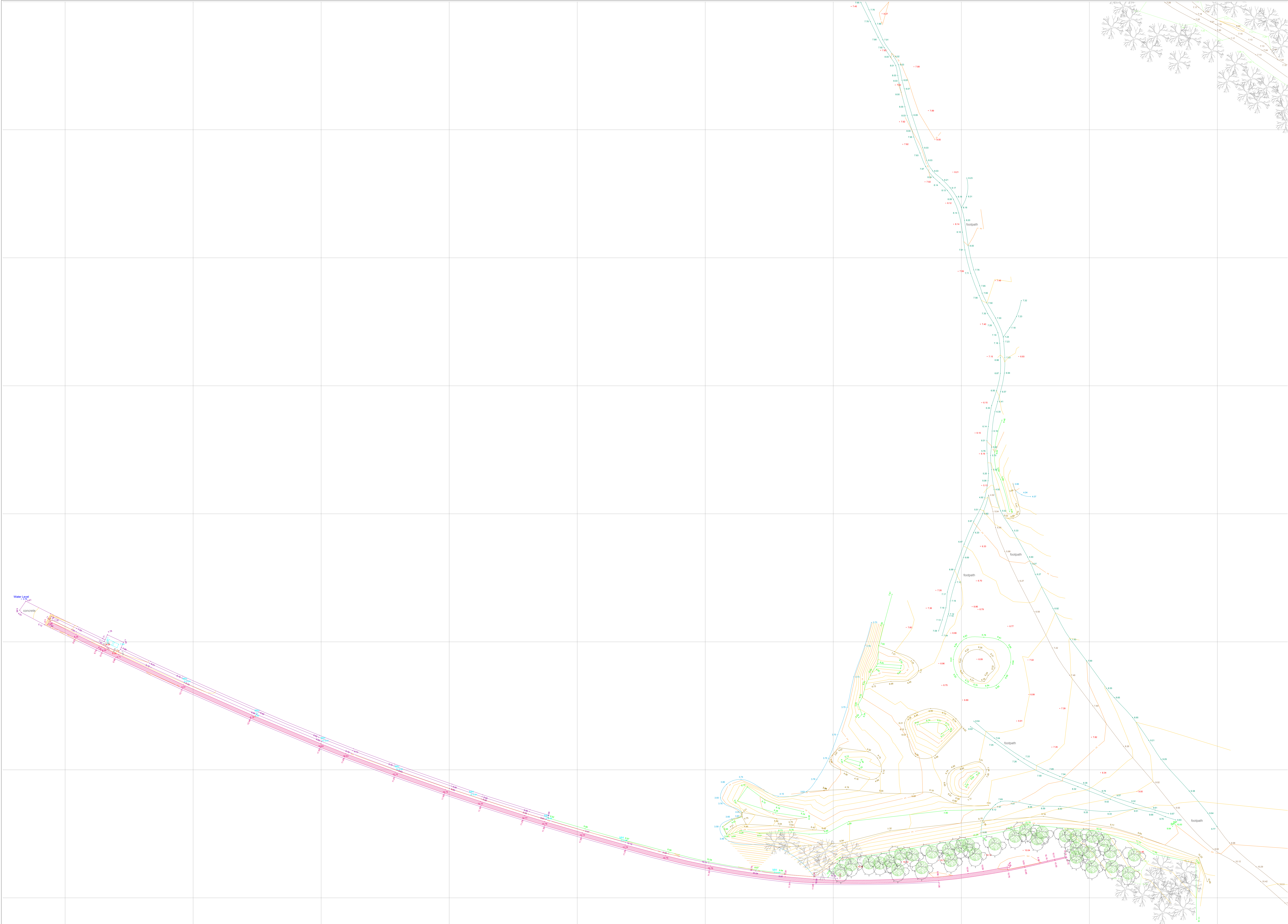
Date	07 JULY 2022	Drawing No. P10913/amr/ Subm. 01
Scale	1: 500 @ A0	

Scale 1: 500 @ A0



Chartered Land Surveyors
mail@amrGeomatics.co.uk

amrGeomatics Northern Ltd
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Hexham
Northumberland
NE46 1ND
T: 01434 600320
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Legend

Building

Barrier

Bottom of Bank

British Telecom

Concrete

Canopy

Drop Kerb

Drain

Fence

Flower Bed

Fence - Birdsmouth

Foliage

Footpath

Fence - Security

Fence - Wire

Grass

Gate

Hedge

Kerb

Kerb Top

Lake / Pond

Marsh

Overhead Electricity Line

Overhead Telephone Line

Ramp

Sign Post

Tarmac

Top of Bank

Track

Verge

Road Markings

Wall

Contours

Steep Slope

123.45

Spot height in metres

Post Box

Borehole

Bus Stop

Cable TV

Cable TV

Electricity Pole

Earth Rod

Fire Hydrant

Floor Level

Flag Pole

Gas Valve

Gas Marker

Gate Post

Gully

Inspection Chamber

Invert Level

Lamp Post

Manhole

Marker

Rodding Eye

Road Sign

Stop Cock

Septic Tank

Survey Station

Sign Post

Stop Valve

Traffic Light

Telegraph Pole

Water Meter

Tree (deciduous)

Tree (coniferous)

Tree (unsurveyed)

Shrub

amr
geomatics

SURVEY STATIONS MARKED WITH ROAD NAILS AND PEGS
WITH COORDINATES RELATING TO OSGB36 NATIONAL GRID

SITE LEVELS MARKED AT STATIONS RELATE TO
ORDNANCE DATUM OSGM15, VIA DIFFERENTIAL GPS.

USE ONLY FOR THE PURPOSE INDICATED BELOW

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Site

"THE IRON LINE"

MILLOM

Drawing

TOPOGRAPHICAL SURVEY

Date

07 JULY 2022

Scale

1: 500 @ A0

Drawn By

MRH

Drawing No.

P10913/amr/5

Subm.

01

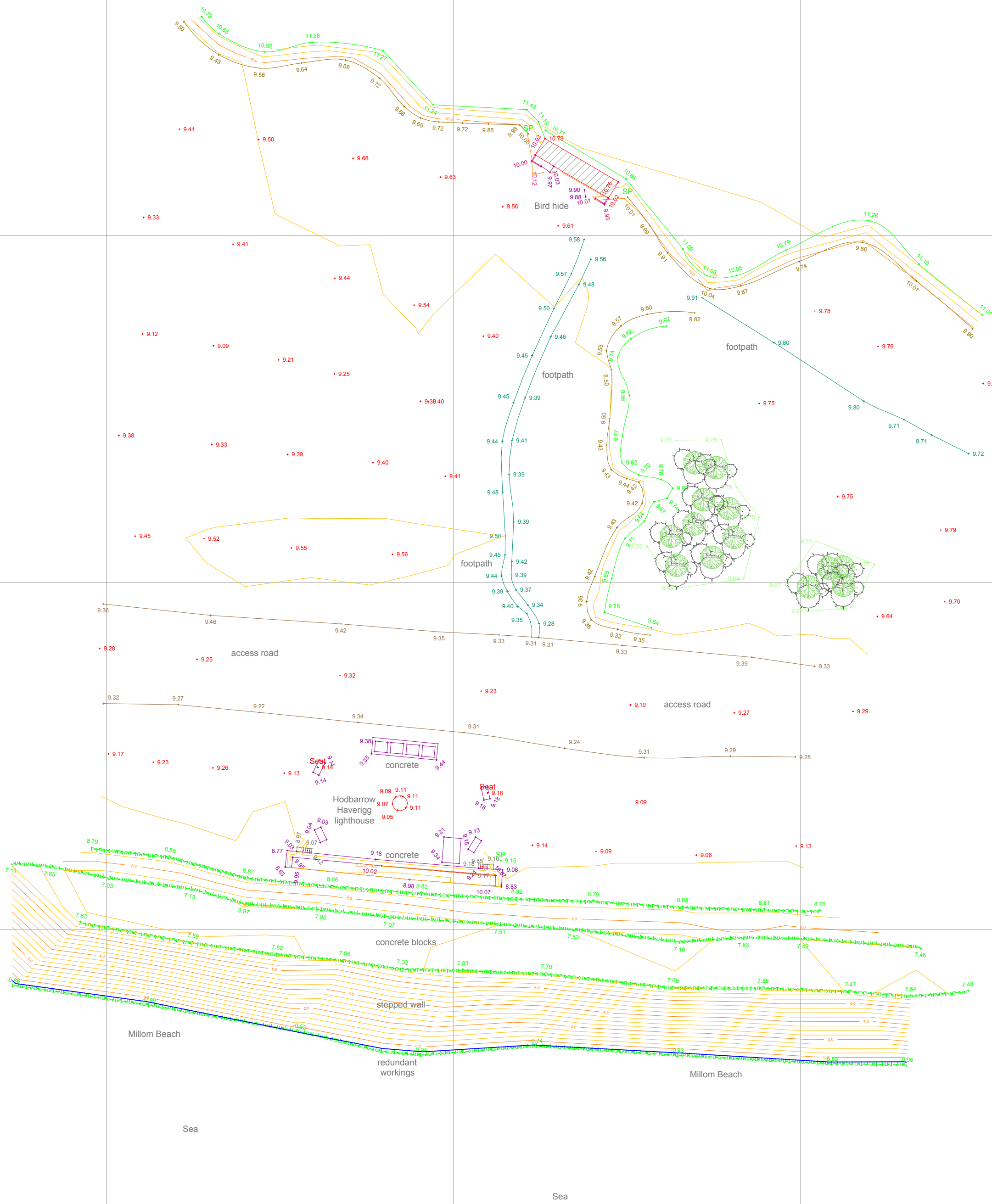
Checked By

LR

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Legend

- | | | | | |
|--------------------|---------------------------|-----------------------|-------------------|-------------------|
| Building | Gate | Steep Slope | Invert Level | Tree (unsurveyed) |
| Barrier | Hedge | Spot height in metres | Lamp Post | Shrub |
| Bottom of Bank | Kerb | Post Box | Manhole | Road Markings |
| British Telecom | Kerb Top | Borehole | Marker | |
| Concrete | Lake / Pond | Bus Stop | Rodding Eye | |
| Canopy | Marsh | Cable TV | Road Sign | |
| Drop Kerb | Overhead Electricity Line | Electricity Pole | Stop Cock | |
| Drain | Overhead Telephone Line | Earth Rod | Septic Tank | |
| Fence | Ramp | Fire Hydrant | Survey Station | |
| Flower Bed | Sign Post | Floor Level | Sign Post | |
| Fence - Birdsmouth | Tarmac | Flag Pole | Stop Valve | |
| Foliage | Top of Bank | Gas Valve | Traffic Light | |
| Footpath | Track | Gas Marker | Telegraph Pole | |
| Fence - Security | Verge | Gate Post | Water Meter | |
| Fence - Wire | Wall | Gully | Tree (deciduous) | |
| Grass | Contours | Inspection Chamber | Tree (coniferous) | |



SURVEY STATIONS MARKED WITH ROAD NAILS AND PEGS WITH COORDINATES RELATING TO OSGB36 NATIONAL GRID

SITE LEVELS MARKED AT STATIONS RELATE TO ORDNANCE DATUM OSGM15, VIA DIFFERENTIAL GPS.

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Drawn By MRH Checked By LR

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No. Detail	DWG No.	Date	Intl.
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2			
3			
4			

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Site "THE IRON LINE"
MILLOM

Drawing
TOPOGRAPHICAL SURVEY

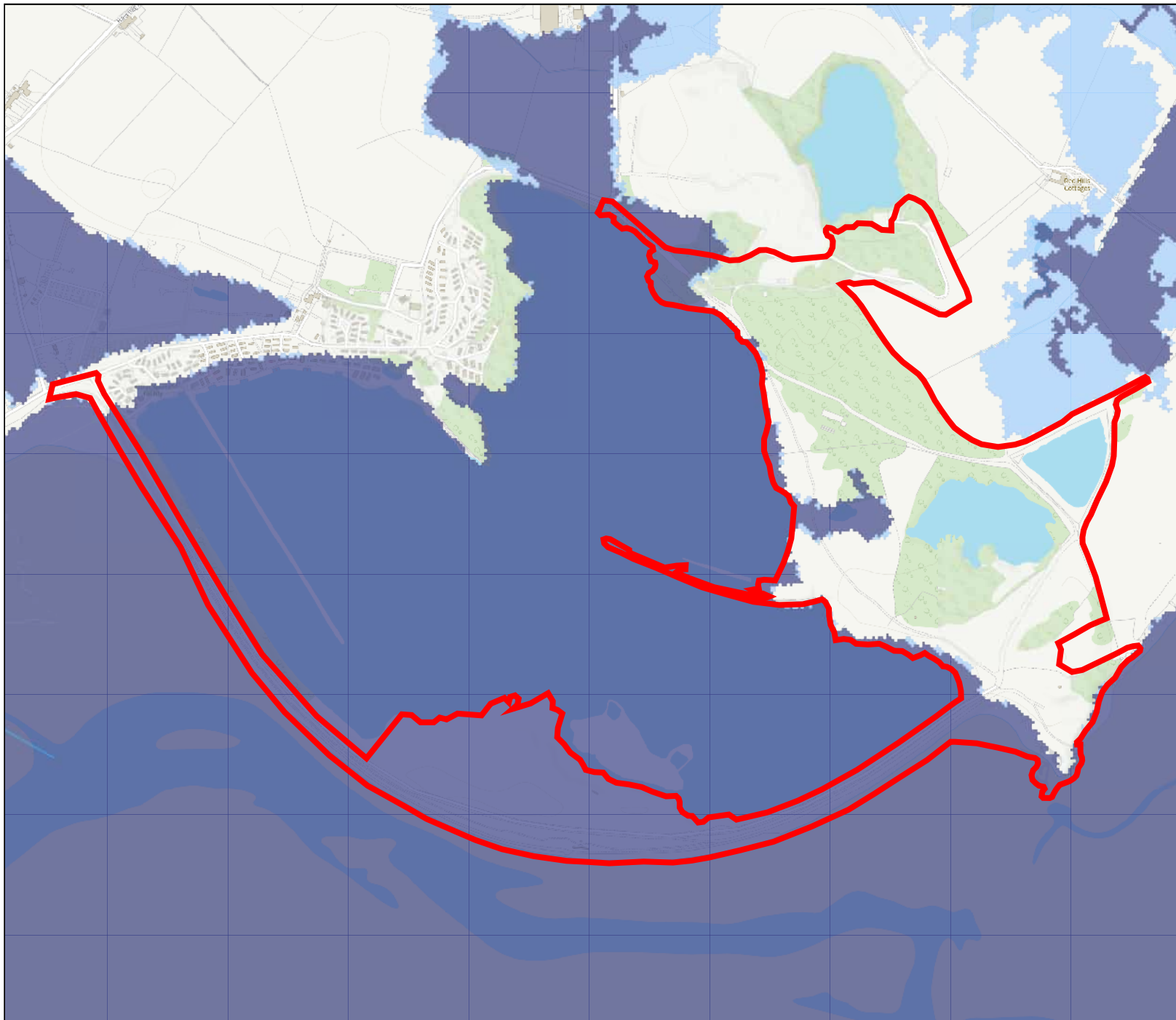
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Drawing No. P10913/amr/6
Subm. 01



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Appendix C – Environment Agency Data



map for planning

ence
Millom Iron Line
 easting/northing)
317419/478517

1:10000

5 Dec 2022 17:14

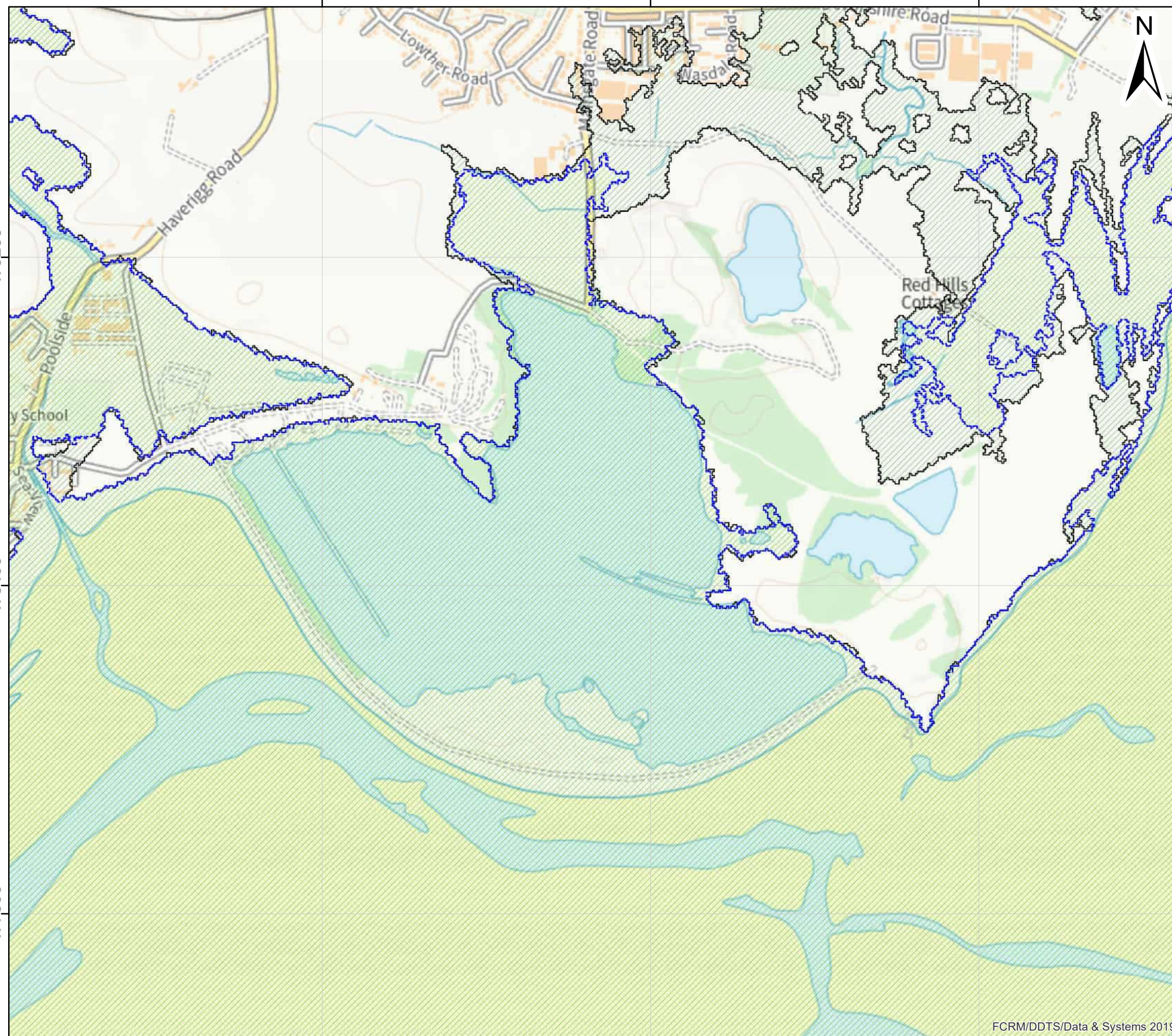
-  ected area
-  od zone 3
-  od zone 2
-  od zone 1
-  od defence
-  n river
-  ter storage area

0 100 200 300m

**Modelled 2d Data Map:
Hodbarrow Reservoir, Millom**
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Flood Zones

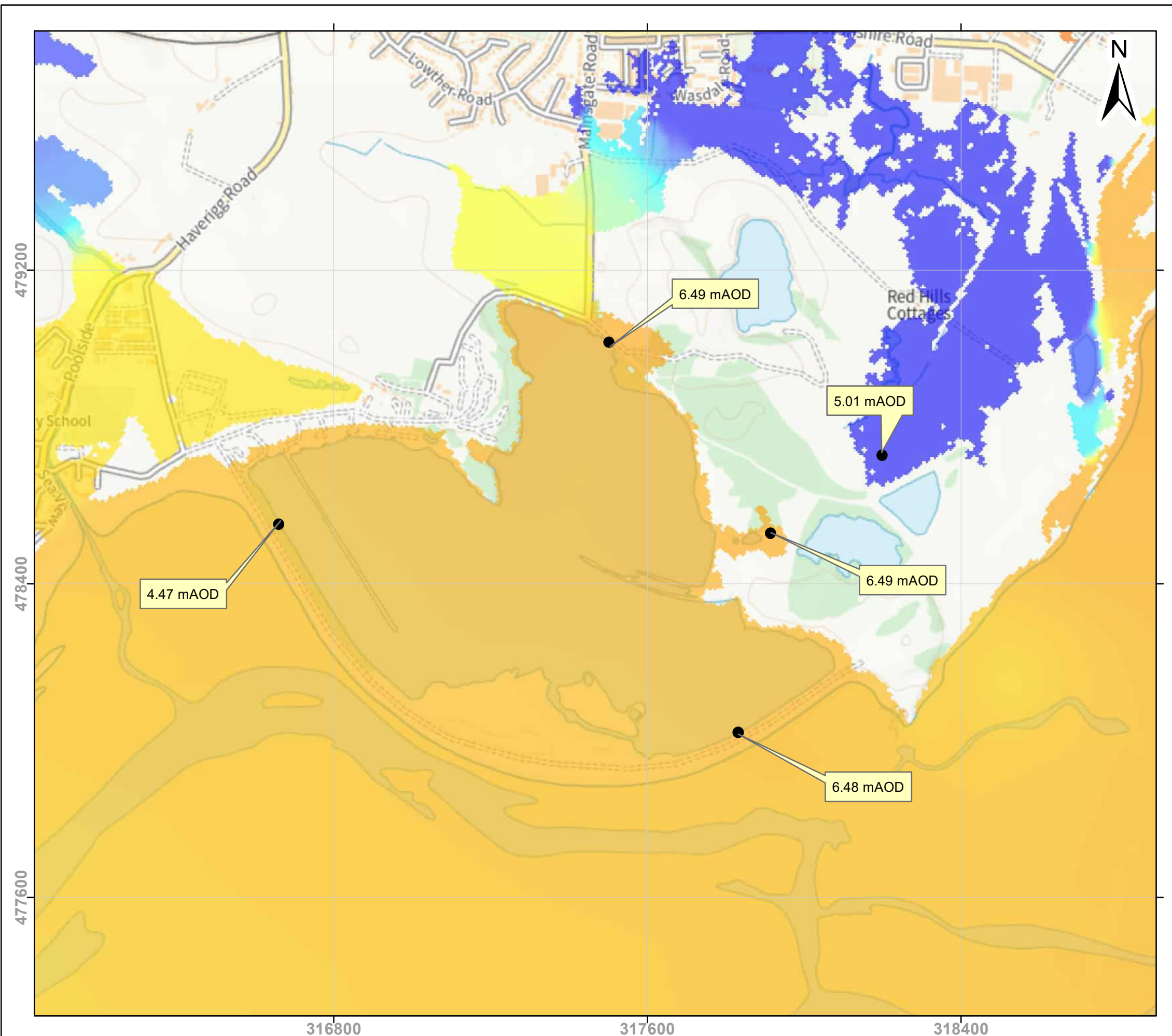
Key

-  BASE FLOOD ZONE 3 TIDAL
-  BASE FLOOD ZONE 2 TIDAL



FCRM/DDTS/Data & Systems 2019





**Modelled 2d Data Map:
Hodbarrow Reservoir, Millom
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Cumbrian Tidal 2012**

Key

0.1% AEP Undefended

mAOD



High : 6.6

Low : 4.7



Modelled 2d Data Map:
Hodbarrow Reservoir, Millom
 Produced: 14/03/2023
 Our Ref: CL298827
 NGR: 317419 , 478517
 Cumbrian Tidal 2012

Key

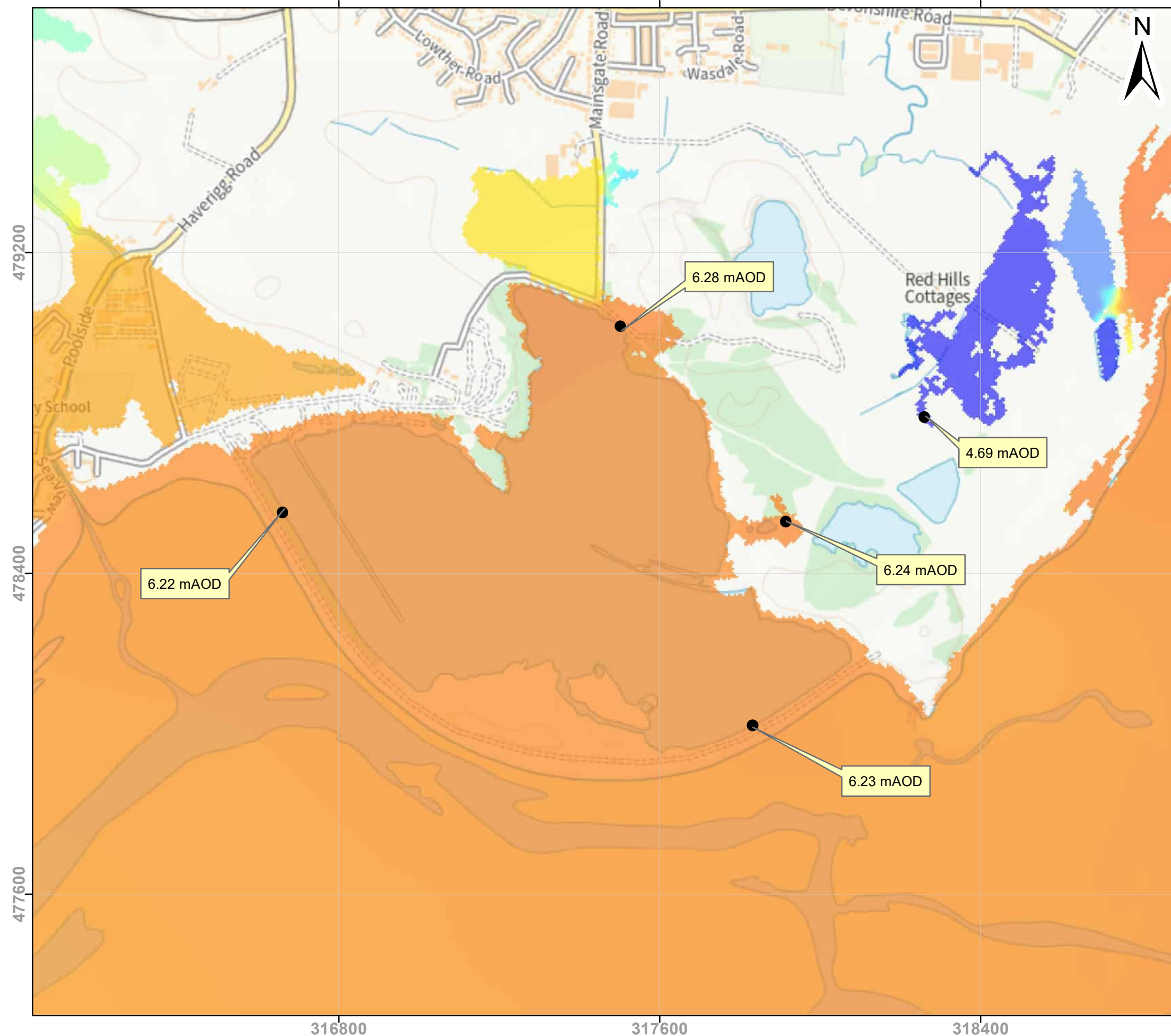
0.5% Undefended

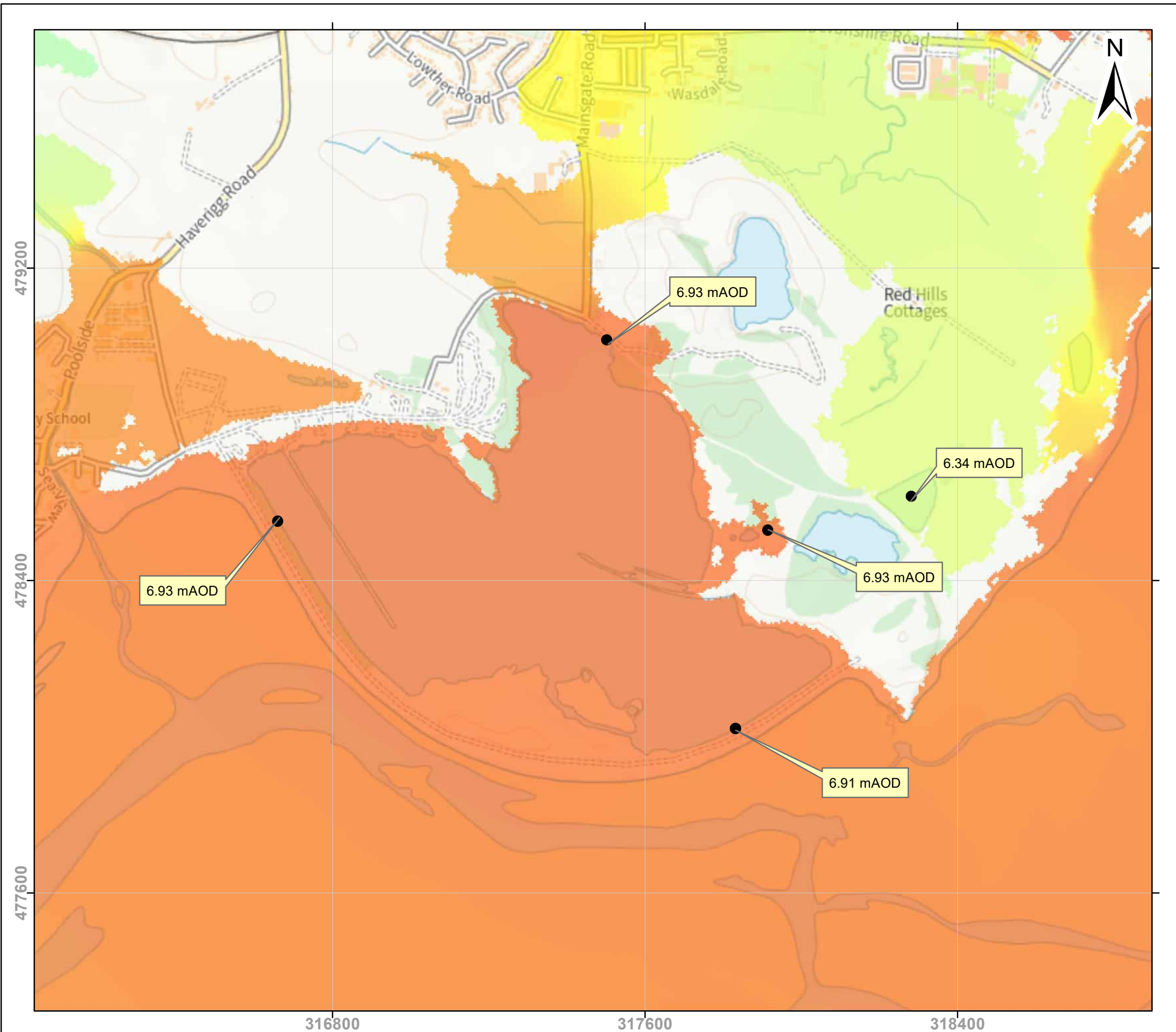
mAOD



High : 6.3

Low : 3.8





Modelled 2d Data Map:
Hodbarrow Reservoir, Millom
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Cumbrian Tidal 2012

Key
0.5% AEP Undefended + CC (600mm SLR)
mAOD
High : 7.0
Low : 4.4



**Modelled 2d Data Map:
Hodbarrow Reservoir, Millom**
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Cumbrian Tidal 2012

Key

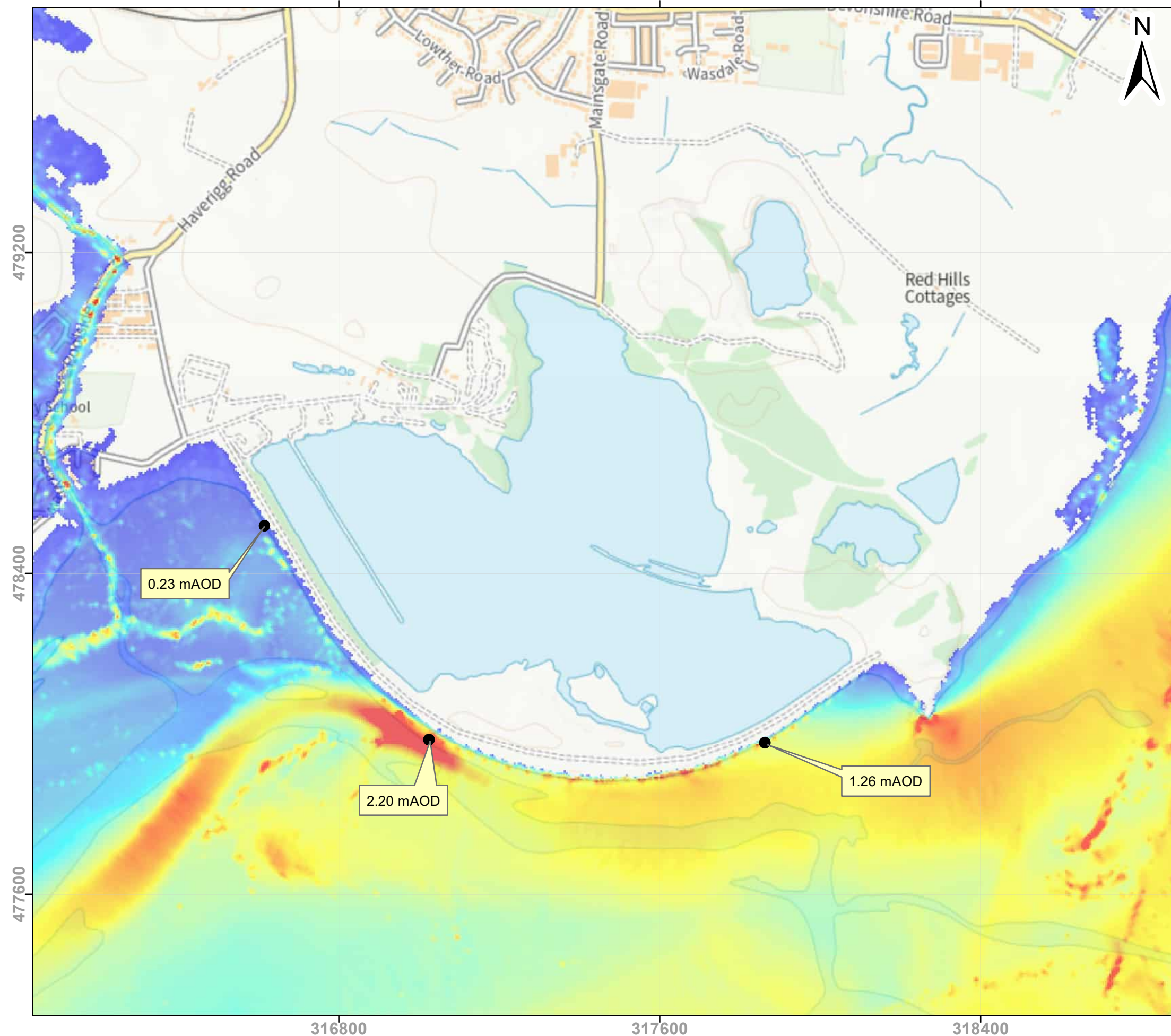
0.1% AEP Defended

mAOD



High : 5.364

Low : 0



**Modelled 2d Data Map:
Hodbarrow Reservoir, Millom**
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Cumbrian Tidal 2012

Key

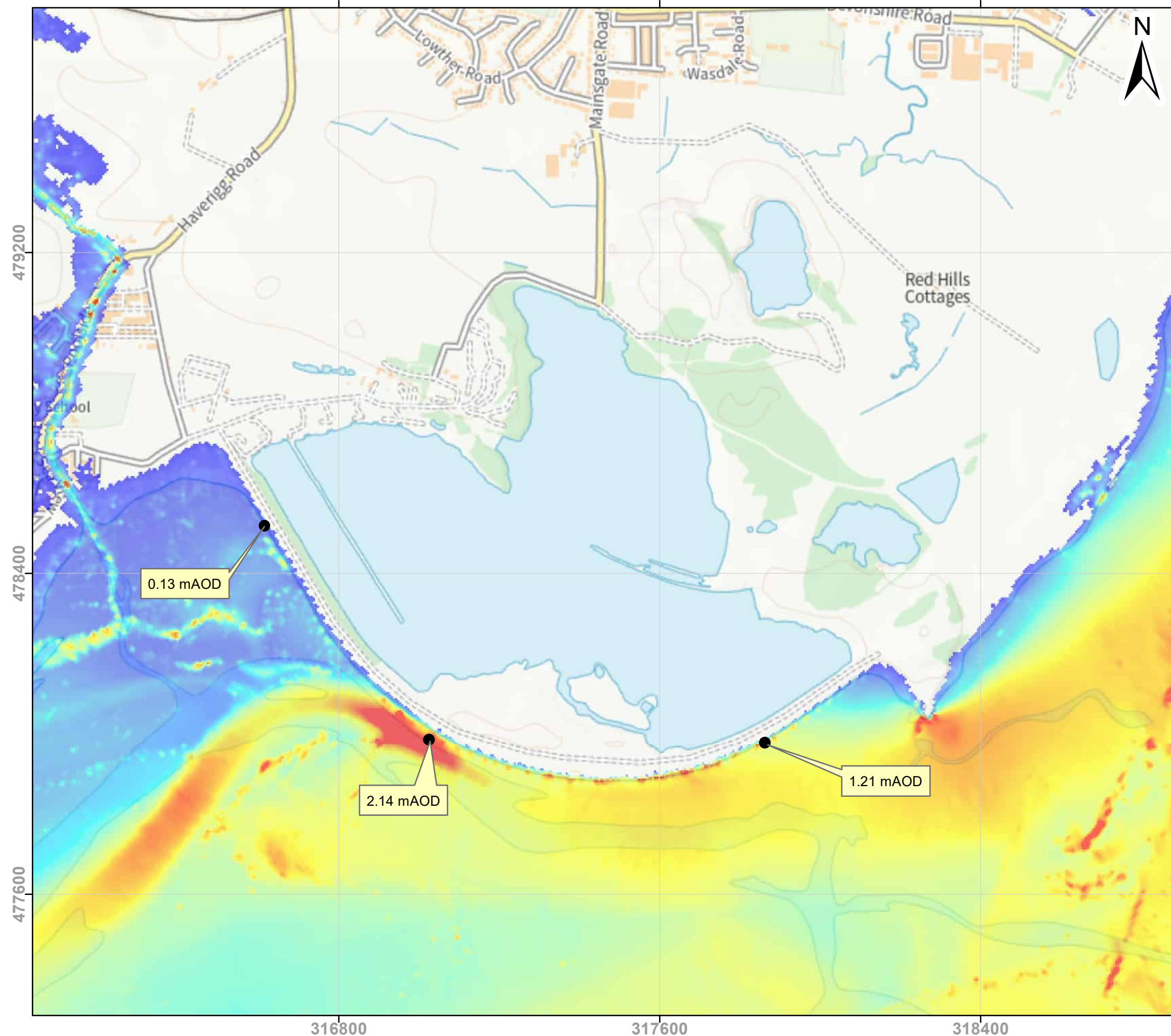
0.5% AEP Defended

mAOD



High : 5.1

Low : 0



Modelled 2d Data Map:
Hodbarrow Reservoir, Millom
Produced: 14/03/2023
Our Ref: CL298827
NGR: 317419 , 478517
Cumbrian Tidal 2012

Key

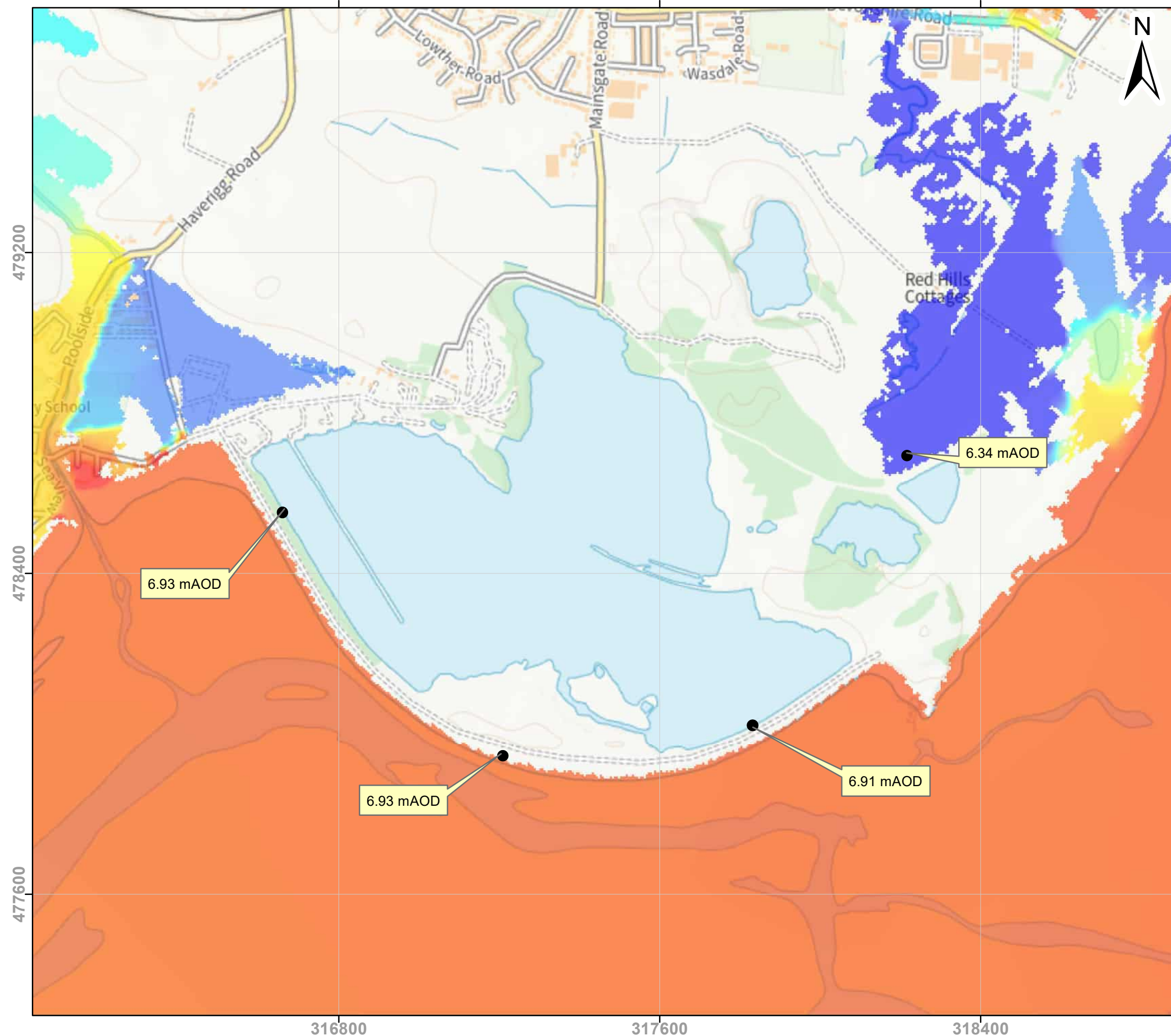
0.5% AEP Defended + CC (600mm SLR)

mAOD



High : 7.4

Low : 4.4

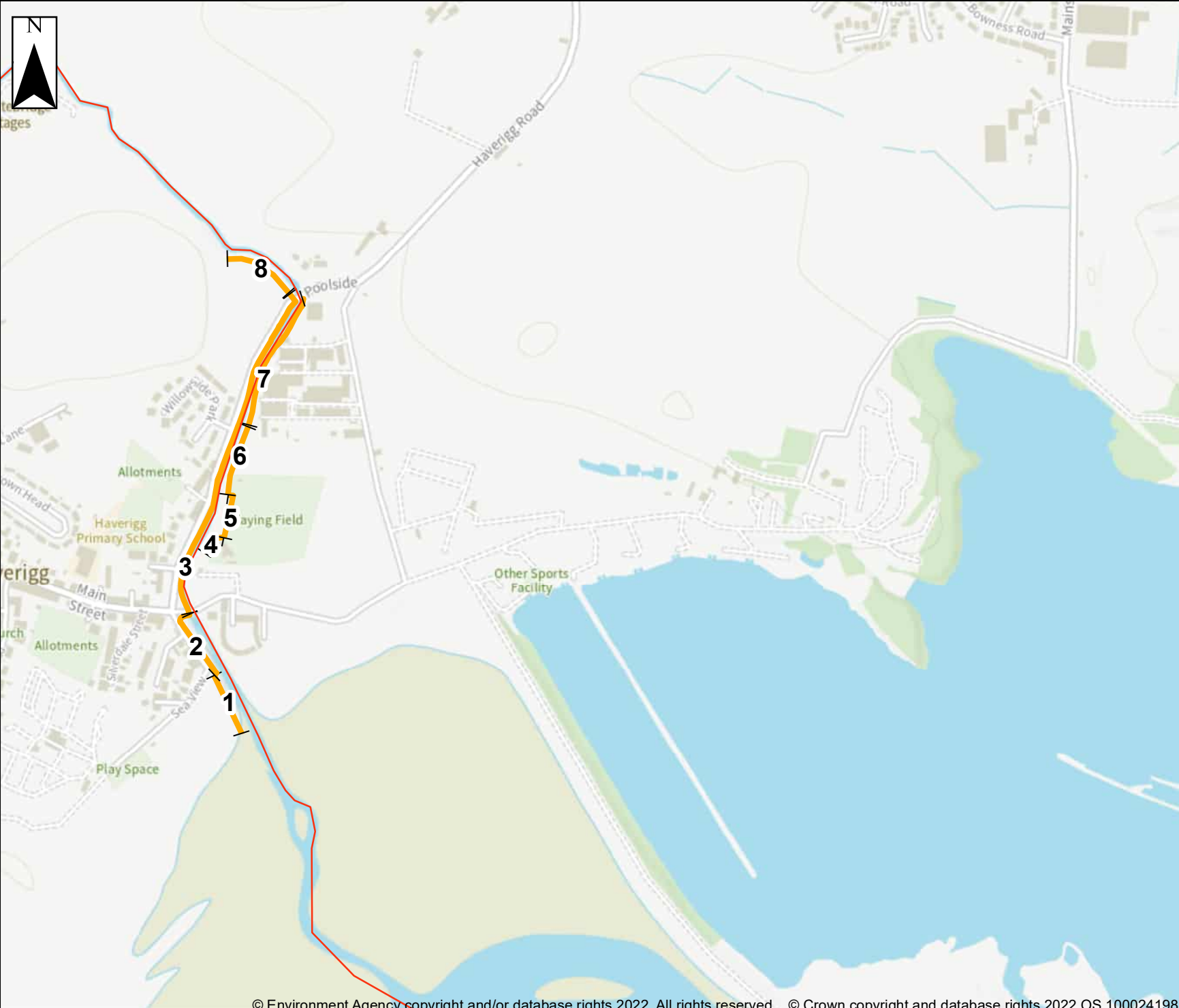


Flood defences and attributes

The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is in mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.



Flood Defences

Location (easting/northing)
317419 / 478517

Scale

1:8,000

Created

20 Mar 2022

— Main river

— Flood defence

0 80 160 240 320 400

Meters

Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
1	127465	Wall	-	2 - Good	3.30	4.36	3.30
2	79170	Wall	100	2 - Good	6.52	6.53	6.52
3	79173	Wall	100	2 - Good	6.52	6.51	6.51
4	162818	Embankment	100	2 - Good	6.53	6.59	6.53
5	79142	Wall	100	2 - Good	6.59	6.59	6.59
6	79533	Embankment	100	2 - Good	6.56	6.43	6.43
7	79172	Wall	100	3 - Fair	6.49	6.49	6.49
8	55126	Embankment	50	3 - Fair	5.88	5.88	5.88

Any blank cells show where a particular value has not been recorded for an asset.