



## Cell 1 Regional Coastal Monitoring Programme Analytical Report 13: 'Full Measures' Survey 2020

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## Abbreviations and Acronyms

Acronym / Abbreviation	Definition
AONB	Area of Outstanding Natural Beauty
DGM	Digital Ground Model
HAT	Highest Astronomical Tide
LAT	Lowest Astronomical Tide
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWS	Mean Low Water Neap
MLWS	Mean Low Water Spring
m	metres
ODN	Ordnance Datum Newlyn

## Water Levels Used in Interpretation of Changes

Water Level Parameter	Water Level (m AOD)		
	Berwick upon Tweed	Holy Island	North Sunderland
1 in 200 year	3.4	3.4	3.5
HAT	2.8	2.8	2.8
MHWS	2.2	2.4	2.4
MLWS	-1.9	-1.8	-1.7
Water Level Parameter	Water Level (m AOD)		
	Amble	Blyth	River Tyne
1 in 200 year	3.5	3.6	3.7
HAT	3.1	3.1	3.1
MHWS	2.4	2.4	2.4
MLWS	-1.9	-1.8	-1.9

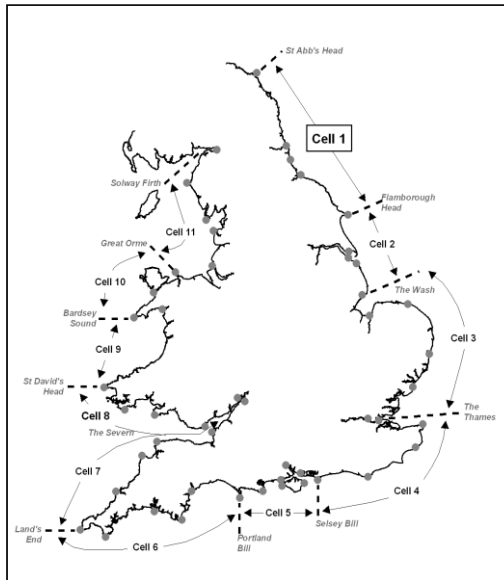
**Source:** *Scottish Border to River Tyne Shoreline Management Plan 2.*  
Royal Haskoning, May 2009.

## Glossary of Terms

Term	Definition
Beach nourishment	Artificial process of replenishing a beach with material from another source.
Berm crest	Ridge of sand or gravel deposited by wave action on the shore just above the normal high-water mark.
Breaker zone	Area in the sea where the waves break.
Coastal squeeze	The reduction in habitat area which can arise if the natural landward migration of a habitat under sea level rise is prevented by the fixing of the high-water mark, e.g. a sea wall.
Downdrift	Direction of alongshore movement of beach materials.
Ebb-tide	The falling tide, part of the tidal cycle between high water and the next low water.
Fetch	Length of water over which a given wind has blown that determines the size of the waves produced.
Flood-tide	Rising tide, part of the tidal cycle between low water and the next high water.
Foreshore	Zone between the high water and low water marks, also known as the intertidal zone.
Geomorphology	The branch of physical geography/geology which deals with the form of the Earth, the general configuration of its surface, the distribution of the land, water, etc.
Groyne	Shore protection structure built perpendicular to the shore; designed to trap sediment.
Mean High Water (MHW)	The average of all high waters observed over a sufficiently long period.
Mean Low Water (MLW)	The average of all low waters observed over a sufficiently long period.
Mean Sea Level (MSL)	Average height of the sea surface over a 19-year period.
Offshore zone	Extends from the low water mark to a water depth of about 15 m and is permanently covered with water.
Storm surge	A rise in the sea surface on an open coast, resulting from a storm.
Swell	Waves that have travelled out of the area in which they were generated.
Tidal prism	The volume of water within the estuary between the level of high and low tide, typically taken for mean spring tides.
Tide	Periodic rising and falling of large bodies of water resulting from the gravitational attraction of the moon and sun acting on the rotating earth.
Topography	Configuration of a surface including its relief and the position of its natural and man-made features.
Transgression	The landward movement of the shoreline in response to a rise in relative sea level.
Updrift	Direction opposite to the predominant movement of longshore transport.
Wave direction	Direction from which a wave approaches.
Wave refraction	Process by which the direction of approach of a wave changes as it moves into shallow water.

## Preamble

The Cell 1 Regional Coastal Monitoring Programme covers approximately 300km of the north east coastline, from the Scottish Border (just south of St. Abb's Head) to Flamborough Head in East Yorkshire. This coastline is often referred to as 'Coastal Sediment Cell 1' in England and Wales (**Figure 1**). Within this frontage, the coastal landforms vary considerably, comprising low-lying tidal flats with fringing salt marshes, hard rock cliffs that are mantled with glacial sediment to varying thicknesses, softer rock cliffs and extensive landslide complexes.



**Figure 1 Sediment Cells in England and Wales**

The work commenced with a three-year monitoring programme in September 2008 that was managed by Scarborough Borough Council on behalf of the North East Coastal Group. This initial phase has been followed by a five-year programme of work, which started in October 2011. The work is funded by the Environment Agency, working in partnership with the following organisations:



The main elements of the Cell 1 Regional Coastal Monitoring Programme involve:

- beach profile surveys
- topographic surveys
- cliff top recession surveys
- real-time wave data collection
- bathymetric and seabed characterisation surveys
- aerial photography
- LiDAR Surveys
- walk-over cliff and coastal defence asset surveys

The beach profile surveys, topographic surveys and cliff top recession surveys are undertaken as a 'Full Measures' survey in autumn/early winter every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

Each year, an Analytical Report is produced for each individual authority, providing a detailed analysis and interpretation of the 'Full Measures' surveys. This is followed by a brief Update Report for each individual authority, providing ongoing findings from the 'Partial Measures' surveys.

Annually, a Cell 1 Overview Report is also produced. This provides a region-wide summary of the main findings relating to trends and interactions along the entire Cell 1 frontage. To date the following reports have been produced:

**Table 1 Analytical, Update and Overview Reports Produced to Date**

Year		Full Measures		Partial Measures		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	
1	2008/09	Sep-Dec 08	May 09	Mar-May 09		-
2	2009/10	Sep-Dec 09	Mar 10	Feb-Mar 10	Jul 10	-
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sep 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb13	-
5	2012/13	Sep-Nov 12	Mar 13	Mar-Apr 13	Jun 13	
6	2013/2014	Sep-Oct 13	Feb 14	Mar-Apr 14	Jul 14	
7	2014/2015	Sep-Nov 14	Feb 15	Mar-Apr 15	Jul 15	
8	2015/2016	Sep-Dec 15	Feb 16	Mar-May 16	Jul 16	Jun 16
9	2016/2017	Aug-Nov 16	Mar 17	Feb-Apr 17	Jul 17	
10	2017/18	Sep-Dec 17	Mar 18	Feb-Apr 18	Jul 18	
11	2018/19	Sep-Dec 18	Feb 19	Feb-Apr 19	Jul 19	
12	2019/20	Aug-Dec 19	Mar 20	Mar-May 20	Jun 20	
13	2020/21	Aug-Oct 20	Dec 20 (*)			

(\*) The present report is **Analytical Report 13** and provides an analysis of the 2020 Full Measures survey for Northumberland County Council's frontage.

In addition, separate reports are produced for other elements of the programme as and when specific components are undertaken, such as wave data collection, bathymetric and seabed sediment data collection, aerial photography, and walk-over visual inspections.

For purposes of analysis, the Cell 1 frontage has been split into the sub-sections listed in the **Table 2**.

**Table 2 Sub-divisions of the Cell 1 Coastline**

<b>Authority</b>	<b>Zone</b>
Northumberland County Council	Spittal A
	Spittal B
	Goswick Sands
	Holy Island
	Bamburgh
	Beadnell Village
	Beadnell Bay
	Embelton Bay
	Boulmer
	Alnmouth Bay
	High Hauxley and Druridge Bay
	Lynemouth Bay
	Newbiggin Bay
	Cambois Bay
Blyth South Beach	
North Tyneside Council	Whitley Sands
	Cullercoats Bay
	Tynemouth Long Sands
	King Edward's Bay
South Tyneside Council	Littehaven Beach
	Herd Sands
	Trow Quarry (incl. Frenchman's Bay)
	Marsden Bay
Sunderland Council	Whitburn Bay
	Harbour and Docks
	Hendon to Ryhope (incl. Halliwell Banks)
Durham County Council	Featherbed Rocks
	Seaham
	Blast Beach
	Hawthorn Hive
	Blackhall Colliery
Hartlepool Borough Council	North Sands
	Headland
	Middleton
	Hartlepool Bay
Redcar & Cleveland Borough Council	Coatham Sands
	Redcar Sands
	Marske Sands
	Saltburn Sands
	Cattersty Sands (Skinningrove)
	Staithes
Scarborough Borough Council	Staithes
	Runswick Bay
	Sandsend Beach, Uppang Beach and Whitby Sands
	Robin Hood's Bay
	Scarborough North Bay
	Scarborough South Bay
	Cayton Bay
	Filey Bay



## 1. Introduction

### 1.1 Study Area

Northumberland County Council's frontage extends from the Scottish border in the north to Hartley, just south of Blyth, in the south. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into 15 areas, namely:

- Sandstell Point (Spittal A)
- Spittal (Spittal B)
- Goswick Sands
- Holy Island
- Bamburgh
- Beadnell Village
- Beadnell Bay
- Embleton Bay
- Boulmer
- Alnmouth Bay
- High Hauxley and Druridge Bay
- Lynemouth Bay
- Newbiggin-by-the-Sea
- Cambois
- Blyth South Beach

### 1.2 Methodology

Along the Northumberland frontage, the following surveying is undertaken:

Full Measures survey annually each autumn comprising:

- Beach profile surveys along 78 transect lines (commenced 2002)
- Beach profile surveys along an additional ten transect lines (commenced 2007)
- Beach profile surveys along an additional 26 transect lines (commenced 2010)
- Topographic survey along Holy Island (commenced 2004)
- Topographic survey along Alnmouth Bay (commenced 2005)
- Topographic survey along Sandstell Point (commenced 2009)
- Topographic survey along Lynemouth Bay (commenced 2020)
- Topographic survey along Newbiggin Bay (commenced 2010)

Partial Measures survey annually each spring comprising:

- Beach profile surveys along 29 transect lines (commenced 2002)
- Beach profile surveys along an additional ten transect lines (commenced 2007)
- Beach profile surveys along an additional one transect line (commenced 2010)
- Beach profile surveys along an additional two transect lines (commenced 2011)
- Topographic survey along Alnmouth Bay (commenced 2005)
- Topographic survey along Sandstell Point (commenced 2009)
- Topographic survey along Lynemouth Bay (to commence 2021)
- Topographic survey along Newbiggin Bay (commenced 2010)

Cliff top survey (bi-annually) at:

- Colliery spoil edge survey at Lynemouth Bay (commenced 2020)
- Cliff top survey at Newbiggin Point (commenced 2008)
- Cliff top survey at Cambois Bay (Sandy Bay) (commenced 2008)
- Cliff top survey at Cambois Bay (Cambois) (commenced 2009)

Sand extent survey (bi-annually) at:

- Edge of sand survey at Newbiggin Bay, Spital Carrs, (commenced 2011 to determine potential adverse impact on foreshore SSSI of the Newbiggin beach recharge scheme)

In addition to the above, laserscan surveys of the cliffs in Lynemouth have been undertaken on several occasions. These are reported separately to Northumberland County Council.

For all cliff-top surveys prior to Full Measures 2011, the data was previously saved in '.kmz' format for plotting and visual comparison in Google Earth. This data has been visualised in GIS, which revealed the quality was variable and reliable interpretations of short-term cliff change could not be made. For the present and future surveys, the data will be plotted in GIS and change will be qualified along a series of pre-defined transect lines. The resulting data on amount and rate of change is presented in tables and the survey results are compared.

The location of these surveys is shown in **Figure 2**. The Full Measures survey was undertaken on various dates along this frontage between 19<sup>th</sup> August and 30<sup>th</sup> October 2020. During this time, weather conditions varied considerably; refer to the survey reports for details of the weather conditions over this survey period.

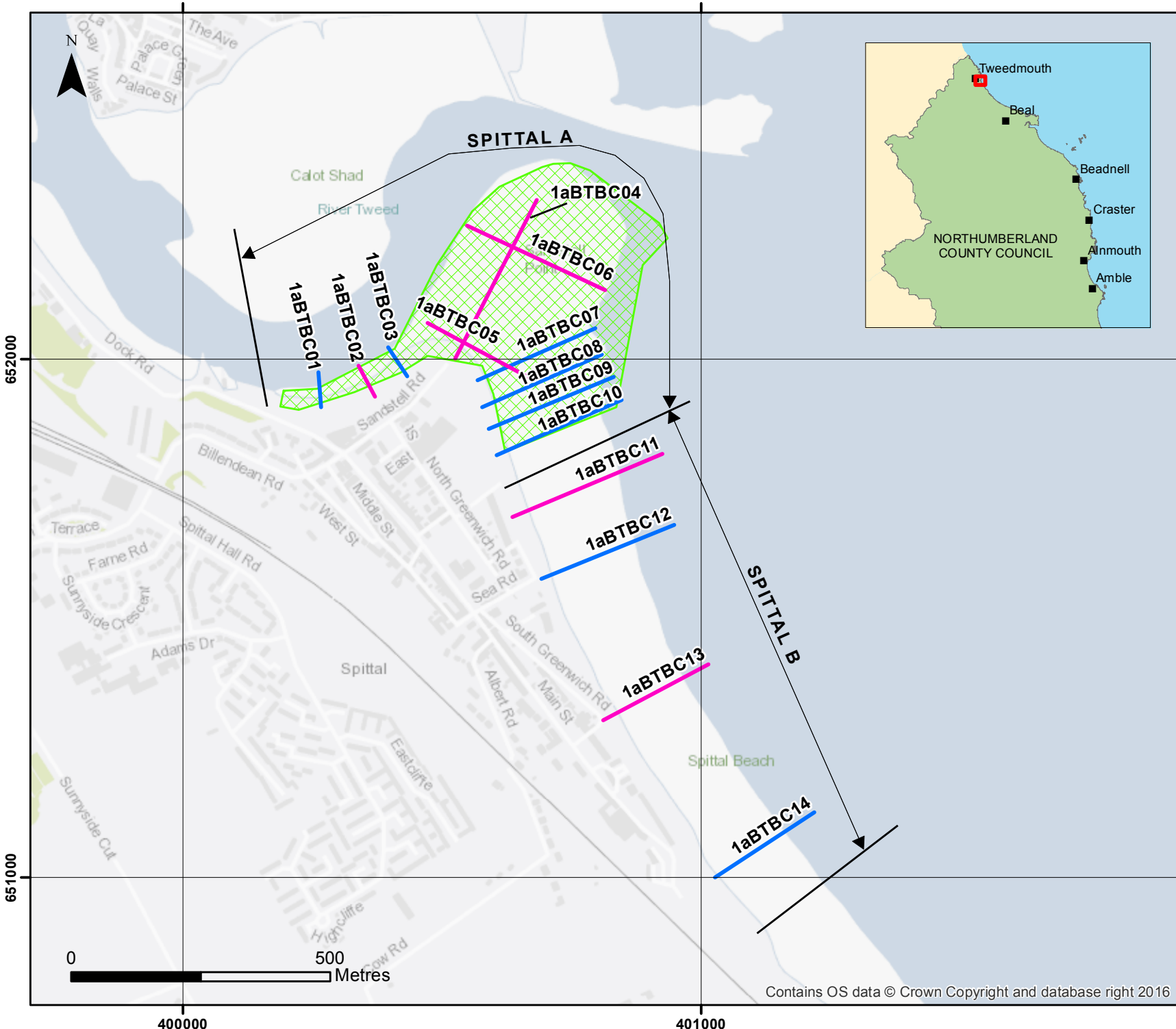
All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and ArcGIS. This data collection approach and file format is comparable to that being used on other regional coastal monitoring programmes, such as in the South East and South West of England.

Upon receipt of the data from the survey team, they are quality assured and then uploaded onto the programme website for storage and availability to others and input to SANDS and GIS for subsequent analysis.

The Analytical Report is then produced following a standard structure for each authority. This involves:

- description of the changes observed since the previous survey and an interpretation of the drivers of these changes (Section 2);
- documentation of any problems encountered during surveying or uncertainties inherent in the analysis (Section 3);
- recommendations for 'fine-tuning' the programme to enhance its outputs (Section 4); and
- providing key conclusions and highlighting any areas of concern (Section 5).

Data from the present survey are presented in a processed form in the Appendices.



Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 1**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

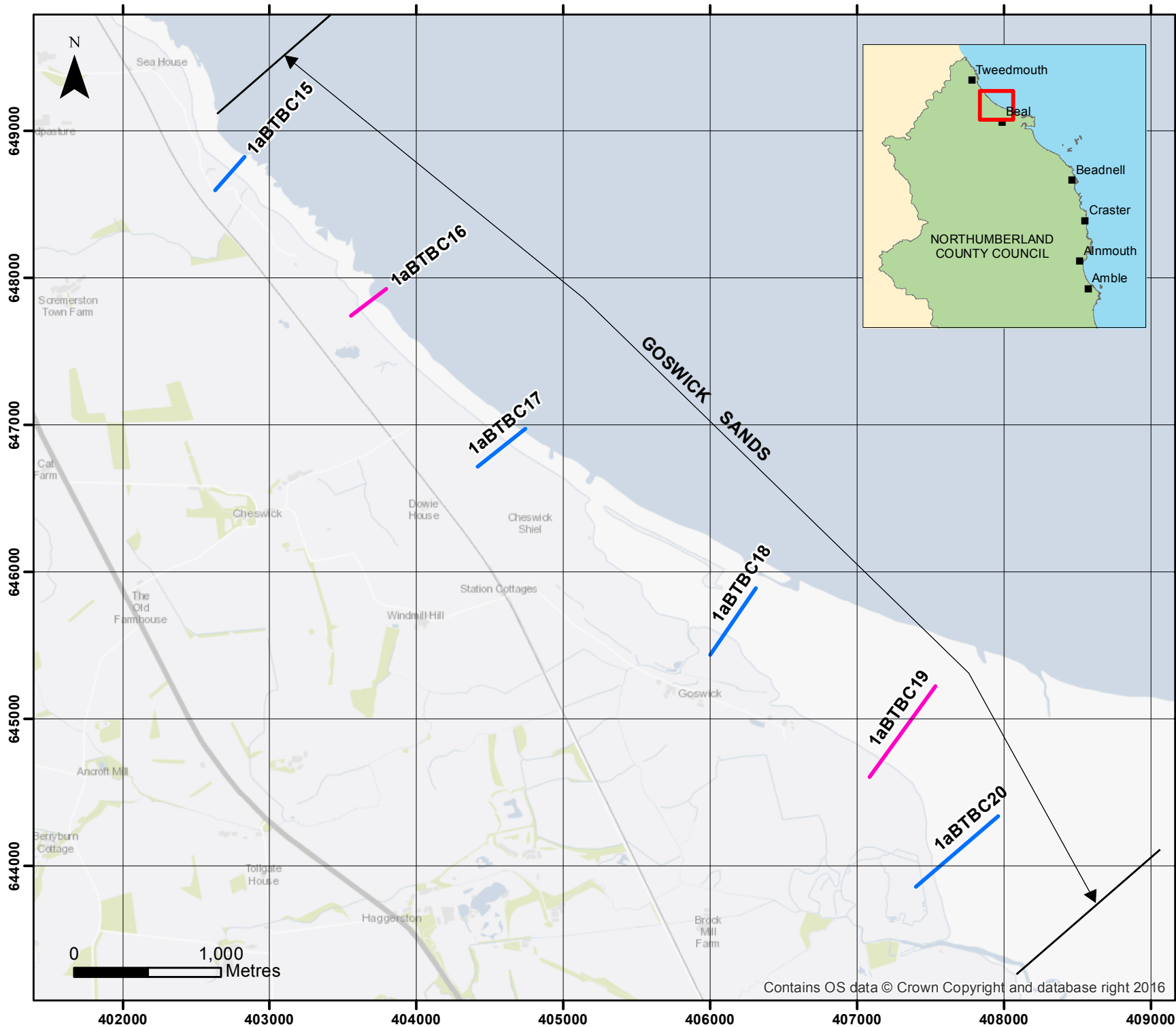
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual (Blue line)
- Bi-Annual (Pink line)

**Topographic Surveys**

- 6 monthly (Green cross-hatch)
- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 2**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

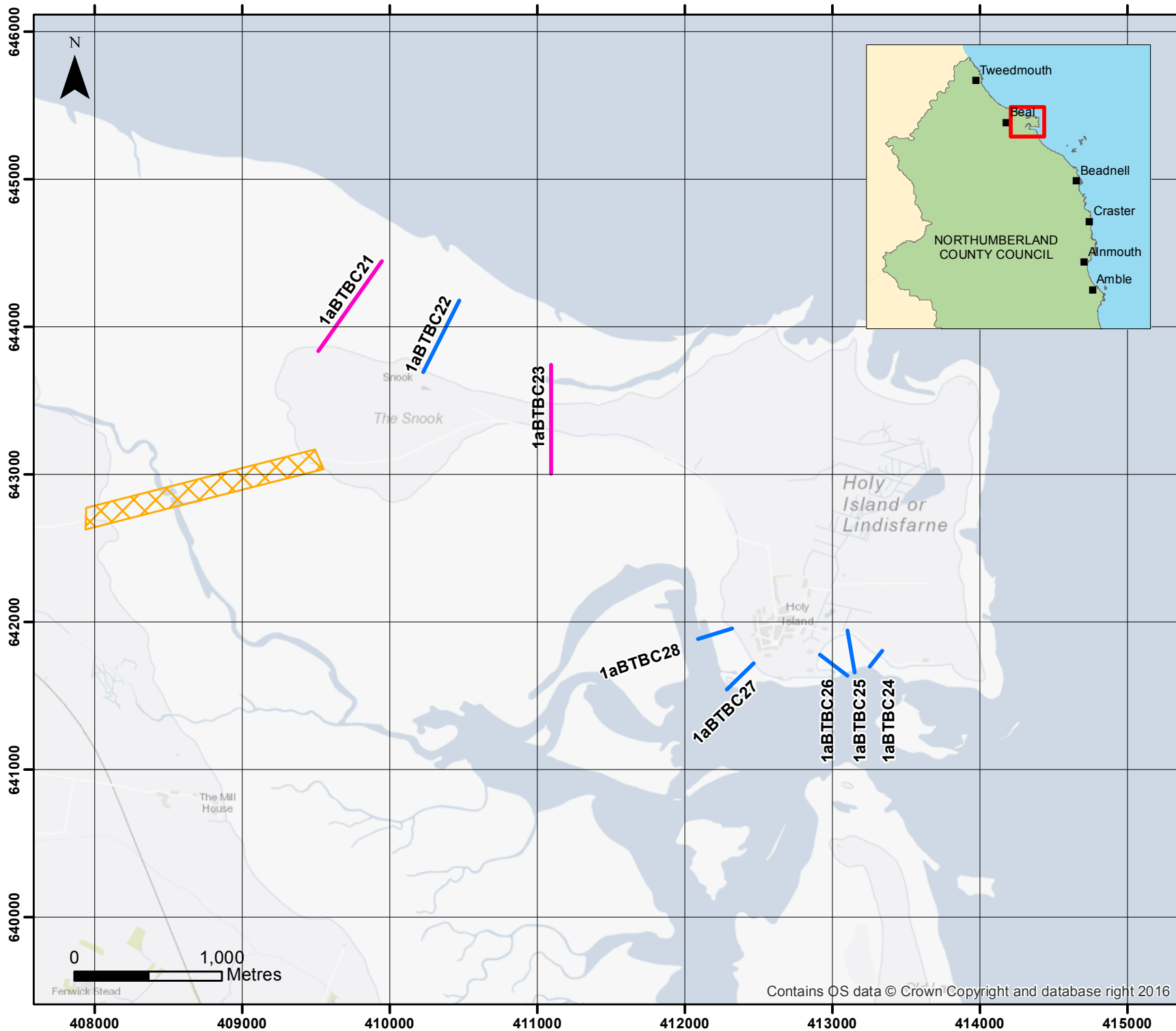
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- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 3**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

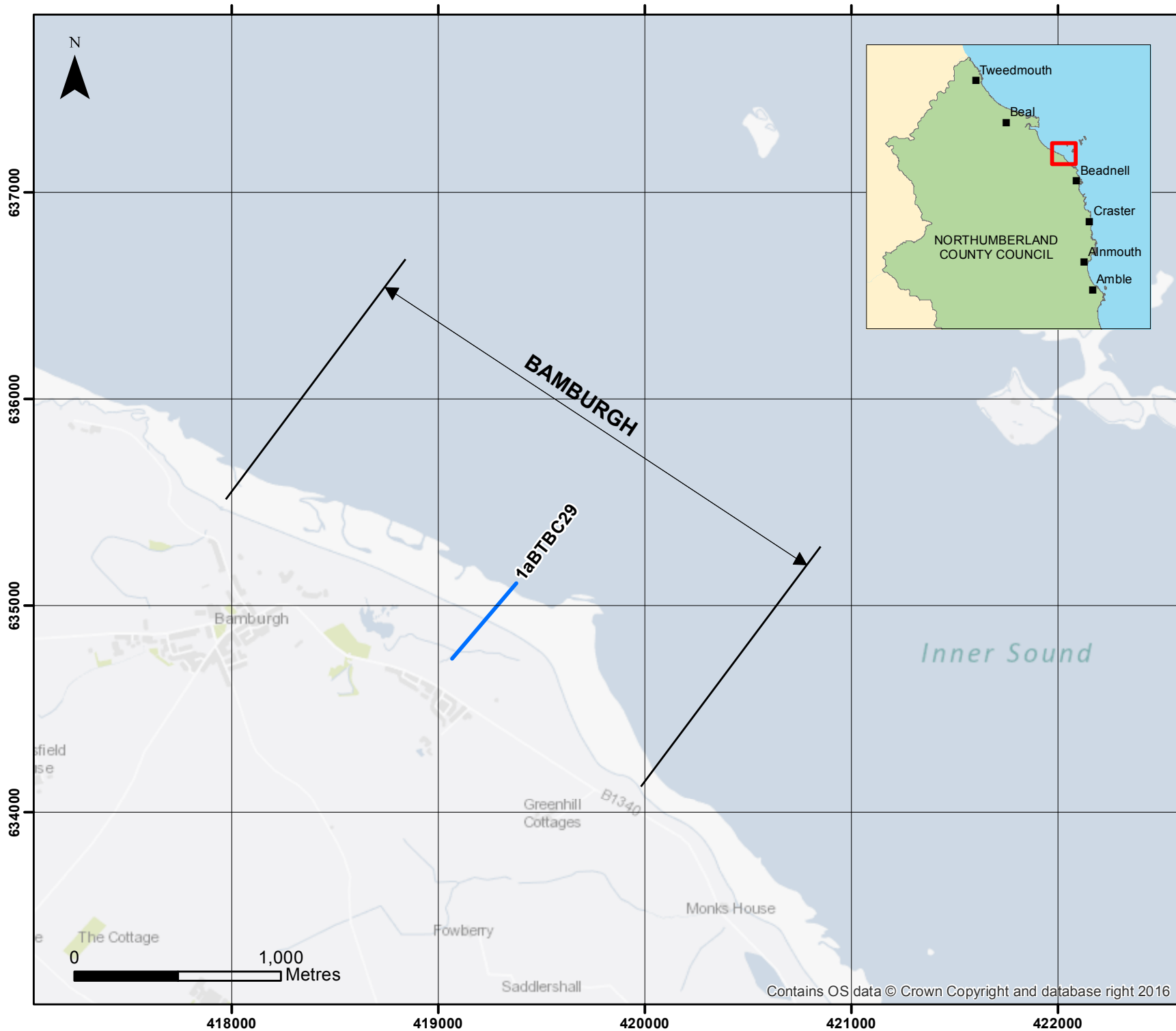
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**Topographic Profiles**

- Annual
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**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 4**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

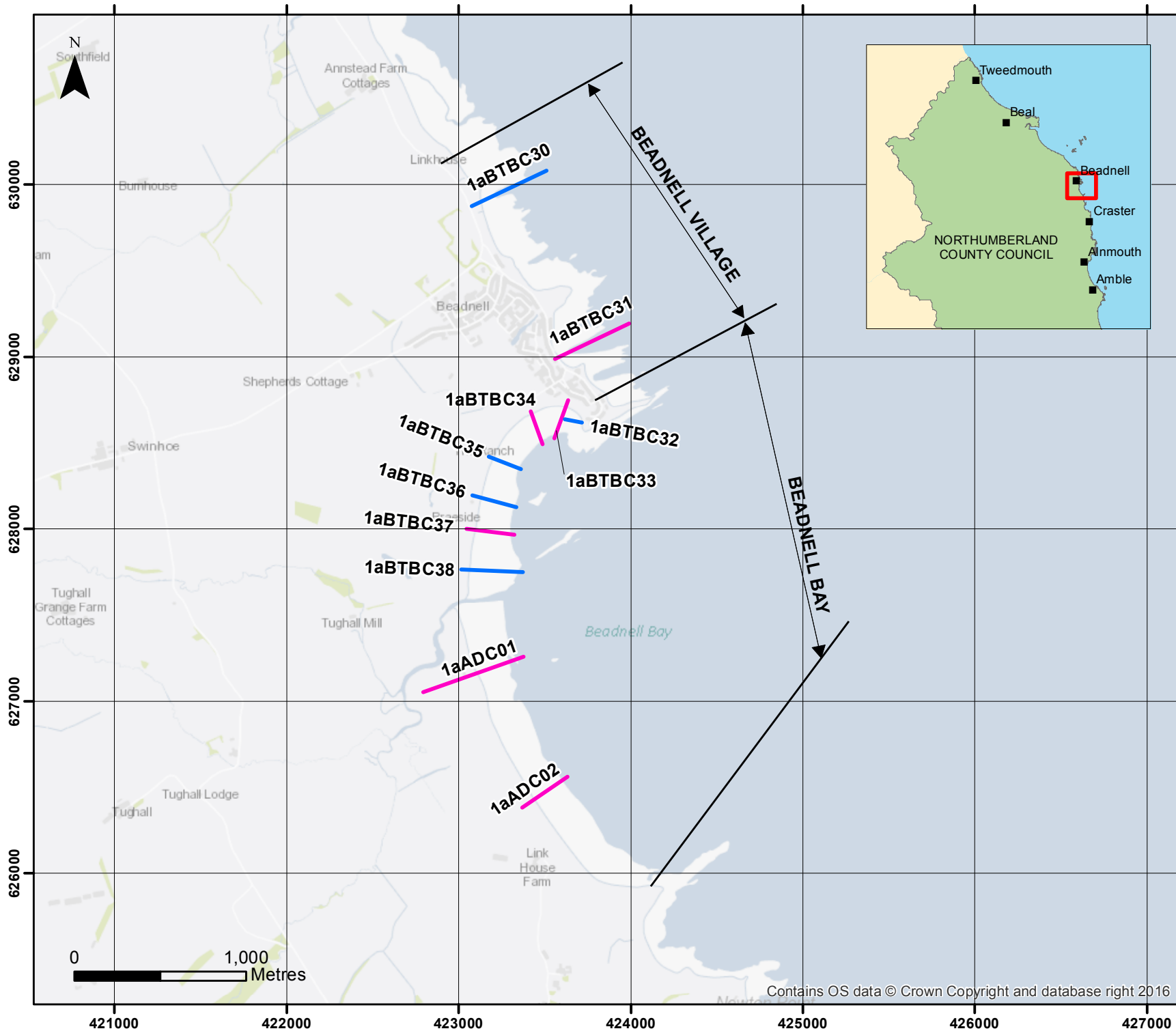
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**Topographic Surveys**

- 6 monthly (Green cross-hatch)
- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 5**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

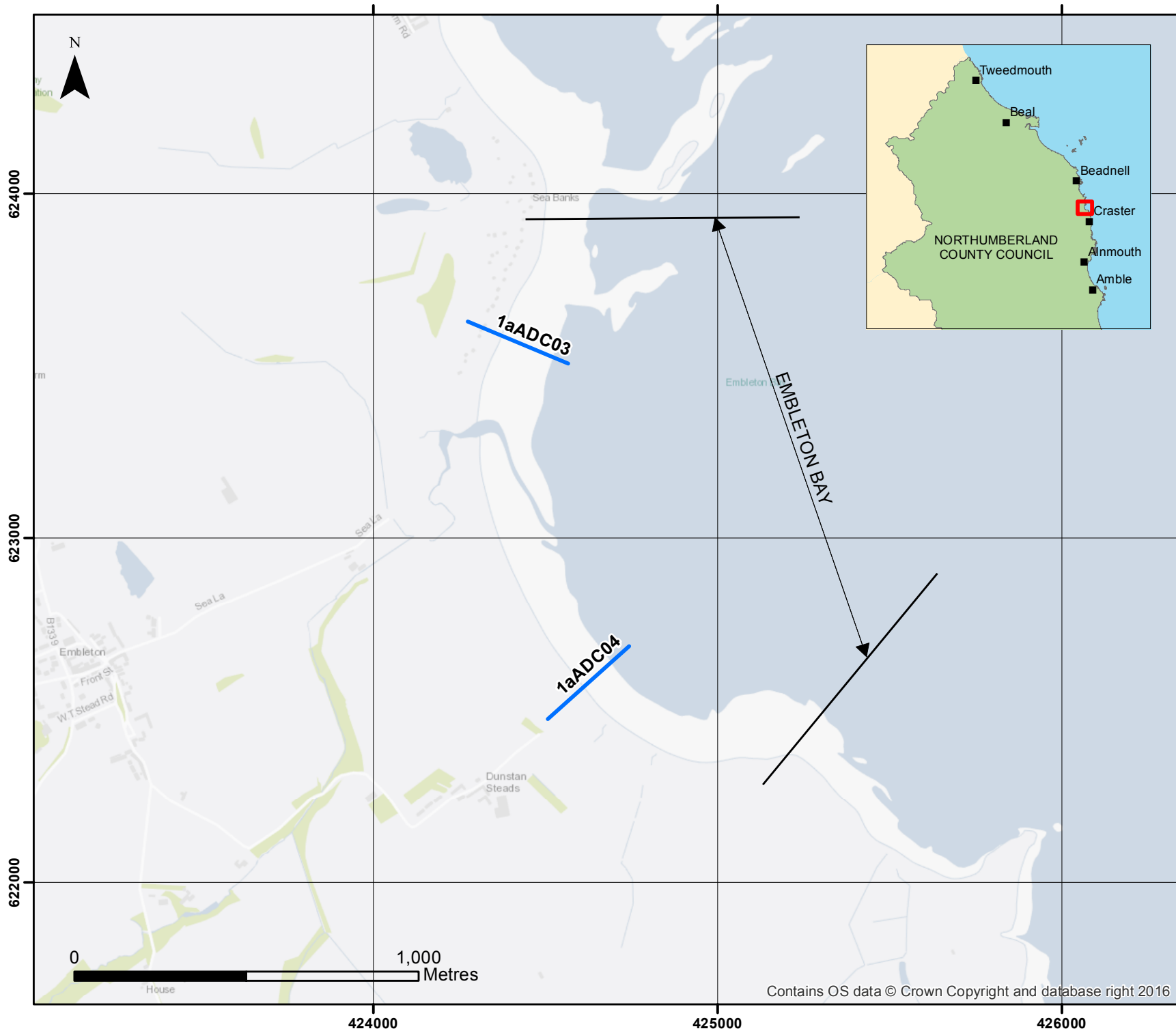
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 6**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

Drawing Scale at A4 1:15,000

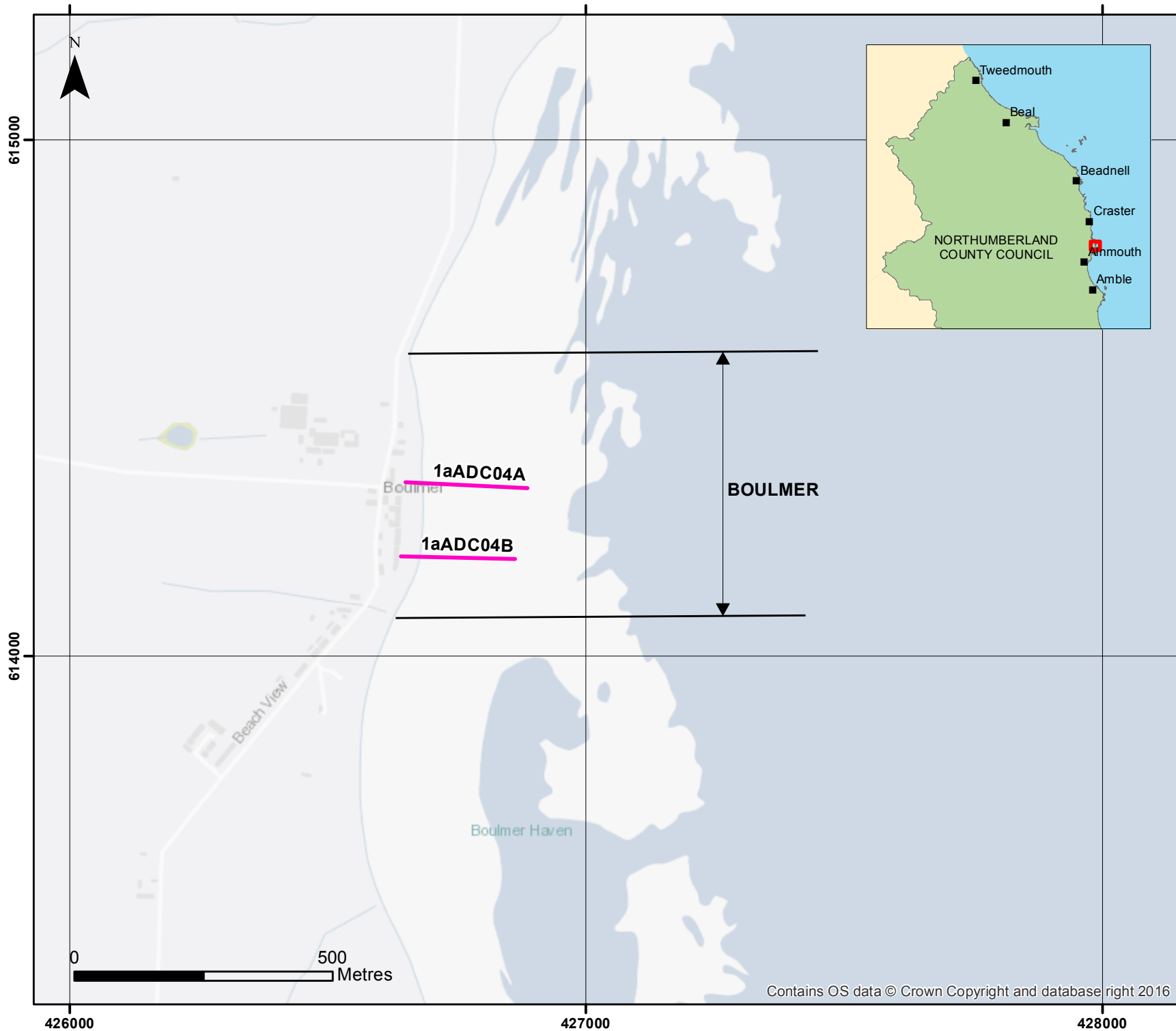
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Key

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**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 7**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

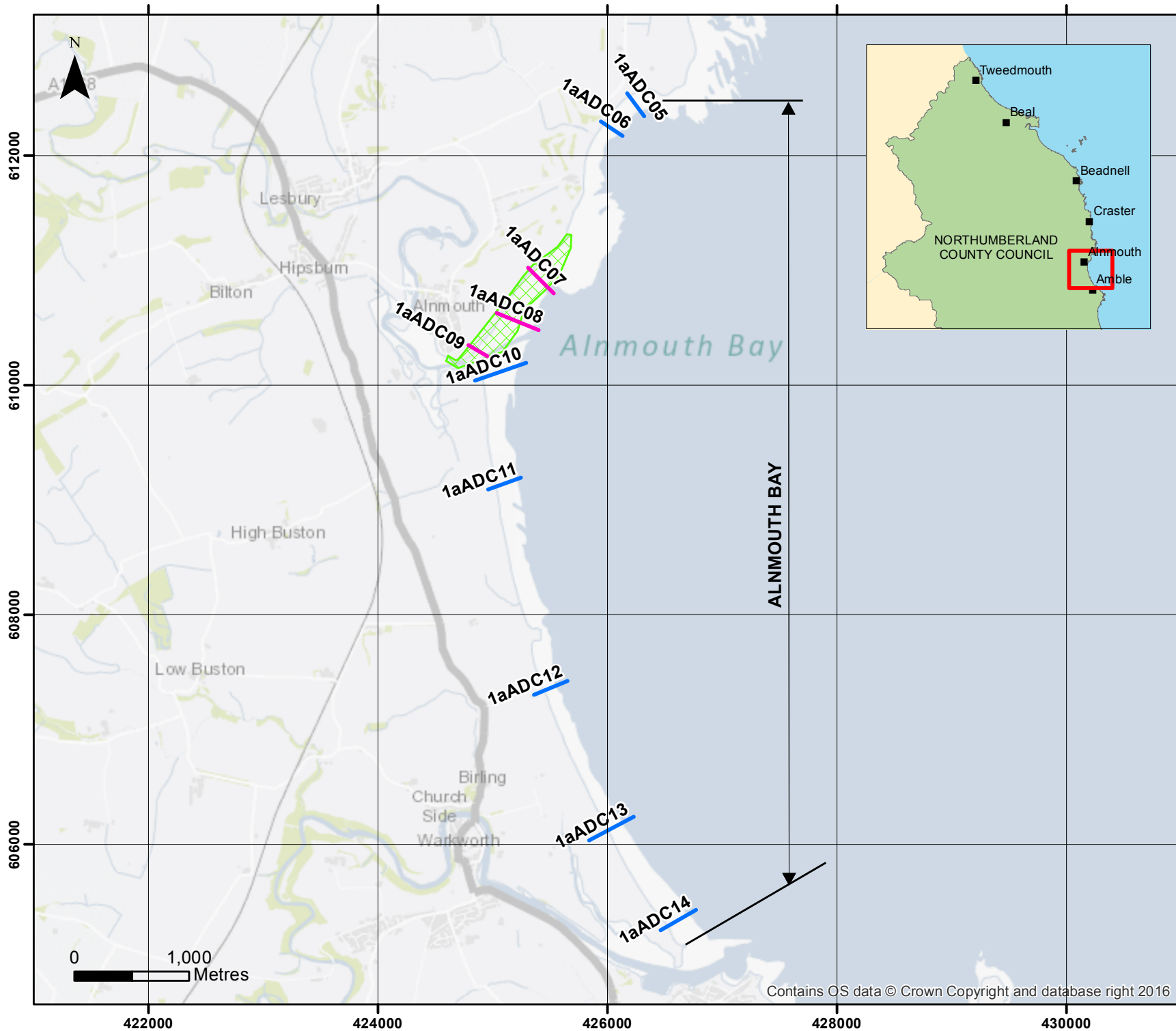
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**Topographic Profiles**

- Annual
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**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 8**

**Northumberland County Council Frontage**

Analytical Report  
 Topo Surveys

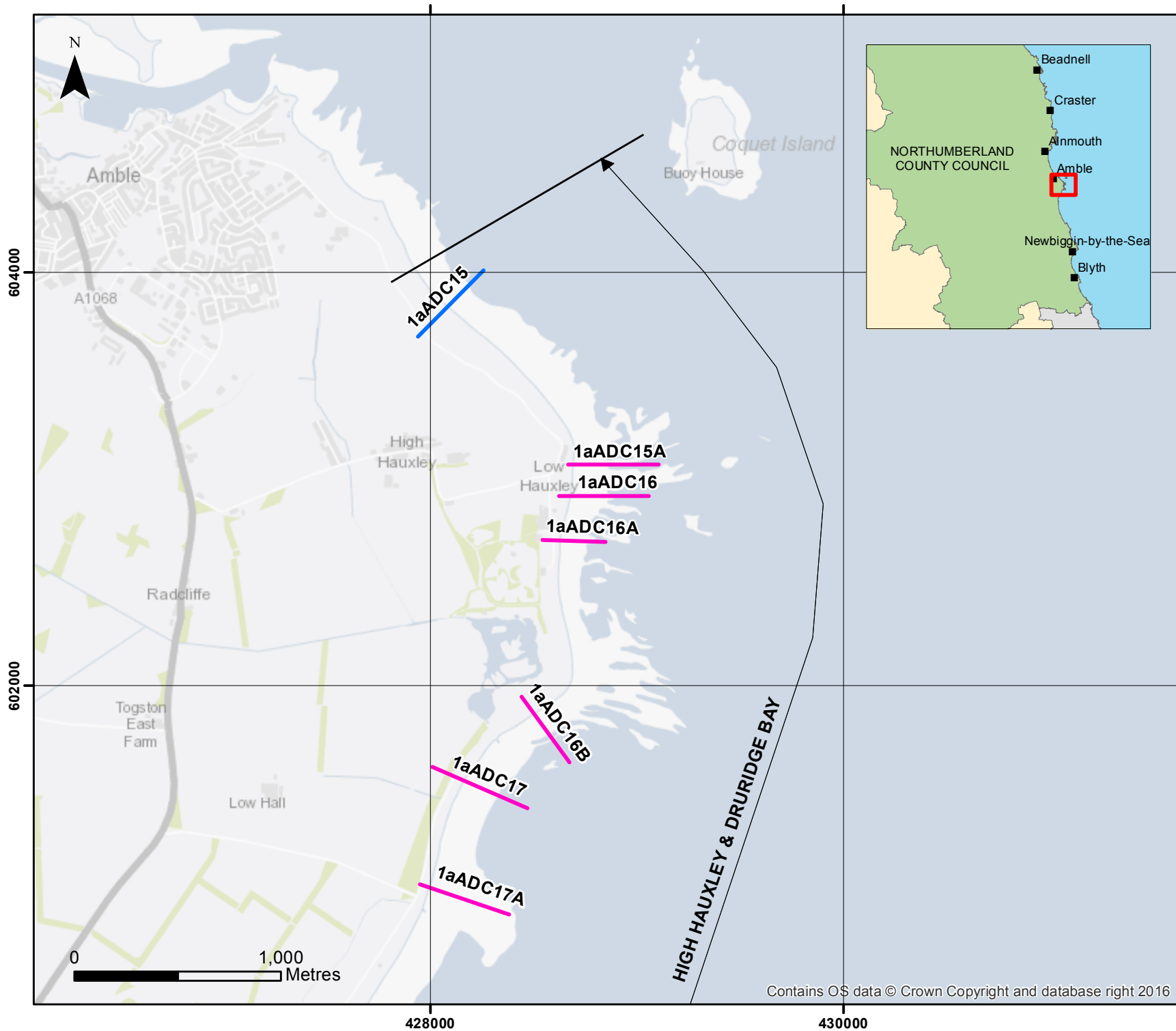
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 9**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

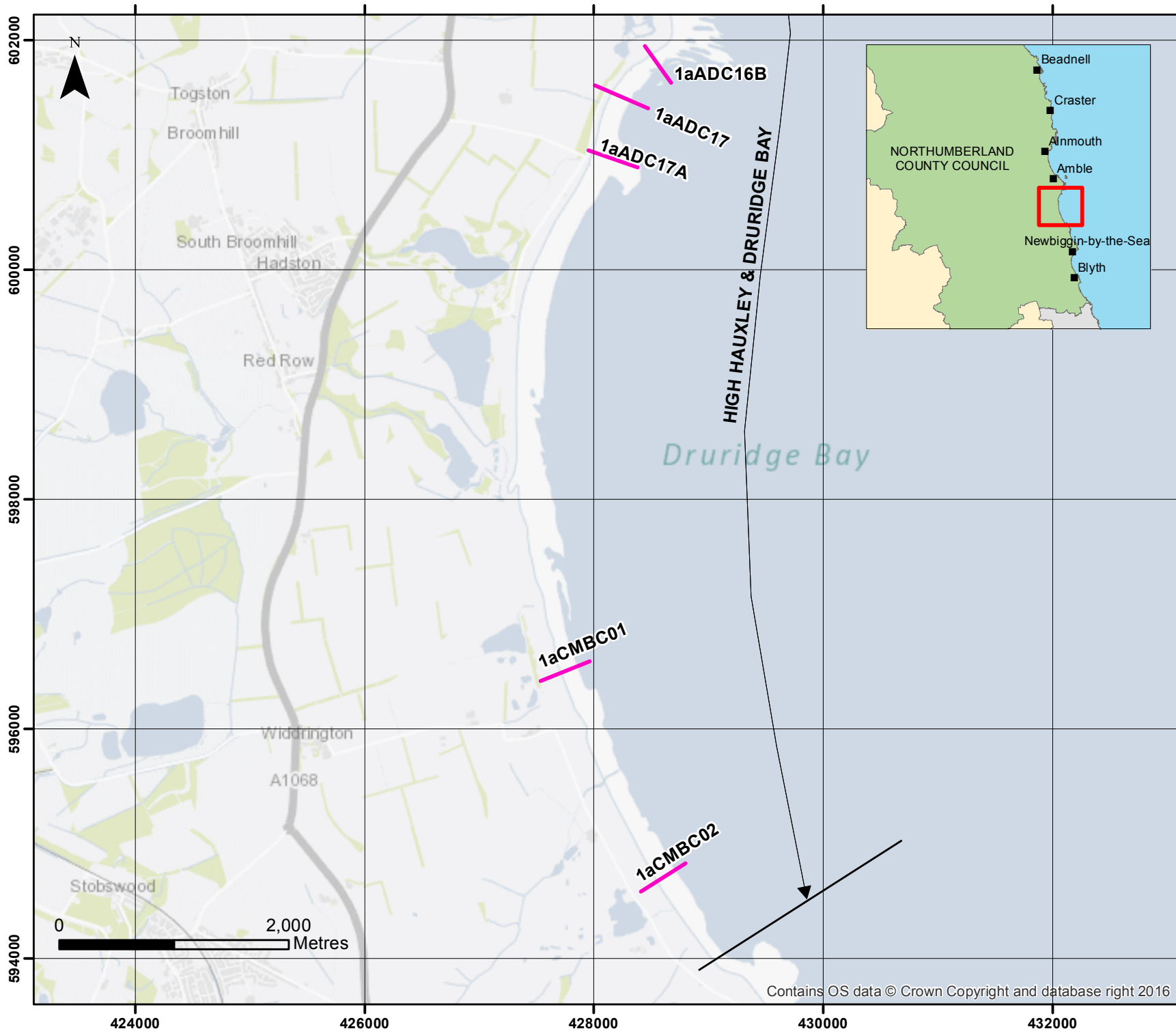
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- Bi-Annual (Pink line)

**Topographic Surveys**

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- yearly (Orange cross-hatch)
- 5 yearly (Brown cross-hatch)

*(Indicative Survey Extents shown)*

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Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 10**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

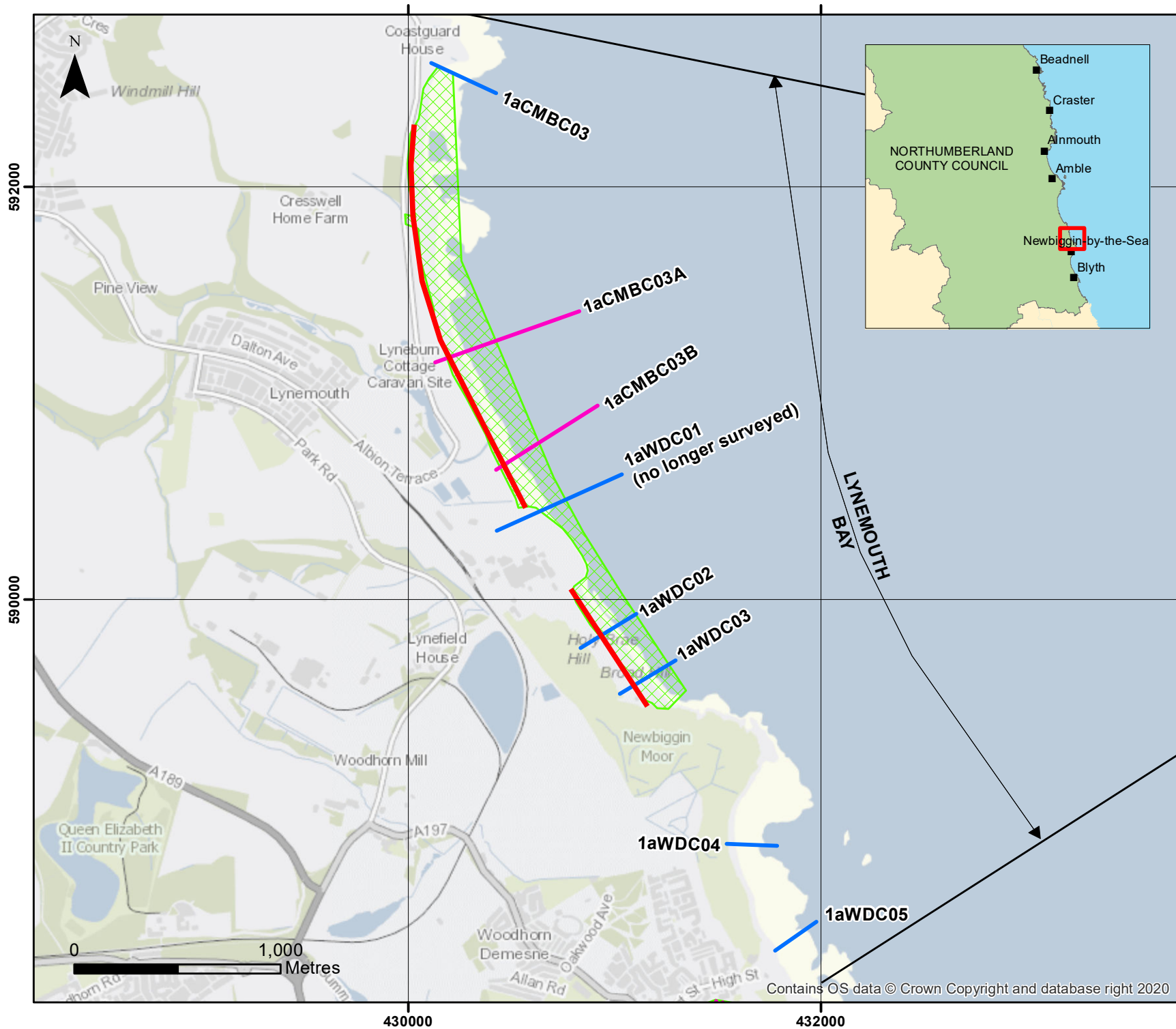
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly\*
- yearly
- 5 yearly
- Cliff Top Edge Survey\*

\* First surveyed in Dec 2020  
(Indicative Survey Extents shown)

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 11**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

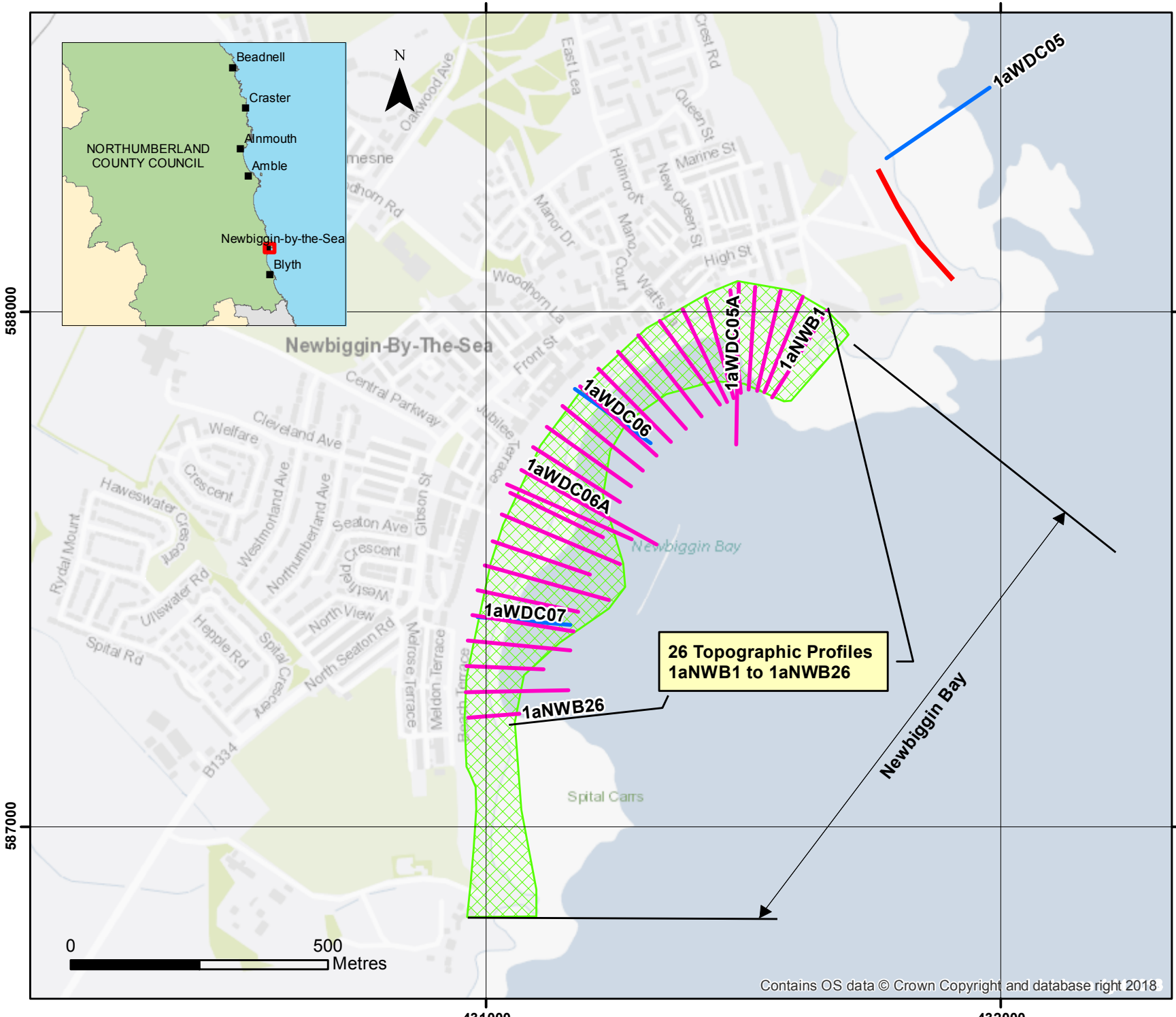
Drawing Scale at A4 1:25,000

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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly
- Cliff Top Edge Survey

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 12**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

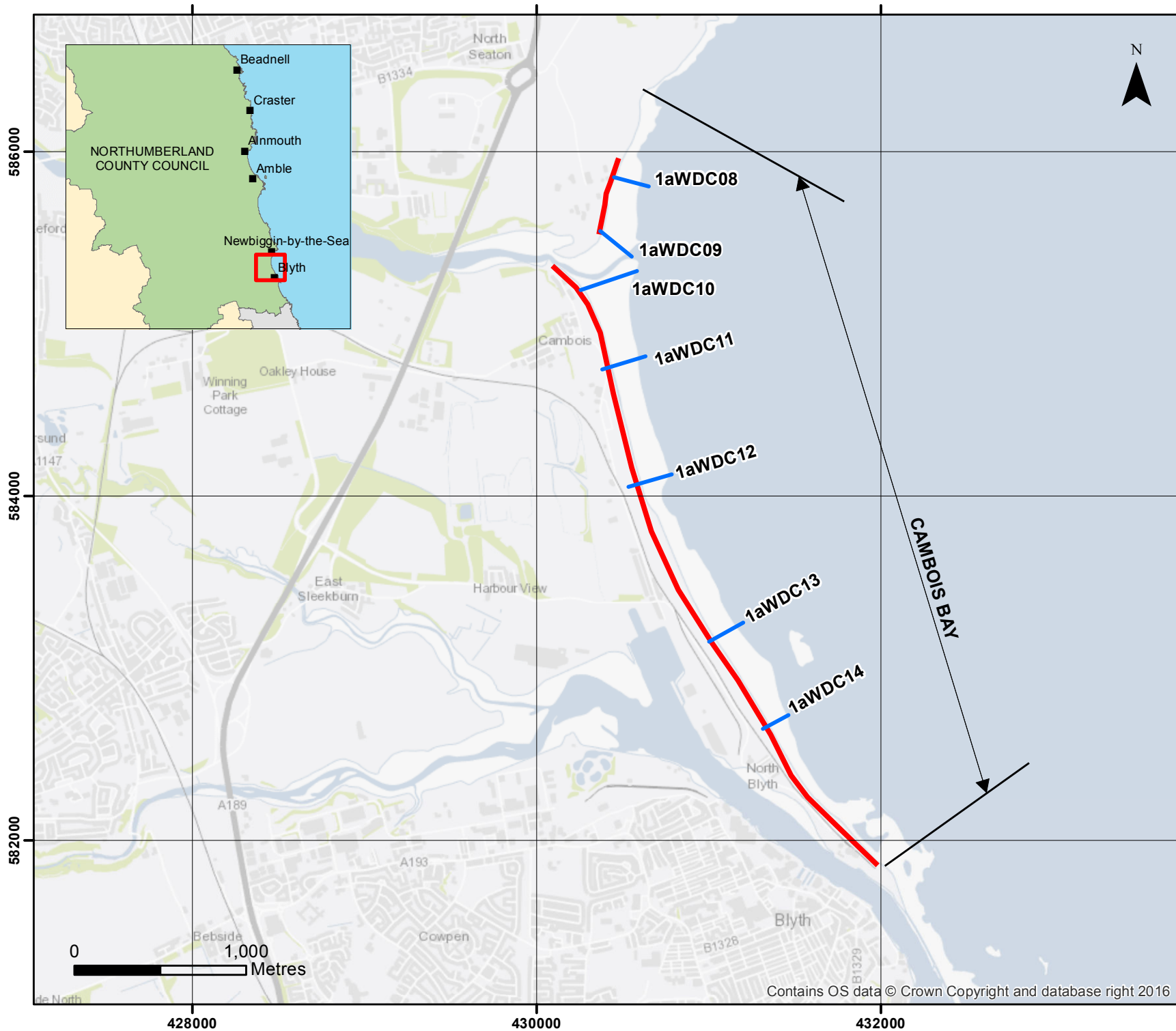
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual
- Cliff Top Edge Survey

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 13**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

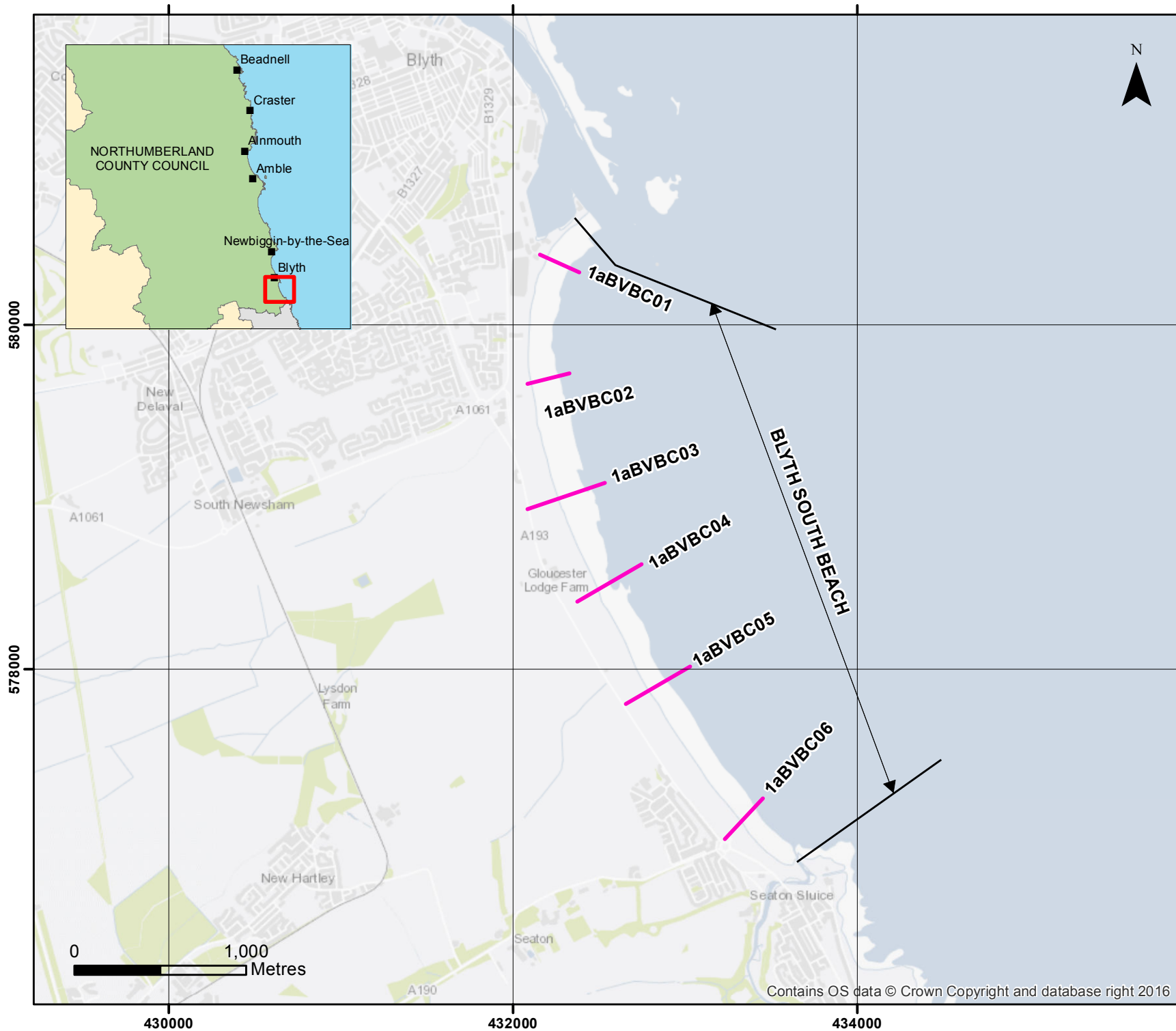
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Key

**SURVEY LOCATIONS**

**Topographic Profiles**

- Annual
- Bi-Annual
- Cliff Top Edge Survey

**Topographic Surveys**

- 6 monthly
- yearly
- 5 yearly

*(Indicative Survey Extents shown)*

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Figure 2 - Map 14**

**Northumberland County Council Frontage**

Analytical Report  
Topo Surveys

Drawing Scale at A4 1:30,000

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## 2. Analysis of Survey Data

### 2.1 Sandstell Point (Spittal A)

Survey Date	Description of Changes Since Last Survey	Interpretation
20 <sup>th</sup> August 2020	<p><b>Beach Profiles:</b></p> <p>Sandstell Point is covered by ten beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC02, 1aBTBC04, 1aBTBC05, and 1aBTBC06 were last surveyed during the Partial Measures Spring survey, 20120. Profiles 1aBTBC01, 1aBTBC03, and 1aBTBC7 to 10 were last surveyed during the Full Measures autumn survey 2019.</p> <p>Profiles <b>1aBTBC01</b> to <b>1aBTBC03</b> are located on the southern bank of the River Tweed in front of the dunes.</p> <p>At <b>1aBTBC01</b>, the dunes have remained mostly stable, with small sections of accretion and erosion by up to 0.1m. The face of the foredune has retreated landward by 0.1m. From chainage 43m to the end of the survey at chainage 71m there has been minor erosion and accretion of the beach level by up to 0.1m. Overall, the profile is at a low level across the beach profile compared to the range recorded from previous surveys.</p> <p>At profile, <b>1aBTBC02</b> there have been small sections of erosion of the beach level by up to 0.1m. Similar to profile 1aBTBC01, there has been minor erosion and accretion of up to 0.1m from chainage 45m to the end of the survey. The dunes are at a medium-high level, while the rest of the profile is a medium level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC03</b>, there has been some minor erosion of the dunes by up to 0.2m, except between chainages 19-27m which shows accretion since the previous survey by up to 0.2m. The face of the foredune has retreated by up to 2.0m. The upper beach profile has lowered by 0.2m to chainage 82m. Seaward of chainage 82m the beach has lowered by &lt;0.1m to the end of the survey. Overall, the dunes are at a high level compared to the range recorded from previous surveys, however the dune front has shown continuous retreat since November 2018. The rest of the profile is at a medium level compared to the range recorded from previous surveys.</p>	<p>Since the last survey, the dunes on south bank of River Tweed have remained stable and relatively unchanged, except at profile <b>1aBTBC03</b> where the dune face is found to have retreated by around 2.0m. The beach sections of the profile generally show minor accretion and erosion and are generally at low to medium levels.</p> <p>There has been alternating sections of erosion and accretion across the spit however the profile remains relatively unchanged at the landward end, with a flattening of the spit profile at the distal end. Changes are broadly similar to those seen between March and October 2019, albeit lower in magnitude.</p> <p>The pattern in the profiles along the open coast show erosion on the upper beach, accretion on the middle and erosion on the upper beach until the two southern profiles (<b>1aBTBC09</b> and <b>1aBTBC10</b>) which generally show the same pattern, however the dune toe has accreted at both profiles.</p> <p><b>Longer term trends:</b> The dunes have remained stable over the past 12 years and are at a medium-high level compared to the range recorded from previous surveys. However, the seaward face of the dune at profile <b>1aBTBC03</b> has shown a landward recession since November 2018.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Profiles <b>1aBTBC04</b> (longitudinal section) and <b>1aBTBC05</b> and <b>1aBTBC06</b> (both cross-sections) cover the spit at Sandstell Point.</p> <p>At profile <b>1aBTBC04</b>, there has been minor erosion and accretion by <math>\pm 0.1\text{m}</math> from the toe of the rock armour to chainage 65m. The dune front between chainages 65-160m has retreated by between 5.0m at the crest and 25.0m at the toe. The middle beach between chainage 160-260m has lowered in level by up to 0.1m, with an infilling of up to 0.3m between chainage 260-343m. The toe of the spit has accreted at the crest by up to 0.2m, whilst the toe has retreated by up to 0.3m. The most landward portion of the profile, and the toe of the spit is at a relatively high level compared to the range recorded from previous surveys, particularly between chainages 375-424m which is at its highest level recorded. The central portion is at a medium level compared to the range recorded from previous surveys.</p> <p>Profiles <b>1aBTBC05</b> and <b>1aBTBC06</b> are transects across the spit, with the open sea on the right-hand side of the plot and the river channel to the left.</p> <p>At <b>1aBTBC05</b>, the crest of the spit has remained stable since the previous survey. The riverside of the spit has experienced a movement of material down the profile, with an erosion of up to 0.2m between chainages 65-95m and an accretion of up to 0.3m between chainages 65m and -30m. There has been little change to the seaward face of the spit, with the exception of some accretion between chainages 206m and 220m. Overall the profile is broadly within the middle of its range recorded from previous surveys, both in terms of height and position.</p> <p>At profile <b>1aBTBC06</b>, the spit structure has flattened at the crest between chainages 202-322m by up to 0.3m and the accumulation of sediment on the river side of the spit from the previous survey has eroded by up to 0.3m. Toward the middle reaches of the river facing spit, there has been an accretion between chainages 30-100m by up to 1.0m. At the toe of the spit on the river side there has been an erosion by up to 0.4m. Overall, the spit profile is at a low level on its riverside face, particularly between chainages -14-25m which is at its lowest level recorded, and a medium level on its seaward face.</p> <p>Profiles <b>1aBTBC07</b> to <b>1aBTBC10</b> are located along the open coast, at the intersection of the southern side of the spit at Sandstell Point and northern end of Spittal Beach.</p>	<p>Changes in beach levels are generally within the bounds of previous surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>At profile <b>1aBTBC07</b>, there has been accretion of up to 0.2m at the crest of the foredune. On the upper beach between chainages 23-28m there has been increase in beach level by up to 0.2m and up to 0.4m between chainages 90-150m. On the mid-upper beach between chainages 28-90m and seaward of chainage 150m there has been erosion of up to 0.5m leading to a steeper beach profile overall. At the toe of the beach, the profile extends 18m seawards compared to the previous survey. Overall, the dunes are at a high level, particularly at the dune crest which is at its highest level recorded. The upper and middle beach profile is at a medium level compared to the range recorded on previous surveys, whilst the lower beach is at a low level.</p> <p>At profile <b>1aBTBC08</b>, there has been little change across the upper beach, between chainages 30m and 34m. From chainage 34m to 94m there has been a lowering of the beach level by up to 0.4m, leading to a steeper upper beach profile. On the middle beach, there has been accretion of up to 0.3m between chainages 94-150m. Seaward of chainage 150m there has been up to 0.5m of erosion. The toe of the profile now extends an additional 17m seawards compared to the previous survey. Overall, the dunes are at a high level, whilst the rest of the profile is at a medium level compared to the range recorded on previous surveys.</p> <p>Profile <b>1aBTBC09</b> again shows a similar pattern, with little change in beach levels in front of the rock revetment up to chainage 27m. Similar to the profile to the north there has been erosion of the beach profile between chainages 27-86m by up to 0.3m. From chainage 86m to 156m there has been up to 0.5m of accretion across the middle beach. Seaward of chainage 156m there has been an accretion of up to 0.2m and an extension of the survey of 37m. Overall, the beach is at a relatively medium level compared to the range recorded on previous surveys.</p> <p>Profile <b>1aBTBC10</b> shows change on the upper beach from chainage 17m to 57m limited to <math>\pm 0.1</math>m. On the mid-upper beach between chainages 57-92m, the beach profile has eroded by up to 0.2m, switching to accretion on the middle beach to chainage 144m with an infilling of a hollow from the previous survey by up to 0.6m. Seaward of chainage 144m the beach profile has accreted by up to 0.4m and the survey has extended by 43m. Overall, the beach is at a medium level compared to the range recorded in previous surveys.</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>May – Aug 2020</b></p>	<p><b>Topographic Survey:</b></p> <p>Due to the significant changes that have been observed from the beach profiles along the spit at Sandstell Point, and the three-dimensional nature of these changes, a topographic survey was introduced to the monitoring programme in November 2011. The previous survey was undertaken for the Partial Measures survey in spring 2020.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2020) have been used to create a digital ground model (DGM) (Appendix B – Map 1) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 5) produced from the last topographic survey and the present survey.</p> <p>The difference plot for this survey shows; (i) little change in the dunes on the south bank of the River Tweed; (ii) a band of erosion running south-east to north-west along the upper beach toward the spit, increasing in magnitude toward the river edge, before terminating in an isolated patch of high magnitude accretion at the toe of the spit on the riverward side; (iii) a band of accretion running approximately north to south from the tip of the spit along its centre, decreasing in magnitude in the south of the survey extent; and (iv) patches of erosion and accretion on the seaward face of the spit.</p>	<p>The findings of the topographic survey show a similar trend to the profile survey. Findings are similar to those seen between autumn 2019 and spring 2020, although they are of lower magnitude.</p>

## 2.2 Spittal (Spittal B)

Survey Date	Description of Changes Since Last Survey	Interpretation
20 <sup>th</sup> August 2020	<p><b>Beach Profiles:</b></p> <p>Spittal B is covered by four beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC11 and 1aBTBC13 were last surveyed during the Partial Measures spring survey, 2020. Profiles 1aBTBC12 and 1aBTBC14 were last surveyed during the Full Measures autumn survey 2019.</p> <p>Profile <b>1aBTBC11</b> is located to the north of Spittal Beach. The survey report noted that new dunes have almost formed at the north end of the car park. The upper beach shows erosion at the toe of the dunes to chainage 29m by up to 0.3m, switching to accretion between chainages 29-36m by up to 0.3m, and erosion to chainage 89m by up to 0.5m. This has caused a steepening of the upper beach. From chainage 89m to 136m the middle beach profile has experienced accretion of 0.2m. On the lower beach, seaward of chainage 136m, the beach profile has lowered by up to 0.5m. Overall, the profile is at a high level on the upper beach and a medium level over the remainder of the profile when compared with the range recorded from previous surveys.</p> <p>Profile <b>1aBTBC12</b> shows accretion of 0.3m immediately at the toe of the seawall, but erosion of up to 0.4m across the upper beach between chainage 5m and 76m, resulting in a steeper upper beach profile. From chainage 76m to 126m there has been accretion limited to 0.2m, followed by a small section of erosion limited to &lt;0.1m to chainage 149m. Seawards of this point, there has been up to 0.4m of accretion. Overall, the profile is at a medium-high level across the beach profile, except between chainages 30-80m which is at a low level compared to the range recorded from previous surveys.</p> <p>Profile <b>1aBTBC13</b> shows a similar pattern as 1aBTBC12 and 1aBTBC11, with erosion of the upper beach profile to chainage 52m by up to 0.6m, an increase in beach level by up to 0.2m across the middle beach to chainage 112m and an erosion of the lower beach by up to 0.2m. This has resulted in a steeper upper beach profile. Overall, the profile is at a medium-high level compared with the range recorded from previous surveys, except between chainages 24-40m which is at a low level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC14</b>, there has been erosion from the toe of the seawall to chainage 20m by up to 0.2m, switching to accretion across the middle beach by up to 0.2m. The lower beach has eroded by</p>	<p>Since the last survey, beach levels along Spittal have fluctuated, generally showing a steepening of the upper beach, increase in level across the middle beach and erosion on the lower beach. Overall, the profiles show the beach is at a roughly medium level compared to previous surveys, with some isolated areas of low beach levels. The uppermost beach at 1aBTBC14 has recovered well since the extreme lows recorded in November 2018.</p> <p><b>Longer term trends:</b> At all profile locations along Spittal Beach, the changes observed from the present survey are within the bounds of previous surveys.</p>

<b>Survey Date</b>	<b>Description of Changes Since Last Survey</b>	<b>Interpretation</b>
	up to 0.8m. Overall, the profile is at a medium level on the upper and middle beach compared to the range recorded from previous surveys, whilst the lower beach is at a low level.	

## 2.3 Goswick Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
1 <sup>st</sup> October 2020	<p><b>Beach Profiles:</b></p> <p>Goswick Sands are covered by six beach profile lines for the Full Measures survey (Appendix A). Profiles <b>1aBTBC16</b> and <b>1aBTBC19</b> were last surveyed during the partial measures spring survey, 2020. Profiles <b>1aBTBC15</b>, <b>1aBTBC17</b> to <b>1aBTBC18</b>, and <b>1aBTBC20</b> were last surveyed during the Full Measures autumn survey, 2019.</p> <p>The profiles along this frontage extend from <b>1aBTBC15</b> to <b>1aBTBC20</b> in a north to south direction. The seaward face of the dunes along the survey extent at Goswick Sands (profiles 1aBTBC15 to 1aBTBC20) have generally remained stable, with an advance of the dune toe by up to 0.4m at some profiles.</p> <p>At profile <b>1aBTBC15</b>, the dunes have eroded in small sections by up to 0.2m, whilst the dune crest has eroded by up to 0.8m. From the toe of the dunes at chainage 94m along the upper beach to chainage 185m there has been an increase in beach level by up to 0.4m. Seawards of this point, beach levels have lowered across the lower beach from chainage 280m until the end of the survey by between 0.1m and 0.4m. Overall, the profile is generally at a high level compared to the range recorded from previous surveys, with the sections between chainages 96-98m, and 121-185m being the highest on record.</p> <p>At profile <b>1aBTBC16</b>, there has been accretion at the toe of the dunes from chainages 40-54m by up to 0.3m. Across the upper beach there has been erosion of 0.3m between chainages 54m and 124m, with material moving seaward across the profile. The lower beach between chainage 124m and the end of the survey at chainage 205m has accreted by up to 1.3m. Compared with the range recorded from previous surveys, the profile is at a high level. The seaward facing dunes have shown no retreat, and their toe remains notably high, particularly between chainages 47-51m which is at its highest level recorded.</p> <p>At profile <b>1aBTBC17</b>, there has been little change across the dunes, with small sections of erosion and accretion limited to <math>\pm 0.2</math>m. The seaward face of the foredune remains stable and its toe remains high, with accretion of 0.8m at the toe of the dune to chainage 235m. There is a small section of erosion on the upper beach by up to 0.1m between chainages 235-243m, before switching to</p>	<p>Beach level change has varied along the length of Goswick Sands since the last survey. Greater movement has occurred in the north of the survey area. Accretion has tended to dominate, with a large amount of accretion between chainages 124-205m at 1aBTBC16 by up to 1.3m. At the southern end of Goswick Sands, the beach has remained stable with no discernible change to the profile form or position. Slightly north at profile 1aBTBC18, the barrier feature has eroded since the previous survey, with the formation of a small berm at the beach toe.</p> <p><b>Longer term trends:</b> The majority of change is a continuation of seasonal behaviour. The notable barrier feature developed further seaward in profile 1aBTBC18 in autumn 2015 has not attained its original height seen in 2003. Subsequent surveys have shown a gradual reduction in the feature's height, with the exception of the last survey (spring 2020) which had shown a rise in level.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>accretion across the rest of the profile to the end of the survey. Accretion ranges from 0.7m on the middle beach to 0.4m on the lower beach which infills a hollow present during the last survey. The foredune is at its most seaward position since records began and the upper to lower beach is at a high level compared to the range recorded from previous surveys. The beach toe is at its highest level recorded between chainages 395m and 460m.</p> <p>At profile <b>1aBTBC18</b>, there has been minor change (<math>\pm 0.1</math>m) to the landward side of the foredune, with an accumulation of 0.2m of sediment on the dune face and dune toe. Across the mid-beach between chainages 210m and 370m there has been a low level of erosion by up to 0.1m. A berm at chainage 510m has lowered by 0.6m to chainage 540m before switching to accretion across the mid-lower beach by up to 0.5m. A berm has formed at the beach toe at chainage 740m with the accumulation of 0.5m of sediment. Overall, the seaward dune face remains at its most seaward position recorded, the upper and lower beach are at a low level compared to the range recorded from previous surveys, whilst the berm at chainage 510m is at a medium level.</p> <p>At profile <b>1aBTBC19</b> there has been very little change across the profile, with erosion or accretion limited to <math>\pm 0.1</math>m. The only exception is at the crest and toe of the dune which has accreted by up to 0.2m. Overall, the beach is at a medium level compared to the range recorded from previous surveys, whilst the dune crest and toe are now at their highest level recorded.</p> <p>At <b>1aBTBC20</b>, the beach has generally remained stable since the last survey, with accretion / erosion of 0.1m or less. Overall, the beach is at a medium-high level across its length compared to the range recorded from previous surveys, particularly between chainages 355m and 370m where the beach has reached its highest recorded position.</p>	



## 2.4 Holy Island

Survey Date	Description of Changes Since Last Survey	Interpretation
19 <sup>th</sup> August 2020	<p><b>Beach Profiles:</b></p> <p>Holy Island is covered by eight beach profile lines for the Full Measures surveys (Appendix A). Profiles 1aBTBC21 and 1aBTBC23 were last surveyed during the Partial Measures spring survey, 2020. Profiles 1aBTBC22, 1aBTBC24 to 1aBTBC28 were last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aBTBC21 to 1aBTBC23</b> are located on the northwest side of the island, along The Snook. <b>1aBTBC24 to 1aBTBC28</b> are located on the south side of the island in the vicinity of the castle and priory. <b>1aBTBC27</b> extends out to and across the small island upon which the remains of a chapel stand.</p> <p>At all profiles on the north side of the island, the dunes have not changed in form or position since the last survey, with small sections of erosion and accretion limited to <math>\pm 0.1</math>m. At profile <b>1aBTBC21</b> there has been a small degree of erosion at the toe of the dune of less than 0.1m, and less than 0.1m of accretion across the majority of the beach profile. Over much of this extent the profile is now at its lowest recorded level when compared to the range from previously recorded surveys, except the dunes which are at a high level.</p> <p>The beach at profile <b>1aBTBC22</b> has remained stable with low levels of accretion (&lt;0.1m) across the beach profile and on the foredune. The profile is at its highest level recorded when compared with the range from previously recorded surveys. Similarly, the profile <b>1aBTBC23</b> has remained generally stable, with accretion across the profile limited to 0.1m, however the dune toe has eroded by 0.2m between chainages 489-510m.</p> <p>On the south side of the island, the dunes at profile <b>1aBTBC24</b> have remained stable since the last survey. The upper beach has eroded by up to 0.3m to chainage 66m, whilst the rest of the profile has shown change limited to <math>\pm 0.1</math>m.</p> <p>The dunes at profiles <b>1aBTBC25</b> and <b>1aBTBC26</b> have accreted by up to 0.3m, however the dune face at <b>1aBTBC25</b> has retreated landward by up to 1.0m and the dune toe has accreted by 0.2m. The</p>	<p>The dunes, sandy foreshore and sand flats around The Snook on Holy Island have remained stable in both form and position since the last survey.</p> <p>On the south side of the island, the backshore and beach have remained stable since the last survey. The largest area of change is the dune face at profile <b>1aBTBC25</b> which has retreated by 1.0m.</p> <p><b>Longer term trends:</b> Generally, the trends observed in the present survey are a continuation of those observed in the past, with the dunes and beach retaining the same form and position. The exception to this is at profile <b>1aBTBC21</b>, where the dune front and toe have advanced by up to c.26.0m through the accumulation of nearly 2.0m of sand since 2002, and <b>1aBTBC22</b> and <b>1aBTBC23</b>, where the advance of the dune toe is similar but less pronounced.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>rest of the beach profiles have remained stable with low levels of erosion and accretion of <math>\pm 0.1</math>m. The survey report notes that the end of the survey at <b>1aBTBC26</b> was not surveyed due to thick mud.</p> <p>There have been minimal changes at <b>1aBTBC27</b> and <b>1aBTBC28</b>, with small areas of erosion and accretion across the dunes and beach profile of <math>&lt;0.1</math>m.</p> <p>Overall, the profiles are at a low-medium level compared to the range recorded from previous surveys, except between chainages 11-17m and 30-50m at profile <b>1aBTBC25</b> which are their highest levels recorded.</p>	
<p><b>Sept 2019 – Aug 2020</b></p>	<p><b>Topographic Survey:</b></p> <p>Holy Island causeway and the adjacent sand flats are covered by an annual topographic survey, which commenced in October 2004. The purpose of this survey was to determine whether raising the level of the causeway had any adverse impacts on the adjacent sand flats.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2020) have been used to create a DGM (Appendix B – Map 2) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 6) produced from the last produced topographic survey (Full Measures, autumn 2019) and the present survey.</p> <p>The difference plot shows overall stability with pockets of elevation change in the order of <math>\pm 0.5</math>m. The main area of change is in the centre of the South Low channel.</p>	<p>The topographic survey shows that the causeway has remained stable since the last survey.</p>

## 2.6 Bamburgh

Survey Date	Description of Changes Since Last Survey	Interpretation
5 <sup>th</sup> October 2020	<p><b>Beach Profiles:</b></p> <p>Bamburgh is covered by one beach profile line for the Full Measures survey (Appendix A). Profile 1aBTBC29 was last surveyed during the Full Measures autumn survey, 2019.</p> <p>Profile <b>1aBTBC29</b> is located approximately 750m south-east of the castle. The survey report noted the following “<i>Profile BTBC29 has historically been observed from the same GPS base station. As phone signal reception has improved in the area the opportunity was there to run the section using VRS (i.e. direct measurement without the need for a base station). This has uncovered a height error on the base station of 1.048m meaning all historical data on this section is 1.048m too low. The data recorded this time is to the correct datum value.</i>” There have been small sections of accretion within the dunes limited to &lt;0.2m, with 0.2m of accretion at the toe of the dunes. The profile has accreted by up to 0.7m and smoothed out, covering the two berms on the upper-middle beach from the previous survey. A berm has formed on the lower beach with the accumulation of 0.9m of sediment. The dunes and beach profile are at a high, particularly on the dune face between chainages 357-365m and 361-373m, and on the beach between chainages 476-542m and 575-640m which are at their highest level recorded compared to previous surveys.</p>	<p>The dunes at Bamburgh have remained stable, and the beach shows an increase in level across the profile. It is worth noting that data from previous years has been 1.048m too low due to a height error at the base station. This has been rectified.</p> <p><b>Longer term trends:</b> The 2020 profile shows that some sections of the seaward face of the dune are at their most seaward position since 2004. The beach is at a high level compared to earlier surveys.</p>

## 2.7 Beadnell Village

Survey Date	Description of Changes Since Last Survey	Interpretation
2 <sup>nd</sup> Oct 2020	<p><b>Beach Profiles:</b></p> <p>Beadnell Village is covered by two beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC31 was last surveyed during the Partial Measures spring survey, 2020. Profile 1aBTBC30 was last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aBTBC30</b> is around 300m to the north of the village. There has been little change to the top of the dunes, and the seaward dune face has remained stable since the last survey. On the upper beach, from the toe of the dunes to chainage 57m there has been up to 0.2m of accretion. From chainage 57m to chainage 91m, erosion ranges from 0.3m to less than 0.1m. Seaward of this point, the lower beach has accreted by up to 0.2m. Overall, the profile is at a low level on the upper and middle beach compared to the range recorded from previous surveys, whilst the lower beach is at a medium level.</p> <p><b>1aBTBC31</b> is in Nacker Hole and extends across the promenade and seawall. There has been no change from chainage 0m to 12m. At the toe of the seawall there has been erosion of &lt;0.1m increasing to 0.1m to chainage 18m. Between chainages 18-21m there has been a small section of accretion by up to 0.1m, switching to erosion across the rest of the profile by up to 0.2m. There has been a change in placement of boulders seaward of 43m. Overall, the profile is at a medium level compared to the range recorded from previous surveys, except between chainages 18-20m which is at its highest level recorded.</p>	<p>The dunes and beach to the south of Beadnell Village have generally remained stable.</p> <p><b>Longer term trends:</b> The changes observed since the last survey are within the bounds of previous surveys.</p>

## 2.8 Beadnell Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>2<sup>nd</sup> October 2020</p>	<p><b>Beach Profiles:</b></p> <p>Beadnell Bay is covered by nine beach profile lines for the Full Measures survey (Appendix A). Profiles 1aBTBC33 to 1aBTBC34, 1aBTBC37 and 1aADC01 to 1aDC02 were last surveyed during the Partial Measures spring survey, 2020. Profiles 1aBTBC32, 1aBTBC35 to 1aBTBC36 and 1aBTBC38 were last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aBTBC32 to 1aBTBC34</b> are located at the northern end of Beadnell Bay, in Beadnell Harbour.</p> <p>At profile <b>1aBTBC32</b>, the crest of the dune ridge and landward side has accreted by up to 0.1m. The dune toe has eroded by up to 0.2m to chainage 21m since the last survey. In the upper reaches of the seaward facing dune, the dune has retreated by up to 0.2m. Between chainages 21-40m there has been accretion by up to 0.2m, switching to erosion across the remainder of the beach profile by up to 0.2m. Overall, the top of the dune ridge is at its most narrow form compared to previous surveys. The beach profile is at a medium level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC33</b>, the back of the dunes and dune crest have lowered by 0.1m, whilst the dune toe has accreted by 0.4m since the last survey. The survey report notes '<i>middle of dunes missing due to dense vegetation</i>', as it did in the previous surveys, so the profile for the dune face has not been analysed. On the upper beach, at the toe of the dunes at chainage 55m to chainage 80m there has been up to 0.1m of accretion. Seawards of this point, across the middle and lower beach there has been erosion of up to 0.2m. Overall, the profile is at a medium level on the upper and middle beach, whilst the lower beach is at a low level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC34</b>, the dune has undergone erosion and accretion, notably on the seaward dune face by <math>\pm 0.2</math>m. The upper beach, between chainage -4m and chainage 42m has seen accretion by up to 0.1m, with the previously exposed boulder patches remaining covered. There has been erosion of up to 0.1m between chainages 42-140m. Seaward of this point, there has been a small amount of accretion at the beach toe by less than 0.1m. Overall, the dune crest has eroded to its lowest point between chainage -12m to -9m. The upper and middle beach profile is at a high level compared with the range recorded from previous surveys, with the section between 15m and 40m reaching their</p>	<p>Along the length of Beadnell Bay, the dunes have remained stable, with the greatest change recorded on the upper reaches of the dune face at <b>1aBTBC37</b> (retreat of 1.0m). Beach levels generally remained stable throughout the bay with minor fluctuations indicating cross shore movement of sediment.</p> <p><b>Longer term trends:</b> Along the length of Beadnell Bay, the majority of the dune and beach form are similar to those observed in the past and the profile form and position is generally within the bounds of previous surveys. However, there are several sections along the north of the bay which exhibit their highest levels recorded (1aBTBC34, 1aBTBC35, 1aBTBC36 and 1aBTBC38).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>highest levels since records began in spring 2002. The lower beach is at a low level compared to the range recorded from previous surveys.</p> <p><b>1aBTBC35 to 1aBTBC38</b> are located between Burn Carrs and the outfall of Brunton Burn/Long Nanny. The dunes along this northern section of coast have remained stable since the last survey.</p> <p>At profile <b>1aBTBC35</b>, the dunes from chainage -13m to 1m have experienced small sections of erosion and accretion limited to <math>\pm 0.2</math>m. At the toe of the dunes, from chainage 1m to 5m there has been accretion by up to 0.2m. Across the upper beach there has been erosion of <math>&lt; 0.2</math>m, switching to accretion seaward of chainage 26m by up to 0.3m. Overall, the profile is at a high level compared to the range recorded from previous surveys, with the profile between chainages 1-4m, 26-64m and 90-165m being the highest levels on record.</p> <p>At profile <b>1aBTBC36</b>, the dunes have undergone sections of erosion and accretion by up to <math>\pm 0.2</math>m. From the toe of the dunes to the end of the survey at chainage 260m there has been accretion by up to 0.4m. Overall, the profile is at a high level compared to the range recorded from previous surveys, with the majority of the profile being the highest on record, except the dunes.</p> <p>At profile <b>1aBTBC37</b>, the upper reaches of the dune face has retreated by up to 1.0m, whilst the dune toe has moved seaward by up to 2.0m. The beach profile has lowered by up to 0.3m until the end of the survey. Overall, the profile is at a medium-high level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aBTBC38</b>, there has been accretion of up to 0.3m from the dune toe to chainage 205m. The lower beach has eroded by up to 0.1m. Overall, the profile is at a medium-high level, particularly between chainages 40-70m and 135-200m which are at their highest levels recorded.</p> <p><b>1aADC01 and 1aADC02</b> are located south of the outfall of Brunton Burn/Long Nanny. The dunes have not changed form or position.</p> <p>At profile <b>1aADC01</b>, there has been 0.2m of erosion in the back dunes between chainages 19-65m, with some smaller areas of erosion and accretion limited to <math>\pm 0.1</math>m. The foredune remains stable, particularly on the lower face of the foredune between chainages 254m and 262m where there has been some accretion of up to 0.3m. Across the upper and middle beach to chainage 420m, the beach profile has accreted by 0.2m. The remainder of the profile, from chainage 420m until the end of the survey at chainage 418m, has eroded by up to 0.6m. When compared to the range of previously</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>recorded results, the dunes, upper and middle beach are at a relatively high level compared to the range recorded from previous surveys. The lower beach is at a middle level compared with the range recorded from previous surveys.</p> <p>At profile <b>1aADC02</b>, there has been no notable change to the landward face or crest of the dune, however, there has been a small section of erosion to the upper section of the dune by up to 0.1m. From the middle of the seaward facing foredune to the toe at chainage 50m, the dune has prograded by up to 2.0m. Across the remainder of the profile, erosion and accretion is limited to <math>\pm 0.1</math>m. Overall, the face of the foredune is in a similar position as April 2008, which is its most seaward position recorded. The rest of the profile is at a medium to high level compared with the range recorded from previous surveys.</p>	

## 2.9 Embleton Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>5<sup>th</sup> October 2020</p>	<p><b>Beach Profiles:</b></p> <p>Embleton Bay is covered by two beach profile lines for the Full Measures survey (Appendix A). Profiles 1aADC03 and 1aADC04 were last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aADC03</b> is located towards the north of the bay, north of Embleton Burn mouth. Profile <b>1aADC04</b> is located towards the south of the bay.</p> <p>At profile <b>1aADC03</b>, the dunes have remained stable, with only small sections of change limited to <math>\pm 0.1\text{m}</math>. There has been erosion at the toe of the dunes by up to 1.0m from chainage 68m to 84m. Seawards of this point, the beach has accreted by up to 0.4m to the end of the survey at chainage 249m. Overall, the profile is at a low level compared to the range recorded from previous surveys, except on the lower beach which is at a relatively medium level.</p> <p>At profile <b>1aADC04</b>, the dune face has mostly remained stable. A small section of dune face has slumped from the top of the dune face to the toe, with the movement of 0.6m of sediment. The rest of the profile has been dominated by erosion, ranging from 0.5m on the upper beach to 0.7m at the beach toe. The middle beach between chainages 171-201m has accreted by up to 0.1m. Overall, the dune toe and dune face is at a low level compared to the range recorded from previous surveys, particularly where the sediment has slumped between chainages 133-136m which is at its lowest level recorded. The upper and middle beach are at a medium level compared with the range recorded from previous surveys.</p>	<p>The dunes at Embleton Bay are generally stable, with small amount of erosion on the upper dune face of 1aADC04.</p> <p>The beach levels have increased at profile 1aADC03, whereas further south, profile 1aADC04 shows erosion.</p> <p><b>Longer term trends:</b> The dunes have remained stable over the longer term and beach levels are within the range of those surveyed since 2002, except between chainages 133-136m at 1aADC04 which is now at its lowest level recorded. The beach levels remain at a medium-low level.</p>



## 2.10 Boulmer

Survey Date	Description of Changes Since Last Survey	Interpretation
16 <sup>th</sup> September 2020	<p><b>Beach Profiles:</b></p> <p>Boulmer is covered by two beach profile lines for the Full Measures survey (Appendix A). These were added to the programme in October 2007. Profiles 1aADC04A to 1aADC04B were last surveyed during the Partial Measures spring survey, 2020.</p> <p>At profile <b>1aADC04A</b>, accretion has dominated across the upper beach. Between the toe of the rock armour at chainage 15m and 35m, accretion is limited to less than 0.1m. From chainage 35m to the rock platform at chainage 76m there has been erosion by up to 0.2m. The rock platform remains exposed from chainage 77m and changes in level seaward of this point are most likely related to variations in survey points. The autumn 2020 survey continues seaward along the rock platform to chainage 141m. Overall the profile is at a medium-high level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC04B</b> there has been a small section of erosion from the toe of the rock armour to chainage 14m by up to 0.3m. Seawards of this point up to chainage 85m there has been up to 0.1m of accretion. The remainder of the profile, from chainage 85m to chainage 155m, is dominated by a rock platform which remains exposed. Overall, the profile is at a medium level on the upper beach compared to the range recorded from previous surveys, whilst the middle beach is at a high level, particularly between chainages 63-86m which is at its highest level recorded.</p>	<p>The changes to beach profile are minimal, predominantly showing erosion at profile 1aADC04A and accretion at 1aADC04B. Profile 1aADC04B has typically remained more stable with some accretion on the upper beach. Beach levels are generally at a medium to high level when compared to the range recorded from previous surveys, particularly across the middle beach at 1aADC04B which is at its highest level recorded.</p> <p><b>Longer term trends:</b> Beach elevations are generally medium-high in comparison to the long-term record of surveys.</p>

## 2.11 Alnmouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>16<sup>th</sup> – 17<sup>th</sup> September 2020</p>	<p><b>Beach Profiles:</b></p> <p>Alnmouth Bay is covered by ten beach profile lines for the Full Measures survey (Appendix A). Profiles <b>1aADC07</b> to <b>1aADC09</b> were last surveyed during the Partial Measures spring survey, 2020. Profiles <b>1aADC05</b>, <b>1aADC06</b> and <b>1aADC10</b> to <b>1aADC14</b> were last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aADC05</b> and <b>1aADC06</b> are located in the small pocket beach that is situated between the rock outcrops of Seaton Point and Marden Rocks.</p> <p>At profile <b>1aADC05</b>, the survey report notes that the cliffs have not been surveyed due to unsafe loose material. They have therefore not been analysed. Between the toe of the cliffs at chainage 20m and chainage 55m there has been limited change up to <math>\pm 0.1</math>m. Across the middle beach, between chainages 55-157m the beach has accreted by up to 0.3m. Seaward of chainage 157m to 186m there has been up to 0.3m of erosion leading to the loss of a lower-beach berm. This material appears to have moved seawards down the profile evidenced by an accumulation of material between chainage 186m and 225m. Overall the beach is at a medium to high level across the beach profile compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC06</b> there has been accretion from the toe of the dune to chainage 28m by up to 0.3m. From chainage 28m to 66m there has been up to 0.4m of erosion. This has led to the creation of a shallow depression. Across the mid-beach between chainage 66m and 134m there has been little change, limited to 0.1m. Seawards of this point, a second small depression has formed with the erosion of up to 0.2m to chainage 188m, before switching to accretion at the beach toe by up to 0.3m. The toe of the dunes is at one of its most landward positions since records began in 2002. The upper and middle beach are at a medium-low level, whilst the lower beach is at a low level, particularly between chainages 134m to the end of the survey which is on par with the lowest level recorded in October 2007.</p> <p><b>1aADC07</b>, <b>1aADC08</b> and <b>1aADC09</b> are located to the north of Alnmouth Bay between Marden Rocks and the mouth of the River Aln Estuary.</p>	<p>To the north of Alnmouth Bay, the dune cliffs and beach levels have remained relatively stable with a limited amount of sediment redistributed across the beach. The beach toe at profile 1aADC06 is at one of its lowest levels recorded.</p> <p>At the centre of bay, north of the mouth of the River Aln Estuary, the dunes have remained stable since the last survey. Since the last survey, the beach has shown some mobility with the movement of berms across the foreshore at 1aADC07. The lower beach at profile 1aADC07 is at its highest level recorded.</p> <p>Immediately south of the mouth of the River Aln, there has predominantly been accretion across the beach profiles, with berm migration at profile 1aADC10 and an even accretion across 1aADC11.</p> <p>At the centre of the bay, there has been accretion across the beach profile at 1aADC12. Profile 1aADC13 and ADC14 have exhibited a similar trend, with erosion on the upper beach and accretion on the middle and beach toe. The crest of the foredune at profile 1aADC14 is at its highest recorded level.</p> <p><b>Longer term trends:</b></p> <p>The cliffs in the far north of the bay have retreated slowly since 2002, by around 1-2m in total. The dunes have generally demonstrated long-term stability.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>At profile <b>1aADC07</b>, the dunes have remained stable since the last survey. The beach profile is dominated by the movement of two berms landward. The upper beach berm has moved approximately 25m landward, whilst the lower beach berm has moved 55m landward. A third berm has formed at the beach toe by up to 0.4m at chainage 312m. Overall the profile is at a high level on the upper beach, particularly between chainage 13-46m where it is at its highest level recorded. The middle beach dips to a medium level, and the lower beach is at a high level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC08</b>, the dunes have remained stable since the previous survey, with a small amount of accretion across the foredune by less than 0.1m. From the toe of the dunes to chainage 34m there has been erosion by up to 0.2m, switching to accretion across the rest of the profile by up to 0.2m on the middle beach and 0.4m on the lower beach. Overall, the profile is at a low level at the toe of the dunes and a medium level across much of the remainder of the profile extent when compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC09</b>, the dunes have remained stable since the previous survey, and the depression at chainage 19m has infilled by up to 0.4m. The rest of the beach profile is dominated with up to 0.4m of accretion across its entire extent, from chainage 22m to around chainage 115m. At chainage 115m the profile drops off steeply with the erosion of up to 0.6m. Overall, the profile is at a medium level across its full extent when compared to the range recorded from previous surveys. The Aln channel remains at a relatively landward position.</p> <p><b>1aADC10 to 1aADC14</b> are located between the south bank of the River Aln Estuary and the north breakwater of Warkworth Harbour at the mouth of the estuary of the River Coquet.</p> <p>At profile <b>1aADC10</b>, there has been alternating sections of erosion and accretion associated with the movement of berms, however accretion has dominated across the profile. There has been 0.3m of accretion at the toe of the dunes to chainage 19m, followed by the erosion of a berm by 0.2m to chainage 32m. A depression between chainages 32-105m has infilled with the accretion by up to 0.6m, followed by the erosion of a berm by up to 0.3m. The middle beach has accreted by up to 0.6m to chainage 285m, again followed by a small section of erosion by up to 0.4m to chainage 322m. A lower beach berm has formed with the accretion of up to 0.7m to chainage 385m, before the profile drops off steeply to the end of the survey at chainage 408m. Overall, the profile is at a medium-high</p>	<p>Changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, with the majority of profiles being at a medium level, although several profiles exhibit sections of record highs (several sections at 1aADC10 and 1aADC11, and the foredune crest at 1aADC14) and one profile exhibits a record low (beach toe at 1aADC06).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>level when compared to the range recorded from previous surveys. Notably, the sections between chainages 11-18m, 70-100m and 330-355m are the highest on record.</p> <p>At profile <b>1aADC11</b>, there has been erosion from the toe of the dunes to chainage 106m by up to 0.6m. The dunes themselves have remained stable. Seawards of this point until the end of the survey at chainage 294m there has been accretion by up to 0.4m, infilling a shallow depression on the middle beach from the previous survey. Overall, the profile is at a high level compared to the range recorded from previous surveys with the sections between chainages 108-144m, 180-205m and 240-276m being the highest levels on record.</p> <p>At profile <b>1aADC12</b>, the dune face has remained stable since the previous survey. There has been accretion across the majority of the beach profile. A small berm has formed on the upper beach by up to 0.6m to chainage 68m. Between chainages 68-91m there is a small amount of erosion of less than 0.1m, switching to accretion by up to 0.3m to chainage 230m. The beach toe has eroded by 0.1m. Overall, the beach profile is at a medium level on the upper beach compared to the range recorded from previous surveys, however the middle beach and toe of the profile are notably high.</p> <p>At profile <b>1aADC13</b>, the dunes and dune face have remained stable since the last survey. At the dune toe there has been accretion of 0.6m. From the dune toe at chainage 147m to chainage 192m there has been erosion of up to 0.4m. Across the middle beach, the profile has accreted by up to 0.5m, before switching to a small section of erosion by up to 0.2m between chainages 192-278m. Seaward of chainage 278m the beach toe has accreted by up to 0.4m. Overall the upper and middle beach profile is at a medium level compared to the range recorded from previous surveys, whilst the lower beach is at a high level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC14</b>, there has been a small amount of accretion (up to 0.2m) on the crest of the foredune, with an erosion of the face of the dune to chainage 162m by up to 0.6m. The middle beach has accreted by up to 0.2m to chainage 236m, switching to a small section of erosion by less than 0.1m to chainage 258m. The beach toe has accreted by up to 0.3m. The crest of the foredune is at its highest recorded level, however the rest of the profile is at a medium-low level compared to the range recorded from previous surveys.</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>May – August 2020</b></p>	<p><b>Topographic Survey:</b></p> <p>The northern part of Alnmouth Bay (to the north of the River Aln Estuary) is covered by a bi-annual topographic survey, which commenced in April 2005. Data from the most recent topographic survey (Full Measures, autumn 2020) have been used to create a DGM (Appendix B – Map 3) using GIS. A difference plot has also been produced using the DGM (Appendix B – Map 7) comparing the last produced topographic survey (Partial Measures, spring 2020) with the present survey.</p> <p>The difference plot broadly shows alternating bands of discontinuous accretion and erosion throughout the survey extent. In general, the upper beach is dominated by low levels of accretion, except in the north of the survey extent which is dominated by low level erosion. The centre of the survey has low levels of change on the upper beach, followed by patches of erosion and accretion on the lower foreshore. The northern edge of the Aln channel shows low level erosion at the toe of the channel. Change is limited to <math>\pm 0.75\text{m}</math>.</p>	<p>The findings of the topographic survey broadly show discontinuous parallel bands of erosion and accretion across the survey extent, with no discernible pattern.</p>

## 2.12 High Hauxley & Druridge Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>18<sup>th</sup> Sept – 30<sup>th</sup> Oct 2020</p>	<p><b>Beach Profiles:</b></p> <p>High Hauxley to Druridge Bay is covered by nine beach profile lines for the Full Measures survey (Appendix A). Four of these (with 'A' or 'B' suffixes) were added to the programme in October 2007. All except 1aADC15 are resurveyed every 6-months.</p> <p>Profile <b>1aADC15</b> extends across the extensive dunes at Amble Links and foreshore. There has been some minor accretion and erosion across the dunes, within the range of <math>\pm 0.2</math>m. Generally, however the dunes have remained stable. The seaward face of the foredune has experienced a small amount of accretion by up to 0.1m to chainage 87m. From chainage 87m to 133m there has been limited change (<math>\pm 0.1</math>m), with the exception of the erosion of a small upper beach berm at chainage 108m by up to 0.3m. Seawards from this point until the end of the survey at chainage 240m there has been erosion of up to 0.3m. Overall, the profile is at a low to medium level compared to the range recorded from previous surveys.</p> <p><b>1aADC15A</b>, <b>1aADC16</b> and <b>1aADC16A</b> are located around Hauxley Haven. At all locations, the dunes have remained stable since the last survey (Partial Measures, spring 2019).</p> <p>At profile <b>1aADC15A</b>, the start of the survey is missing due to access restrictions and therefore it has not been analysed. There has been 0.2m of erosion from the toe of the dune to chainage 24m. From chainage 20m to 168m the profile is dominated by low level erosion of up to 0.1m. Seaward of chainage 168m, the beach toe has accreted by up to 0.3m and the survey has extended to chainage 220m to expose a patch of rocks. Overall, the profile is at a medium level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC16</b>, the start of the survey is missing due to access restrictions and therefore it has not been analysed. Erosion has occurred at the toe of the dune between chainages 65m and 95m by up to 0.4m. Seawards of this point, until the end of the survey at chainage 285m there has been 0.1m of accretion. The survey has extended further than in recent years, exposing some rocks seaward of chainage 270m. The upper and middle beach is at a medium level compared to the range recorded from previous surveys, whilst the lower beach profile is at a low level.</p>	<p>At High Hauxley (profile 1aADC15), the dunes have remained stable and there has been some accretion on the seaward face of the dunes, however the remainder of the profile has been dominated by low levels of erosion.</p> <p>At Hauxley Haven (profiles 1aADC15A to 1aADC16A), the dunes have remained stable since the last survey. Overall, the profiles generally show low levels of erosion at the dune toe and accretion at the beach toe. The magnitude of changes recorded is low.</p> <p>In Druridge Bay, changes in beach levels in the north generally showed limited change, except at profile 1aADC17A which experienced accretion across the upper and middle beach by up to 0.6m. In the south of the bay, the beach is dominated by erosion, leading to a steeper beach profile.</p> <p><b>Longer term trends:</b> At High Hauxley, Hauxley Haven and north and south Druridge Bay, the dunes have remained stable except for limited changes at the dune toe. The beach levels are mostly within the bounds of previous surveys.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>At profile <b>1aADC16A</b>, there has been erosion at the toe of the rock revetment from chainage 80m to 90m of 0.3m. Between chainages 90-140m there has been accretion on the upper beach by up to 0.1m, switching to erosion between chainage 140-210m by up to 0.1m. Seaward of chainage 210m, the beach toe has accreted by 0.2m and similar to the previous profile, has exposed a rock patch. The profile is at a medium level on the upper and lower beach, and a low level on the middle beach compared to the range recorded from previous surveys. Between chainage 142m and 184m the profile is at its lowest level.</p> <p><b>1aADC16B</b>, <b>1aADC17</b> and <b>1aADC17A</b> are located to the north of Druridge Bay, between Bondi Carrs and Hadston Carrs and extend seawards from Togston Links. At all locations, the dunes have remained stable since the last survey (Partial Measures, spring 2020).</p> <p>At profile <b>1aADC16B</b>, there has been varying sections of minor erosion / accretion of <math>\pm 0.1</math>m between some of the rock exposures. At chainage 188m there is an accumulation of 0.4m of sediment. Overall, the profile is at a medium to low level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC17</b>, there has been small sections of erosion and accretion across the dunes limited to <math>\pm 0.1</math>m. At the toe of the dunes, there has been an accumulation of 0.2m of sediment to chainage 50m. Between 50-146m there has been little change across the profile. Seaward of chainage 146m, there has been 0.2m of erosion to the end of the survey at chainage 258m. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys.</p> <p>At profile <b>1aADC17A</b>, the upper and middle beach has experienced accretion, ranging from 0.1m on the upper beach to 0.6m on the middle beach. Seawards of the this point, up to the end of the survey at chainage 269m there has been erosion of up to 0.4m, exposing the rocky foreshore from chainage 210m. Overall, the profile is at a high level on the upper beach, and medium – high level on the middle and lower beach, when compared to the range recorded from previous surveys.</p> <p><b>1aCMBC01</b> and <b>1aCMBC02</b> are located in the southern section of Druridge Bay.</p> <p>At profile <b>1aCMBC01</b>, the dunes appear to have experienced minor erosion / accretion of <math>\pm 0.1</math>m. The profile is dominated by erosion, leading to a steeper profile than seen in spring 2020. The toe of the dunes has experienced a small accretion of 0.1m, switching to erosion by up to 0.9m on the upper beach, 0.2m on the middle beach and 0.2m on the lower beach. The beach toe has accreted by up to</p>	

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>0.5m. The beach is at a medium to high level compared to the range recorded from previous surveys, particularly at the beach toe which is at its highest level recorded.</p> <p>At profile <b>1aCMBC02</b>, the dune has remained mostly stable since the previous survey, however, there has been up to 0.5m of erosion towards the crest of the seaward face of the foredune. The upper beach has eroded by up to 0.6m, whilst the lower beach has eroded by up to 0.6m leading to a steeper profile overall. The middle beach has accreted by up to 0.3m. Overall, the profile is at a medium level on the upper and middle beach compared to the range recorded from previous surveys whilst the lower beach is at a low level.</p>	



## 2.13 Lynemouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
1 <sup>st</sup> Sept & 30 <sup>th</sup> October 2020	<p><b>Beach Profiles:</b></p> <p>Lynemouth Bay is covered by six beach profile lines for the Full Measures survey (<b>Appendix A</b>). Profiles <b>CMBC03A</b> and <b>CMBC03B</b> were added to the programme in October 2007.</p> <p>Profiles <b>1aCMBC03a</b> to <b>1aWDC01</b> were last surveyed during the Partial Measures spring survey, 2020. Profiles <b>1aCMBC01</b> and <b>1aWDC02</b> to <b>1aWDC05</b> were last surveyed during the Full Measures autumn survey, 2019.</p> <p><b>1aCMBC03</b> is located just to the south of Snab Point. The profile extends across the cliff and the rock platform below. The profile has experienced very little change since the last survey, with only minor differences in positions of rock being recorded, indicating a stable cliff and rocky foreshore.</p> <p><b>1aCMBC03A</b> is located opposite Lynemouth and extends across the extensive area of historically tipped colliery spoil before reaching the foreshore. Generally, the colliery spoil areas from chainage 0m have not changed substantially in form since the last survey (Partial Measures, spring 2020). At the toe of colliery spoil cliff, there has been 0.3m of lowering. Across the remainder of the profile there has been a relatively consistent level of lowering between 0.1m to 0.4m at the beach toe. Overall, the profile is at a low level compared to the range recorded from previous surveys, with the sections between chainages 86-88m and 94-124m being the lowest recorded level when compared with the range from previous surveys.</p> <p><b>1aCMBC03B</b> is located to the north of Lynemouth Power Station and extends across the extensive area of historically tipped colliery spoil before reaching the foreshore. The process of colliery spoil erosion has been progressively ongoing for some years. Since the last survey, the seaward face of the colliery spoil cliff has retreated by landwards by approximately 0.5-1.0m, which is now at its most landward position since Cell 1 survey records began. There has been deposition of sediment across the upper beach by up to 0.1m to chainage -7m, switching to lowering of beach levels by up to 0.2m across the remainder of the profile to the end of the survey at 42m chainage. Overall, the profile is at a low level compared to the range recorded from previous surveys, particularly the face of the colliery spoil cliff and between chainages -6m to 10m which are at their most landward / lowest level recorded. The retreat of the colliery spoil has slowed somewhat compared to previous years.</p>	<p>To the south of Snab Point, the shoreline has not changed in form or position since the last survey. Opposite Lynemouth, the historically tipped colliery spoil has generally remained stable, with some erosion in beach level at the toe of the cliff face. Across the remainder of the profile, beach lowering has been the dominant process and several sections are now at their lowest recorded level.</p> <p>To the north of the power station, the seaward cliff of the historically tipped colliery spoil has retreated landwards by a further 0.5 - 1.0m and is now at its most landward position since Cell 1 survey records began. At these locations, the upper beach has experienced accretion by up to 0.1m, however the remainder of the profile has lowered and remains at a low level.</p> <p>It has been observed that between profile 1aCMBC03A and the River Lyne, and along the riverbanks around the mouth of the river, the colliery spoil has eroded, exposing a considerable quantity of refuse material, including rubber tubing, plastics, construction waste and the like. This material has always been known to be present, but recently appears more exposed in the face of the colliery spoil at these locations.</p> <p>To the south of the power station, between Lyne Sands and Beacon Point, 1aWDC02 and 1aWDC03 have generally accreted, however the colliery spoil</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Profile <b>1aWDC01</b> extended from seaward of the rock revetment down to low water but is no longer measured.</p> <p><b>1aWDC02</b> is located to the south of the Power Station. The dunes and area of tipped colliery spoil up to chainage 125m remain largely unchanged. The crest of the colliery spoil berm has retreated landward by approximately 4m, whilst the toe has migrated seaward as a result of slumping of colliery spoil material from the crest to the toe. The rest of the beach profile has accreted by up to 1.0m. The beach profile is at a medium level compared with the range from previous surveys. The berm crest is at one of the most landward positions recorded (second only to 2018).</p> <p><b>1aWDC03</b> is located to the south of the Power Station and to the north of Beacon Point. On the landward side of the colliery spoil berm, from chainage 40m to 85m, there has been a lowering by up to 0.1m, switching to accretion by up to 0.1m to the colliery spoil berm crest at chainage 97m. On the upper reaches of the seaward face of the colliery spoil berm, the profile has experienced lowering by up to 0.3m to chainage 126m. Seaward of this point, the beach profile has accreted by up to 0.6m. The profile is at a low level compared to the range recorded from previous surveys.</p> <p><b>1aWDC04</b> and <b>1aWDC05</b> are located between Beacon Point and Newbiggin Point.</p> <p>At profile <b>1aWDC04</b>, the dunes have remained generally stable, with small sections of minor erosion limited to less than 0.1m. The profile shows the dune face remains steep. There has been accretion from the centre of the dune face across the remainder of the profile. The upper beach experiences accretion by up to 0.8m, the middle beach by up to 0.1m and the lower beach by up to 0.4m. The remainder of the profile up to chainage 196m is unchanged with the rocky foreshore exposed. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys, particularly on the dune face which is at its most seaward position recorded between chainages 41-50m, and the lower beach between chainages 92-122m which is at its highest level recorded.</p> <p>At <b>1aWDC05</b>, the cliffed section has remained stable. There has been an accumulation of boulders at the cliff toe. Seaward of this point, the beach profile has eroded by up to 0.2m on the upper beach and 0.3m on the lower beach. Seawards of chainage 32m the rock platform remains exposed and the profile is largely unchanged. Overall, the profile is at a medium to low level compared to the range recorded from previous surveys.</p>	<p>crest remains at one of its most landward positions recorded.</p> <p><b>Longer term trends:</b></p> <p>To the south of Snab Point, the changes observed from the present beach profiles are within the bounds of previous surveys. Total recession between the first survey in spring 2002 and the most recent survey in autumn 2020 is 1.25m, with a reduction in the annual rate of erosion up to last survey (0.07m/yr) (<b>Table 3</b>).</p> <p>Opposite Lynemouth, the colliery spoil has demonstrated a total recession between the first survey in autumn 2007 and the most recent survey in autumn 2020 of 29.5m overall, however the rate of erosion has not changed since the rate up to the last survey (2.3m/yr). The backing coastal slopes have remained relatively stable over this time.</p> <p>To the north of the power station, total recession between the first survey in autumn 2007 and the most recent survey in autumn 2020 is 56.25m. The average annual rate of erosion is 4.3m/yr which is a slight reduction on the rate seen up to the last survey (4.6m/yr).</p> <p>To the south of the power station, the prominent colliery spoil berm has retreated landward since the first survey in spring 2002 to the most recent survey in autumn 2020 by between 53.75 - 55m, however the average annual rate of erosion has remained the same (3.1m/yr) at 1aWDC02 and decreased slightly</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
		at 1aWDC03 (3.0m/yr) on the rates seen up to the last surveys (3.1 m/yr at both profiles).
December 2020	<p><b>Beach Topographic Survey:</b></p> <p>Lynemouth Bay is covered by a 6-monthly topographic survey, which was added to the programme in December 2020. This first survey represents a useful pre-scheme baseline against which future beach topographic surveys can be compared to determine locations and rates of change (landward recession or foreshore lowering/accretion).</p> <p><b>Appendix B (Map 4)</b> shows that the beach contours from the December 2020 survey are generally parallel to the shore, except for in the vicinity of the rock outcrops at Headagee towards the northern part of the bay. Here, the shoreline has prograded seawards in the lee of the rocks.</p>	<p>The seaward progradation of the shore in the lee of Headagee rock outcrops is facilitated by the shelter against wave energy provided to the leeward side by these rocks.</p> <p><b>Longer term trends:</b> Future repeat surveys are expected to identify areas of the beach that are relatively stable (likely to be towards the northern end of the bay and in the lee of Headagee) and areas where landward recession continues to occur as the historically tipped colliery spoil is eroded on an ongoing basis.</p>
December 2020	<p><b>Colliery Spoil Edge Survey:</b></p> <p>Colliery spoil edge survey data was collected for a baseline survey in December 2020.</p> <p>In the very north of the bay (<b>Figure 3</b>), the colliery spoil forms a beach and the survey of the low cliffed edge of this spoil beach shows a progradation of sediment in the lee of the Headagee rock outcrops. The edge of the colliery spoil beach then merges back into the colliery spoil cliff toe just to the south of the rock outcrops. It has been observed empirically that the spoil beach is eroding landwards and the point where it merges into the cliff is moving northwards, causing the cliffs to become exposed and start eroding. Further north, the remaining spoil beach protects natural cliffs/coastal slopes.</p> <p>In the centre of the bay (immediately north of the power station north towards Headagee, (<b>Figure 4</b>) the colliery spoil cliff is no longer protected by a distinct fronting colliery spoil beach (although the natural beach is very much intermixed with spoil, it does not form a distinct spoil beach like that present in the north of the bay). This results in the colliery spoil cliffs eroding landwards at a measurable rate.</p>	<p>Where a spoil beach is present on the foreshore, the backing spoil cliffs or natural cliffs/dune are stable because they are not currently affected by marine processes.</p> <p>Where the spoil beach is absent, the backing colliery spoil cliffs are actively eroding, causing measurable landward recession.</p> <p><b>Longer term trends:</b> Future repeat cliff top surveys are expected to help quantify rates of erosion (landward recession) of the historically tipped colliery spoil on a wider basis than is possible from the beach profile surveys alone.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>In the south of the bay (north of the power station, <b>(Figure 5)</b> the colliery spoil extends some distance seaward of the backing (and underlying) natural dunes, forming a 'berm' (rather than a distinct cliff edge) at the seaward edge. This berm has been eroding landwards, but at a lesser rate than in the centre of the bay.</p>	



Figure 3 – Baseline cliff top survey (North)



Figure 4 – Baseline cliff top survey (Centre)



Figure 5 – Baseline cliff top survey (South)

## 2.14 Newbiggin-by-the-Sea

Survey Date	Description of Changes Since Last Survey	Interpretation
1 <sup>st</sup> September 2020	<p><b>Beach Profiles:</b></p> <p>Newbiggin-by-the-Sea is covered by four beach profile lines for the Full Measures survey (Appendix A). Two of these, profiles <b>WDC05A</b> and <b>WDC06A</b>, were added to the programme in October 2007 specifically to help assess the performance of the capital scheme involving beach replenishment and construction of an offshore breakwater. Profiles <b>1aWDC05A</b> and <b>1aWDC06A</b> were last surveyed during the Partial Measures spring survey, 2020. Profiles <b>1aWDC06</b> and <b>1aWDC07</b> were last surveyed during the Full Measures autumn survey, 2019.</p> <p>In addition, a further 26 profiles (<b>1aNWB1</b> to <b>1aNWB26</b>) have been surveyed since September 2010 as part of a topographic survey of Newbiggin Bay. These profiles are not individually described.</p> <p>Beach profiling works were completed here in September 2012. Four areas were re-profiled; 2 sections to the east of profile <b>1aWDC05A</b>, one section at <b>1aWDC06A</b> and a narrow section at the top of <b>1aWDC07</b>.</p> <p><b>1aWDC05A</b> is in the north of Newbiggin Bay. There has been accretion at the toe of the seawall (chainage 7m) to chainage 12m of 0.4m. Between chainages 12-36m the upper beach has eroded by 0.1m. The middle beach between 36m and 58m has accreted by up to 0.3m, switching to erosion on the lower beach by up to 0.3m to chainage 95m. There is limited change across the exposed rock from chainage 115m, with minor erosion / accretion of <math>\pm 0.1</math>m. The beach profile is at a high level across the upper and middle beach and a medium level on the lower beach when compared to the range recorded from previous surveys.</p> <p><b>1aWDC06</b> is located in the centre of the northern part of Newbiggin Bay, between the two breakwaters. There has been no change outside the range <math>\pm 0.1</math>m from the toe of the seawall to chainage 18m. On the upper and middle beach to chainage 75m there has been an even band of accretion by up to 0.3m. Seawards of chainage 75m, the lower beach has eroded since the previous survey by up to 0.3m, resulting in a marginally steeper beach profile. Overall, the profile is at a medium level compared to the range recorded from the previous surveys.</p>	<p>Since the last survey, the profiles have generally eroded on the upper beach, accreted on the mid-beach and eroded on the lower beach at Newbiggin-by-the-Sea. Profiles in the north of the bay have tended to be more stable than those in the south, particularly at <b>1aWDC07</b> which is at a low level across much of its extent, reaching its lowest level recorded between chainage 32m and the end of the survey. However, changes have tended to be within the range of previously recorded results.</p> <p><b>Longer term trends:</b> Data since monitoring began in May 2002 reflects the change in beach width resulting from the beach nourishment scheme implemented at Newbiggin-by-the-Sea. This change is also reflected in the beach profile plot in Appendix A.</p> <p>The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, except at profile <b>1aWDC07</b> which has reached its lowest level recorded between chainage 32m and the end of the survey. Compared to the record of earlier surveys, the beaches are at medium to medium-high levels in the north and centre, and low in the south of the Bay.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>1aWDC06A</b> is located in the centre of Newbiggin Bay, behind the offshore breakwater. There has been very little change from the seawall to chainage 190m. Seawards of this point, across the lower beach to the end of the survey at chainage 263m, the beach profile has eroded by up to 0.3m. Overall the profile is generally at a medium-high level when compared to the range recorded from previous surveys.</p> <p><b>1aWDC07</b> is located towards the south of Newbiggin Bay. The dune crest has migrated landward by approximately 1.0m, whilst the dune toe has eroded by 0.1m. There has been a band of accretion on the upper beach by up to 0.1m to chainage 31m, switching to erosion across the middle and lower beach by up to 0.3m leading to a steeper beach profile. Overall, the profile is at a low level across much of its extent, reaching its lowest level recorded between chainage 32m and the end of the survey.</p>	
<p><b>May – Aug 2020</b></p>	<p><b>Topographic Survey:</b></p> <p>Newbiggin-by-the-Sea is covered by bi-annual topographic survey, which commenced in September 2010. The surveys are planned to help assess the performance of a capital scheme constructed in 2007, which involved beach replenishment and construction of an offshore breakwater. Prior to incorporation in the programme, these surveys were undertaken on occasions between 2007 and 2010 as part of the scheme development.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2020) have been used to create a DGM (Appendix B – Map 4) using a GIS. A difference plot has also been produced using the DGM (Appendix B – Map 8) produced from the last produced topographic survey (Partial Measures, spring 2020) and the present survey.</p> <p>The difference plot shows patchy areas of both erosion and accretion across the beach, although patches are larger in the south of the bay than the north. The magnitude of change is generally low, limited to <math>\pm 0.25</math> in the north and centre of the bay, and slightly larger in the south (<math>\pm 0.5-0.75</math>m). The largest area of accretion is on the mid-upper beach immediately north and south of the breakwater. The largest area of erosion is on the lower beach slightly south of the breakwater. Changes at Spital Carrs in the south is patchy, with no discernible pattern.</p>	<p>The topographic survey shows areas of both gain and loss across the beach of generally low magnitude. Overall, the north and centre of the bay have remained mostly stable, with the south undergoing more accretion and erosion (limited to <math>\pm 0.5-0.75</math>m).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
<p><b>August 2020</b></p>	<p><b>Sand Extent Survey:</b></p> <p>Spital Carrs is located to the south of Newbiggin Bay and is covered by a bi-annual sand extent survey, which commenced in 2012. The survey was designed to address concerns that the beach recharge scheme undertaken in the Newbiggin Bay may have impacts on the Spital Carrs SSSI and SPA if sand from the recharge scheme moves to the south. The sand extent survey therefore identifies the boundary of the sand beach on the rock platform.</p> <p>Data from the most recent sand extent survey (Full Measures, autumn 2020) has been plotted onto aerial imagery (refer to Appendix C – Map 1). The plot shows that in general there has been retreat of the limit of sand cover between the spring 2020 and the autumn 2020 survey in the centre of the survey, with several sections at their most landward position recorded. The greatest area of retreat is in the lower half of the survey where 22.0m of retreat has occurred. There has been some advance in the north of the survey extent, limited to 5.0m, whilst the most southern part of the survey has remained stable.</p>	<p>Since the last survey, there has generally been retreat in the centre, advance in the north, and the southern portion has remained mostly stable. Since 2014, there has been a general trend in the south of the survey area for advance in the summer and retreat in the winter. The autumn 2020 survey does not fit this general trend in the south, however the northern part of the survey extent has advanced.</p> <p><b>Longer term trends:</b> Review of the sand extent surveys shows the sand front has oscillated by a small amount with no net trend.</p>
<p><b>September 2020</b></p>	<p><b>Cliff-top Survey:</b></p> <p>Cliff top survey data collected for baseline survey (autumn, 2008), the previous Partial Measures survey (spring 2020) and the present Full Measures survey (autumn, 2020) is presented in this report.</p> <p>The cliff top survey is carried out as a continuous cliff edge line survey at the Newbiggin Caravan Park at Newbiggin Point. The results from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2\text{m}</math> due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality.</p> <p>There has been very little change in the position of the cliff top since the previous survey in spring 2020 and the present Full Measures survey in autumn 2020. Up to 1.0m of retreat has been noted at the cliff edge slightly south of the northernmost tip of the concrete armour blocks, approximately 130m south east of the northern end of the survey extent.</p>	<p>Since the last survey there has been no significant movement recorded.</p> <p><b>Longer term trends:</b> Since surveys began in October 2008, cliff movement has been greatest in the north of the survey area with up to 3.3m of cliff top retreat, whilst the central and southern parts of the survey area have shown less movement with retreat of less than 2.0m.</p>

## 2.15 Cambois Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>2<sup>nd</sup> September 2020</p>	<p><b>Beach Profiles:</b></p> <p>Cambois Bay is covered by seven beach profile lines for the Full Measures survey (Appendix A). Profiles. All profiles are resurveyed every 12-months.</p> <p><b>1aWDC08</b> and <b>1aWDC09</b> are located to the north of the River Wansbeck estuary in front of Sandy Bay Caravan Park.</p> <p><b>1aWDC08</b> extends from the cliff across the rock revetment onto the foreshore. There has been accretion across the beach profile, ranging from 0.6m on the upper beach at the toe of the rock revetment, 0.3m on the middle beach, and 0.8m at the beach toe. The depression which previously ran between the revetment and chainage 44m has now been fully infilled. The beach profile has a consistent, shallow gradient across its full extent. Overall, the profile is at a high level compared to the previous surveys, particularly between chainages 75-125m which is at its highest recorded level.</p> <p><b>1aWDC09</b> extends from the cliffs at the very southern end of the Caravan Park. The survey report notes that the cliff was not surveyed due to loose material and therefore has not been analysed. There has been accretion at the toe of the boulders by up to 0.7m, filling in a previously formed depression. The upper-mid beach berm has been eroded by up to 0.4m, switching to a small section of accretion by up to 0.5m to chainage 230m before eroding across the rest of the beach profile. Overall, the beach level is at a high level compared to the range recorded from previous surveys.</p> <p>Profiles <b>1aWDC10</b> to <b>1aWDC14</b> are all located along Cambois Bay, between the River Wansbeck and River Blyth estuaries.</p> <p><b>1aWDC10</b> is located on the southern side of the Wansbeck Estuary, just to the south of Cambois House. There has been erosion at the cliff toe by up to 0.6m to chainage 16m. A berm has formed on the mid-upper beach at chainage 39m with the accumulation of 0.8m of sediment, with continued accretion across the middle beach to chainage 161m by up to 0.4m. At the toe of the beach seawards of chainage 161m the profile has experienced 0.8m of erosion. Overall, the profile is at a high level compared to the range recorded from previous surveys, however the beach toe seaward of chainage 175m drops off to the lowest level recorded.</p>	<p>To the north of the River Wansbeck, the cliff top has remained stable (however this is based only on profile 1aWDC08 due to unsafe conditions at profile 1aWDC09). In general, beach levels have accreted at profile 1aWDC08 and eroded at profile 1aWDC09 since the previous survey. Beach levels remain high compared to earlier surveys.</p> <p>To the south of the Wansbeck Estuary, beach levels have shown a mixture of erosion and accretion, attributed to movement of beach berms from the previous survey. Beach levels remain at a medium-high level compared to earlier surveys, except the beach toe seaward of chainage 175m at 1aWDC11 which drops off to the lowest level recorded.</p> <p>At the centre of Cambois Bay, the cliff top has remained stable, however the dune face has retreated by up to 1m at profile 1aWDC13. Beach levels have generally shown erosion across the upper to middle beach, with accretion experienced on the lower beach and an extension of the beach toe. The profiles range in level compared to the range recorded from previous surveys, however they are within the bounds of previous surveys.</p> <p>At the southern extent of Cambois Bay, beach levels have accreted across the profile, however the cliff face is at its most landward position recorded.</p>



Survey Date	Description of Changes Since Last Survey	Interpretation
	<p><b>1aWDC11</b> extends across the rock revetment fronting the now disused foundry. There has been accretion across the upper beach profile, between chainage 44m to 115m, of up to 0.4m. From this point to chainage 185m across the mid-beach there has been up to 0.2m of erosion. Seawards of this point until the end of the survey at chainage 235m there has been accretion by up to 0.7m. The profile is at a medium to high level compared to the range recorded from previous surveys, particularly between chainages 195-230m which is at its highest level recorded.</p> <p><b>1aWDC12</b> is situated approximately mid-way along Cambois Bay. Since the last survey (Full Measures, autumn 2019), the beach levels from the toe of the cliff to chainage 84m have eroded by up to 0.3m. Seawards of this point, to the end of the survey at chainage 249m, there has been accretion ranging from &lt;0.1m on the middle beach to 0.7m at the beach toe. Overall, the profile is at a medium-high level compared to the range recorded from previous surveys.</p> <p>At <b>1aWDC13</b> is located to the centre-south of Cambois Bay. There has been a retreat of the dune face by up to 1m and a slight accretion at the toe by up to 0.2m to chainage 38m. Between chainage 38m and 100m the middle beach has eroded by up to 0.5m. Seawards of this point, across the mid-lower beach to the end of the survey at chainage 218m there has been up to 1.4m of accretion, forming a shallow berm at the beach toe. The upper and middle beach is at a low level, whilst the lower beach is at a medium level when compared with the range of previously recorded results.</p> <p><b>1aWDC14</b> is located to the south of Cambois Bay, at North Blyth. There has been a retreat of less than 1m of the cliff face, however there has been up to 0.9m of accretion from the dune toe across the upper beach to the rock / boulder patch at chainage 34m. Seaward of the rock/boulders, the beach level has increased by up to 0.3m to the end of the survey. Overall, the cliff face is at its most landward position recorded. The upper beach is at a high level and the middle and lower beach are at a relatively medium level compared to the range recorded from previous surveys.</p>	<p><b>Longer term trends:</b> Beach profiles in the north of the survey area are at higher levels compared to those in the south, suggesting a south-north movement of sediment or a greater input of sediment (possibly from the River Wansbeck) in the north of the survey area. Several profiles during the autumn 2020 survey show progressive erosion of the rill and dune cliffs.</p>
<p><b>September 2020</b></p>	<p><b>Cliff-top Survey:</b> Cliff top survey data collected for baseline survey (spring, 2009), the previous Partial Measures survey (spring 2020) and the present Full Measures survey (autumn, 2020) is presented in this report.</p> <p>The cliff top survey is carried out as a continuous cliff edge line survey in two locations within Cambois Bay; at Sandy Bay Caravan Park to the north of the River Wansbeck estuary, and Cambois Bay from south of the River Wansbeck to the breakwater at the southern end of the bay. The results</p>	<p>Since the last survey in spring 2020, there has been several sections of landward retreat in cliff top position recorded for Sandy Bay Caravan Park, with a maximum retreat of 5.0m. Cambois Bay appears to have been relatively stable along its full frontage with isolated areas of retreat limited to 1.0m.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>from the cliff top monitoring are anticipated to have an accuracy of <math>\pm 0.2\text{m}</math> due to the technique used. Furthermore, problems in precisely locating the cliff top, due to vegetation growth or the indistinct form of the cliff top, have also affected the data quality.</p> <p>The survey report notes that there has been “noticeable slumps and cliff falls at Cambois and Sandy Bay”. Most changes are recorded adjacent to Sandy Bay Caravan Park. The largest area of erosion occurs north of the slipway, where a 20m length of cliff top has retreated by a landward distance of up to 5.0m. Three smaller sections of cliff top to the south (8.0m, 8.0m and 14.0m) have retreated by up to 3.0m, 2.0m and 4.0m (respectively). The remainder of the cliff top adjacent to Sandy Bay appears to have retreated by less than 0.2m. During December 2019 it was noted that a slip in the cliff top had occurred to the north of the survey area at Sandy Bay Caravan Park. The location of the slip is thought to be approximately 100m north of the northernmost corner of the caravan park. The slippage has encroached onto the public footpath in this area. It was noted that the slippage had already been taped off in December 2019, with signs placed by Northumberland County Council alerting footpath users to the unstable cliff edge. It is recommended that this slip and the wider area is monitored to ensure public safety along this popular coastal footpath.</p> <p>Along the Cambois Bay frontage the cliff tops have remained relatively stable along much of the extent of the survey. There are small isolated areas of retreat limited to 1.0m, except for one 4.0m section close to Debdon House which has retreated by 1.5m and a 9.0m section south of Gray Street in the south of Cambois Bay which has retreated by 3.5m since the previous survey.</p>	<p><b>Longer term trends:</b> At Sandy Bay Caravan Park the cliff top retreat has been more significant in the southern part of the survey area with up to 10m of erosion since 2008, whilst the northern part has eroded by c.1.0-3.0m.</p> <p>In Cambois Bay, the area of greatest cliff top retreat since the surveys began in 2009 is the centre of the bay opposite Ridley Terrace, Cambois, where up to 12.0m of erosion has occurred. The north and south of the bay have retreat more typically c.1.0-5.0m.</p>

## 2.16 Blyth South Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>3<sup>rd</sup> September 2020</p>	<p><b>Beach Profiles:</b></p> <p>Blyth South Beach is covered by six beach profile lines for the Full Measures survey (Appendix A). All profiles are resurveyed every 6-months.</p> <p><b>1aBVBC01</b> is located towards the north of South Beach, in front of the area of land owned by the Port of Blyth. There have been some minor changes to the form of the dunes, limited to <math>\pm 0.1\text{m}</math>, but their position remains unchanged since the last survey (Partial Measures, spring 2020). The seaward face of the foredune from chainage 35m to 108m has experienced accretion by up to 0.4m. Between chainage 108m and 160m there has been erosion by up to 0.8m, leading to a steep lower beach profile. Seawards of this point, a small accumulation of sediment (<math>&lt;0.2\text{m}</math>) occurs at the beach toe. Overall, the profile is at a high level on the upper and middle beach, particularly between chainages 36-44m and 85-105m which are at their highest level recorded. Conversely, the lower beach is at a low level particularly between chainages 140-160m which is at its lowest level recorded.</p> <p><b>1aBVBC02</b> shows an accumulation of sediment at the toe of the sea defence by up to 0.3m. Following this, the upper beach has eroded by 0.5m to chainage 35m, leading to a steeper upper beach profile. The depression at chainage 60m has infilled by up to 0.4m of sediment to chainage 84m. Seaward of this point, the lower beach has eroded by up to 0.4m. Overall, the profile is generally at a medium level across its full extent with the exception of the upper beach which is at a high level compared to the range recorded from previous surveys.</p> <p>At <b>1aBVBC03</b> there have been no significant changes to the position and form of the dunes since the last survey (Partial Measures, spring 2020), with small sections of accretion limited to 0.2m. The dunes remain at their most landward extent since 2002. Meggies Burn channel is still visible at chainage 89m but has migrated landward (by 6m) and narrowed since the previous survey in spring 2020. The upper beach berm is still present at chainage 110m has widened and flattened, with the crest moving seaward by approximately 15m. Seawards of this point to chainage 270m there has been accretion by up to 0.2m, switching to erosion at the beach toe by up to 0.4m. Overall, the upper beach berm is at its most seaward position recorded and the dune face remains at a relatively landward position compared to previous surveys. The rest of the beach is at a high level, reaching its</p>	<p>Since the last survey, the dunes and dune face at Blyth South Beach have remained largely stable, retaining the same form and position and some small areas of accretion limited to 0.2m.</p> <p>There has been variable accretion and erosion across the beach at Blyth South Beach, with no noticeable trend across the profiles. The profiles range in level compared to previous surveys, however they are generally at a medium to high level.</p> <p><b>Longer term trends:</b> At Blyth South Beach, the dunes have generally demonstrated a long-term trend of stability.</p> <p>The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, however the lower beach at 1aBVBC01 is at its lowest level recorded, whilst several sections at 1aBVBC01 and 1aBVBC03 are at their highest level recorded since records began. Meggies Burn continues to change in width and position across the foreshore, and there are concerns that it is threatening to undermine one of the beach groynes.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>highest recorded level between chainage 200m and 255m. Anecdotal evidence suggests previously covered WWII defences in the vicinity of this profile are now exposed as the channel of Meggies Burn cuts across the foreshore. This is a known issue with the channel of Meggies Burn, which has migrated northward and is threatening to undermine one of the beach groynes. This is best observed from analysis of the Cell 1 aerial photography, rather than from the profile surveys.</p> <p>At <b>1aBVBC04</b>, there has been accretion by up to 0.1m on the crest and 0.2m of on the face of the dunes, however there has been no significant change to the position of the dunes since the last survey (Partial Measures, spring 2020). Between chainage 45m and 110m there has been up to 0.6m of erosion, causing a steepening of the profile across the upper beach. Seawards of this point up to chainage 220m there has been up to 0.3m of accretion. At the toe of the beach there is some minor erosion of less than 0.1m. Overall, the dune crest is at its highest level recorded since 2007, whilst the upper-lower beach profile is at medium level compared to the range recorded from previous surveys.</p> <p>At <b>1aBVBC05</b>, there has been little change to the form or position of the dunes since the last survey (Partial Measures, spring 2020), with accretion by up to 0.4m at the dune toe. Seawards of this point, there are alternating sections of erosion and accretion, however accretion has dominated the beach profile ranging from 0.2m on the upper beach to 0.4m on the lower beach. The dunes are at a high level compared to the range recorded from previous surveys, whilst the dune toe remains at a low level. The upper beach is at a high level whilst the mid and lower beach is at a medium level, when compared to the range recorded from previous surveys.</p> <p>At profile <b>1aBVBC06</b>, there has been no significant change to the position or form of the dunes since the last survey (Partial Measures, spring 2020). From the toe of the dunes at chainage 90m across the upper and middle beach to chainage 193m, there has been an erosion by up to 0.8m leading to a steeper upper beach profile. Seaward of chainage 193m, the beach toe has accreted by up to 0.1m. The dunes and upper beach are at a relatively high level, whilst the middle and lower beach are at a relatively low level when compared to the range recorded from previous surveys. The autumn 2020 survey extends seawards over the rocks from chainage 170m however a shallow veneer of up to 0.7m is present in the autumn 2020 survey meaning they are no longer fully exposed.</p>	

## 4. Problems Encountered and Uncertainty in Analysis

### Individual Profiles

- At profiles BTBC19 and BTBC20, the survey report states that the offshore extent of the survey is limited by a drain. This drain is likely a runnel which separates the barrier feature in the lower foreshore from the rest of the beach.
- At BTBC26, the survey report notes that it was unsafe to survey the end of the section as the mud was too thick.
- At profile BTBC33, there are gaps in the section (at the location of the middle of dunes) due to dense vegetation. This needs to be taken into account when assessing the profile data as the levels in these measurement gaps will not be reliable.
- At profile ADC05 there was unsafe loose material which prevented the survey of the cliff face.
- Profiles ADC08 and ADC09 end at the river.
- The start of sections AD15A and ADC16 were unable to be surveyed due to access being denied by homeowner.
- At profile ADC16B, the section starts at a new fence.
- Profile WDC01 is no longer measured.
- At profile WDC09, there was unsafe loose material which prevented the survey of the cliff face.
- Profiles WDC09 and WDC10 terminate at a river.
- At profile BVBC05 the surveyors were unable to measure an area at the end of the section due to soft sand and deep water.

### Topographic Survey

- The surveyors report notes that the concrete sea wall was buried in places so the guardrail was picked up to identify the back of the beach at Newbiggin-by-the-Sea.

### Cliff Top Surveys

- Cambois, Newbiggin, and Sandy Bay cliff tops have now been combined into one survey area.
- At Cambois Bay, the surveyors noted that very thick dense vegetation at north end of the cliffs hindered surveying. This was also noted in all previous reports. The report also notes some noticeable slumps and cliff falls at Cambois and Sandy Bay.

## 5. Recommendations for 'Fine-tuning' the Monitoring Programme

At Lynemouth, the refuse in amongst the colliery spoil has become exposed in the cliff face prompting Northumberland County Council to develop a waste management scheme at Lynemouth Bay to prevent this material being released into the wider environment, causing unwanted adverse aesthetic and environmental effects. A *Site Restoration & Aftercare* report was submitted which recommended that enhanced coastal monitoring be undertaken to define the ongoing rates of coastal erosion along the frontage, both before and after the waste management scheme is implemented.

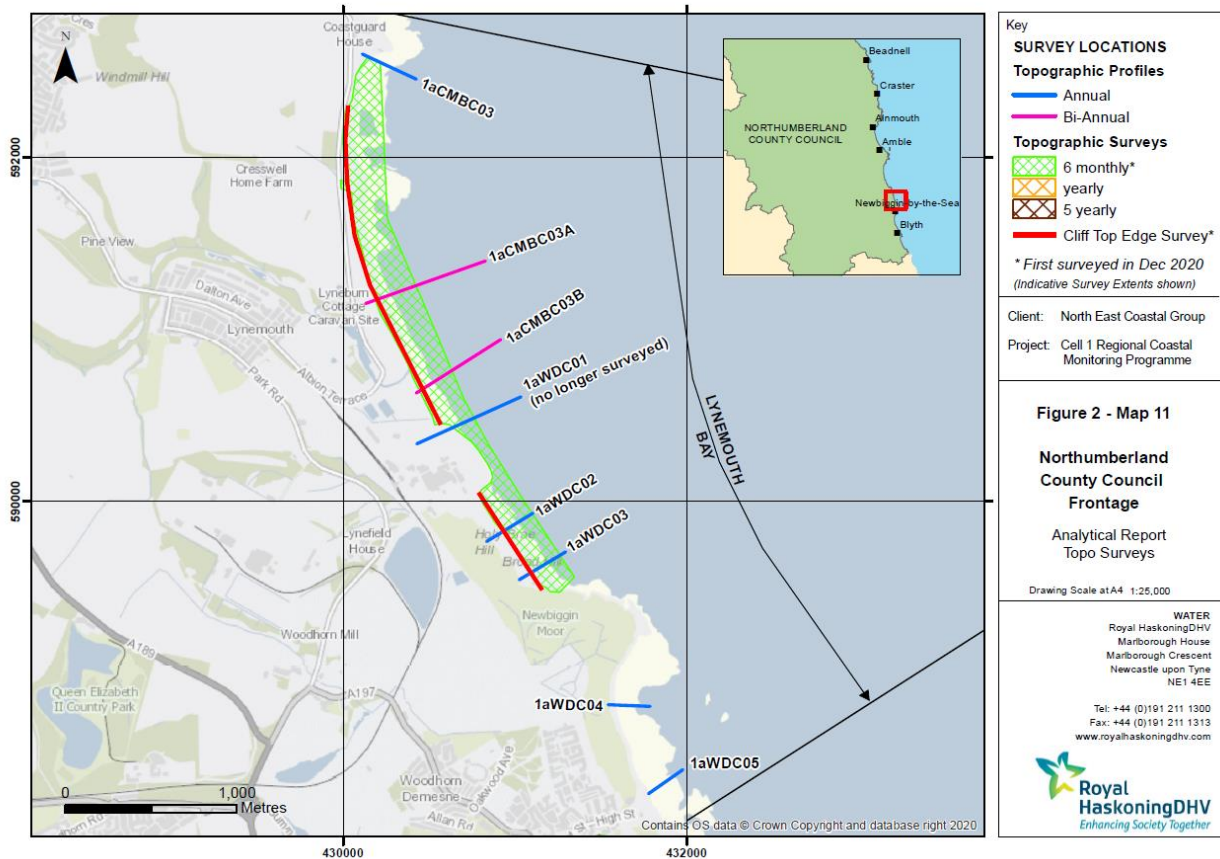
It is recommended that the pre-existing Cell 1 monitoring will continue at Lynemouth Bay and, from December 2020 onwards, be enhanced with the following additions:

- 6-monthly topographic survey of the beach (from the toe of the cliffs/slopes down to low water);
- 6-monthly survey of the cliff-top and/or cliff-toe position of the colliery spoil cliffs.

A baseline bathymetric survey will also be undertaken in 2023, extending profile 1aCMBC03B seaward to the 20m sea bed contour along a shore-normal corridor.

The scope of the enhanced coastal monitoring is shown in **Figure 6**. Due to the timing of receipt of the first of the newly recommended enhanced surveys in December 2020, the data have been included in the present Analytical Report for the Full Measures 2020 survey.

All surveys within the proposed construction works area will temporarily be suspended during the construction works and will re-commence thereafter upon completion of the waste management scheme.



**Figure 6 – Scope of Enhanced Coastal Monitoring**

## 6. Conclusions and Areas of Concern

- At Sandstell Point (Spittal A), the recorded profiles and topographic survey present no causes for concern. However, the seaward face of the dune at profile **1aBTBC03** has shown a landward recession since November 2018.
- At Spittal (Spittal B), the recorded profiles present no causes for concern.
- At Goswick Sands, the recorded profiles present no causes for concern. The barrier feature in the seaward end of profile 1aBTBC18 shows movement and is likely to be a cyclical feature.
- At Holy Island, the recorded profiles and topographic survey present no causes for concern.
- At Bamburgh, the recorded profiles present no causes for concern. It is worth noting that data from previous years has been 1.048m too low due to a height error at the base station (see **Section 4** above). This has been rectified.
- At Beadnell Village, the recorded profiles present no causes for concern.
- At Beadnell Bay, the recorded profiles present no causes for concern.
- At Embleton Bay, the recorded profiles present no cause for concern
- At Boulmer, the recorded profiles present no cause for concern.
- At Alnmouth Bay, the northern profiles have remained stable, with a limited amount of sediment redistributed across the profiles. Towards the centre of the bay, beach levels have remained stable with some movement of berms at 1aADC07. Similarly, in the south, profiles are have remained stable, predominantly showing accretion across the beach. The recorded profiles present no cause for concern.
- At High Hauxley & Druridge Bay, the High Hauxley and Hauxley Haven profiles have remained stable since the previous survey, generally showing low levels of erosion at the dune toe and accretion on the lower beach. The recorded profiles present no cause for concern. The profiles in Druridge Bay show a steepening of the beach profile, however they do not present a cause for concern.
- At Lynemouth Bay, the recorded profiles show a retreat of the colliery spoil bank north of the power station by 0.5-1.0m and is now at its most landward position recorded. The cliff top survey shows that where the spoil beach is absent, the backing cliffs are eroding, often at a measurable rate. To monitor this trend, repeat future cliff top surveys have been recommended to help quantify rates of erosion of the historically tipped colliery spoil on a wider basis than is possible from the beach profile surveys alone.
- At Newbiggin-by-the-Sea, profiles in the north of the bay have remained more stable than those in the south. Much of the beach level at profile 1aWDC07 is now at its lowest level recorded. Changes have tended to be within the range of previously recorded results. Results from the sand extent survey show that there has generally been advance of sand in the central and northern section of the survey, whilst the south has remained mostly stable. There have been no adverse impacts on the SSSI at Spital Carrs. There has been no significant movement in cliff top position since the previous survey.
- Several sections of cliff slumping has occurred at Sandy Bay Caravan Park, with a maximum retreat in cliff top position by up to 5.0m and several smaller sections by up to 4.0m since the previous Full Measures survey in autumn 2019.
- At Cambois Bay, the beach and cliffs have mostly remained stable, however the bottom reach of the dune face at 1aWDC13 has retreated by up to 1.0m since the previous Full Measures survey in 2019. The profiles and cliff top survey present no cause for concern.
- At Blyth South Beach, the profiles range in level compared to previous surveys, however they are generally at a medium to high level. The profiles present no causes for concern. There is known to be an issue with the channel of Meggies Burn extending across the foreshore and in places undermining the beach groyne, although this is best observed from analysis of the Cell 1 aerial photography, rather than from the profile surveys.

## **Appendices**



# **Appendix A**

## **Beach Profiles**

The following sediment feature codes are used on some profile plots:

Code	Description
S	Sand
M	Mud
G	Gravel
GS	Gravel & Sand
MS	Mud & Sand
B	Boulders
R	Rock
SD	Sea Defence
SM	Saltmarsh
W	Water Body
GM	Gravel & Mud
GR	Grass
D	Dune (non-vegetated)
DV	Dune (vegetated)
F	Forested
X	Mixture
FB	Obstruction
CT	Cliff Top
CE	Cliff Edge
CF	Cliff Face
SH	Shell
ZZ	Unknown

# Beach Profile

Location: 1aBTBC01

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

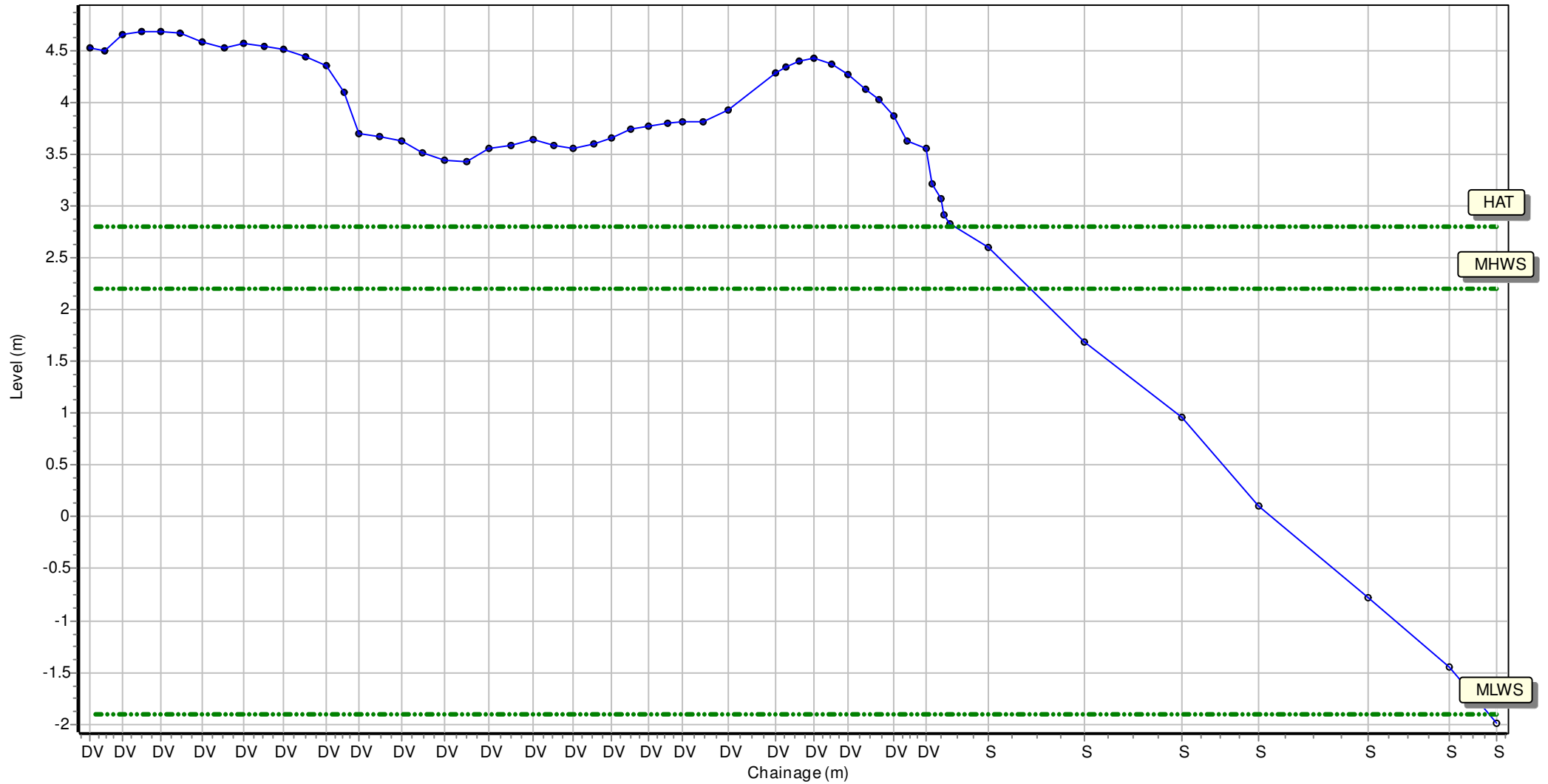
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400275.192 Northing: 651875.262 Profile Bearing: 347 ° from North



# Beach Profile

Location: 1aBTBC02

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

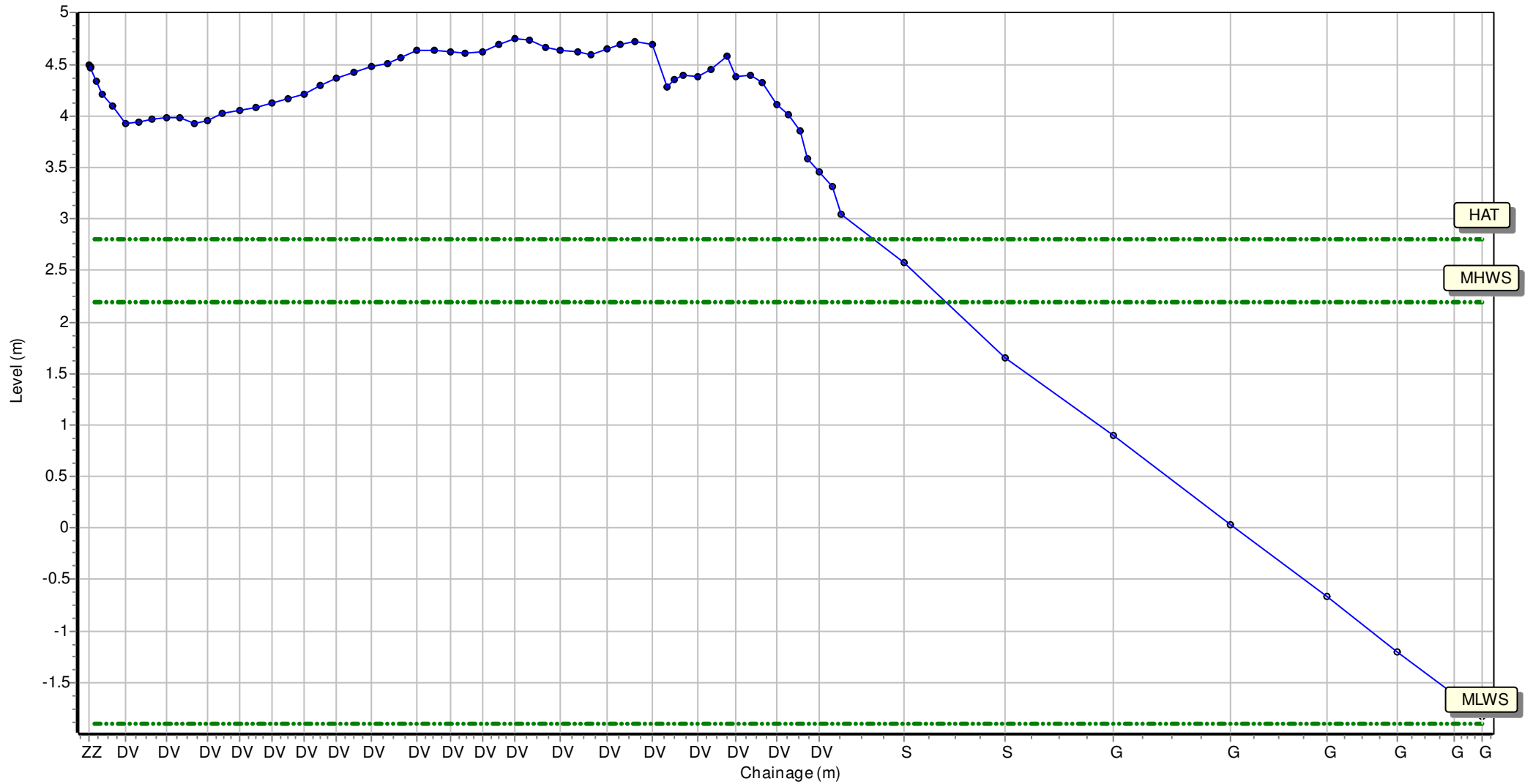
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400388.132 Northing: 651916.302 Profile Bearing: 334 ° from North



# Beach Profile

Location: 1aBTBC03

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

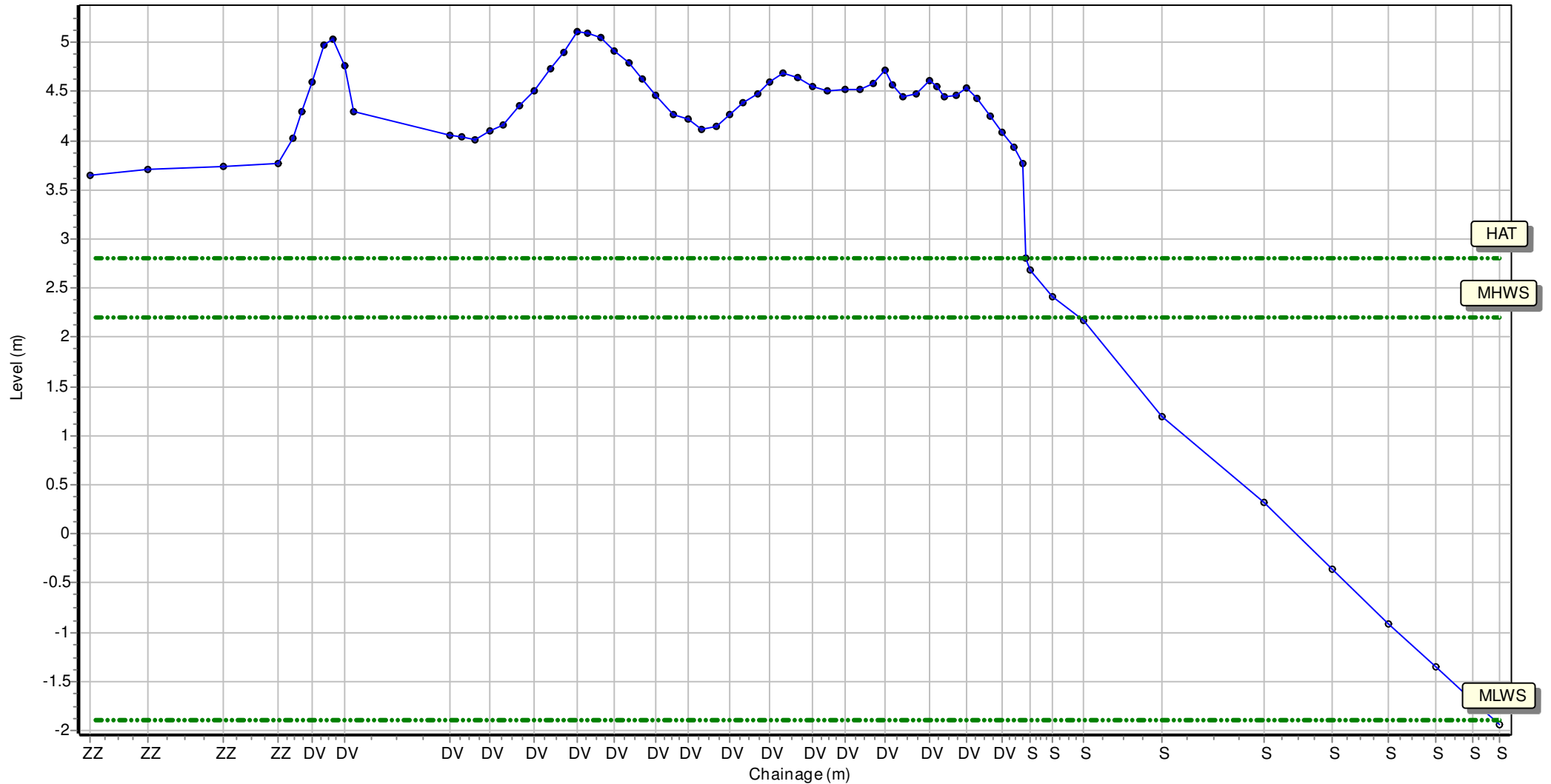
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400455.187 Northing: 651937.742 Profile Bearing: 330 ° from North



# Beach Profile

Location: 1aBTBC04

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

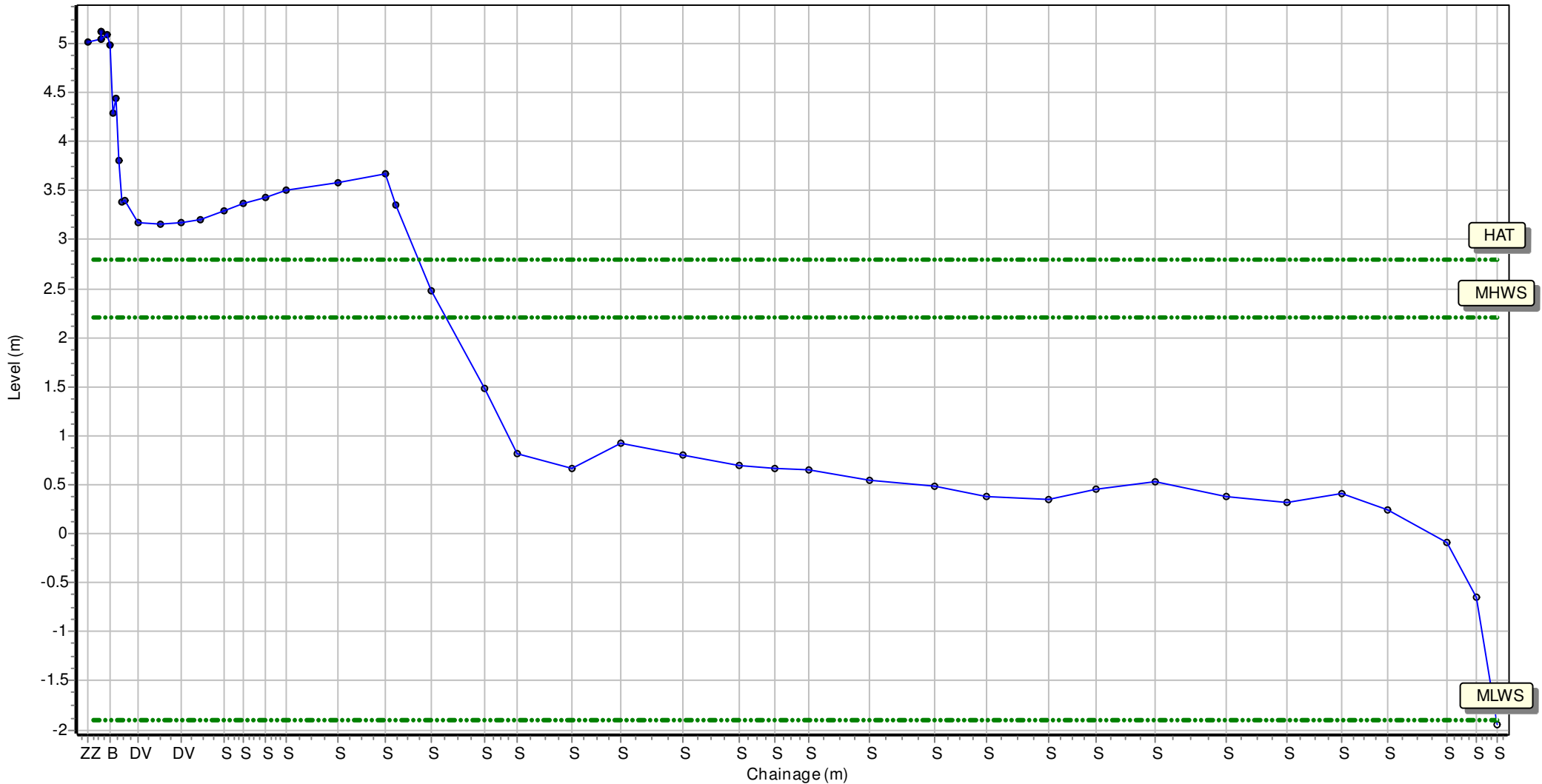
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400531.615 Northing: 652001.966 Profile Bearing: 27 ° from North



# Beach Profile

Location: 1aBTBC05

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

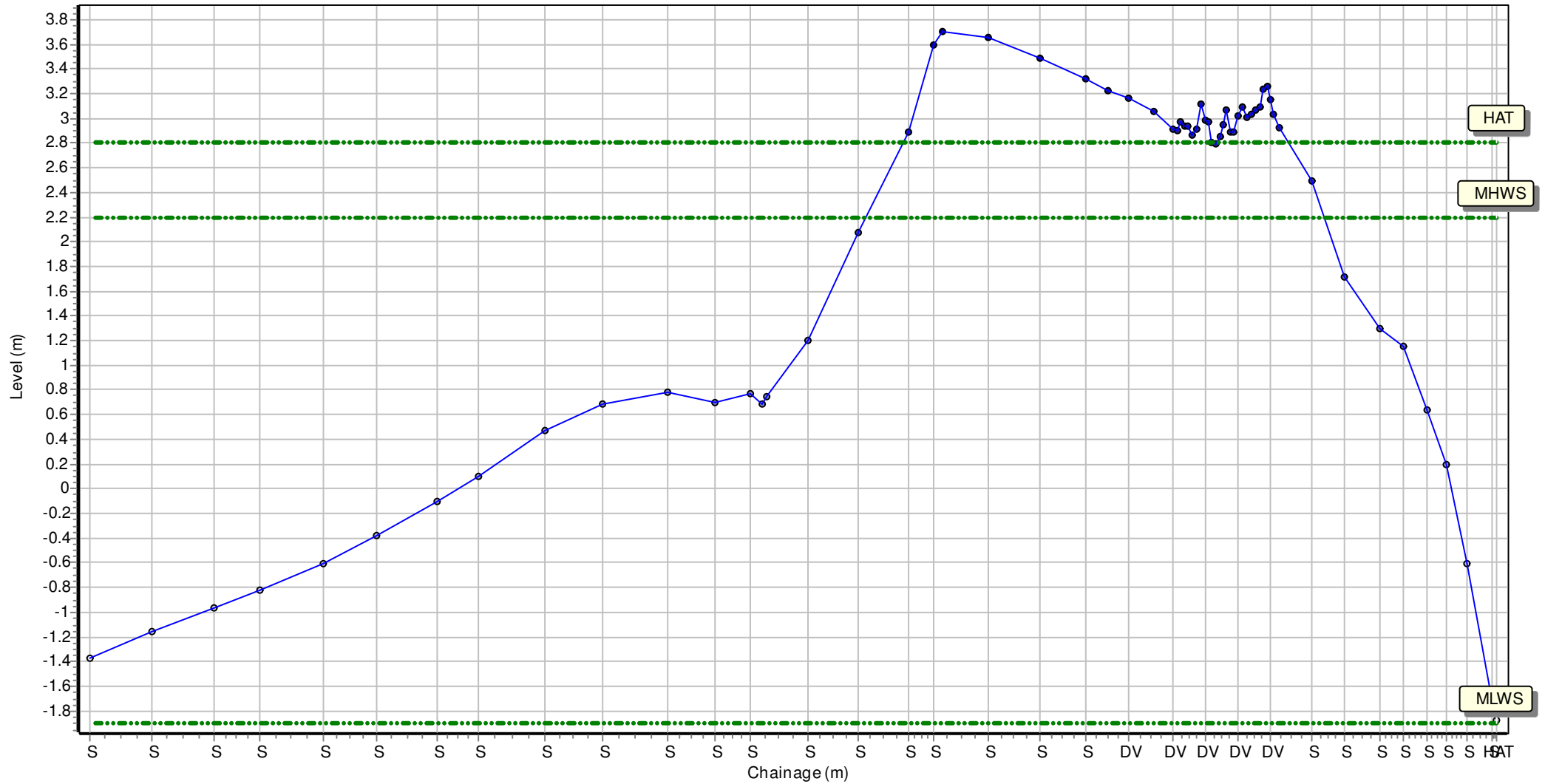
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400678.665 Northing: 651969.27 Profile Bearing: 298 ° from North



# Beach Profile

Location: 1aBTBC06

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

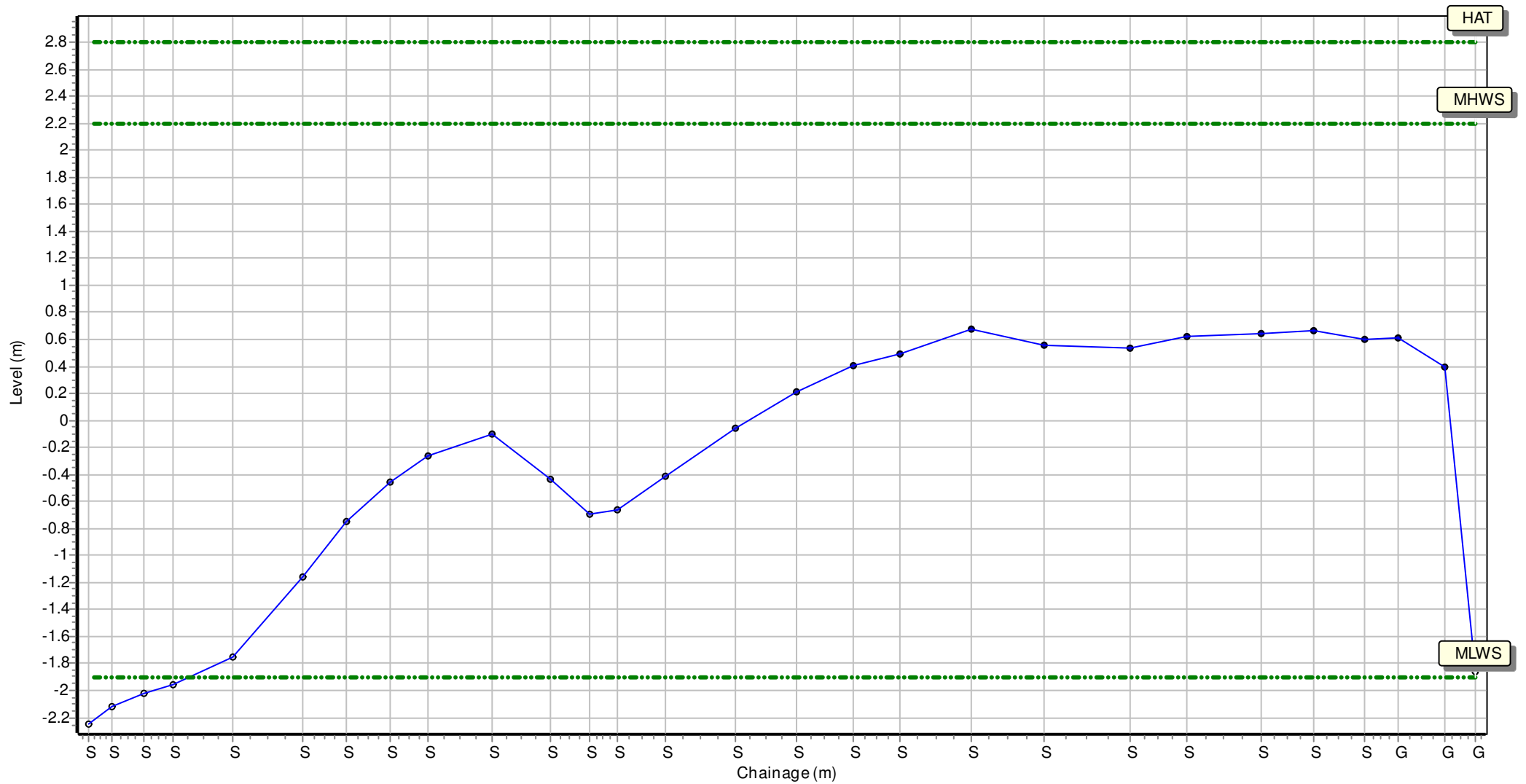
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400825.582 Northing: 652135.224 Profile Bearing: 295 ° from North





# Beach Profile

Location: 1aBTBC07

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

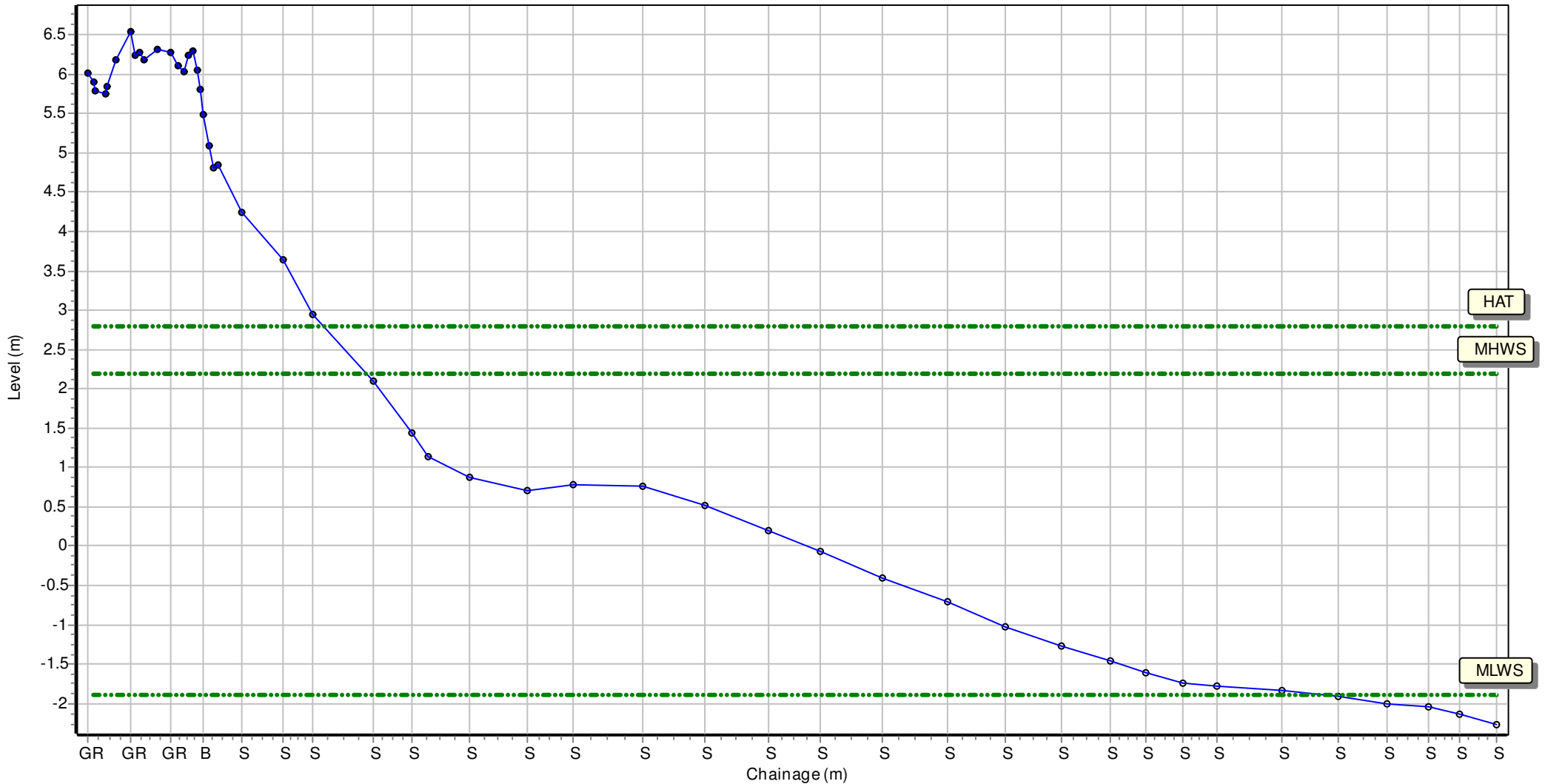
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400559.428 Northing: 651953.804 Profile Bearing: 67 ° from North



# Beach Profile

Location: 1aBTBC08

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

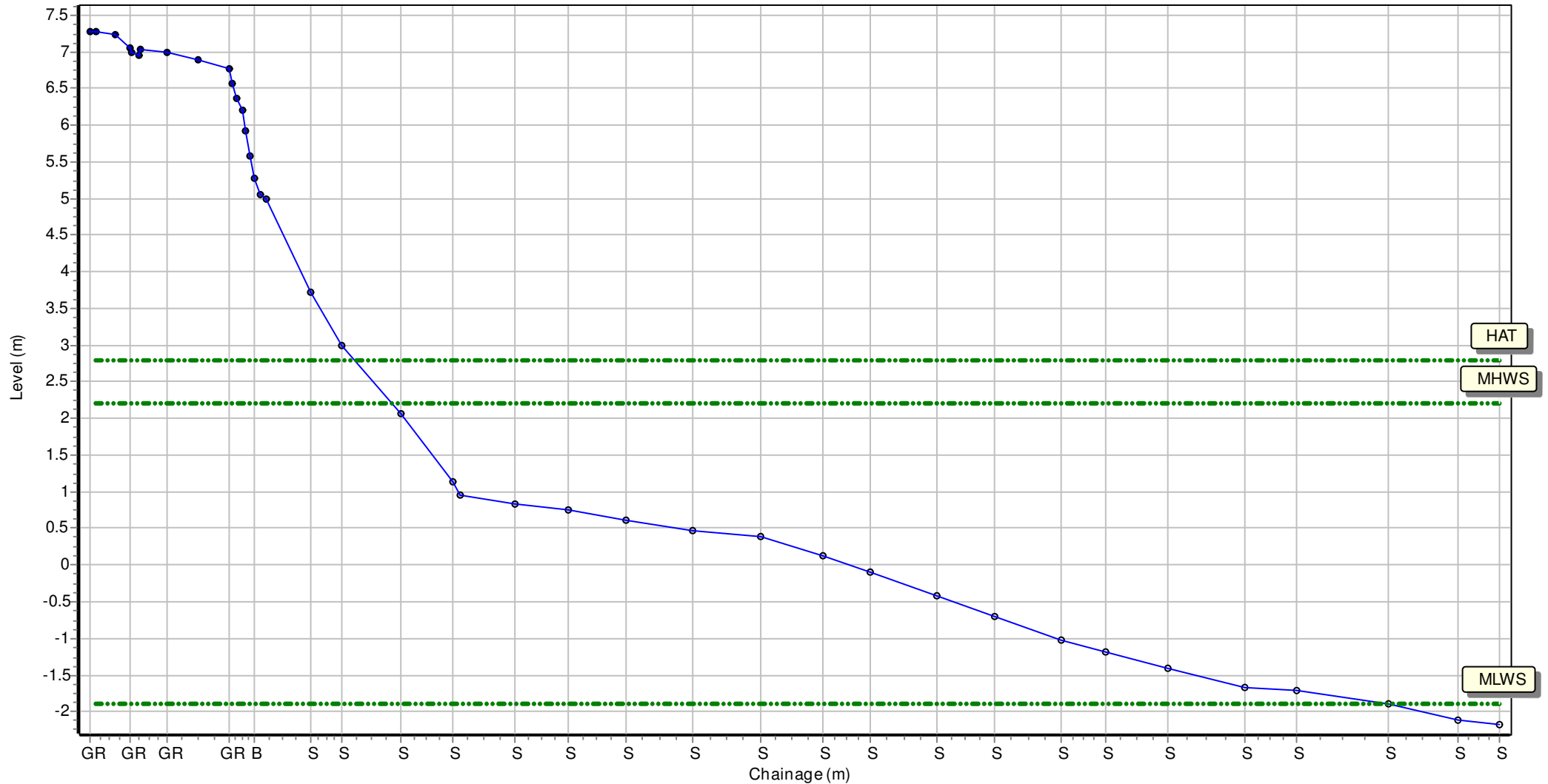
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400568.995 Northing: 651908.786 Profile Bearing: 68 ° from North



# Beach Profile

Location: 1aBTBC09

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

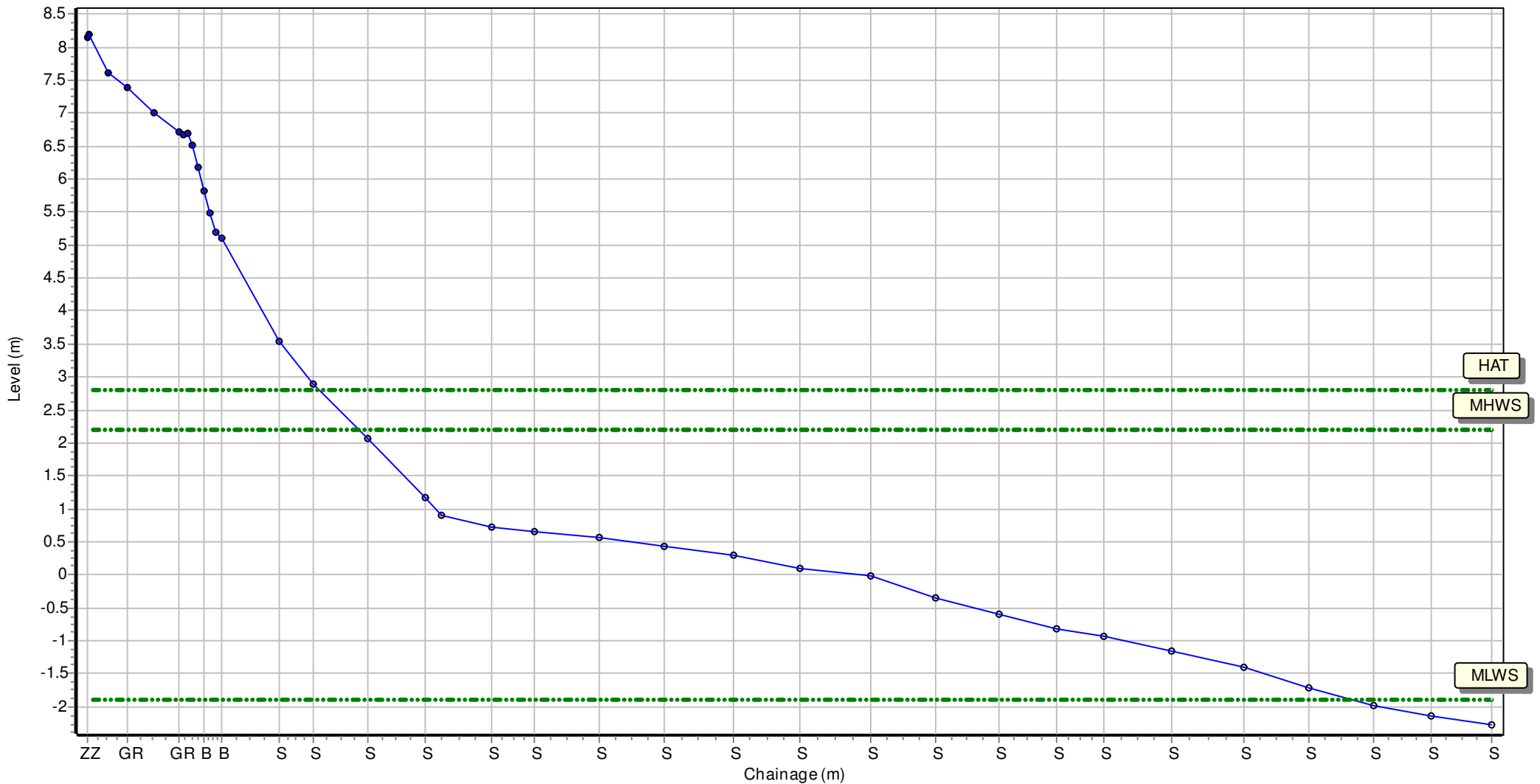
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400587.135 Northing: 651868.576 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aBTBC10

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

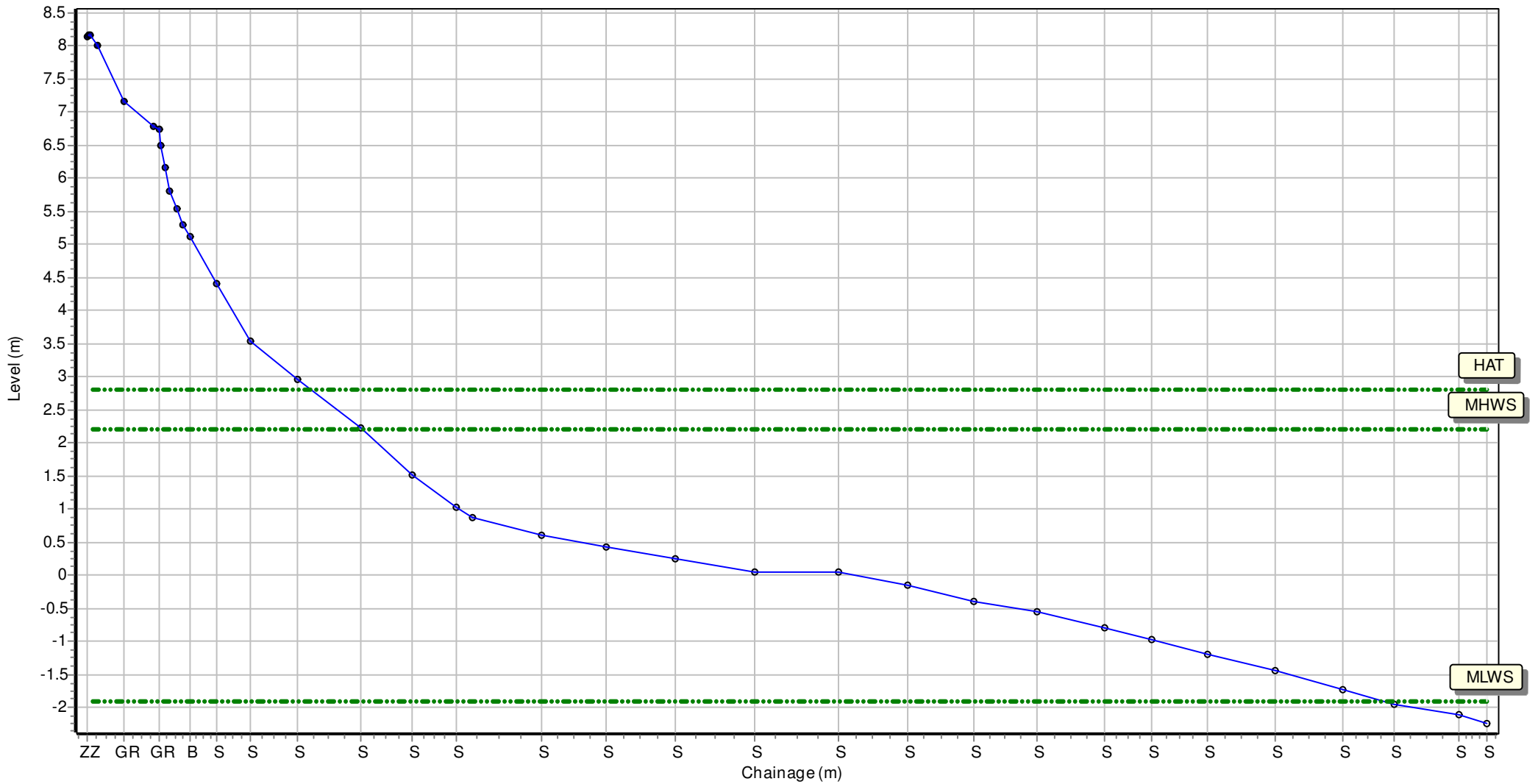
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400603.233 Northing: 651816.609 Profile Bearing: 69 ° from North



# Beach Profile

Location: 1aBTBC11

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

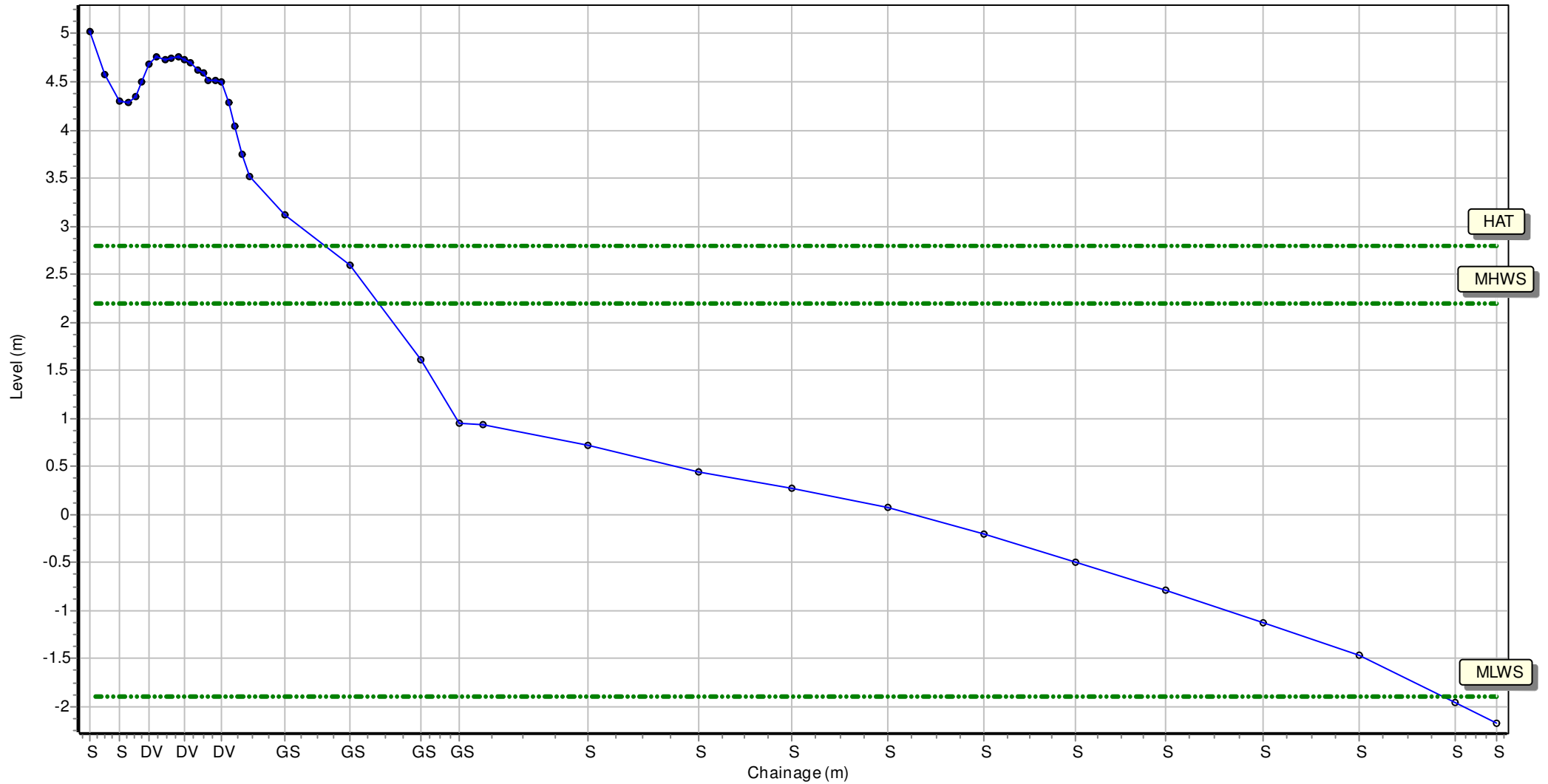
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400638.037 Northing: 651699.812 Profile Bearing: 66 ° from North



# Beach Profile

Location: 1aBTBC12

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

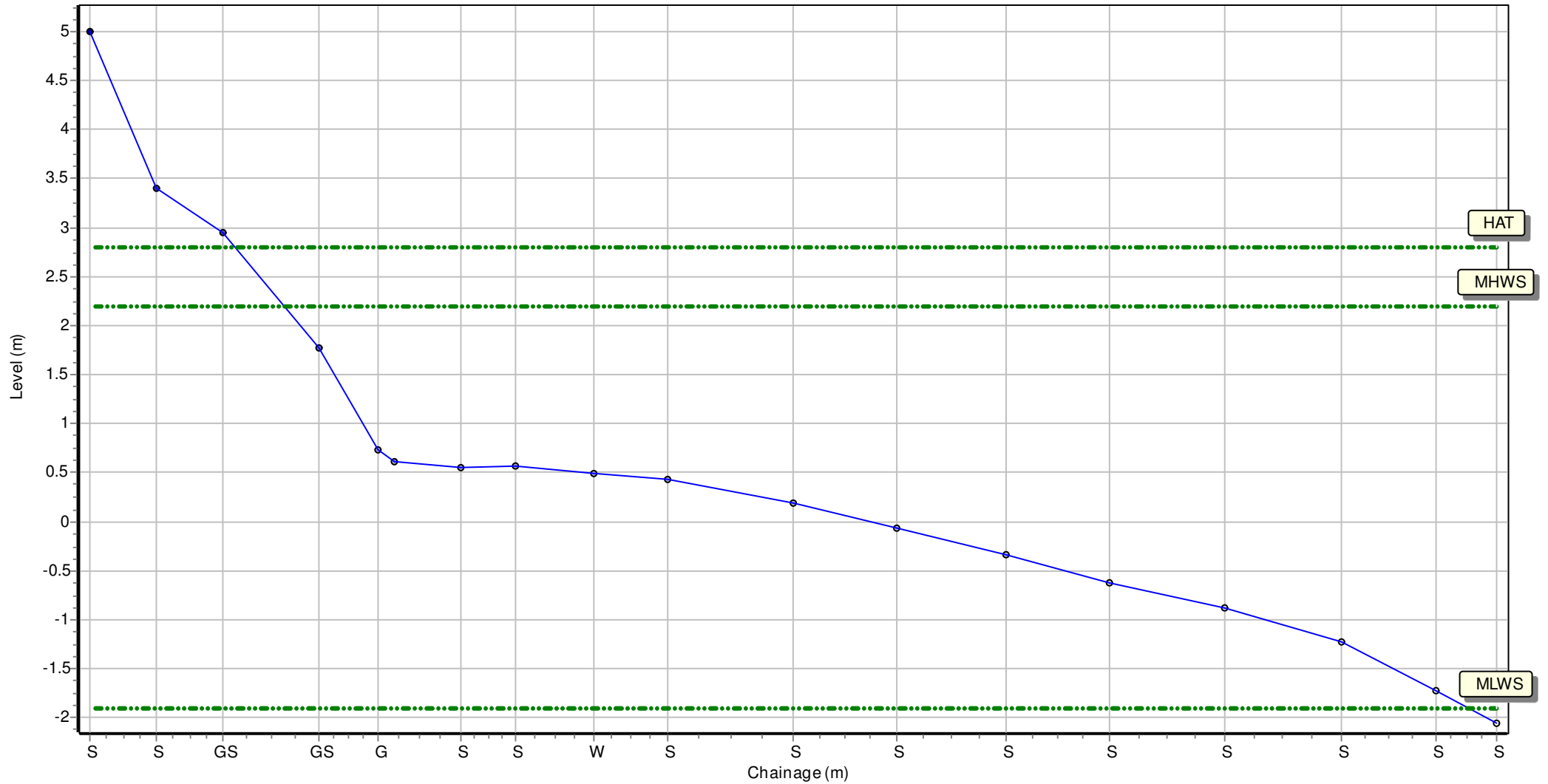
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400693.518 Northing: 651579.795 Profile Bearing: 63 ° from North



# Beach Profile

Location: 1aBTBC13

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

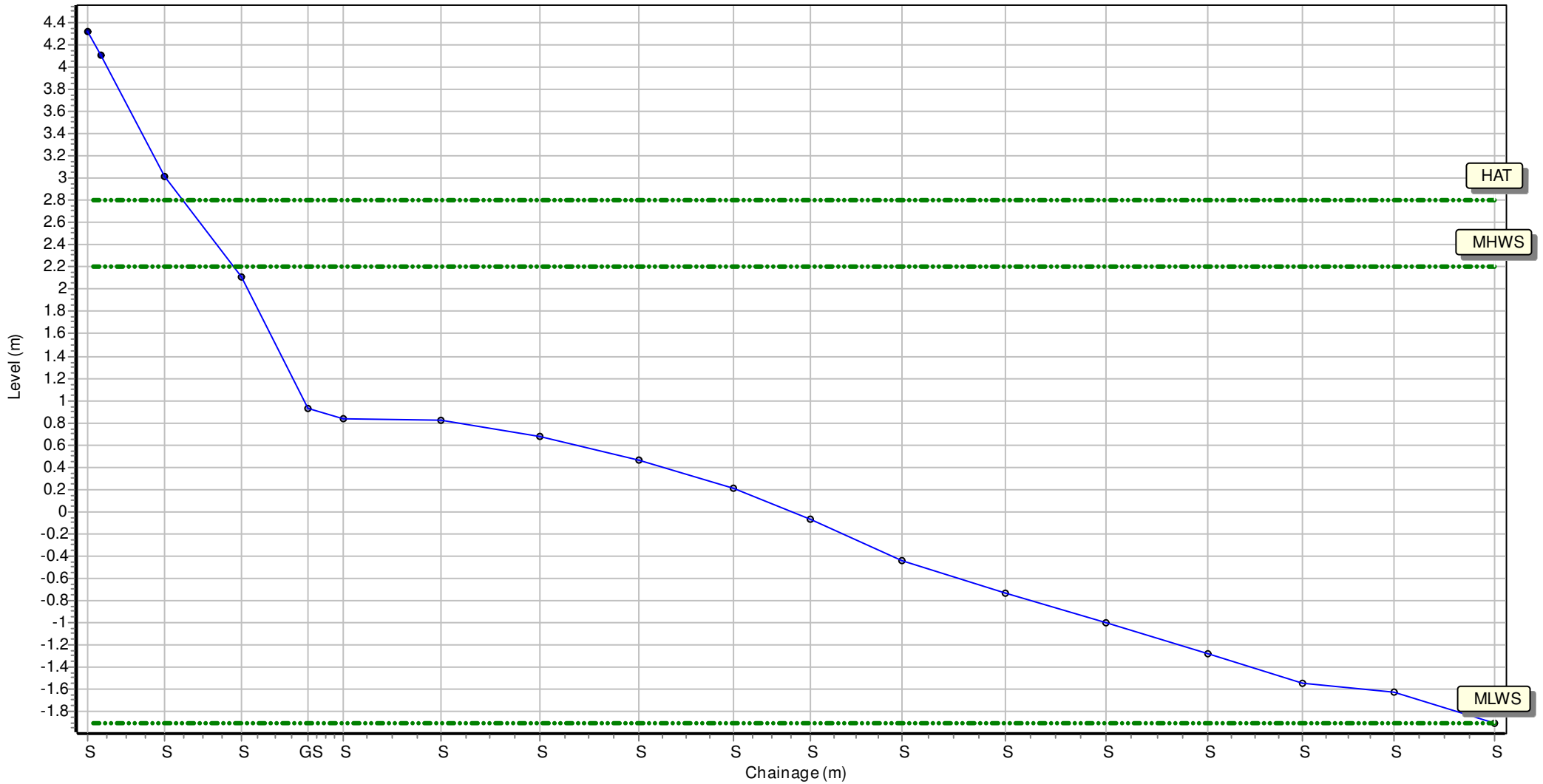
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 400820.787 Northing: 651312.459 Profile Bearing: 65 ° from North



# Beach Profile

Location: 1aBTBC14

Date: 20/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

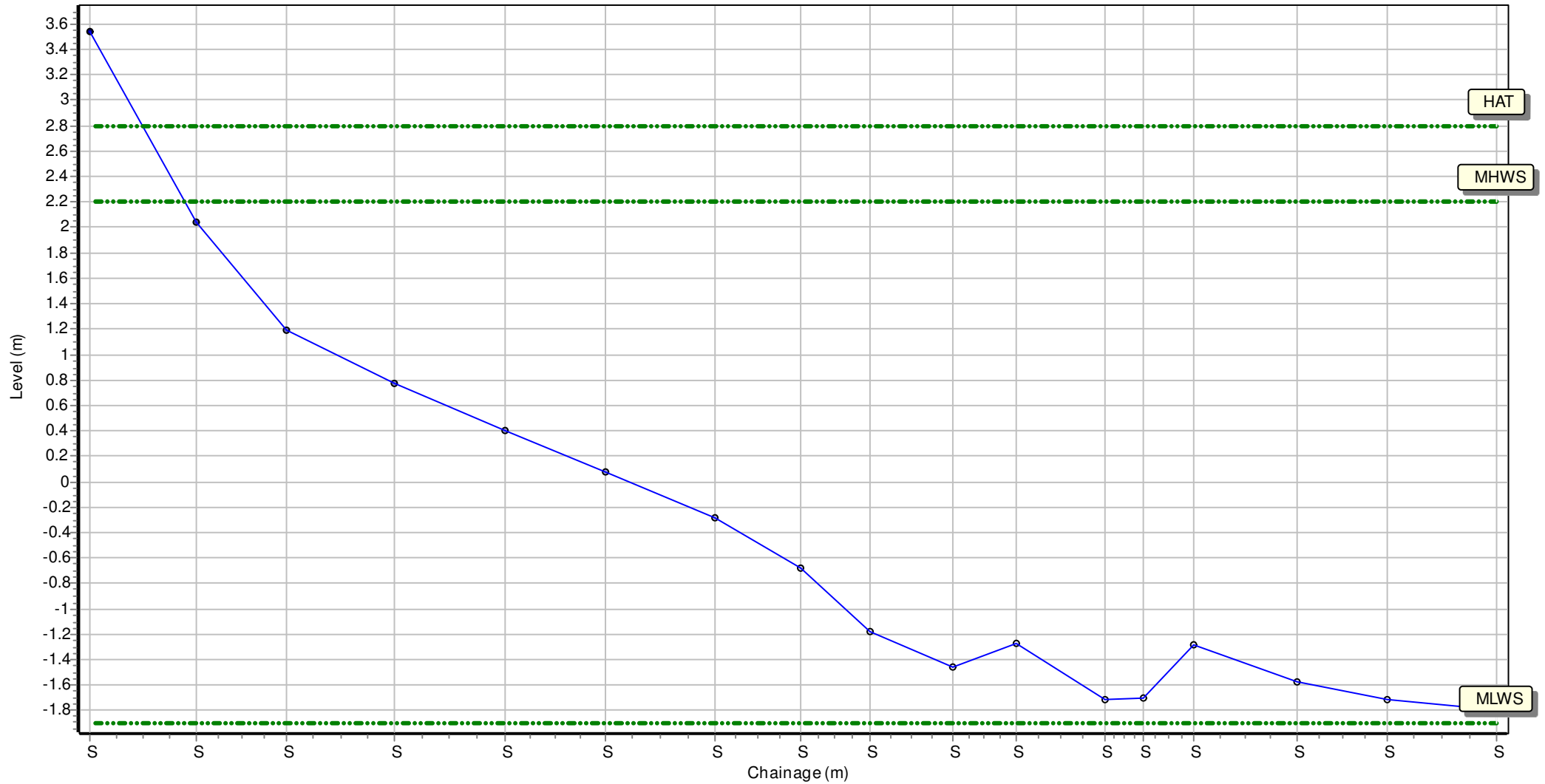
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 401030.513 Northing: 651003.409 Profile Bearing: 60 ° from North





# Beach Profile

Location: 1aBTBC15

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

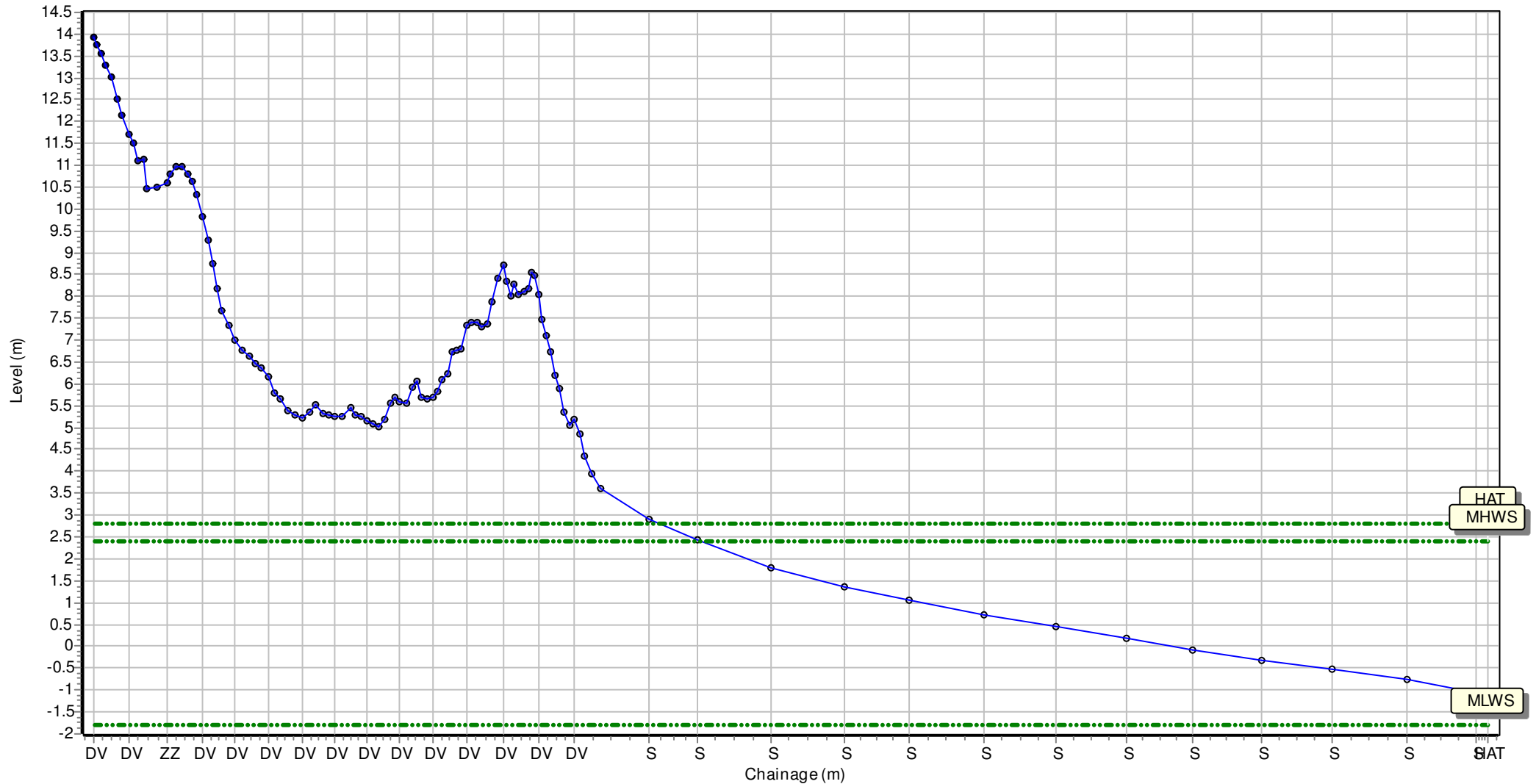
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 402663.736 Northing: 648593.739 Profile Bearing: 40 ° from North



# Beach Profile

Location: 1aBTBC16

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

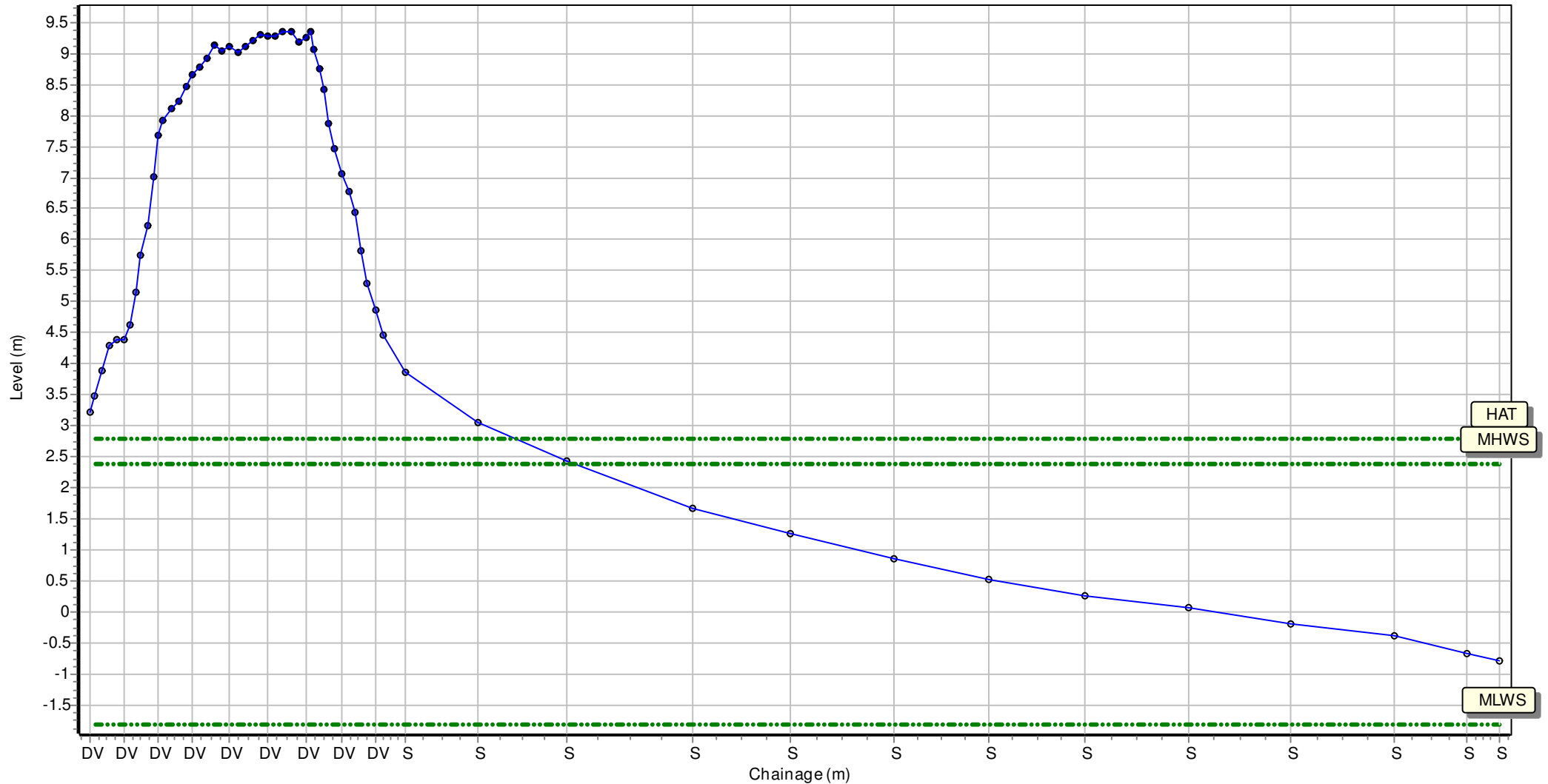
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 403565.671 Northing: 647735.833 Profile Bearing: 53 ° from North



# Beach Profile

Location: 1aBTBC17

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

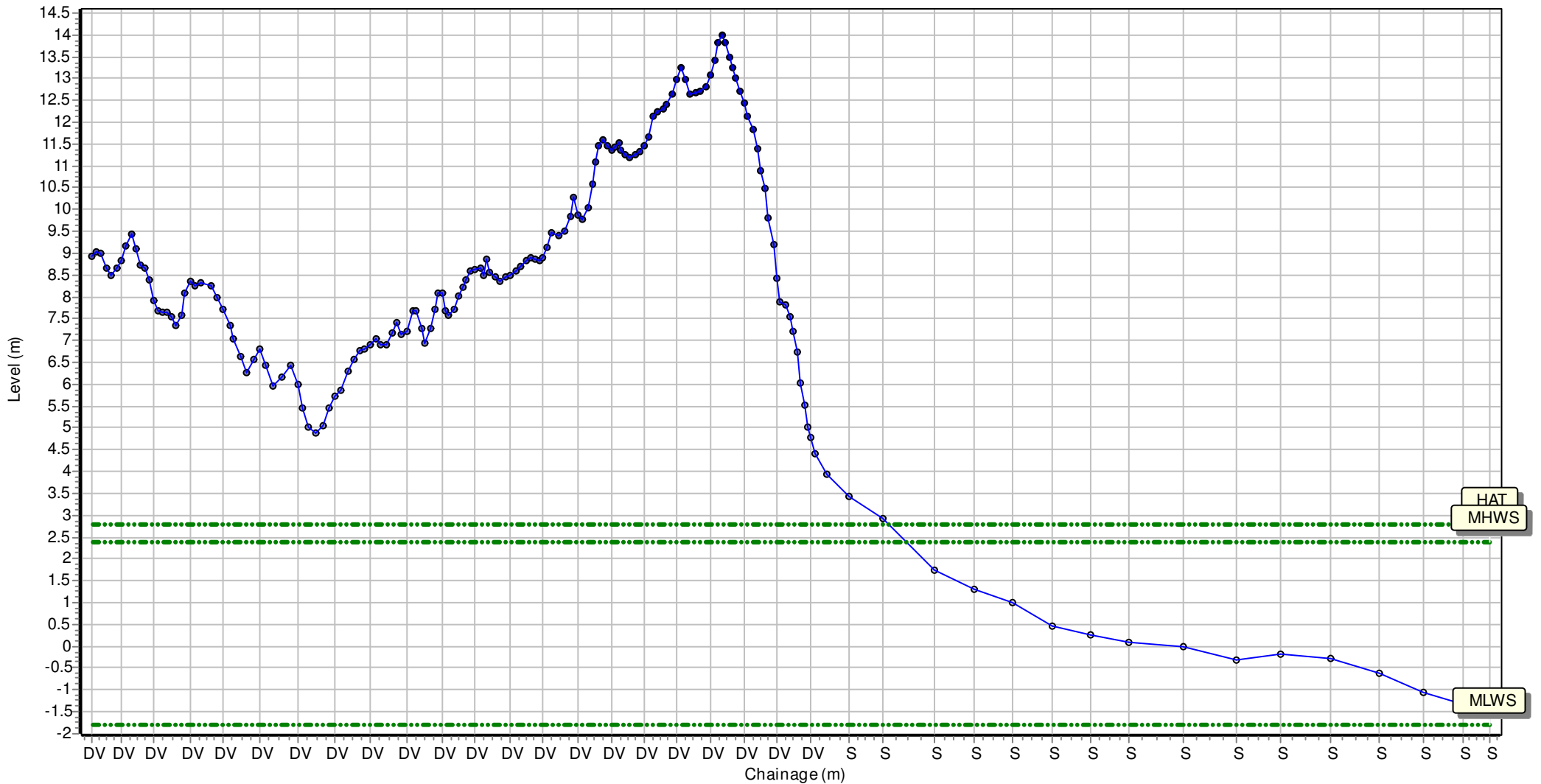
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 404433.939 Northing: 646713.965 Profile Bearing: 51 ° from North



# Beach Profile

Location: 1aBTBC18

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

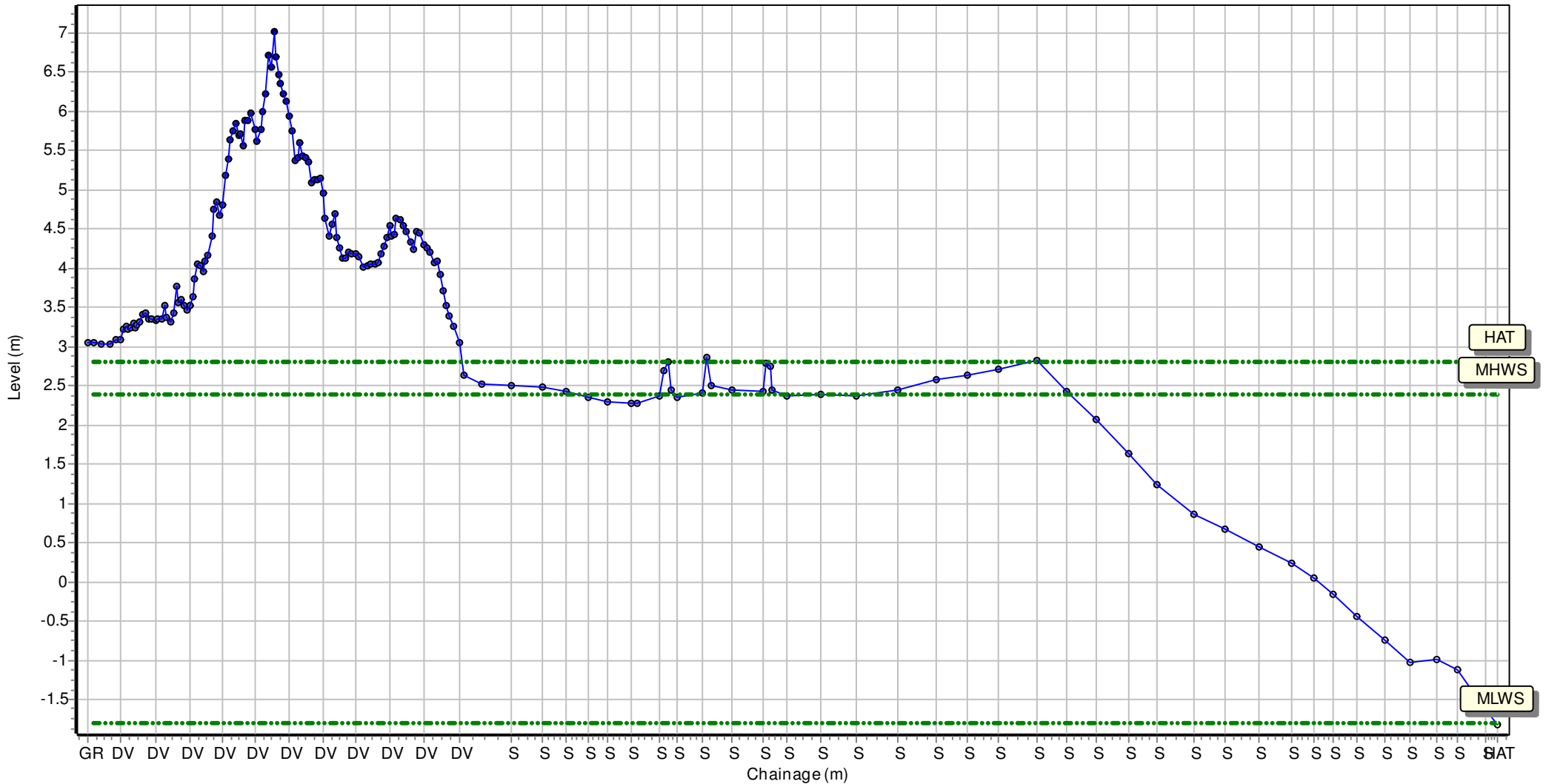
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 405985.759 Northing: 645466.297 Profile Bearing: 38 ° from North



# Beach Profile

Location: 1aBTBC19

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

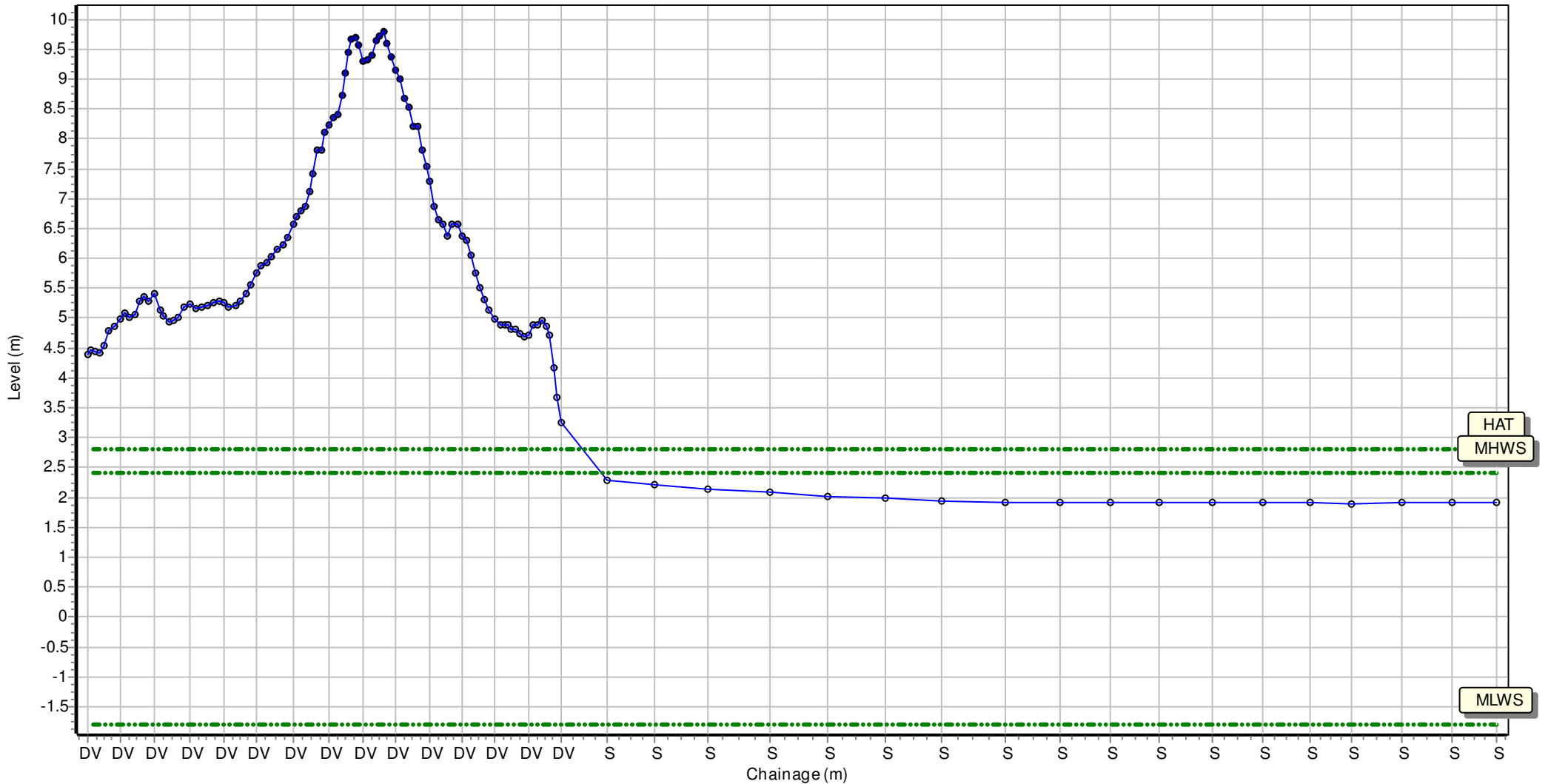
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 407091.566 Northing: 644616.133 Profile Bearing: 34 ° from North



# Beach Profile

Location: 1aBTBC20

Date: 01/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

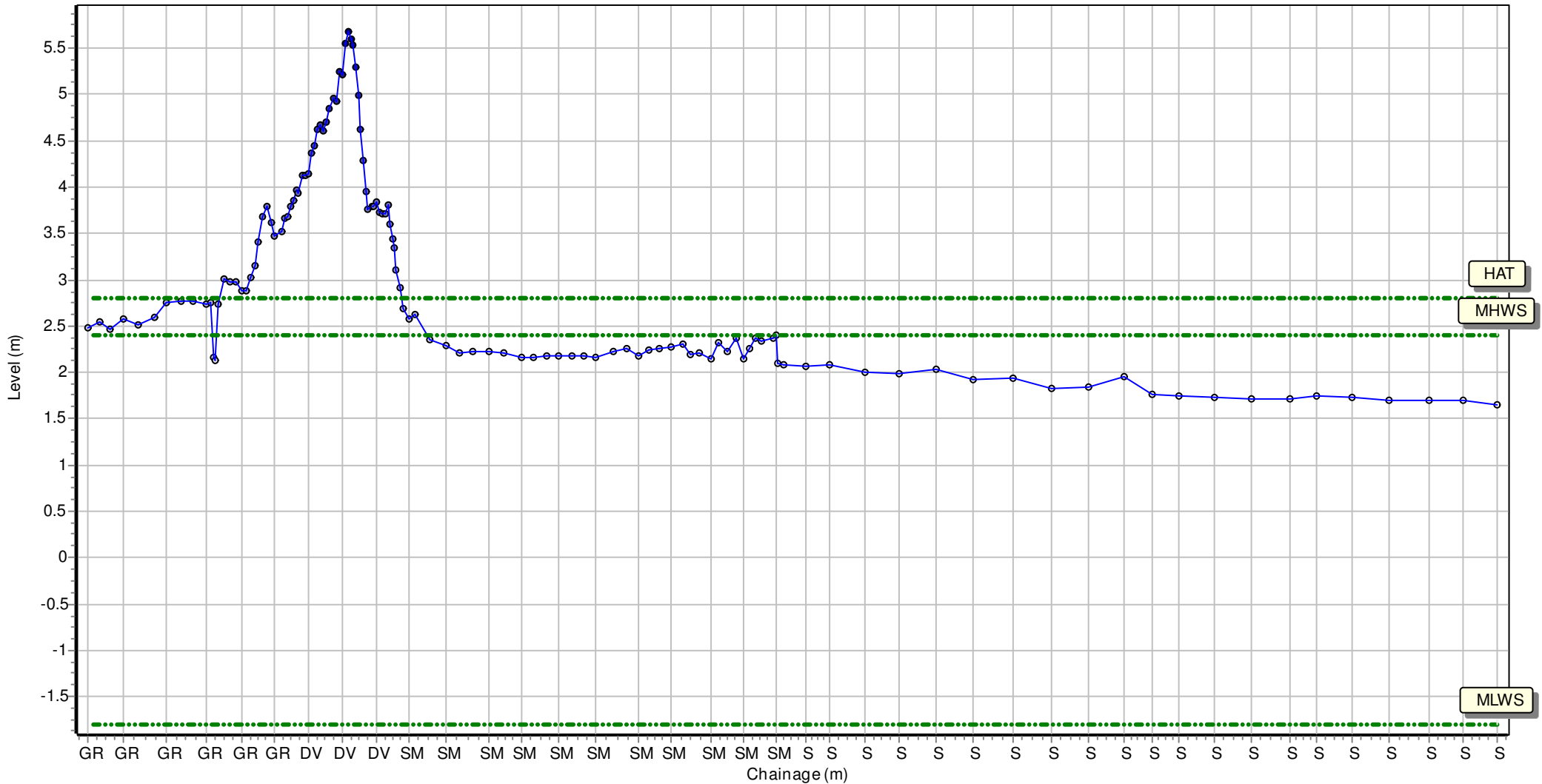
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 407390.255 Northing: 643841.768 Profile Bearing: 45 ° from North



# Beach Profile

Location: 1aBTBC21

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

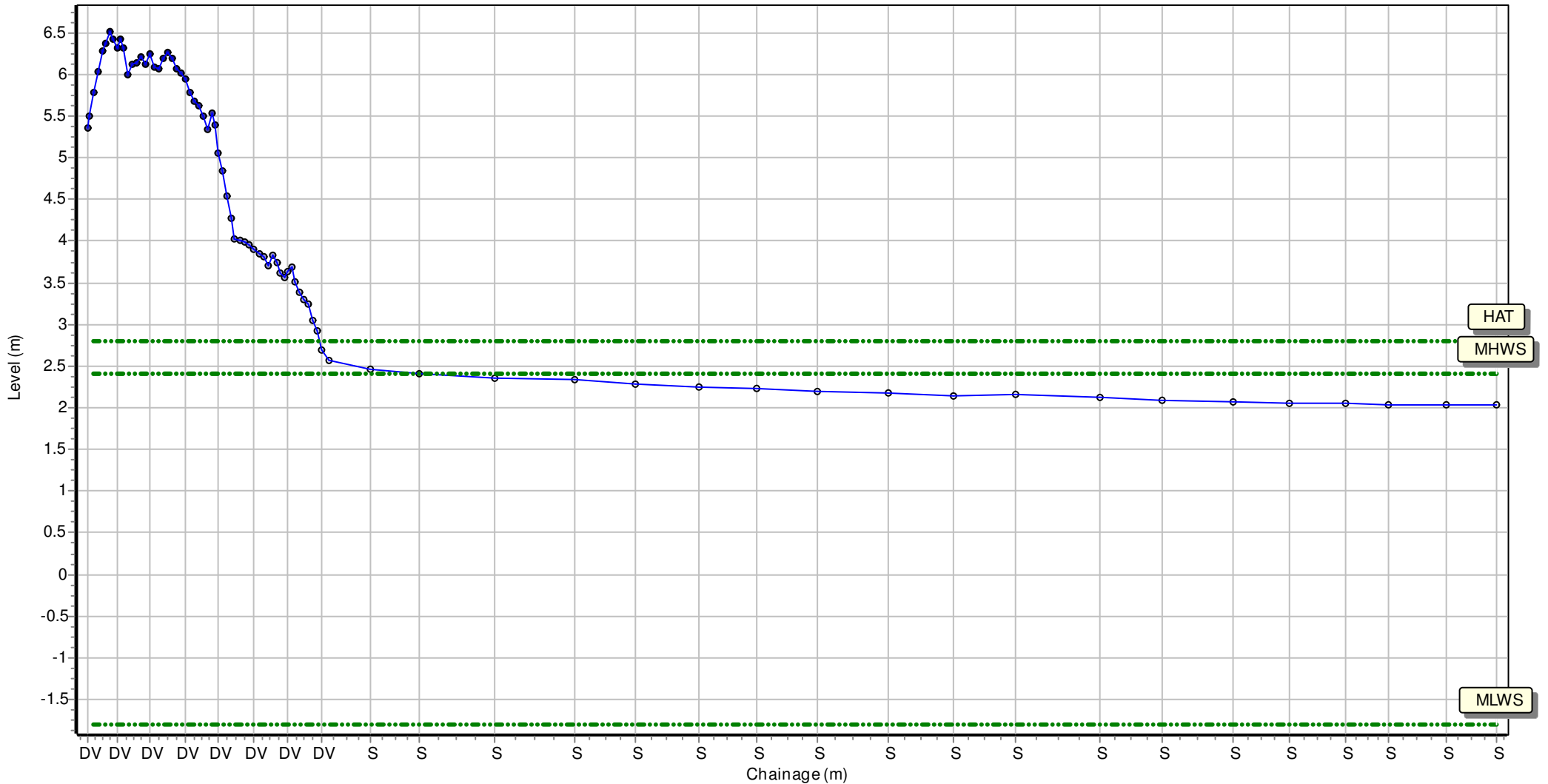
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 409501.341 Northing: 643847.61 Profile Bearing: 33 ° from North



# Beach Profile

Location: 1aBTBC22

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

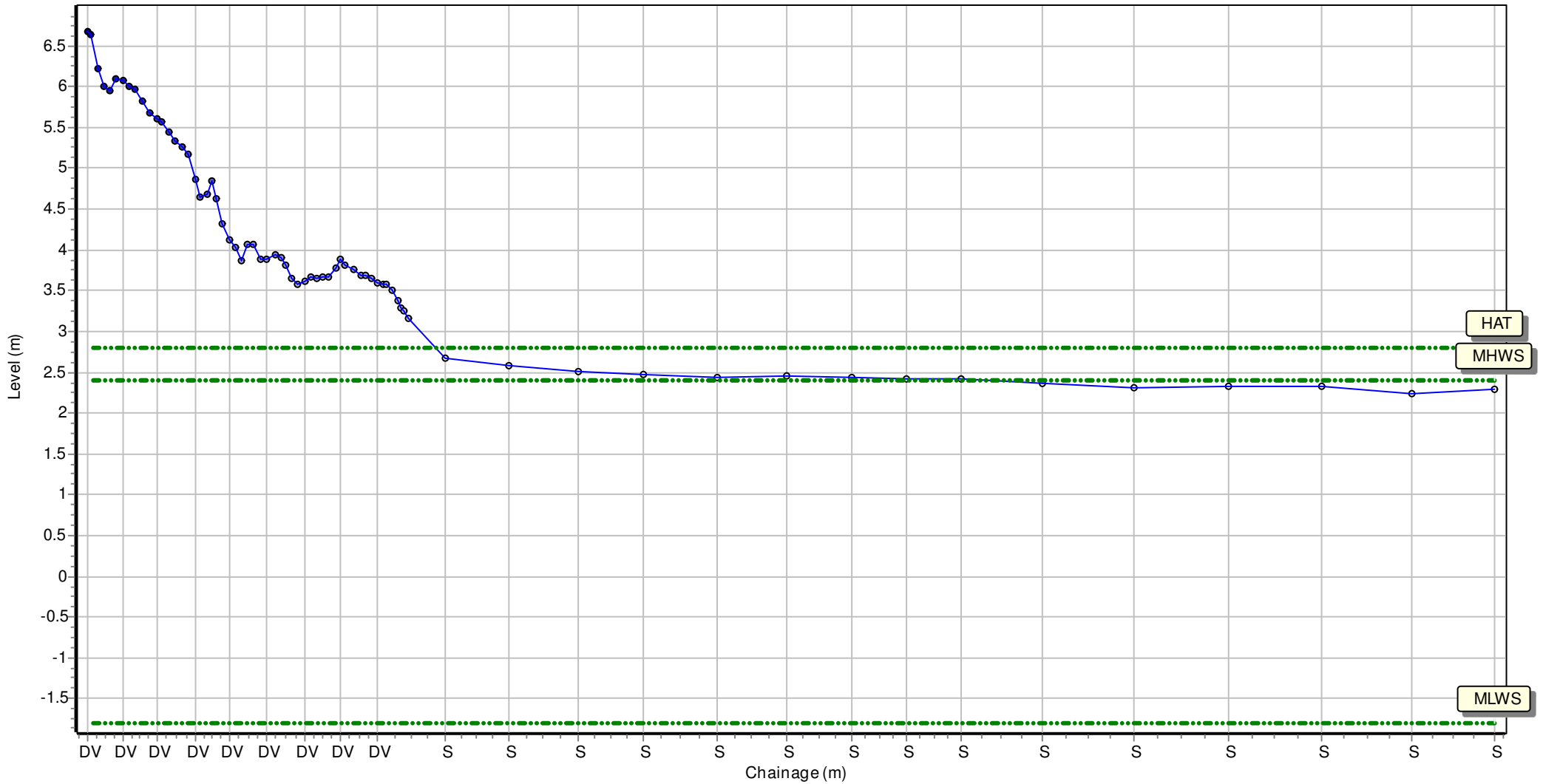
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 410213.981 Northing: 643697.867 Profile Bearing: 27 ° from North





# Beach Profile

Location: 1aBTBC23

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

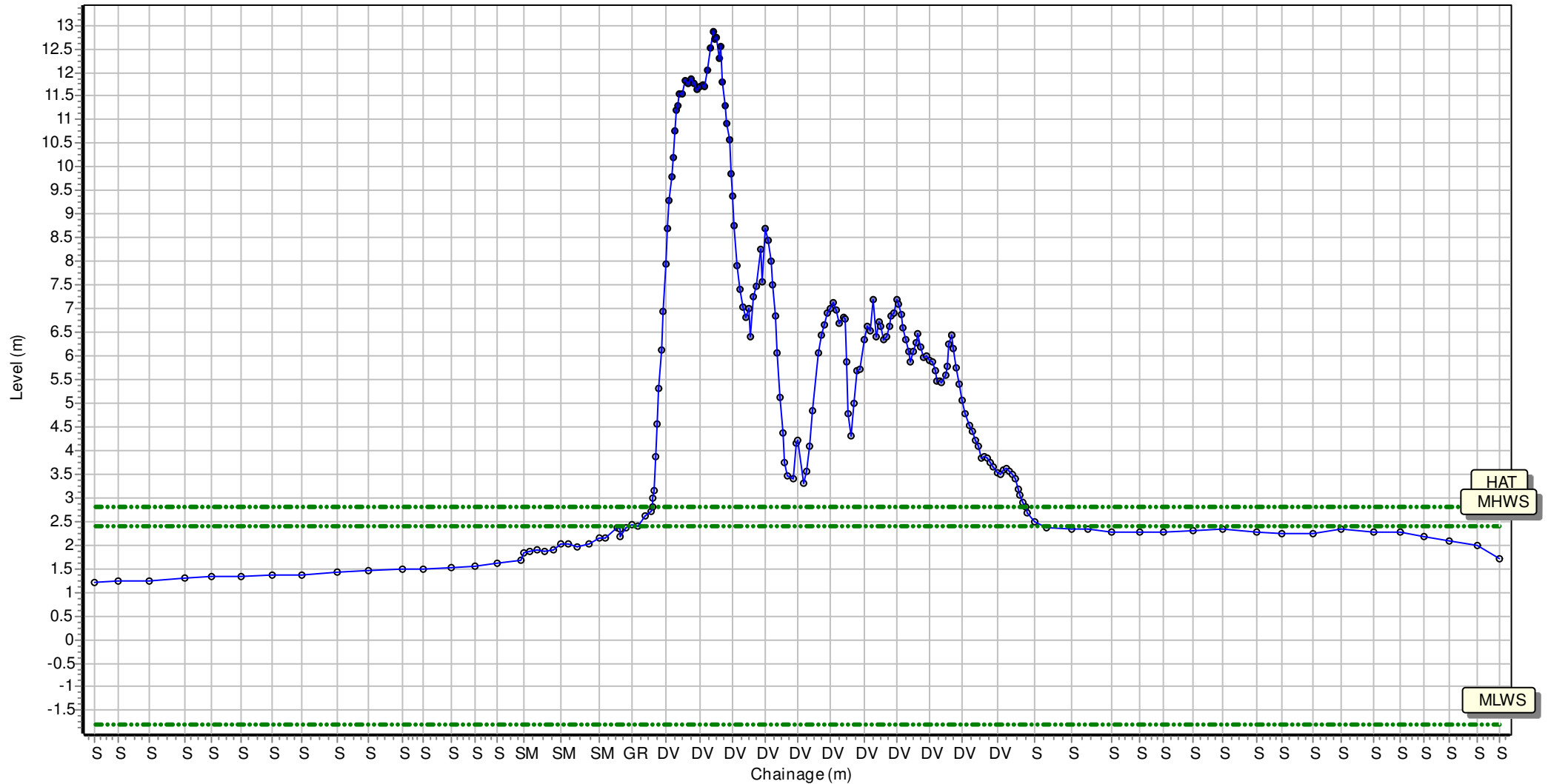
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 411084.123 Northing: 643008.731 Profile Bearing: 0 ° from North



# Beach Profile

Location: 1aBTBC24

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

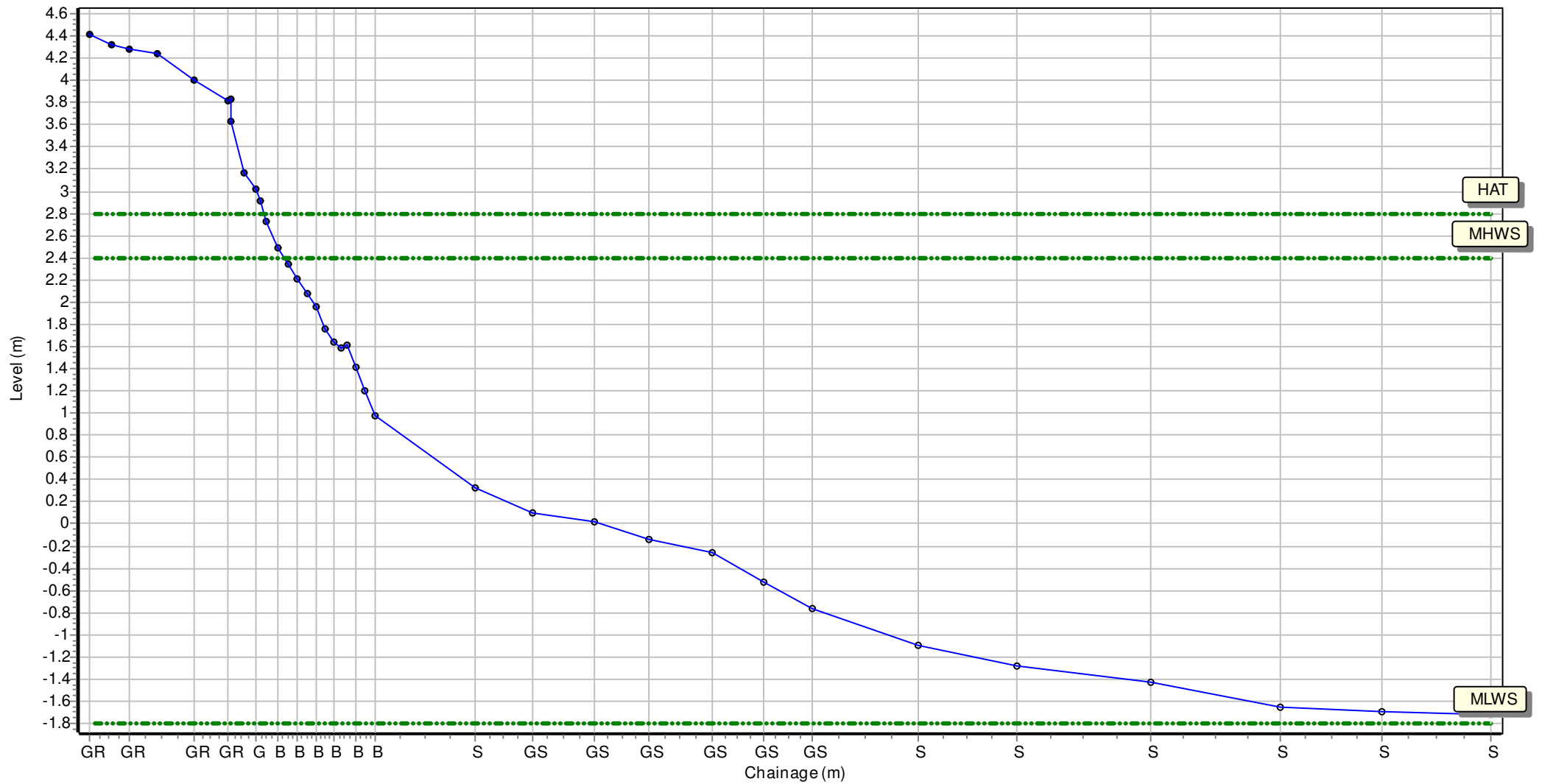
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 413330.108 Northing: 641794.909 Profile Bearing: 227 ° from North



# Beach Profile

Location: 1aBTBC25

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

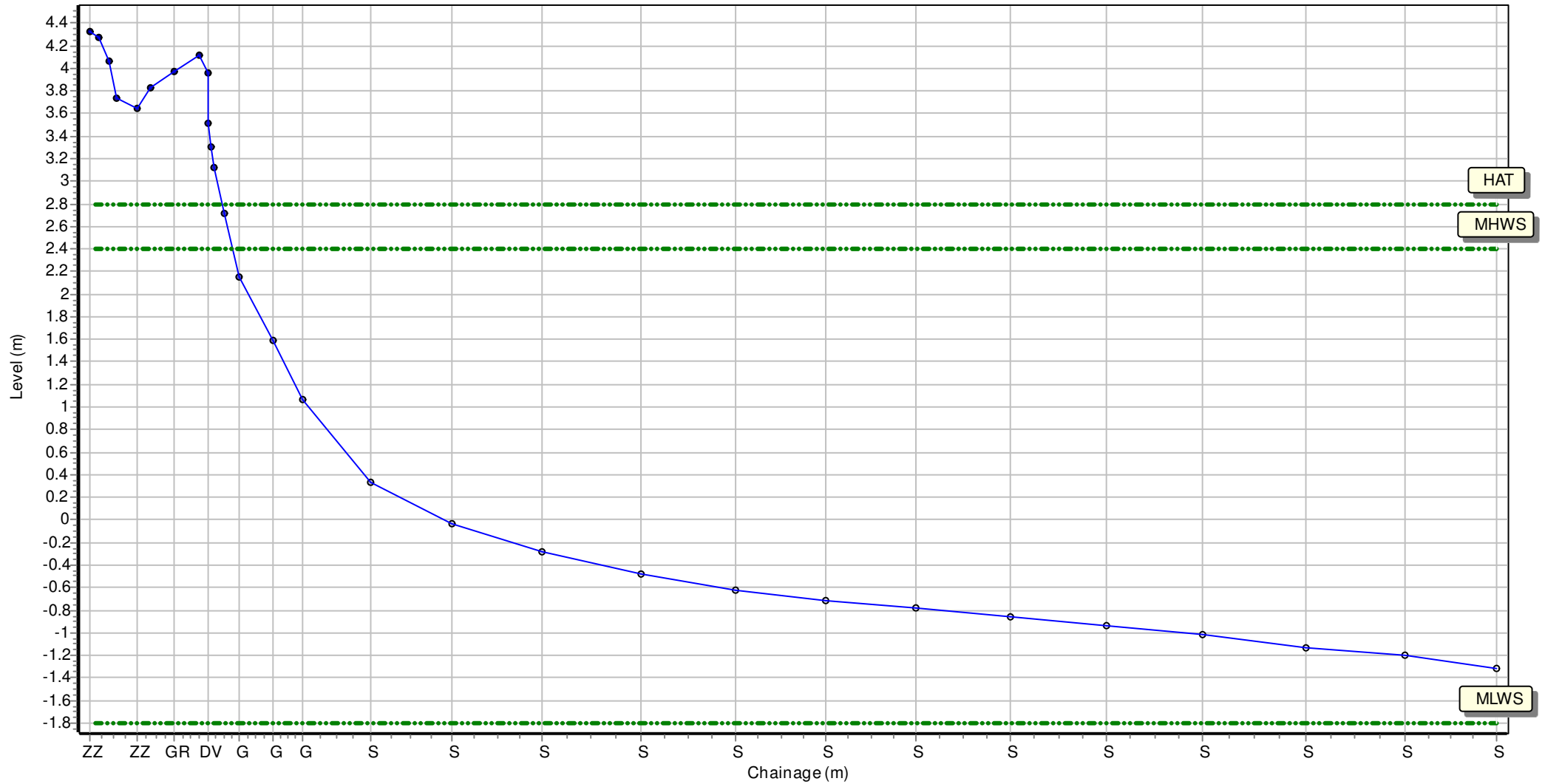
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 413102.684 Northing: 641936.754 Profile Bearing: 173 ° from North



# Beach Profile

Location: 1aBTBC26

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

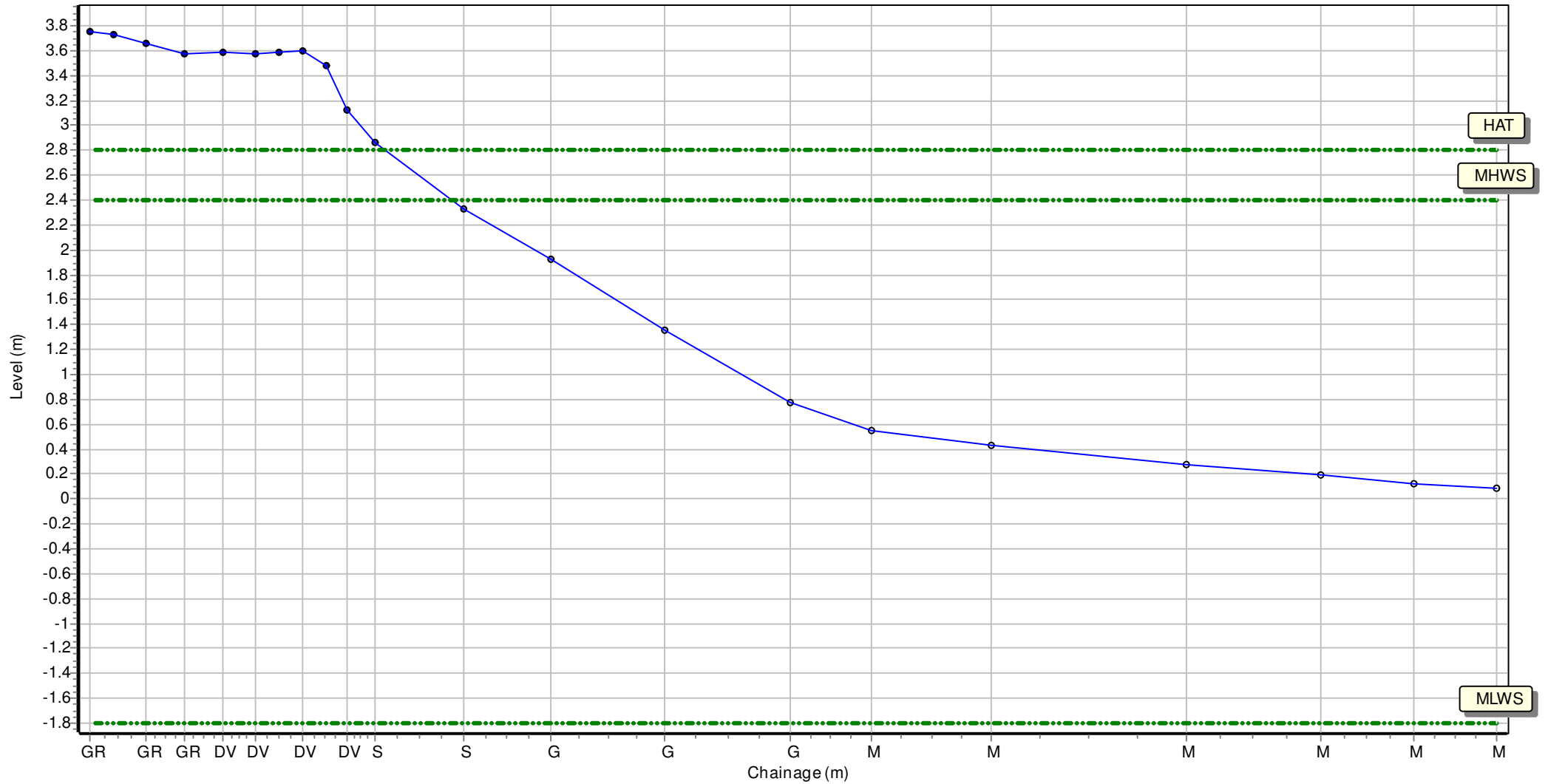
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 412895.322 Northing: 641784.343 Profile Bearing: 122 ° from North



# Beach Profile

Location: 1aBTBC27

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

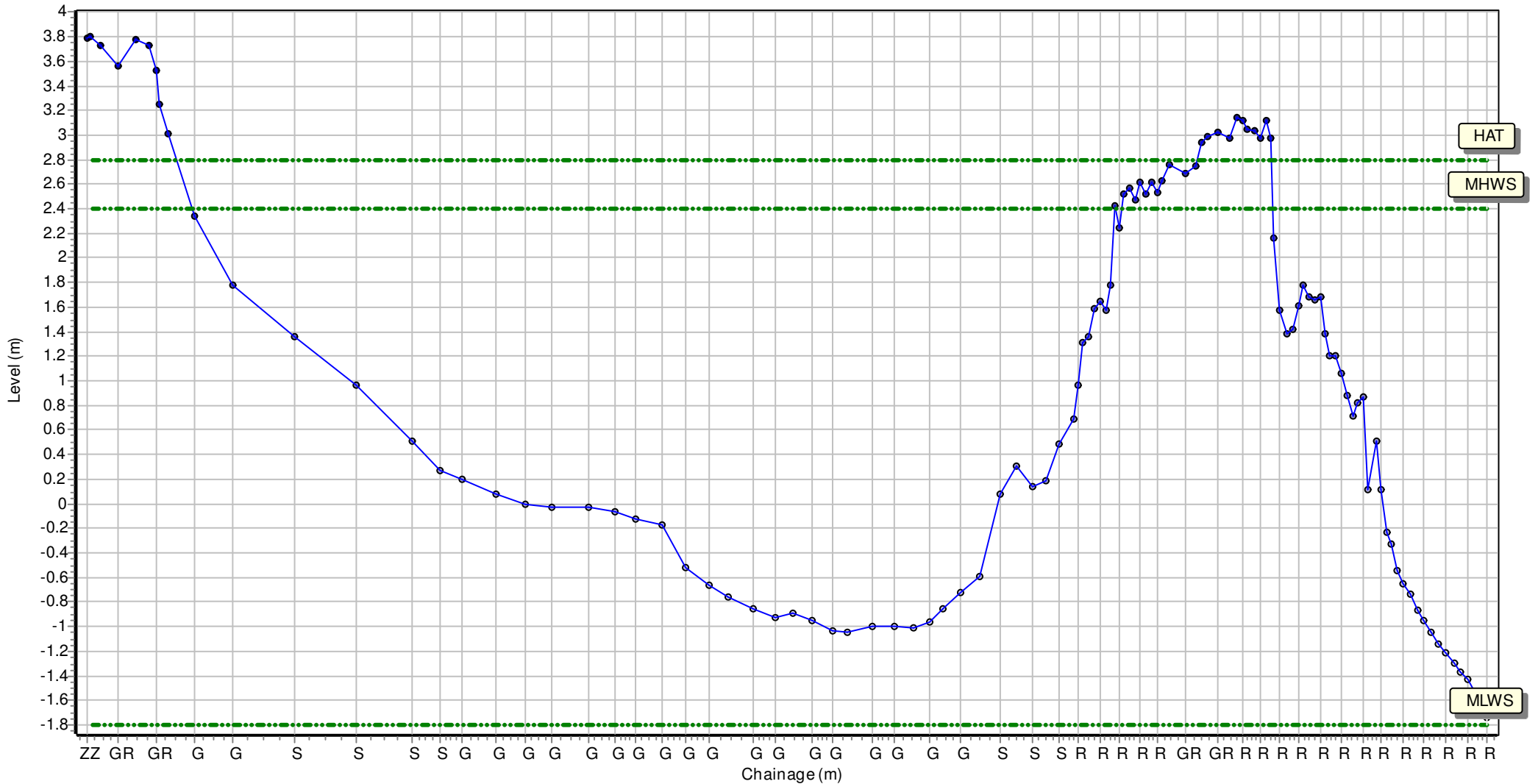
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 412475.398 Northing: 641733.834 Profile Bearing: 227 ° from North



# Beach Profile

Location: 1aBTBC28

Date: 19/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

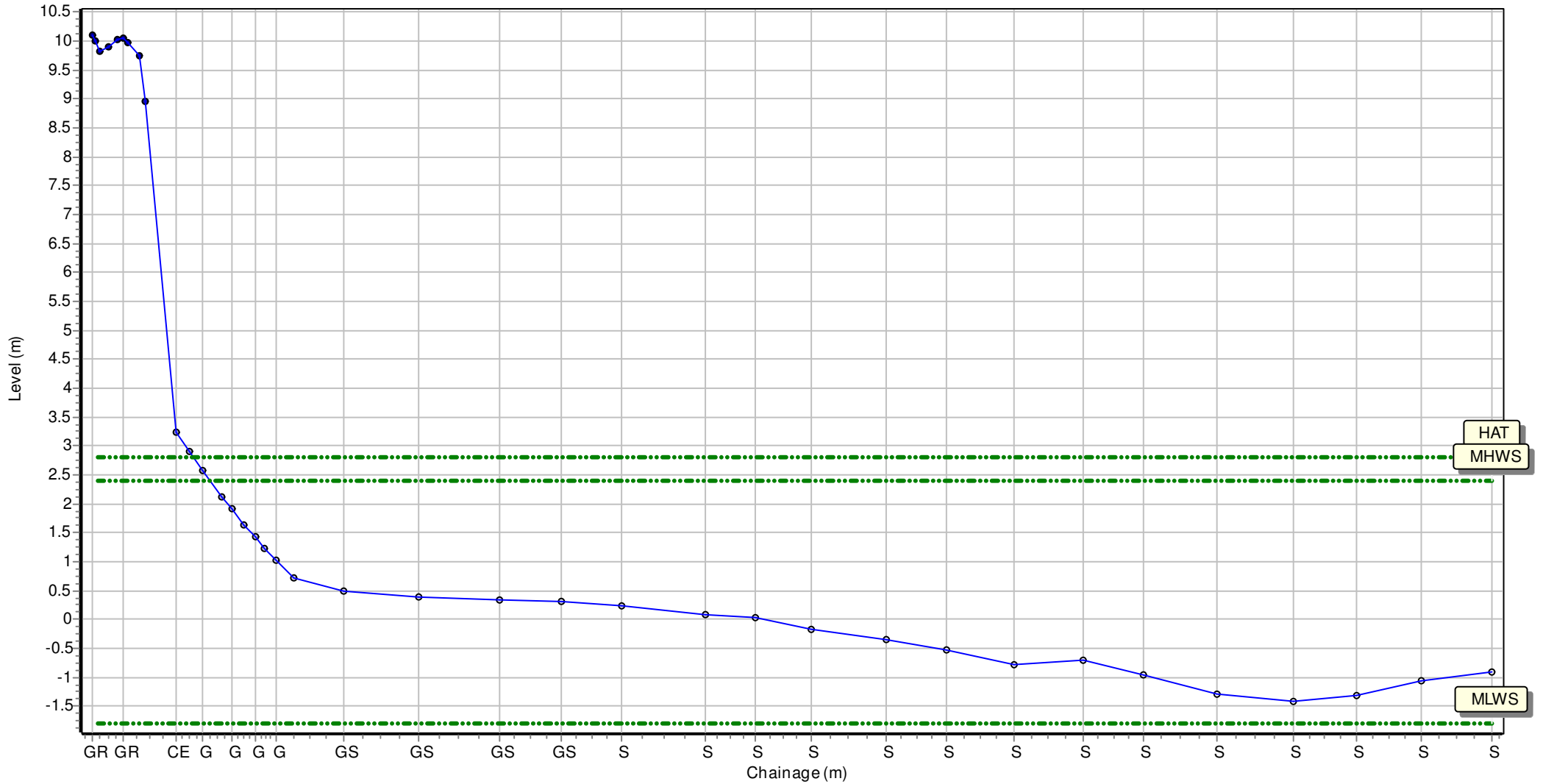
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 412324.036 Northing: 641984.353 Profile Bearing: 245 ° from North



# Beach Profile

Location: 1aBTBC29

Date: 05/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

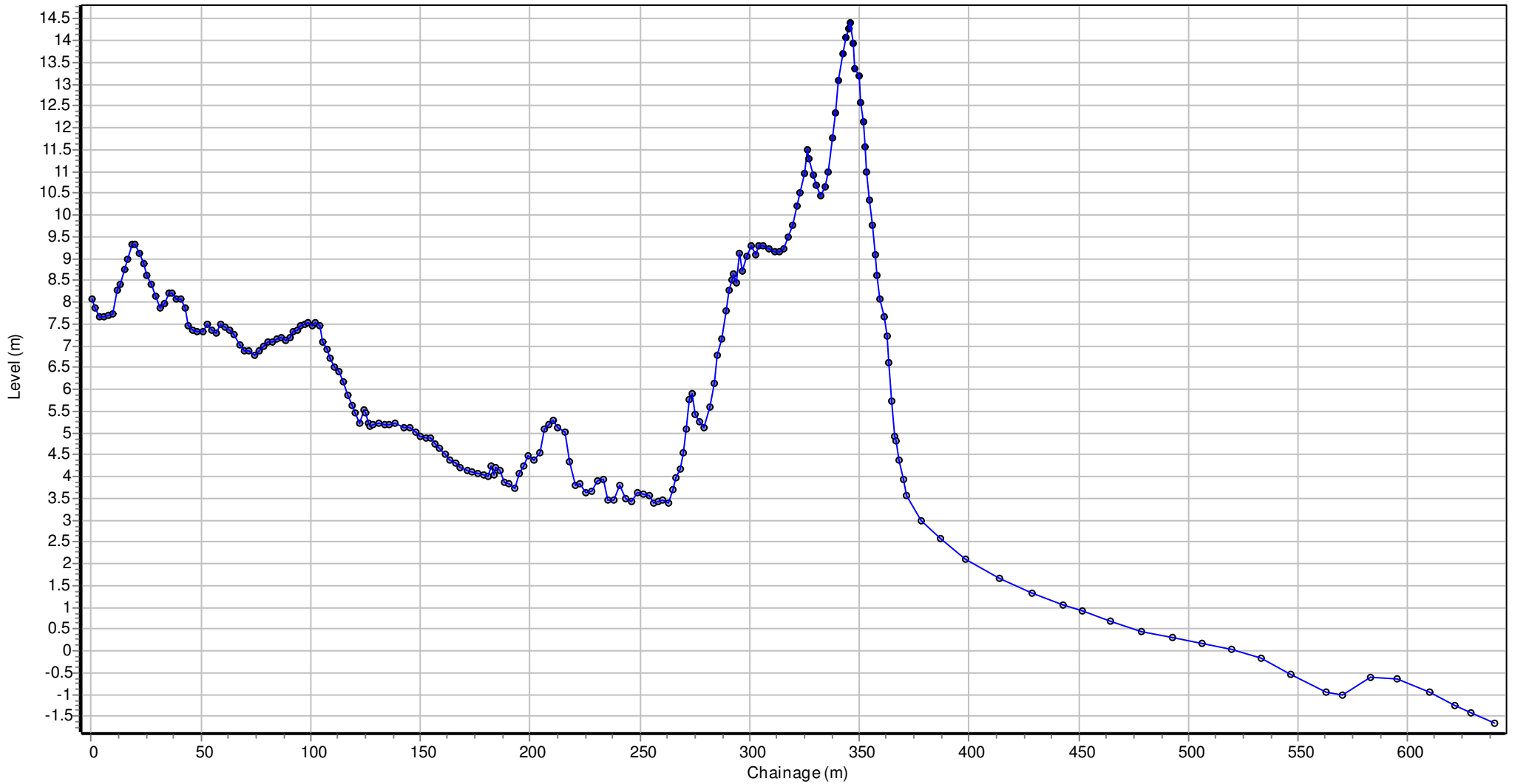
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 418972.296 Northing: 634628.46 Profile Bearing: 31 ° from North



# Beach Profile

Location: 1aBTBC30

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

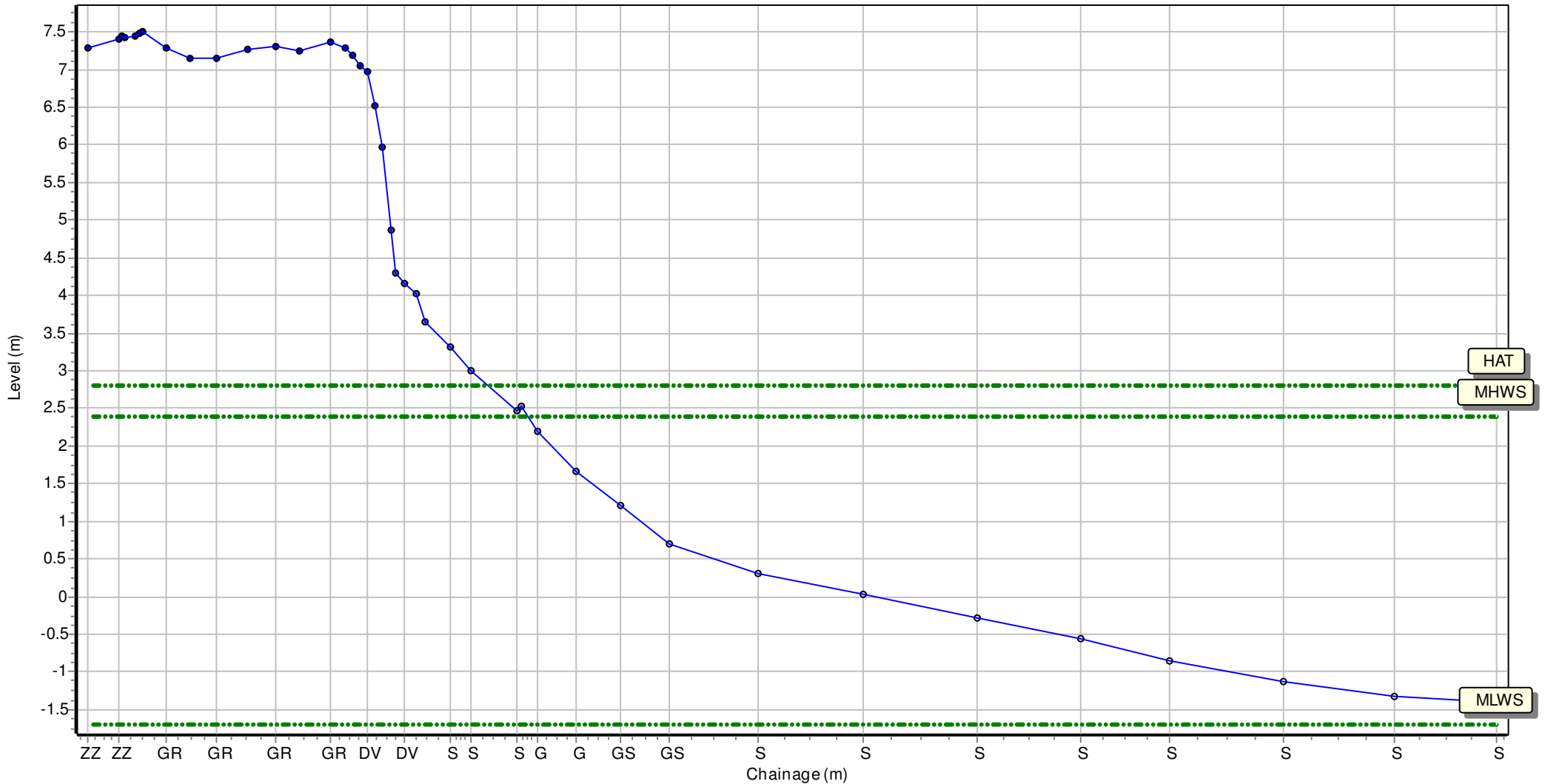
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423056.791 Northing: 629887.437 Profile Bearing: 71 ° from North





# Beach Profile

Location: 1aBTBC31

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

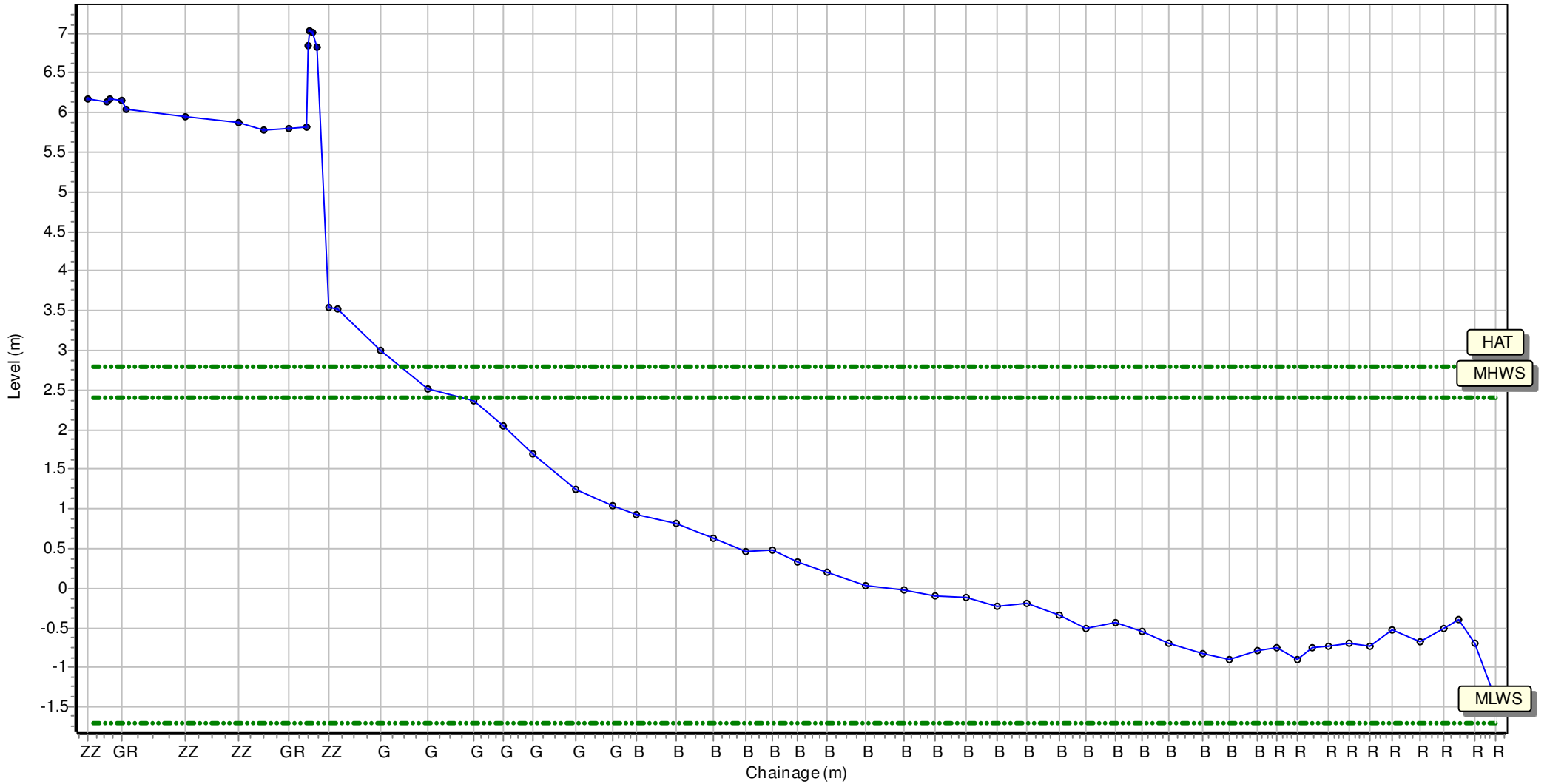
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423579.204 Northing: 628973.295 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aBTBC32

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

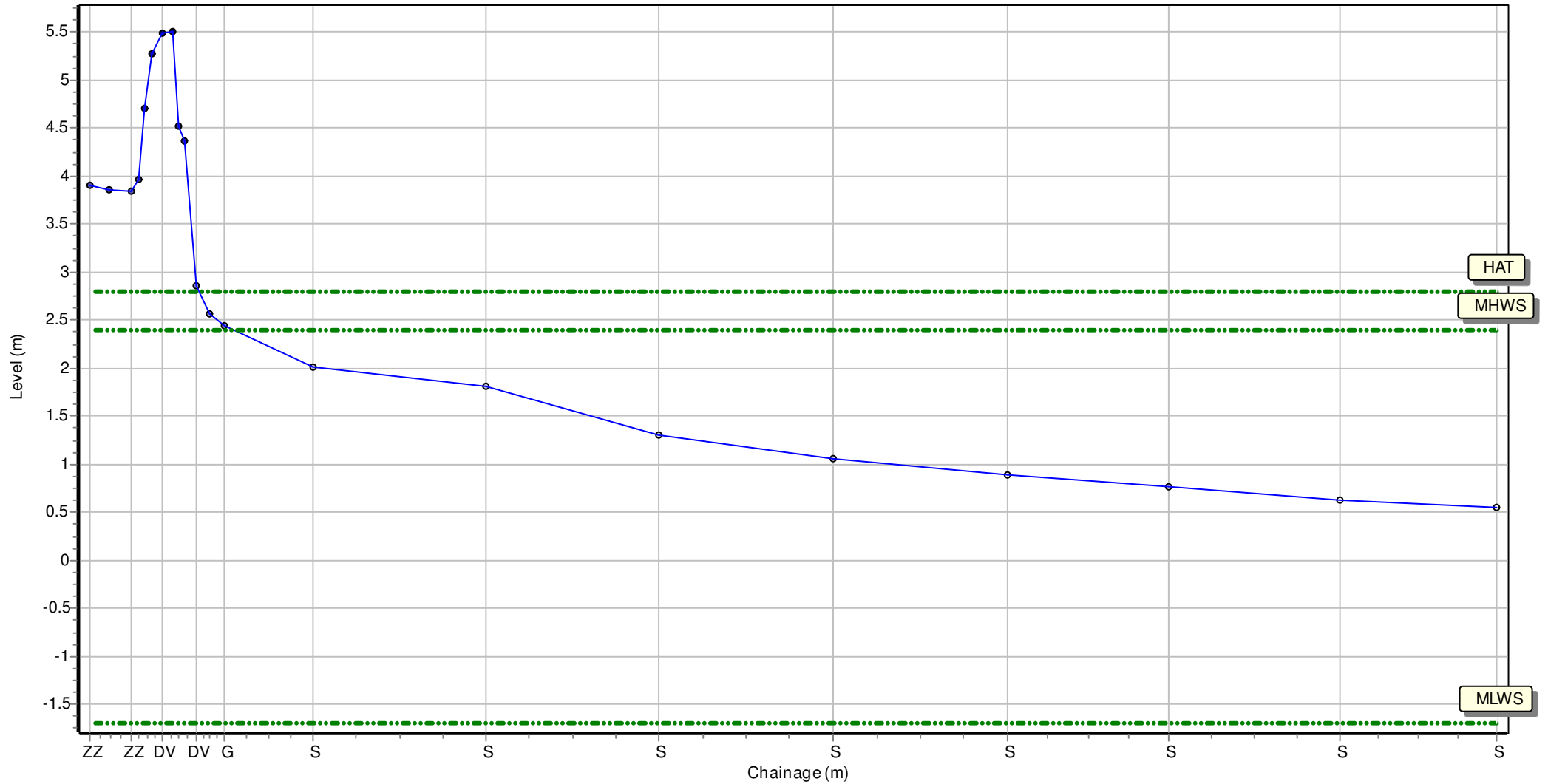
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423738.386 Northing: 628624.99 Profile Bearing: 279 ° from North



# Beach Profile

Location: 1aBTBC33

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

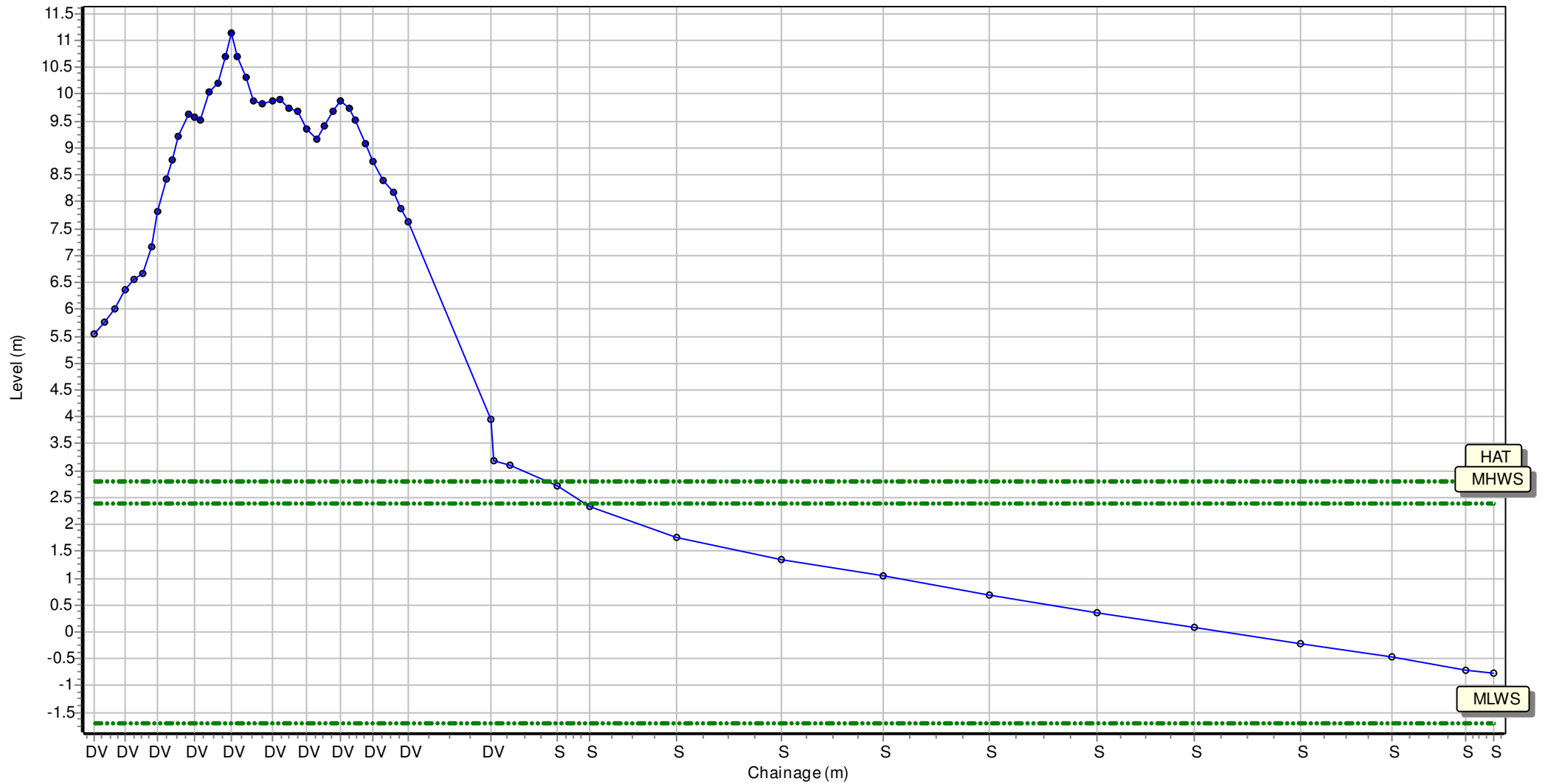
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423672.571 Northing: 628761.646 Profile Bearing: 204 ° from North



# Beach Profile

Location: 1aBTBC34

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

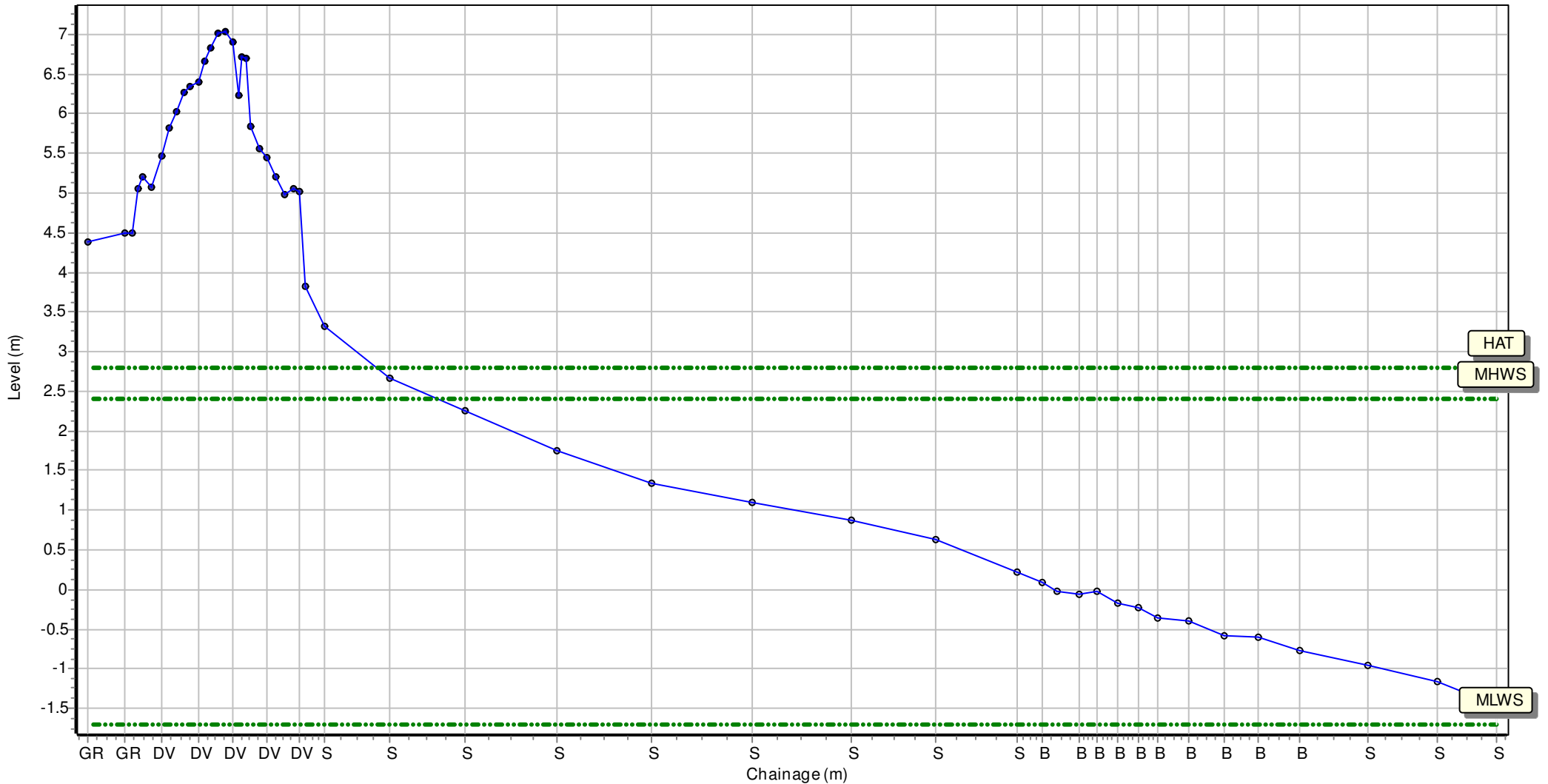
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423434.960 Northing: 628693.15 Profile Bearing: 160 ° from North



# Beach Profile

Location: 1aBTBC35

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

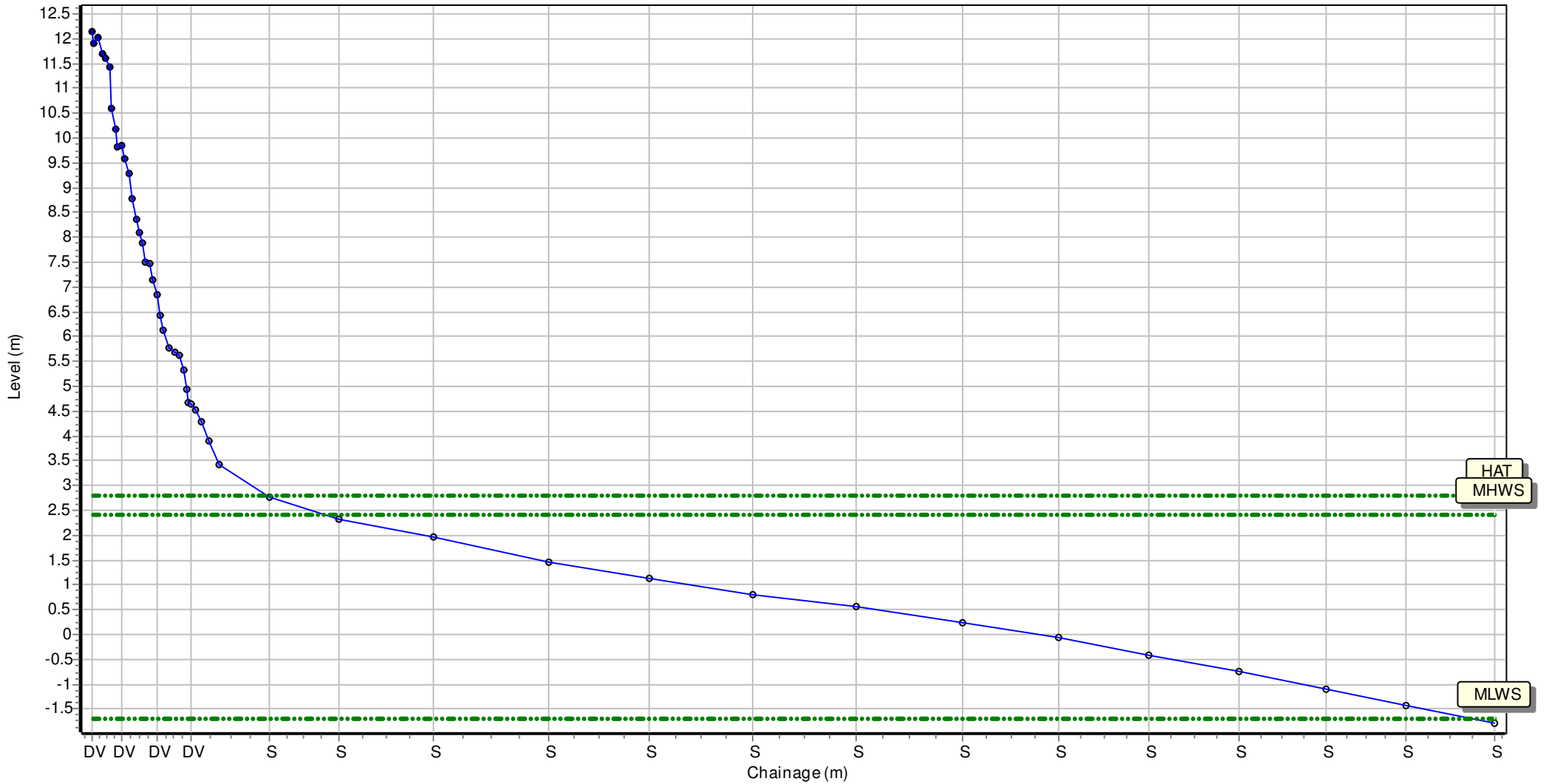
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423171.083 Northing: 628414.273 Profile Bearing: 105 ° from North



# Beach Profile

Location: 1aBTBC36

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

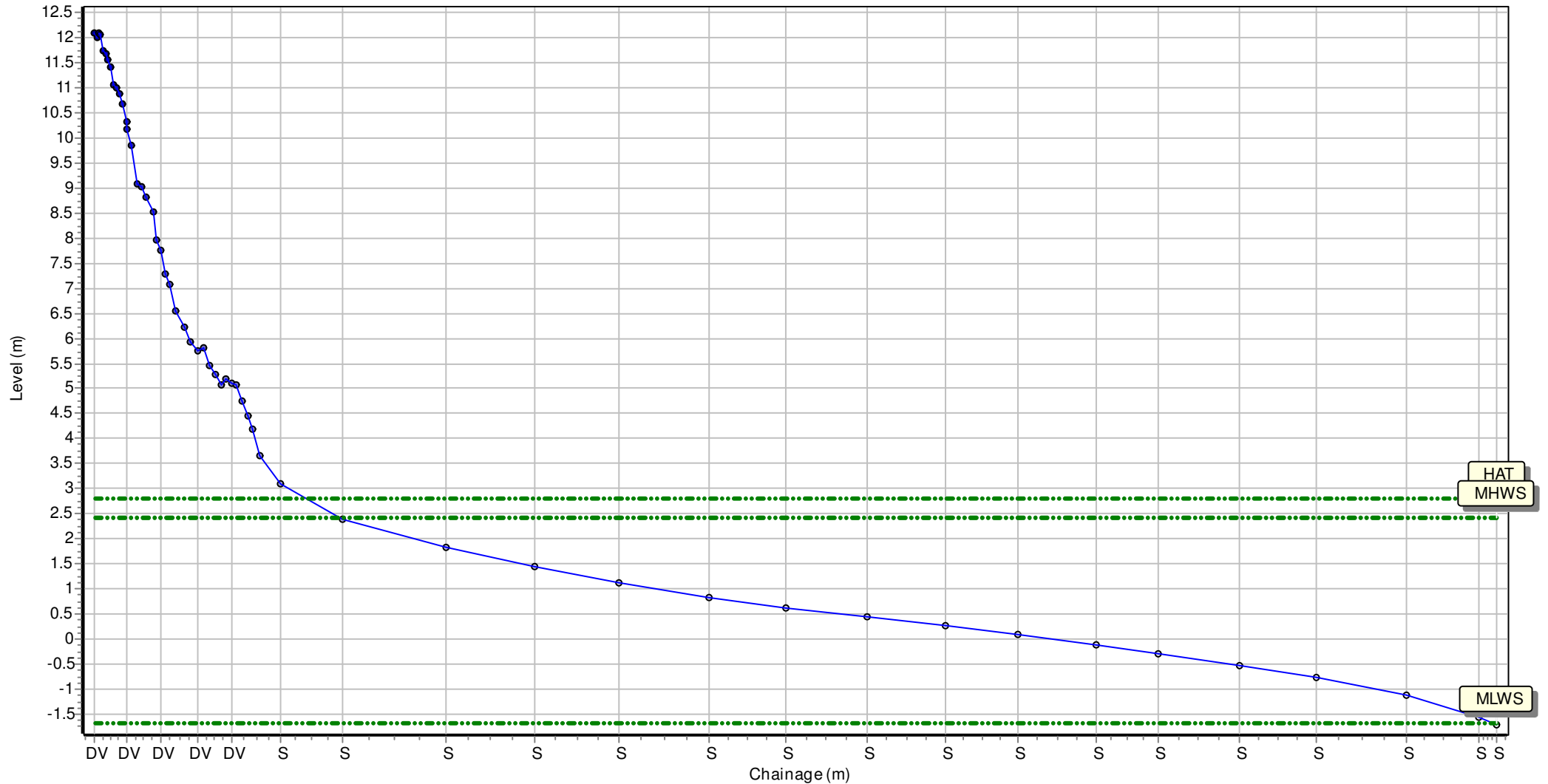
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423094.516 Northing: 628204.644 Profile Bearing: 106 ° from North



# Beach Profile

Location: 1aBTBC37

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

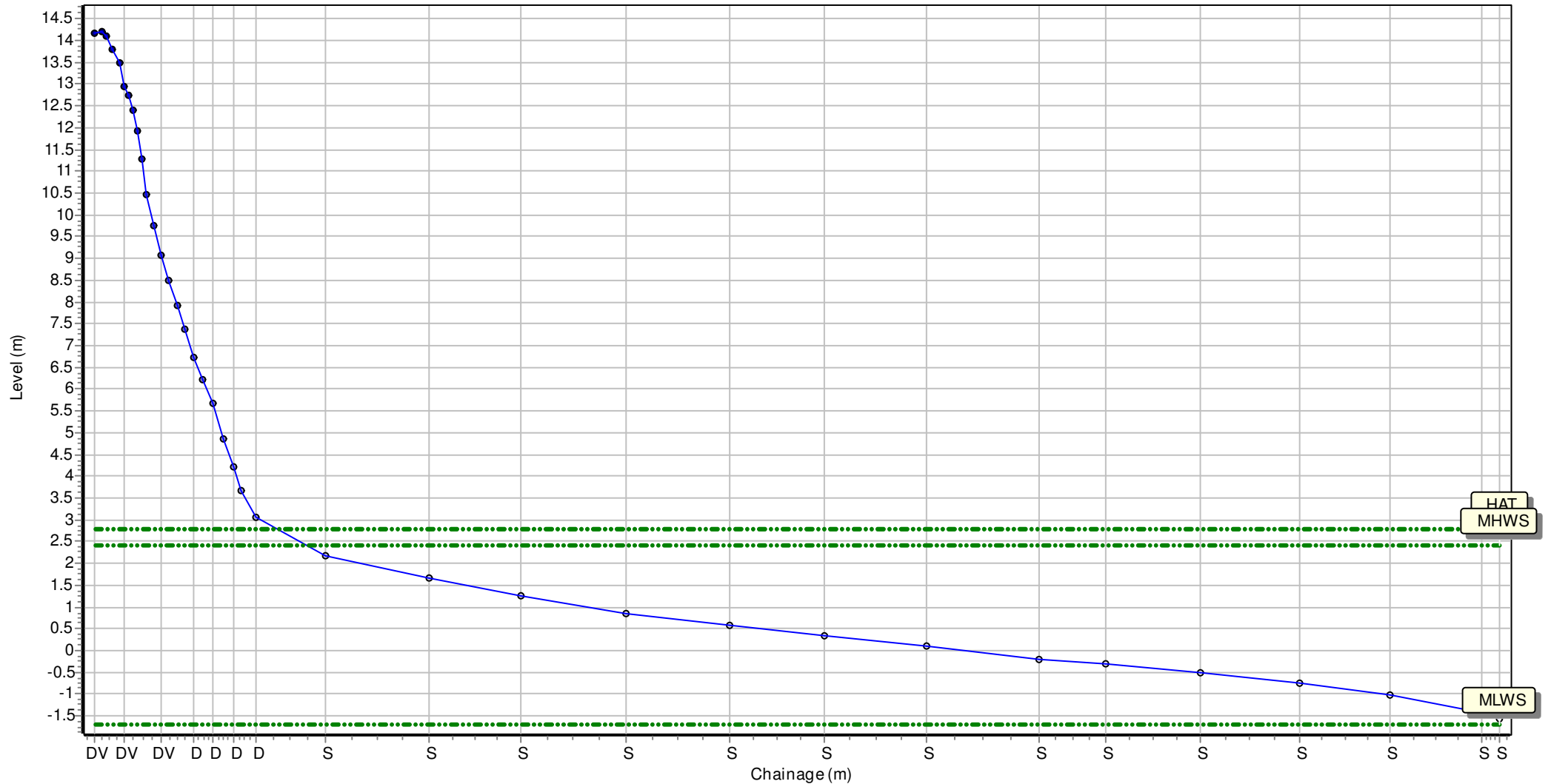
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423060.156 Northing: 628006.169 Profile Bearing: 96 ° from North



# Beach Profile

Location: 1aBTBC38

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

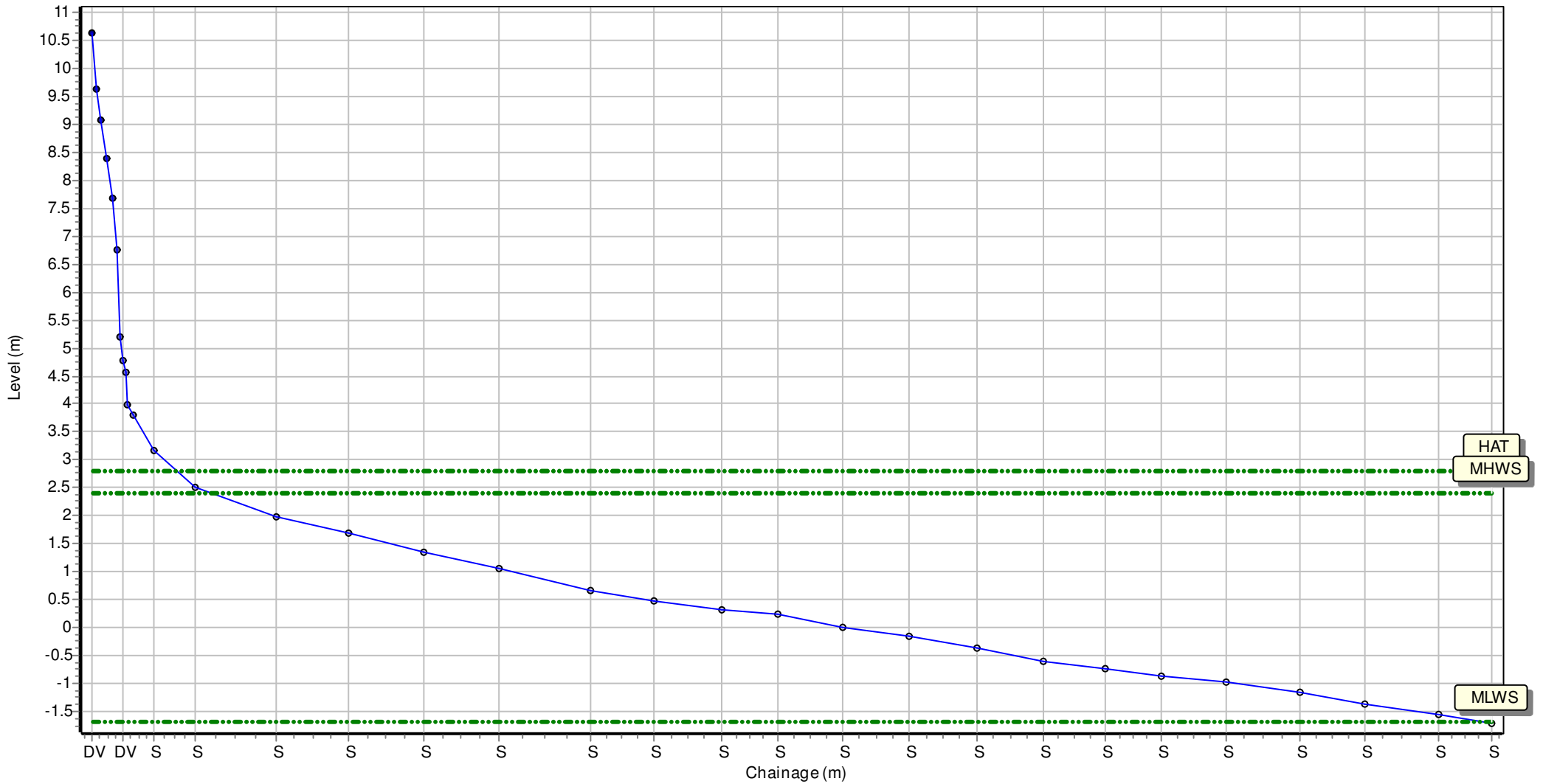
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423022.073 Northing: 627769.195 Profile Bearing: 92 ° from North





# Beach Profile

Location: 1aADC01

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

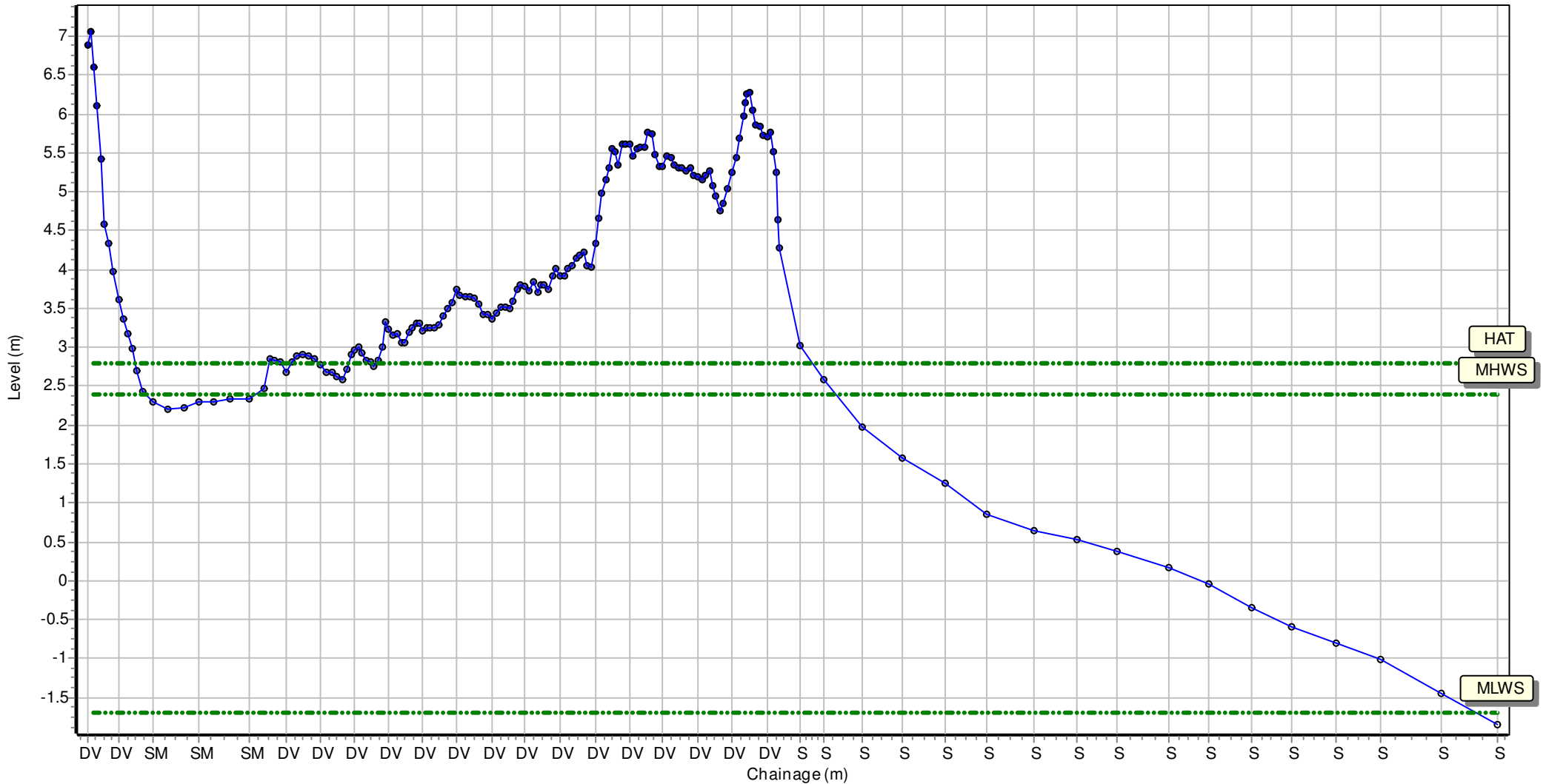
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 422824.294 Northing: 627077.805 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aADC02

Date: 02/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

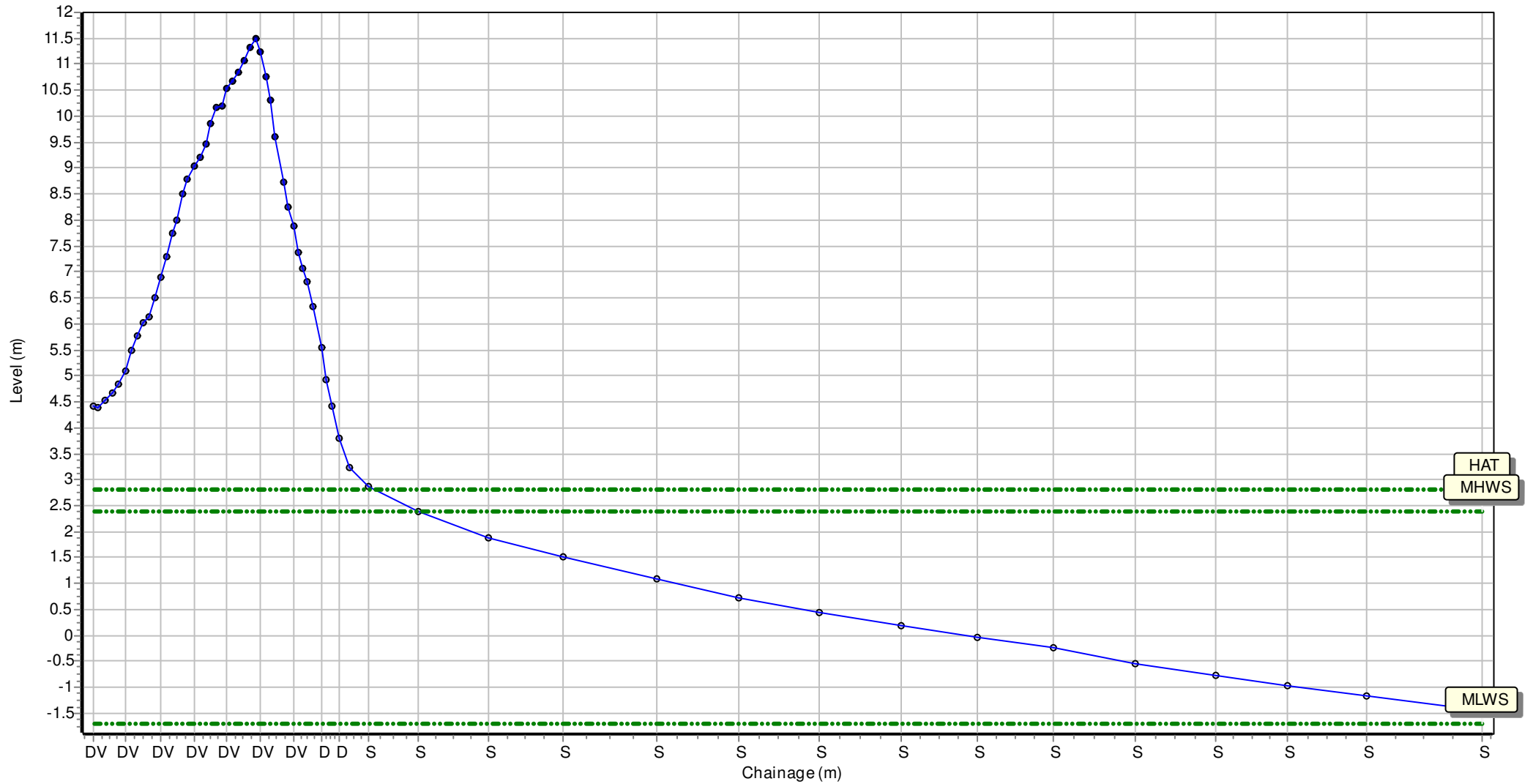
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 423387.925 Northing: 626385.049 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aADC03

Date: 05/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

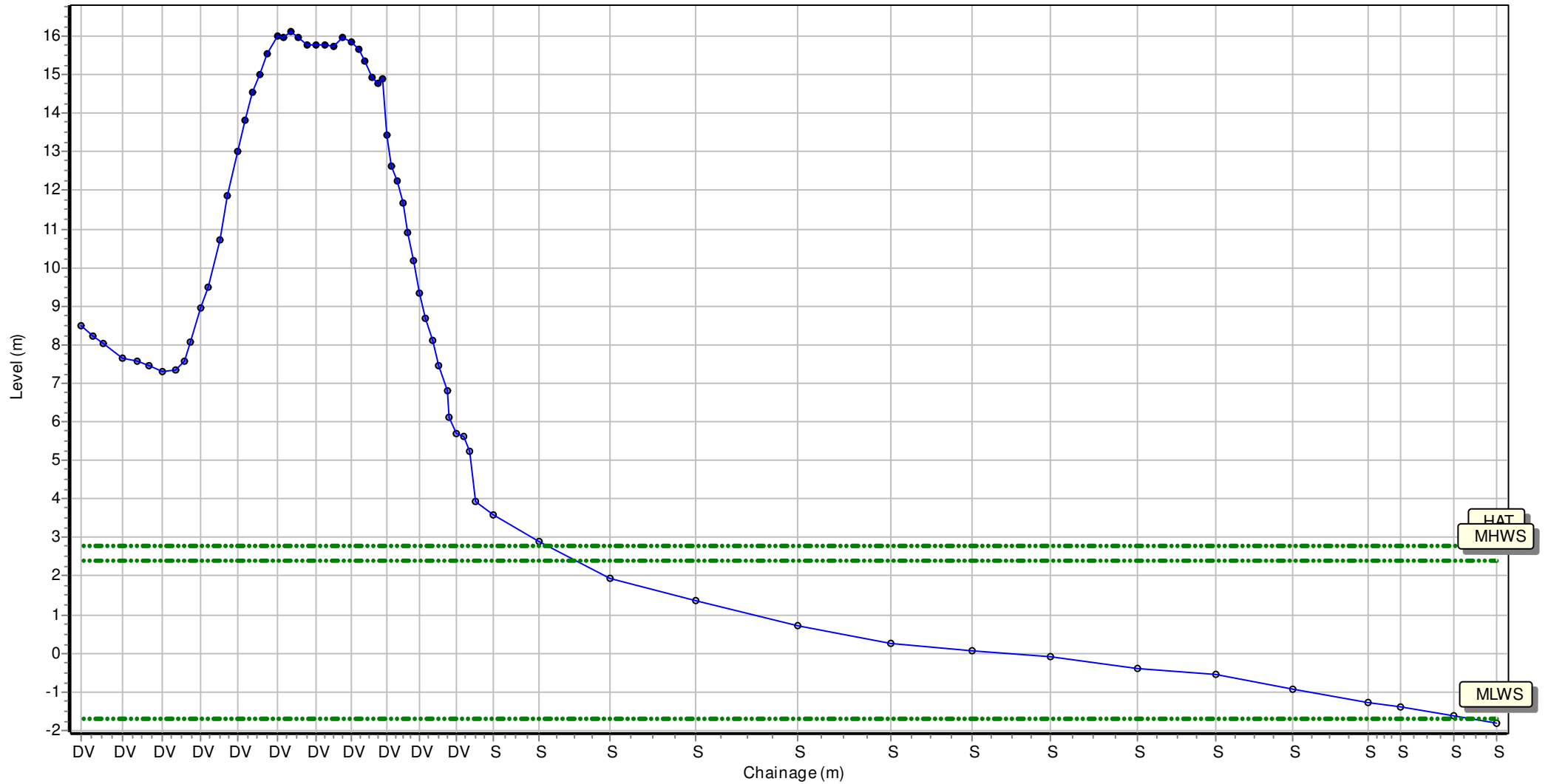
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 424282.669 Northing: 623628.714 Profile Bearing: 112 ° from North



# Beach Profile

Location: 1aADC04

Date: 05/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

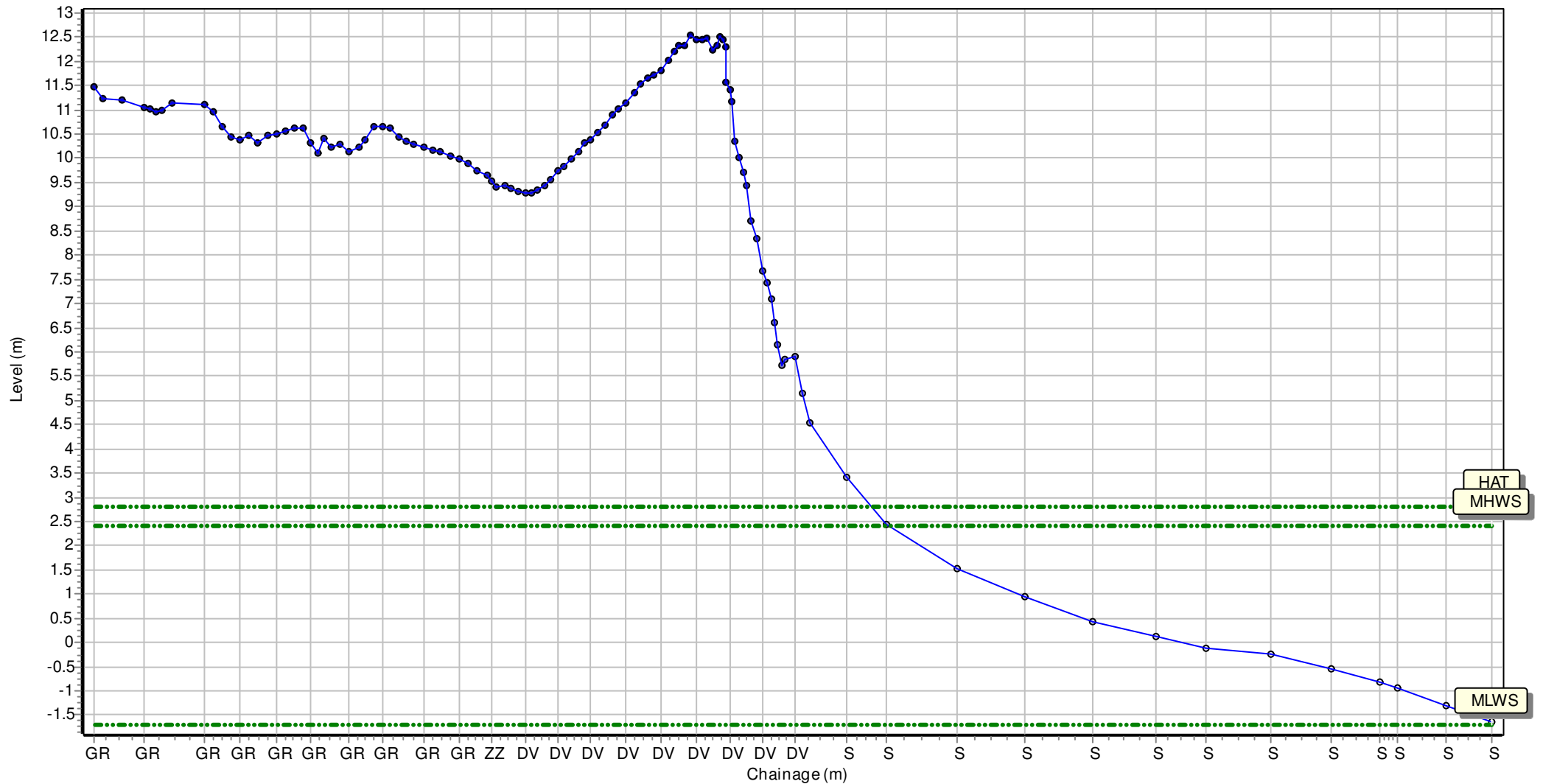
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 424479.626 Northing: 622434.173 Profile Bearing: 50 ° from North



# Beach Profile

Location: 1aADC04A

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

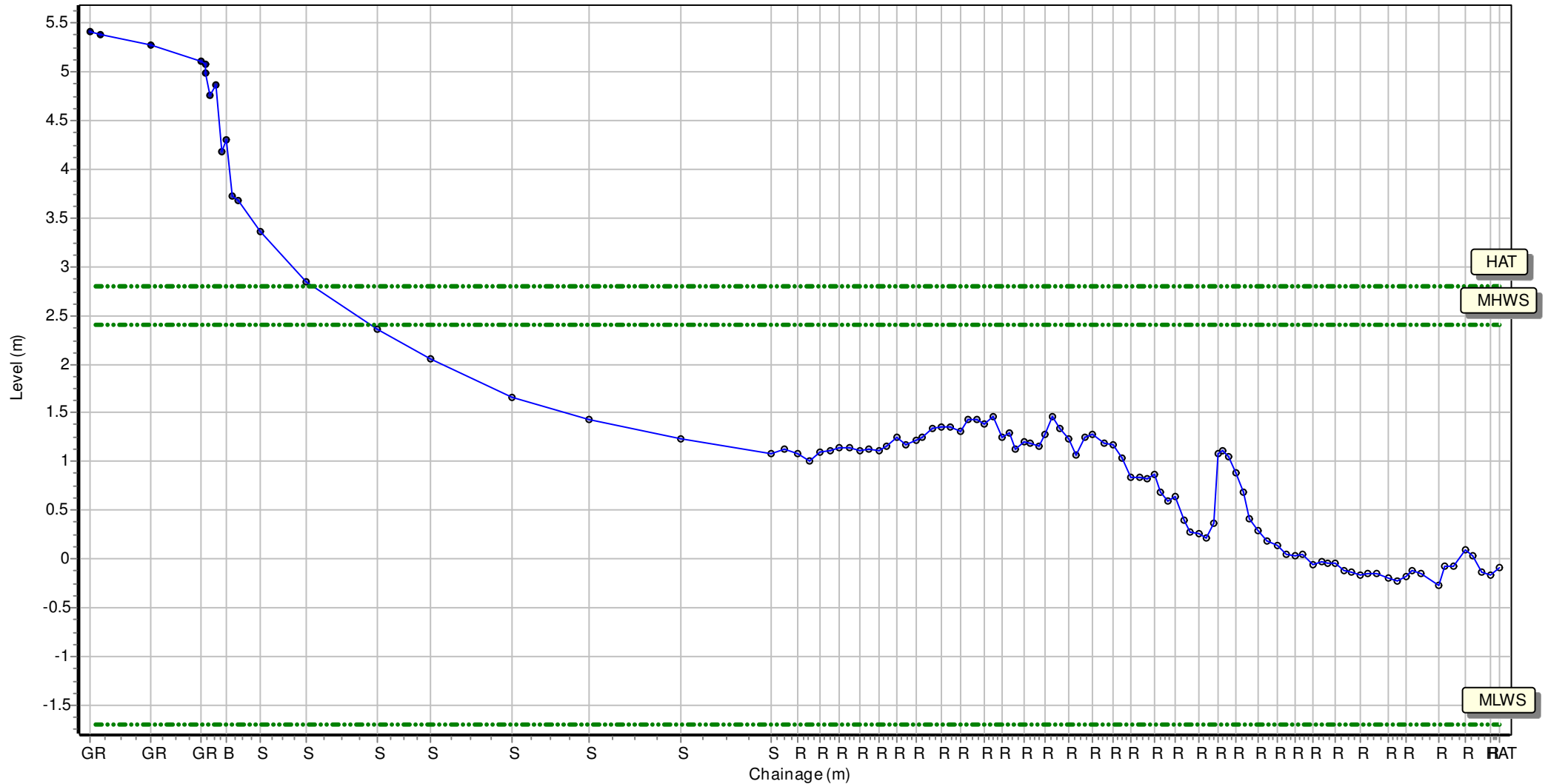
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 426649.592 Northing: 614336.9 Profile Bearing: 93 ° from North



# Beach Profile

Location: 1aADC04B

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

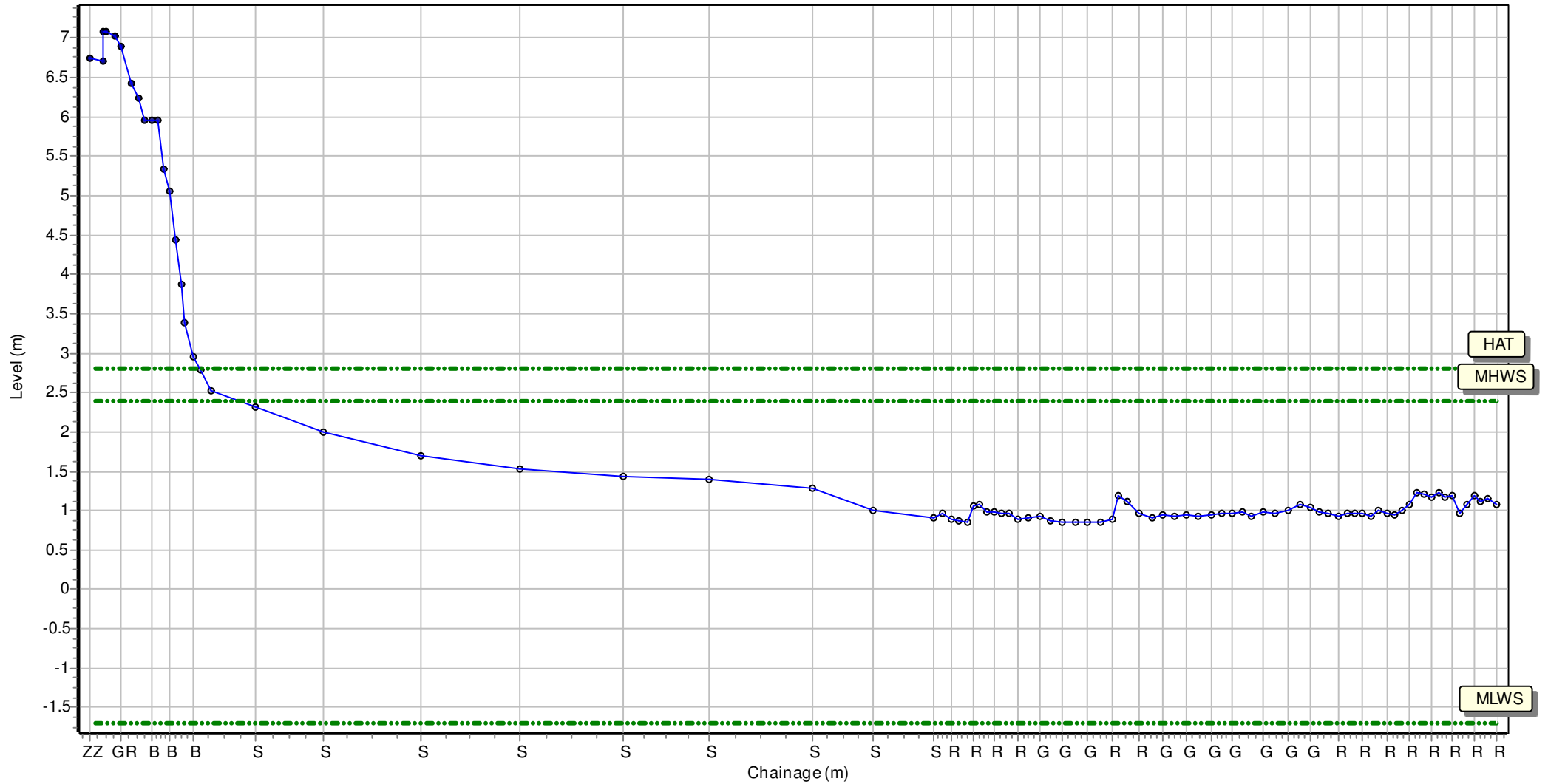
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 426641.642 Northing: 614193.793 Profile Bearing: 91 ° from North



# Beach Profile

Location: 1aADC05

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

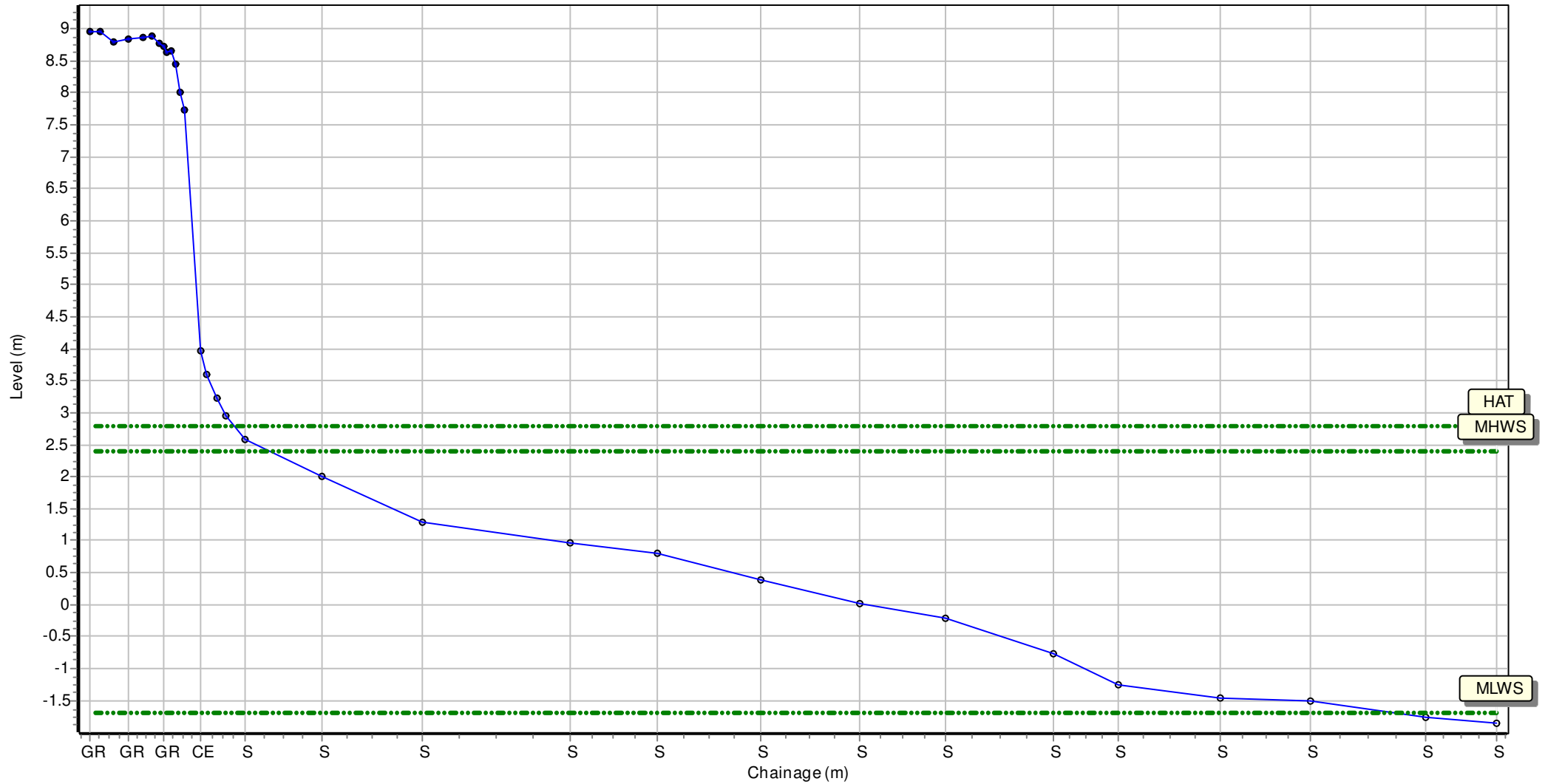
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 426185.186 Northing: 612543.216 Profile Bearing: 142 ° from North



# Beach Profile

Location: 1aADC06

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

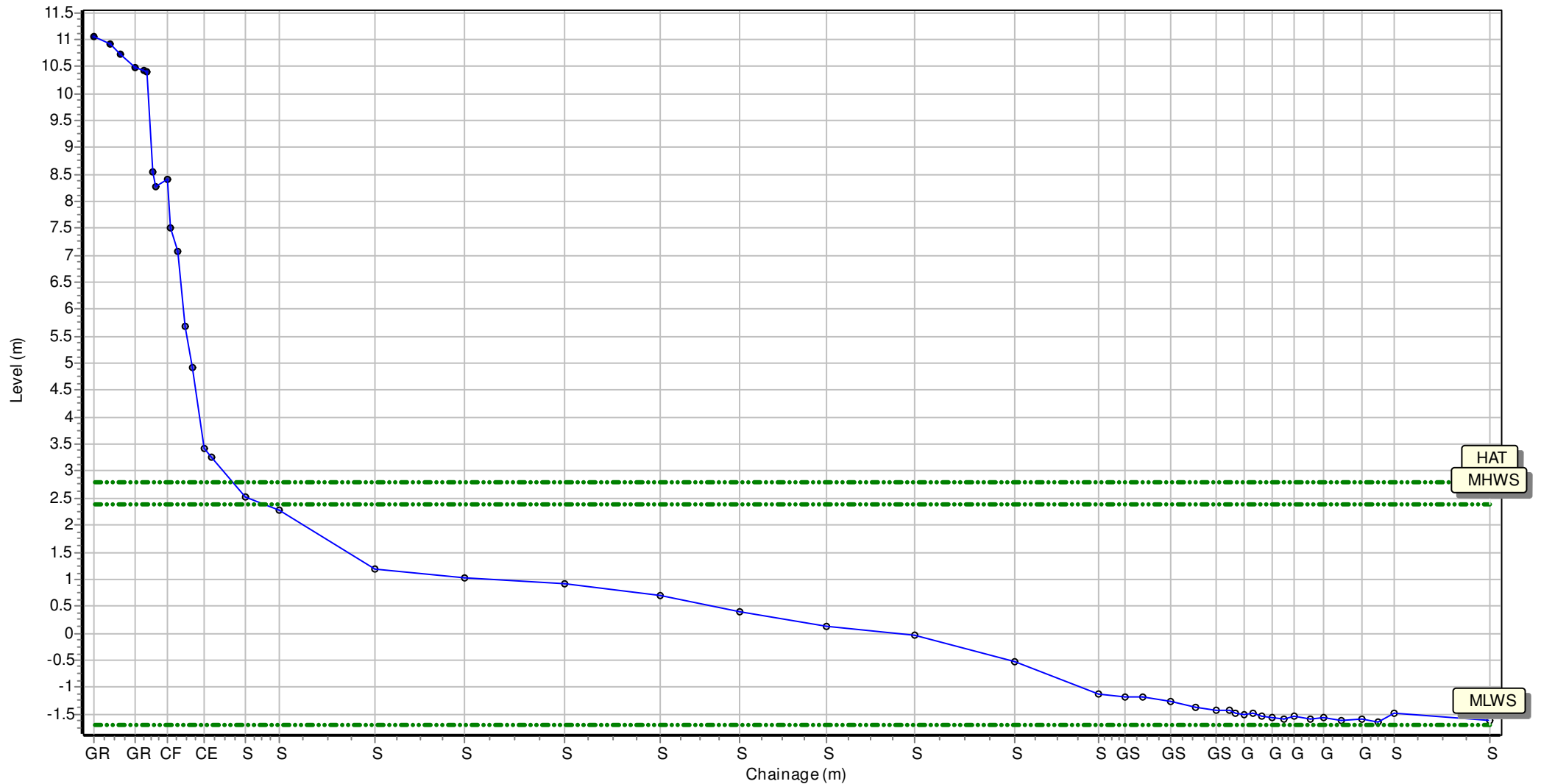
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 425950.4 Northing: 612302.499 Profile Bearing: 122 ° from North





# Beach Profile

Location: 1aADC07

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

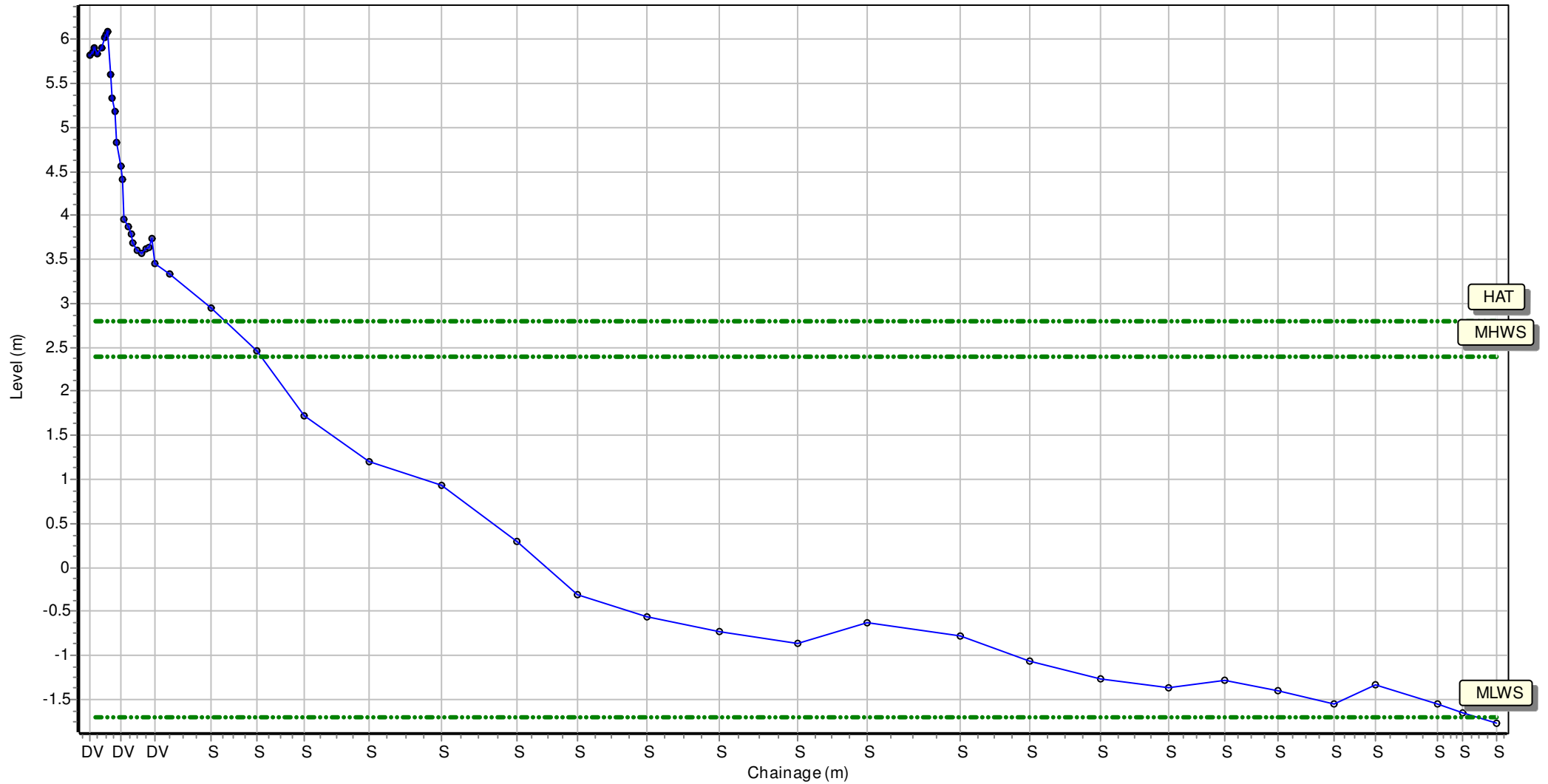
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 425324.445 Northing: 611018.794 Profile Bearing: 134 ° from North



# Beach Profile

Location: 1aADC08

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

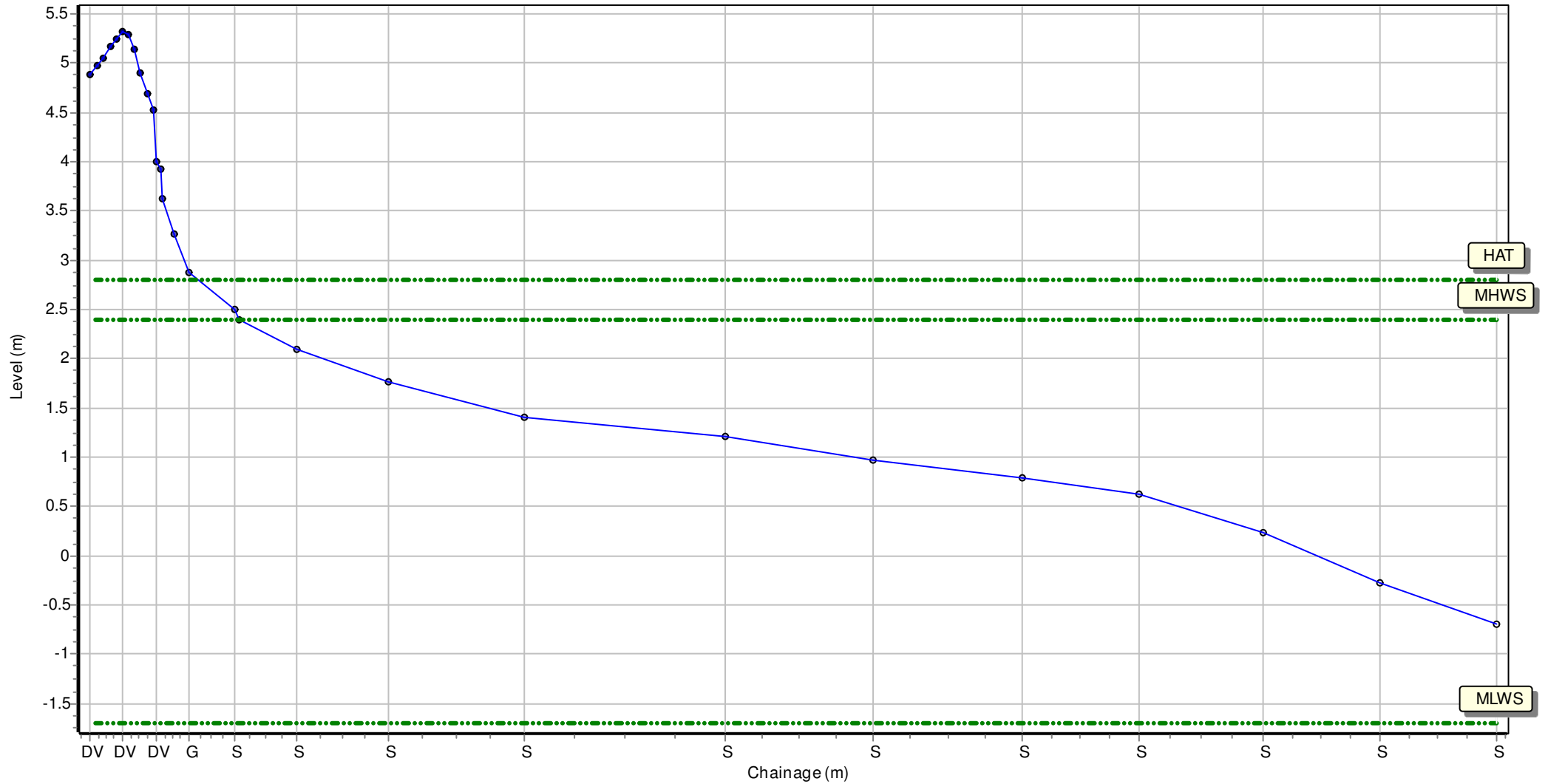
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 425031.727 Northing: 610632.355 Profile Bearing: 112 ° from North



# Beach Profile

Location: 1aADC09

Date: 16/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

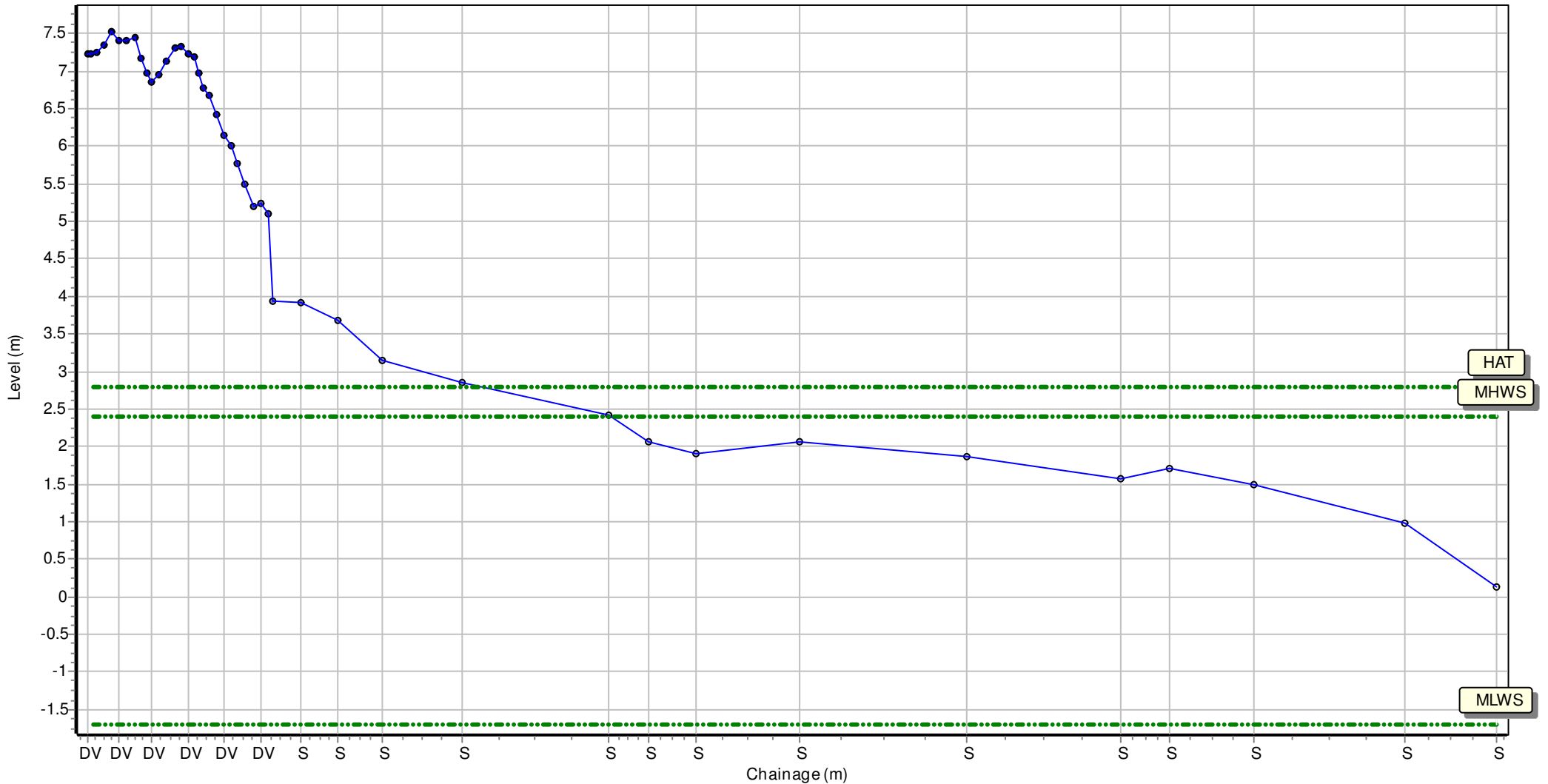
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 424802.33 Northing: 610353.259 Profile Bearing: 120 ° from North



# Beach Profile

Location: 1aADC10

Date: 17/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

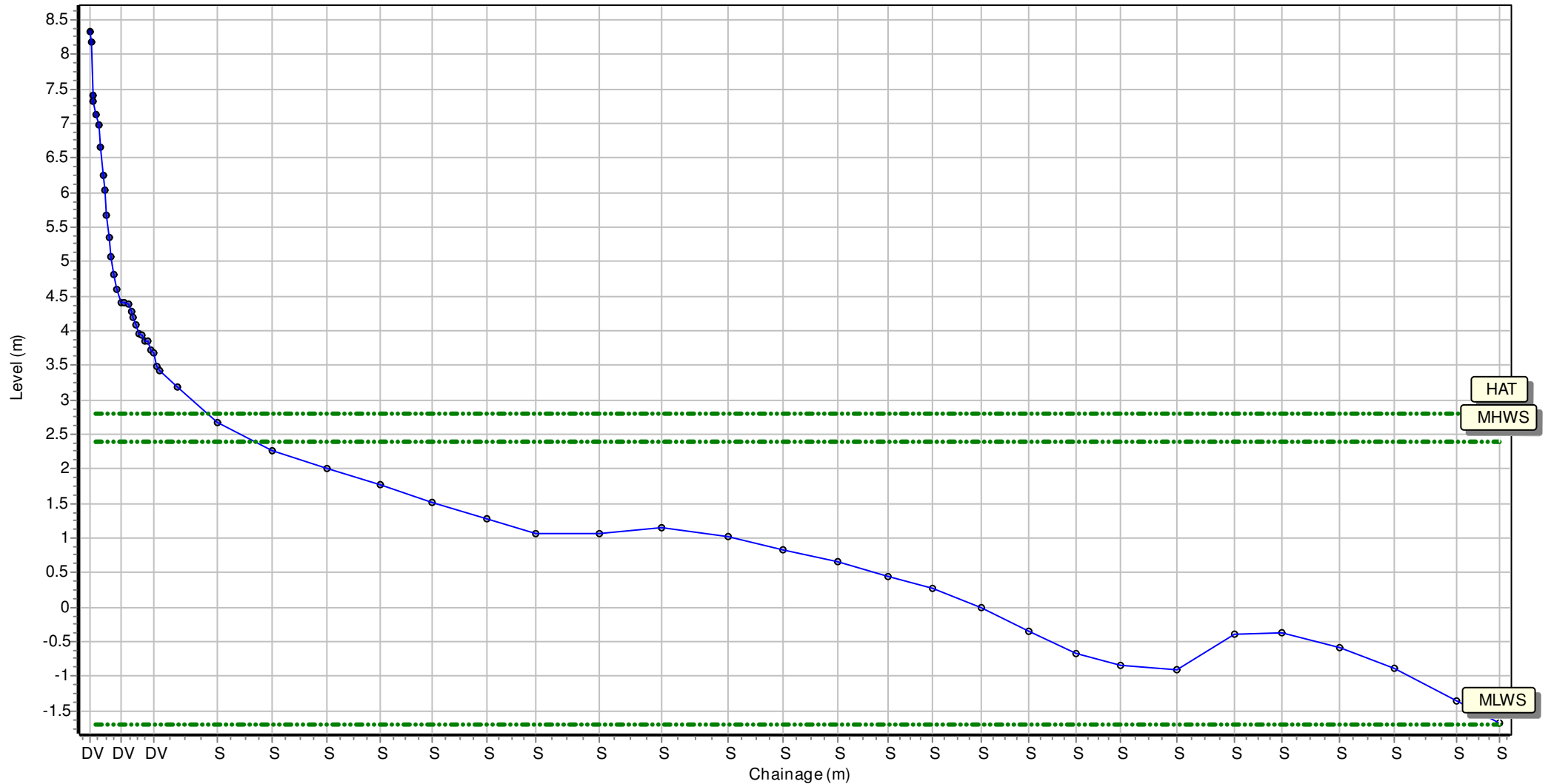
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 424845.495 Northing: 610035.618 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aADC11

Date: 17/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

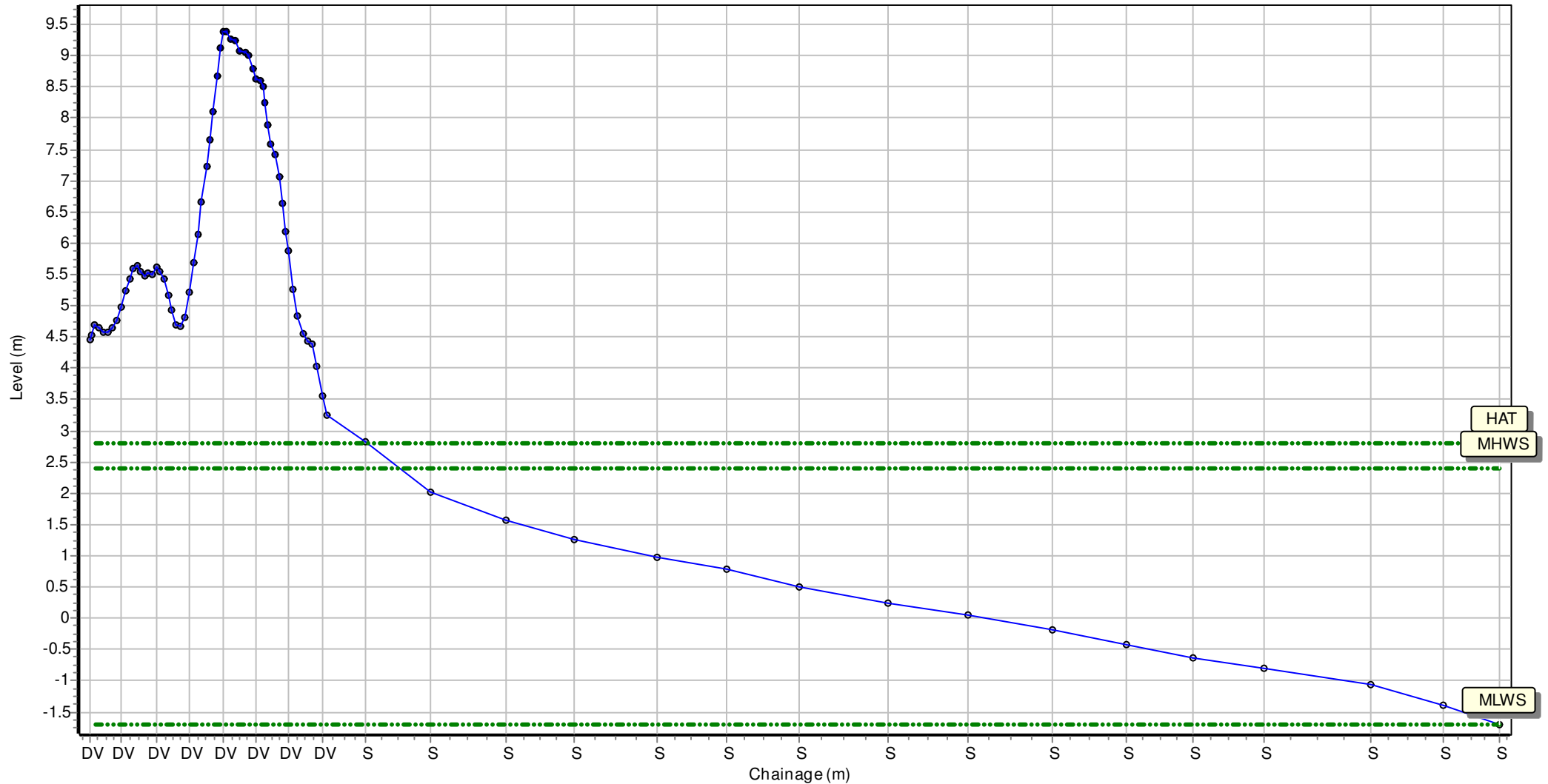
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 424966.878 Northing: 609097.685 Profile Bearing: 71 ° from North



# Beach Profile

Location: 1aADC12

Date: 17/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

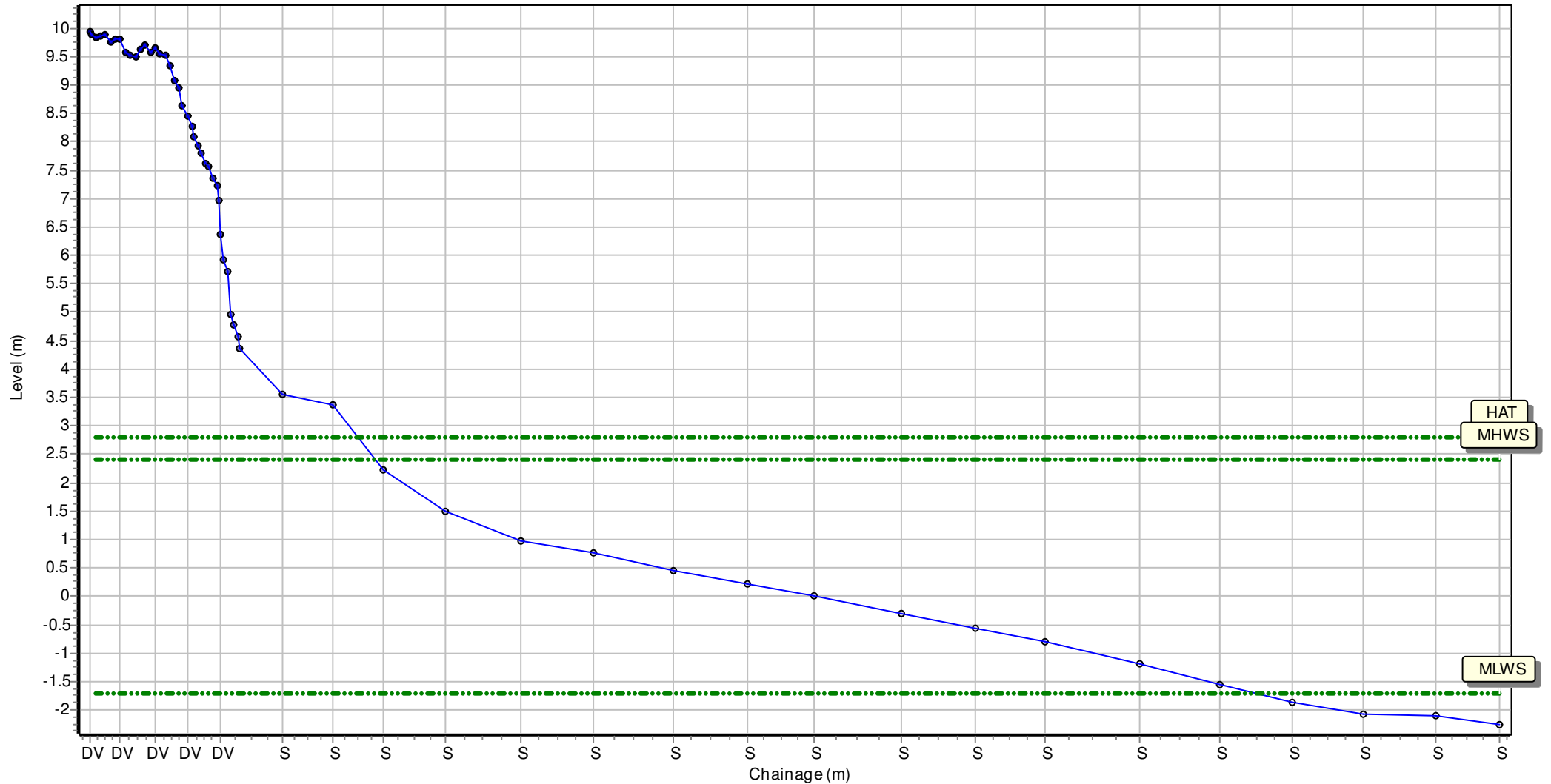
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 425376.479 Northing: 607303.998 Profile Bearing: 67 ° from North



# Beach Profile

Location: 1aADC13

Date: 17/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

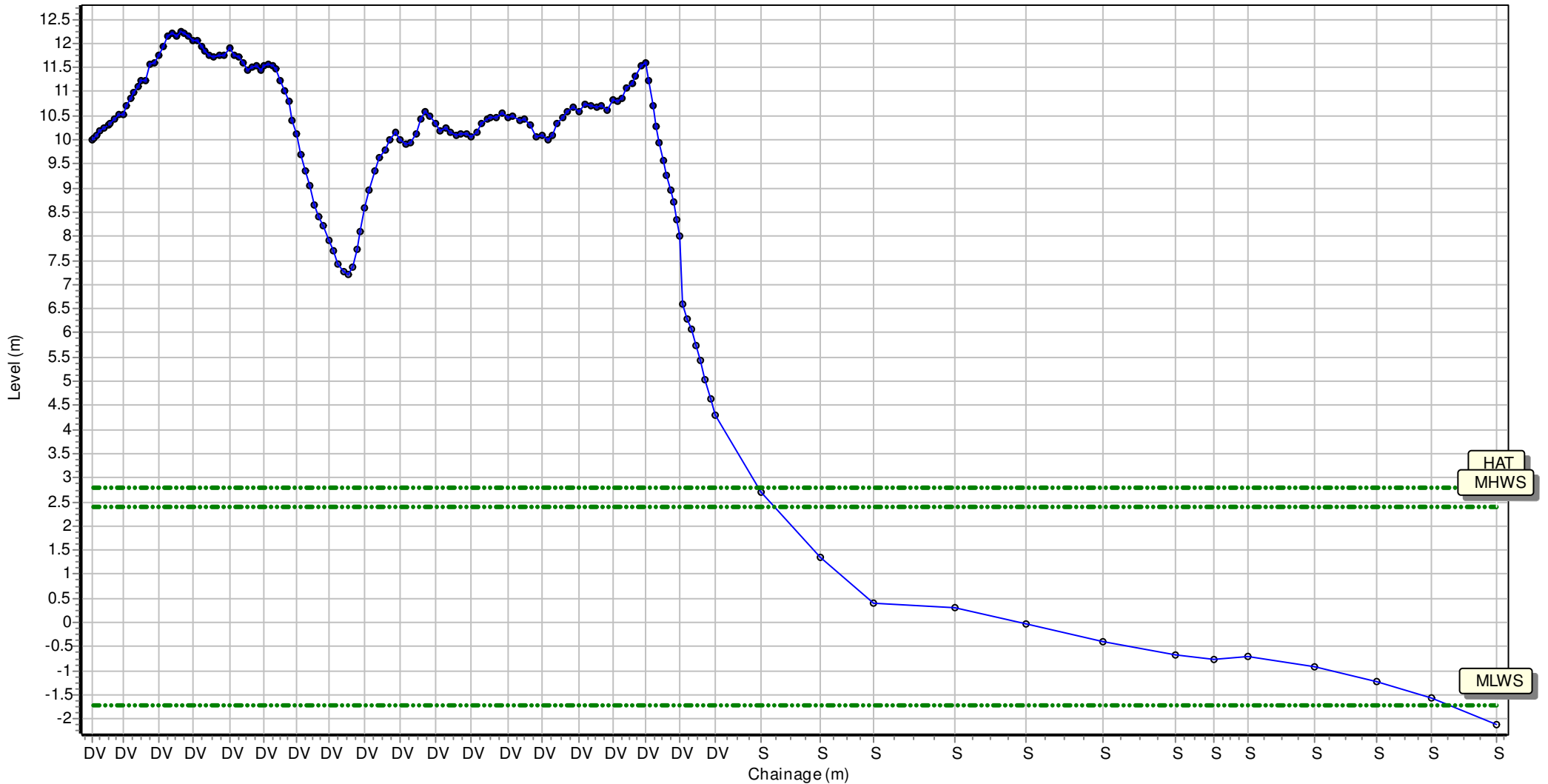
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 425859.769 Northing: 606033.935 Profile Bearing: 63 ° from North



# Beach Profile

Location: 1aADC14

Date: 17/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

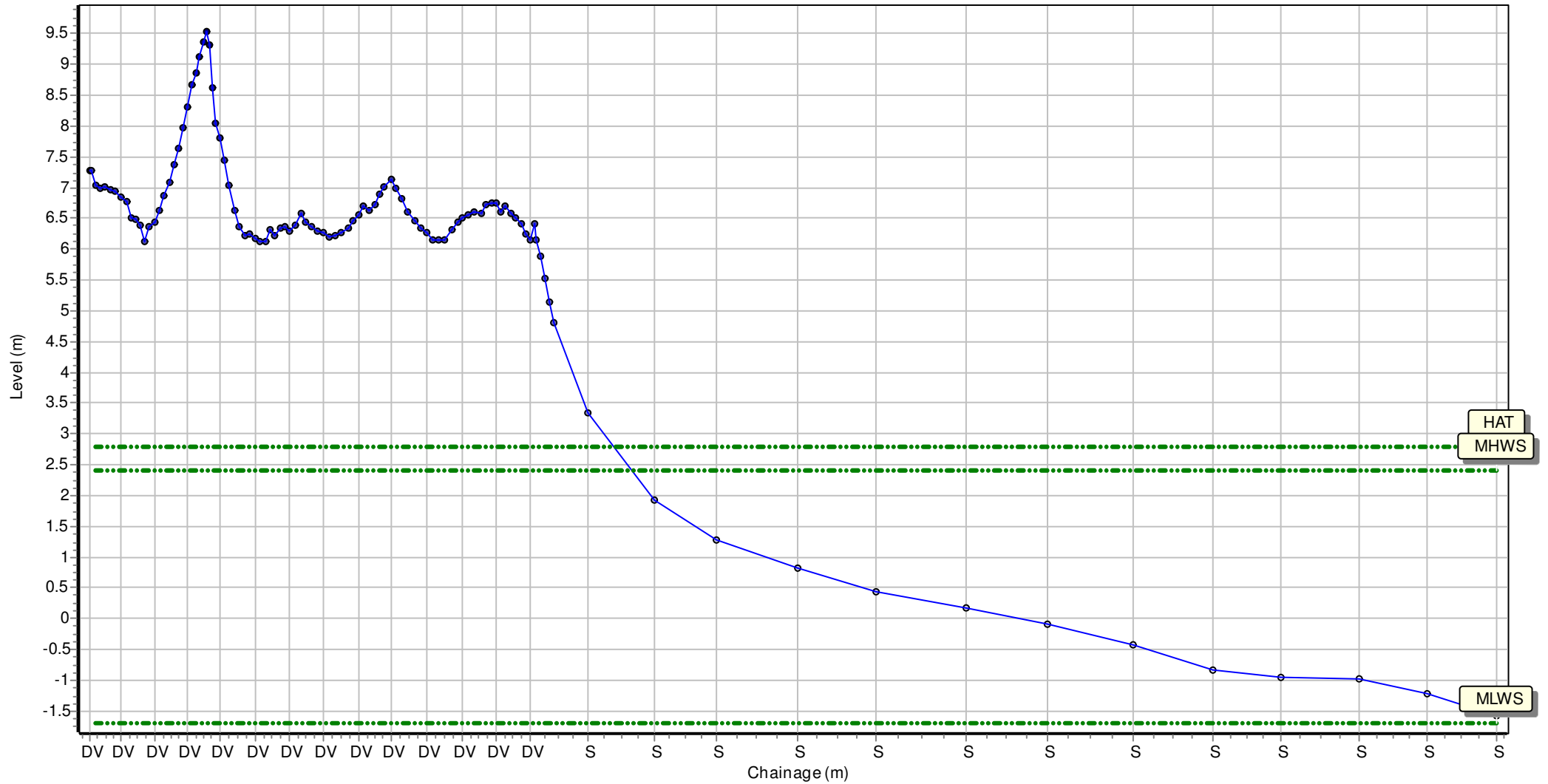
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 426469.136 Northing: 605263.954 Profile Bearing: 59 ° from North





# Beach Profile

Location: 1aADC15

Date: 18/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

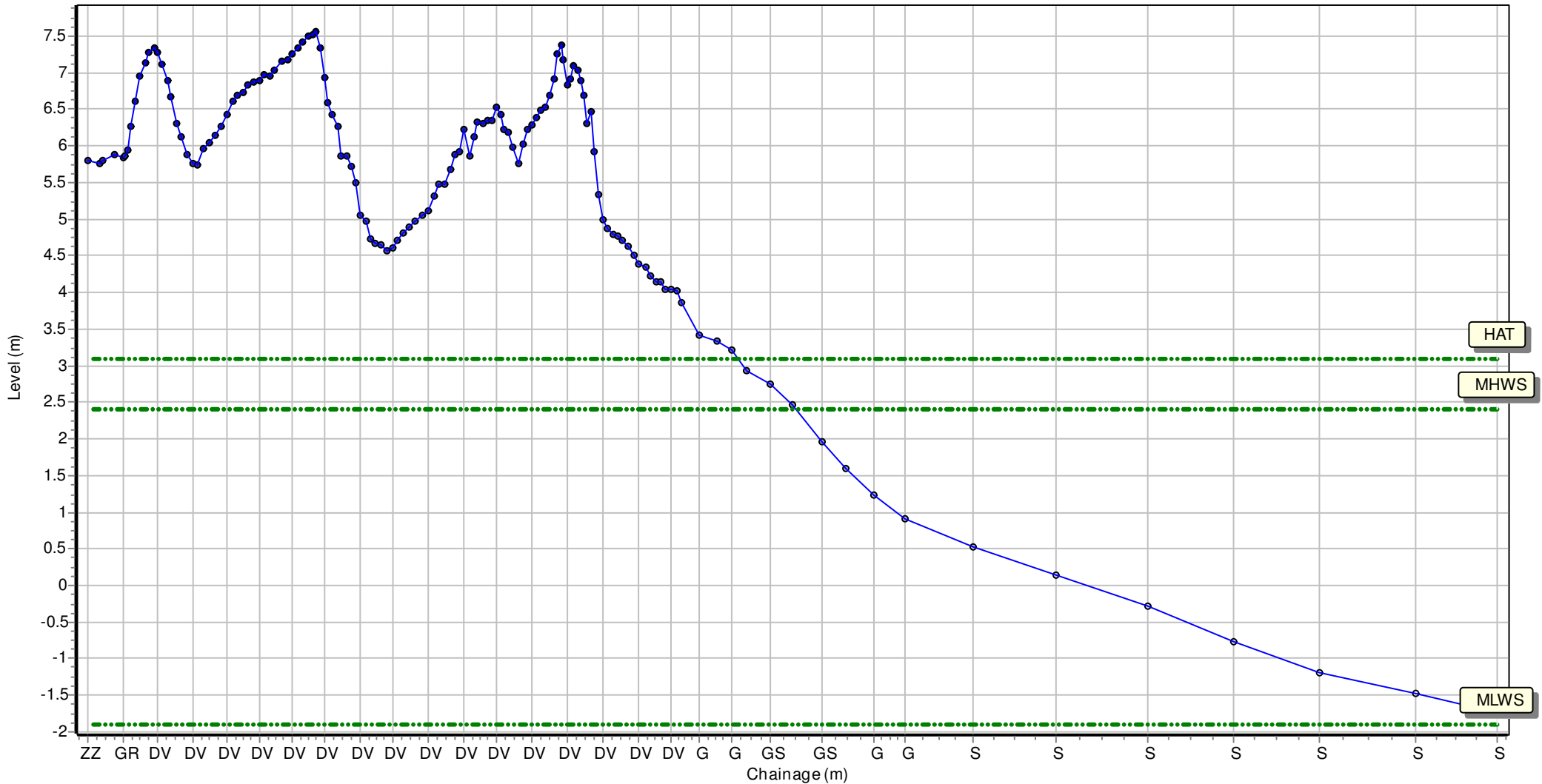
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 427956.742 Northing: 603743.758 Profile Bearing: 46 ° from North



# Beach Profile

Location: 1aADC15A

Date: 18/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

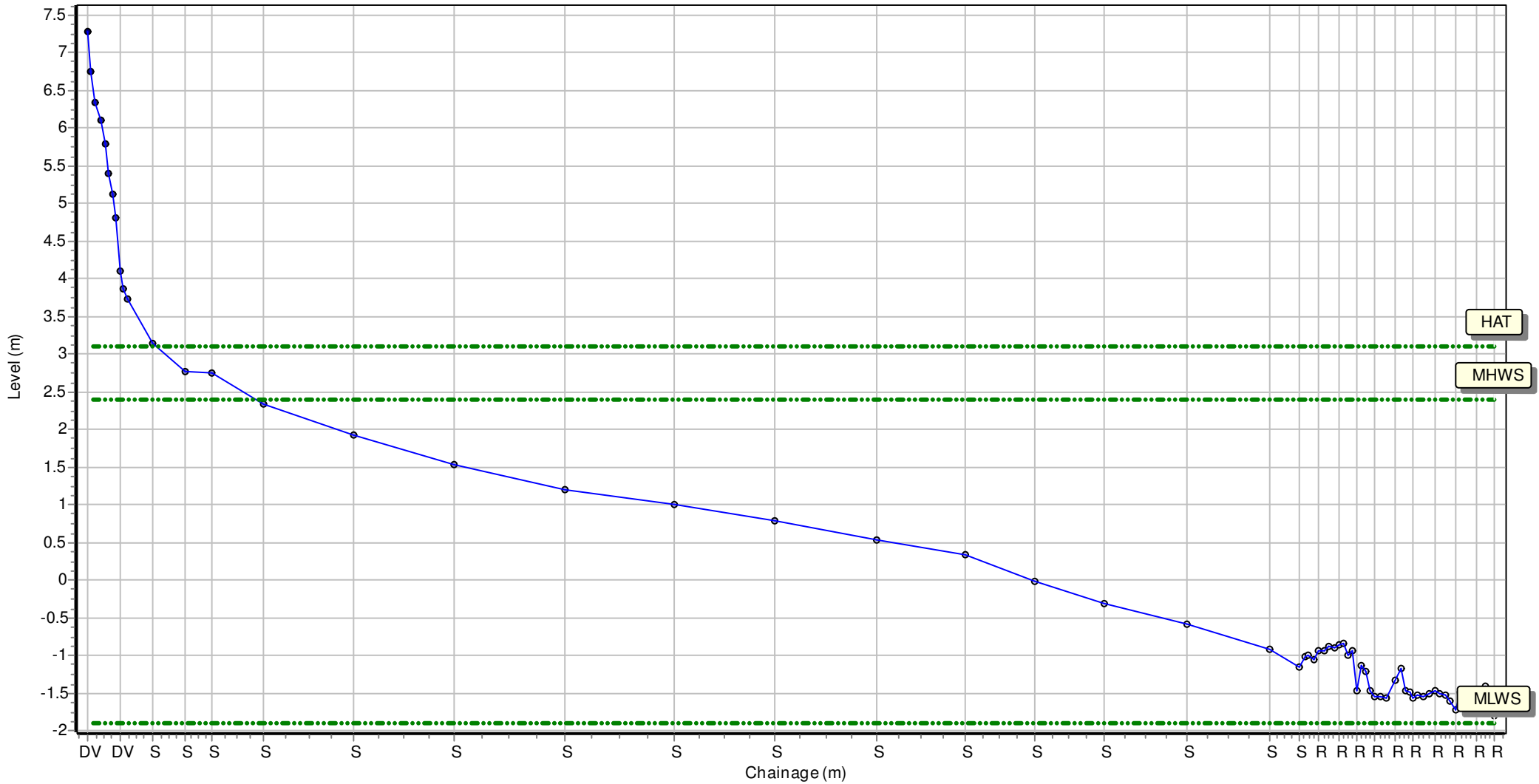
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428642.365 Northing: 603069.145 Profile Bearing: 90 ° from North



# Beach Profile

Location: 1aADC16

Date: 18/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

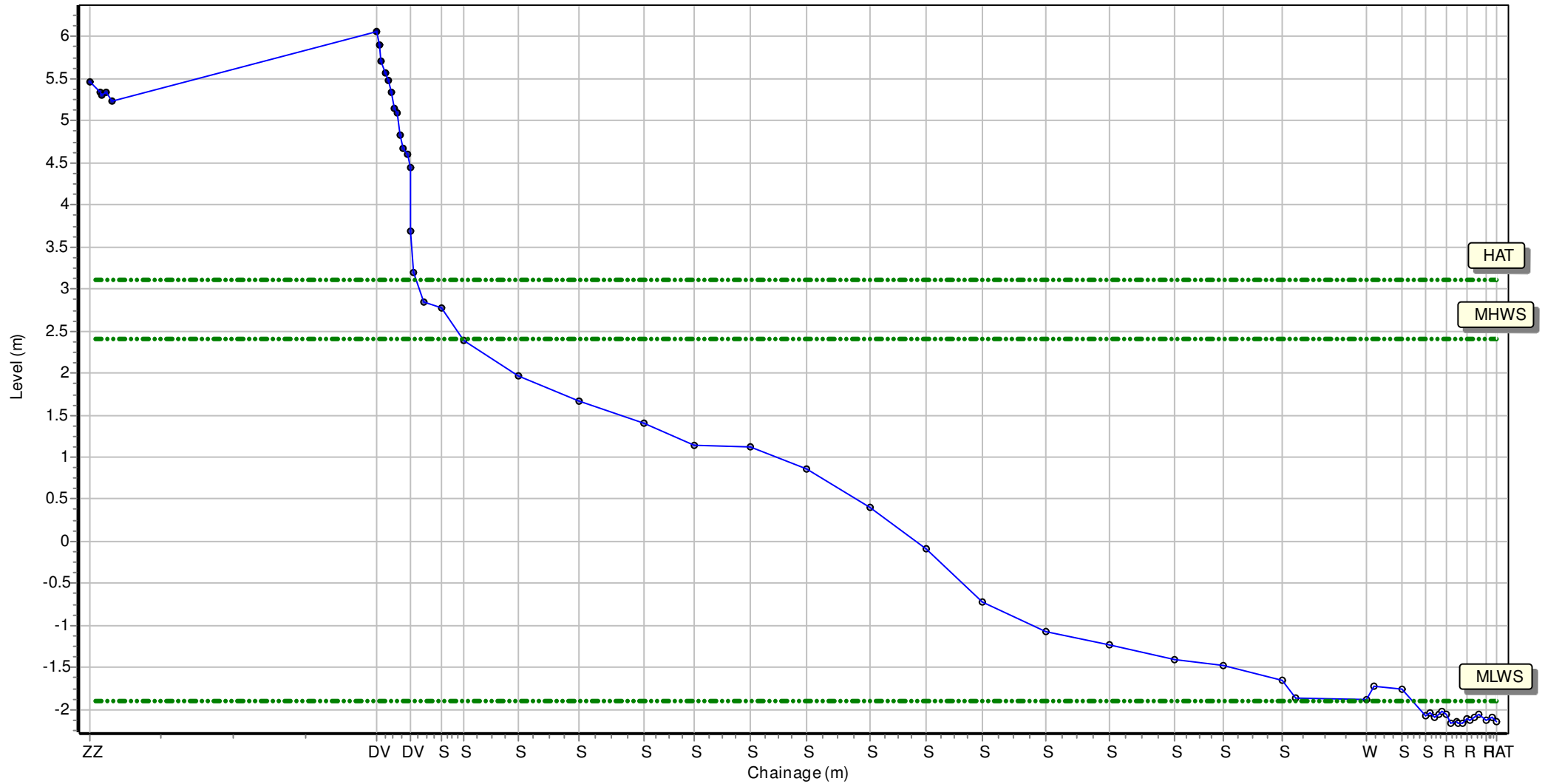
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428575.092 Northing: 602921.577 Profile Bearing: 93 ° from North



# Beach Profile

Location: 1aADC16A

Date: 18/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

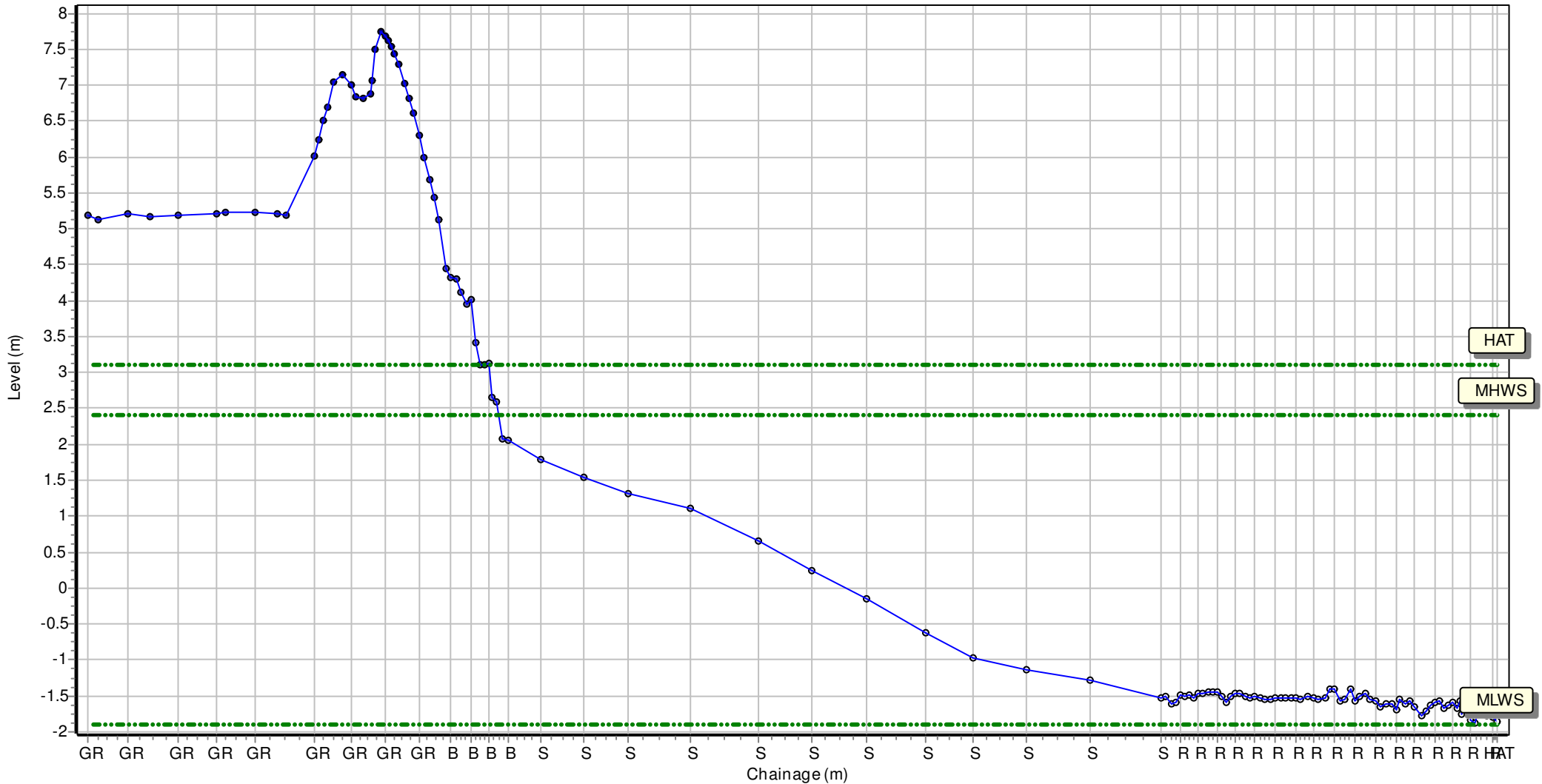
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428543.525 Northing: 602704.175 Profile Bearing: 92 ° from North



# Beach Profile

Location: 1aADC16B

Date: 15/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

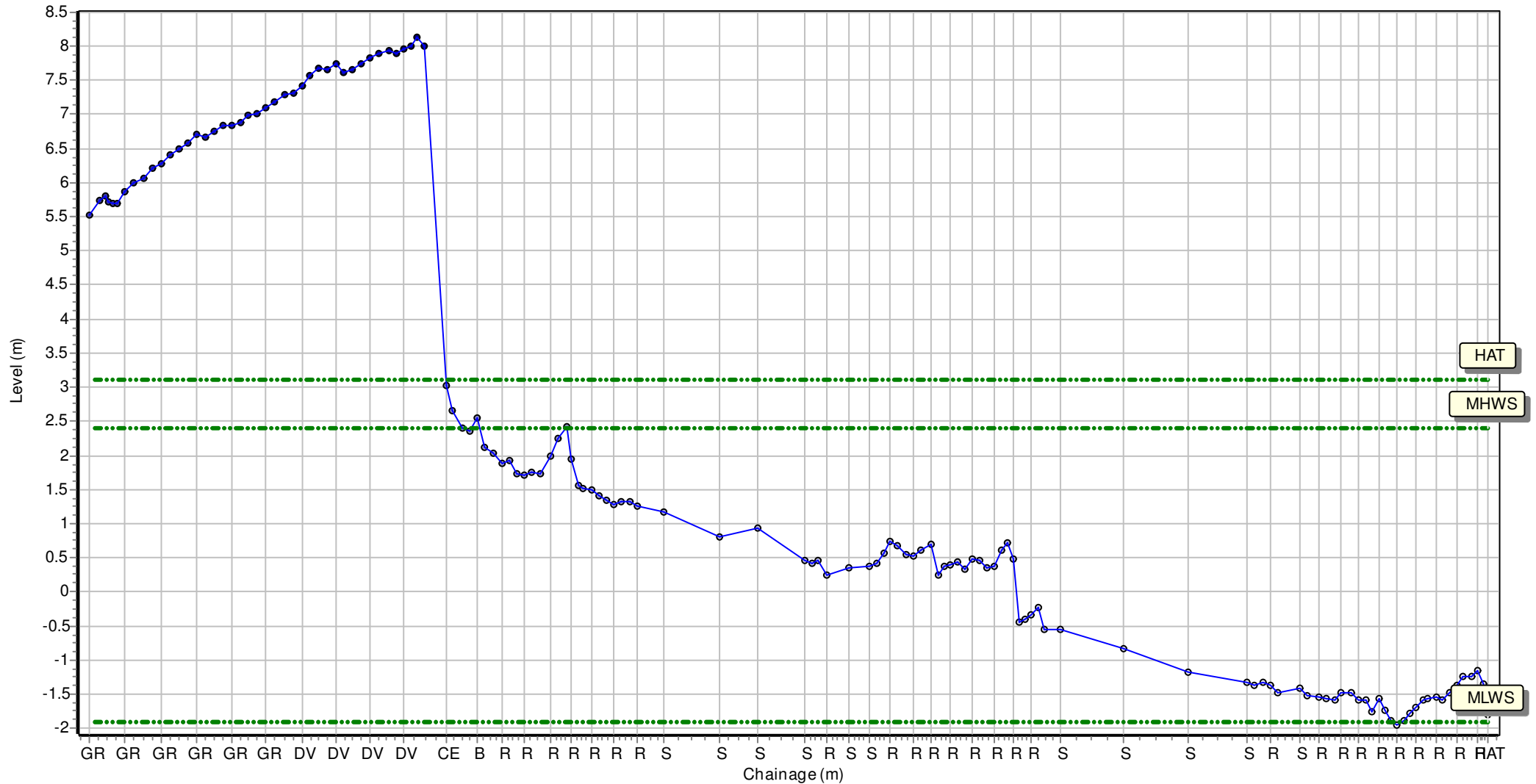
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428440.457 Northing: 601948.341 Profile Bearing: 144 ° from North



# Beach Profile

Location: 1aADC17

Date: 15/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

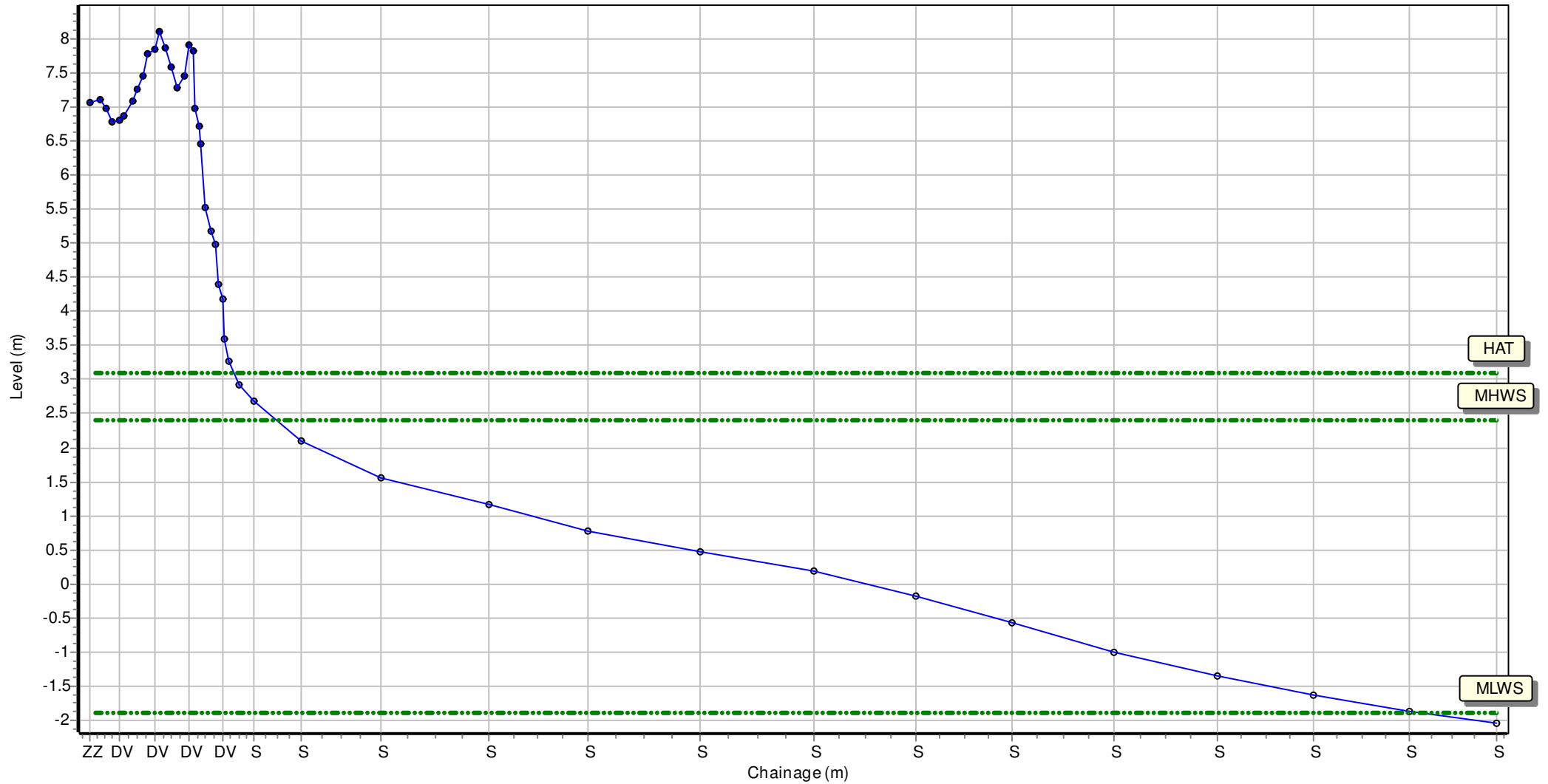
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428116.847 Northing: 601565.465 Profile Bearing: 114 ° from North



# Beach Profile

Location: 1aADC17A

Date: 15/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

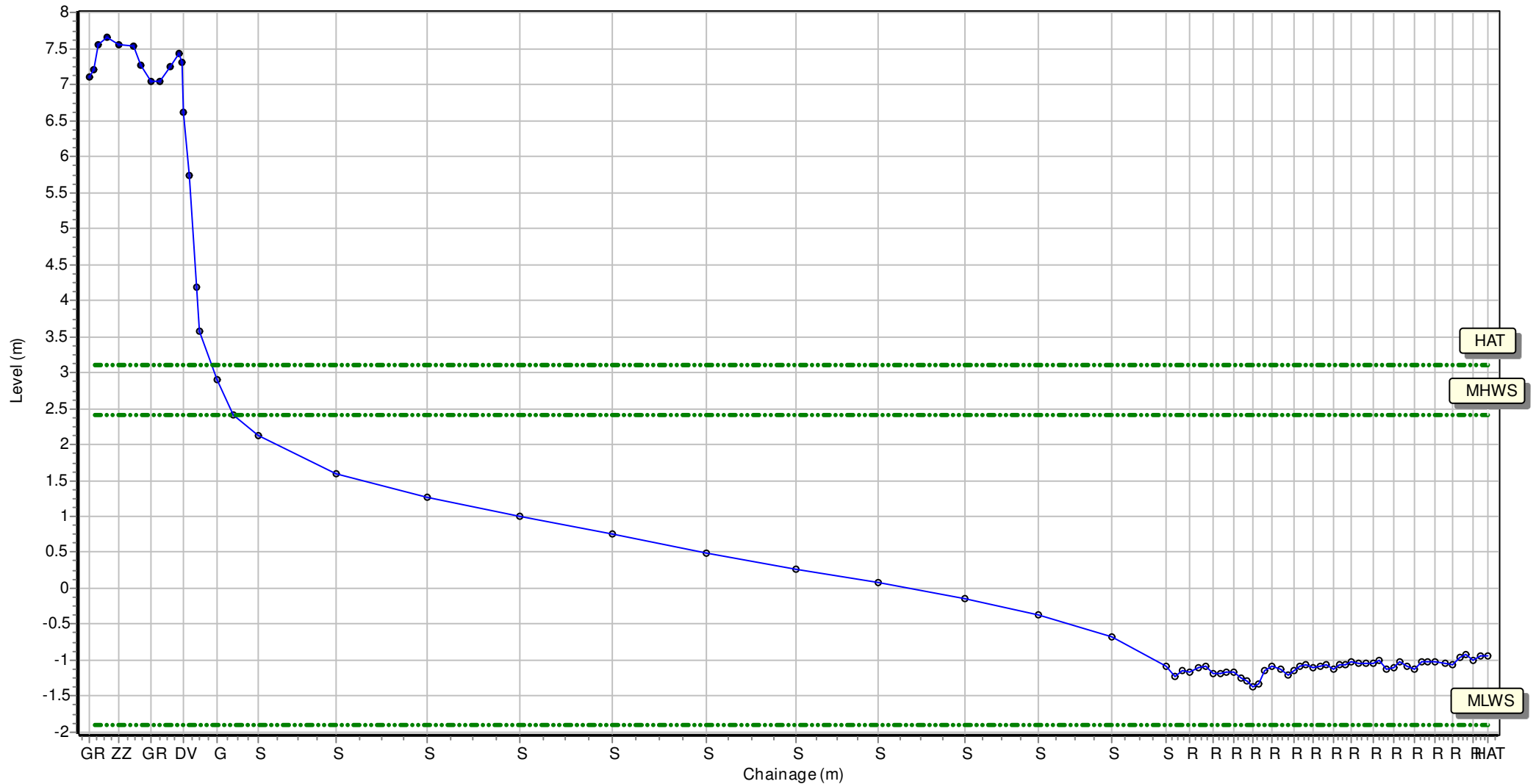
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 427947.662 Northing: 601040.259 Profile Bearing: 109 ° from North



# Beach Profile

Location: 1aCMBC01

Date: 30/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

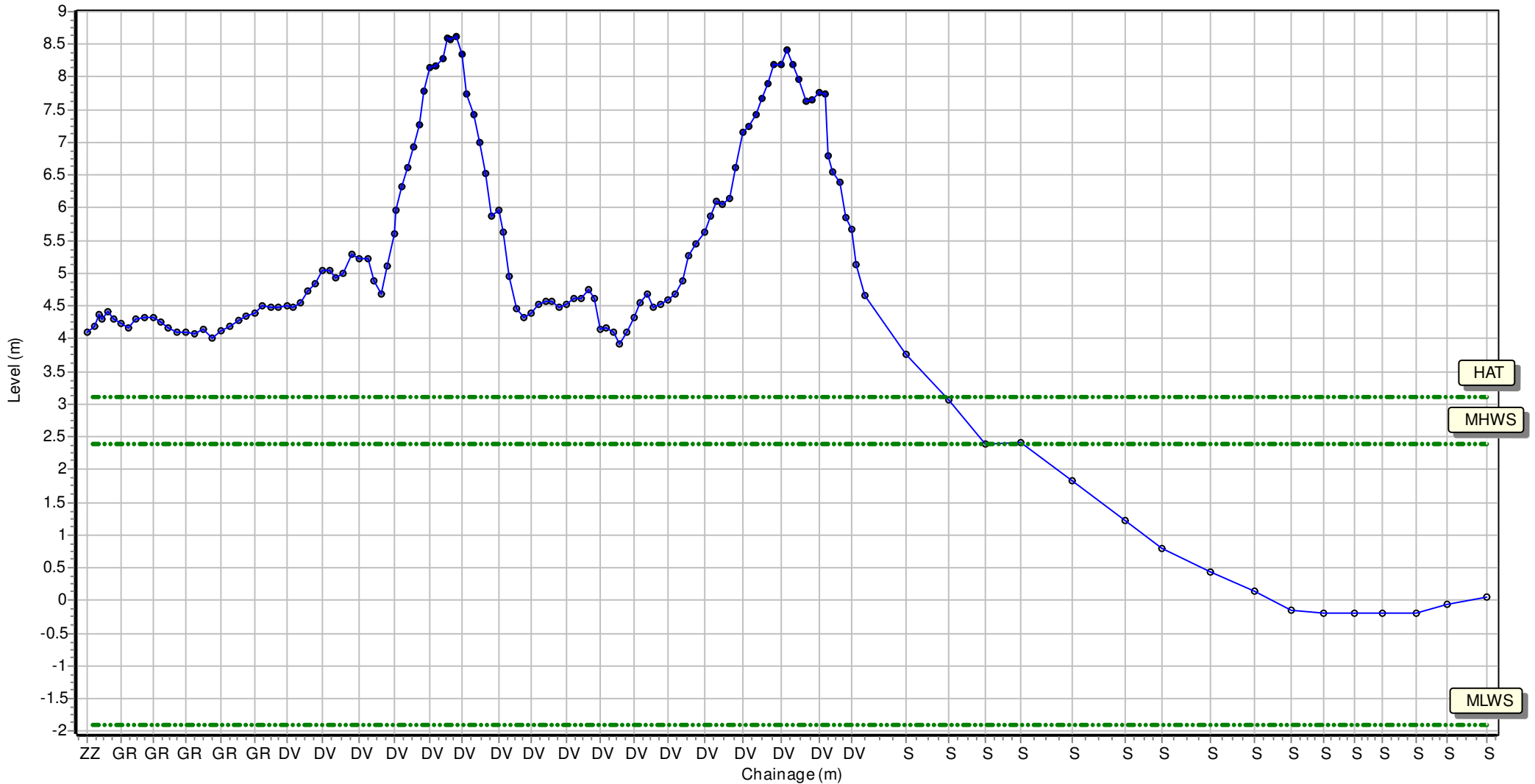
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 427552.578 Northing: 596402.769 Profile Bearing: 59 ° from North





# Beach Profile

Location: 1aCMBC02

Date: 30/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

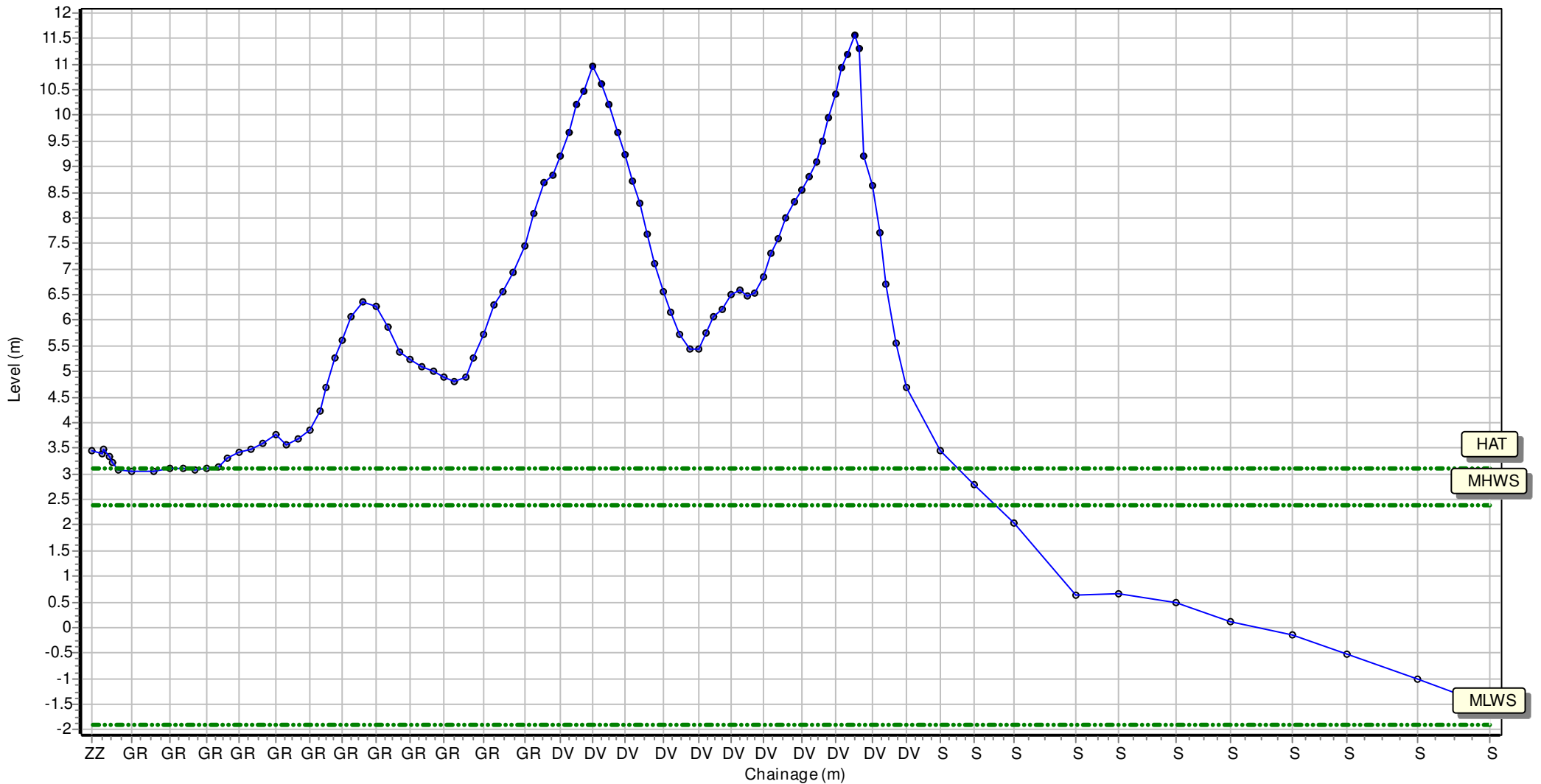
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 428355.916 Northing: 594532.141 Profile Bearing: 56 ° from North



# Beach Profile

Location: 1aCMBC03

Date: 30/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

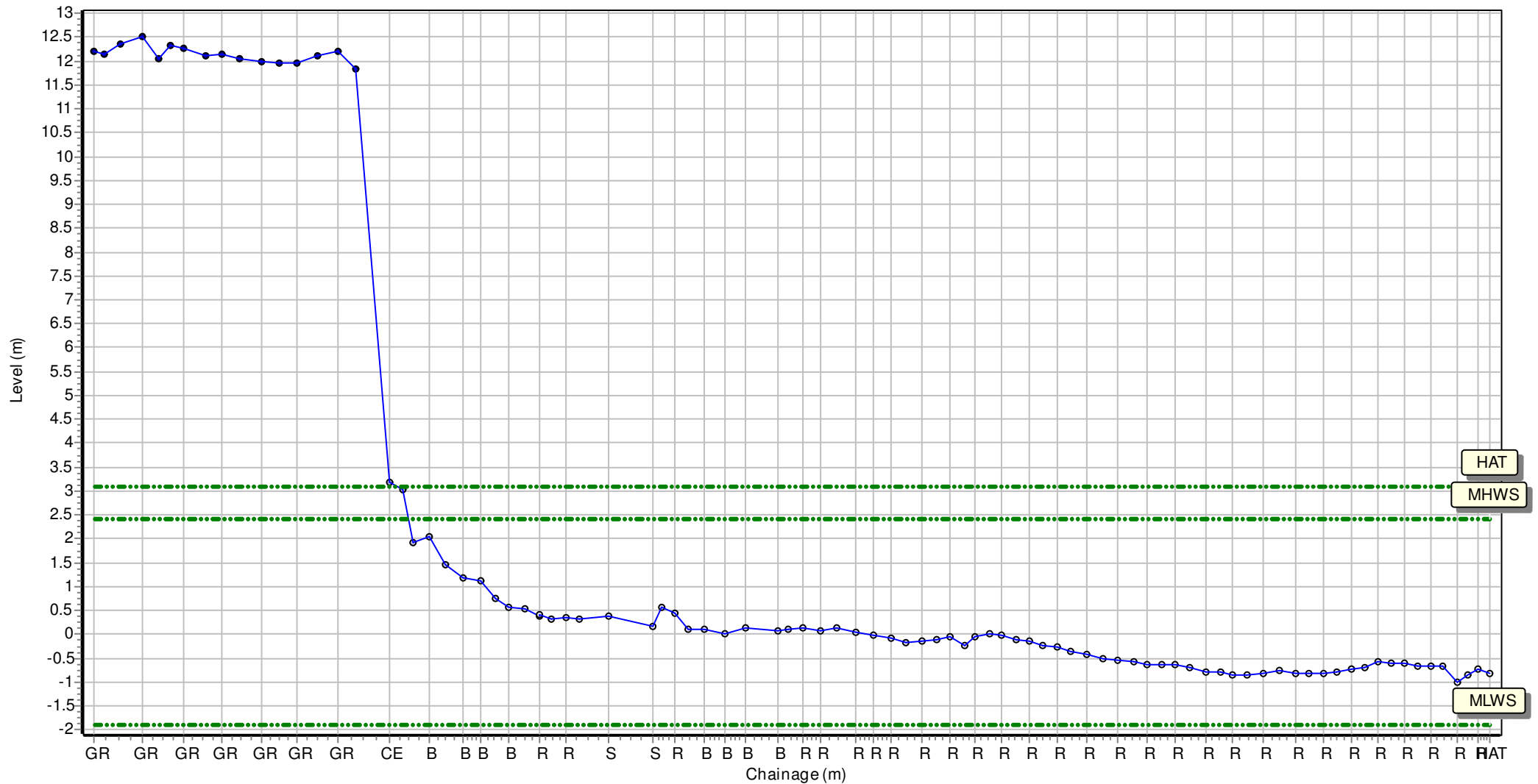
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430118.859 Northing: 592587.445 Profile Bearing: 115 ° from North



# Beach Profile

Location: 1aCMBC03A

Date: 30/10/2020 Inspector: AG

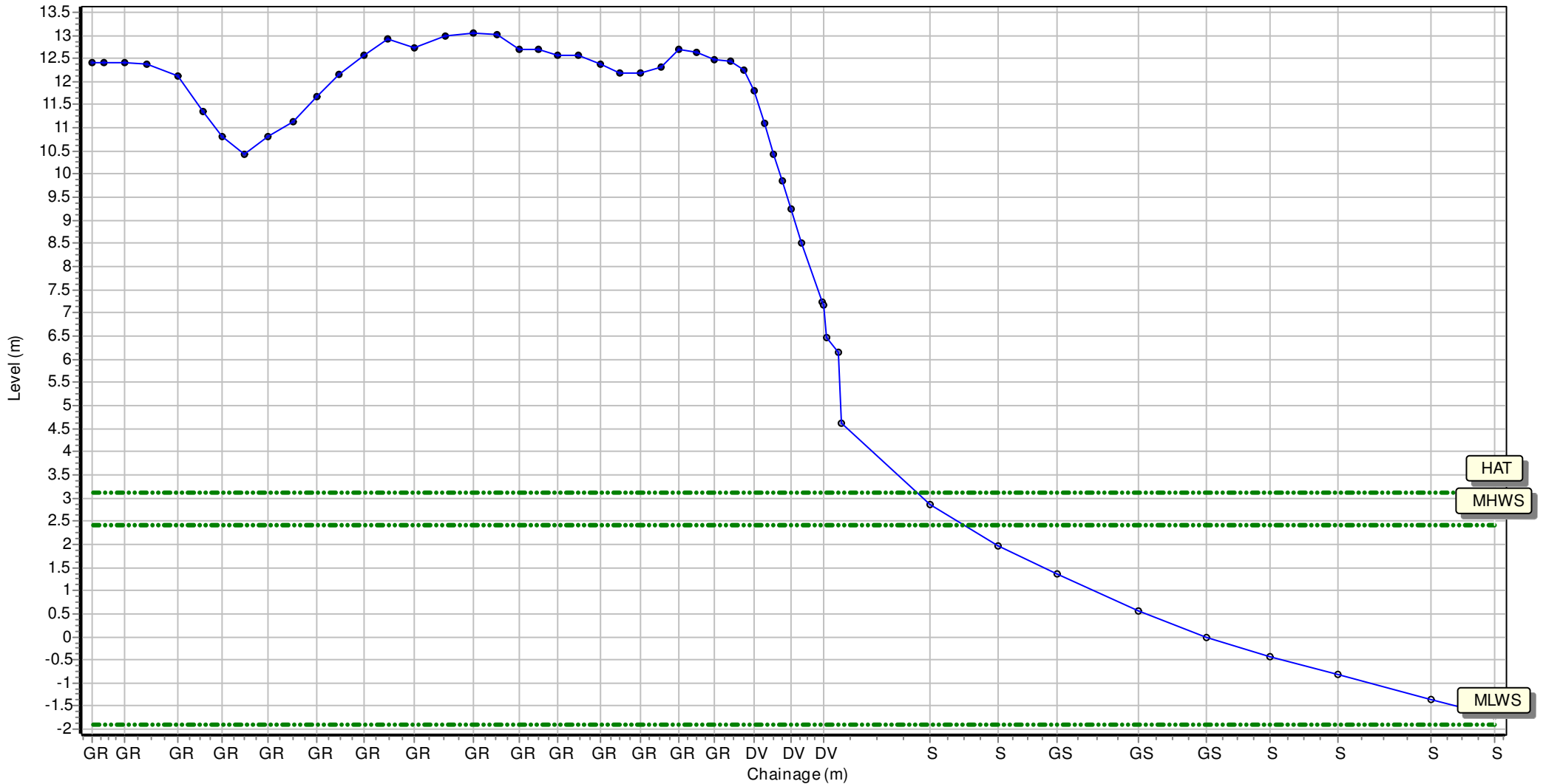
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430128.317 Northing: 591148.463 Profile Bearing: 70 ° from North



# Beach Profile

Location: 1aCMBC03B

Date: 30/10/2020 Inspector: AG

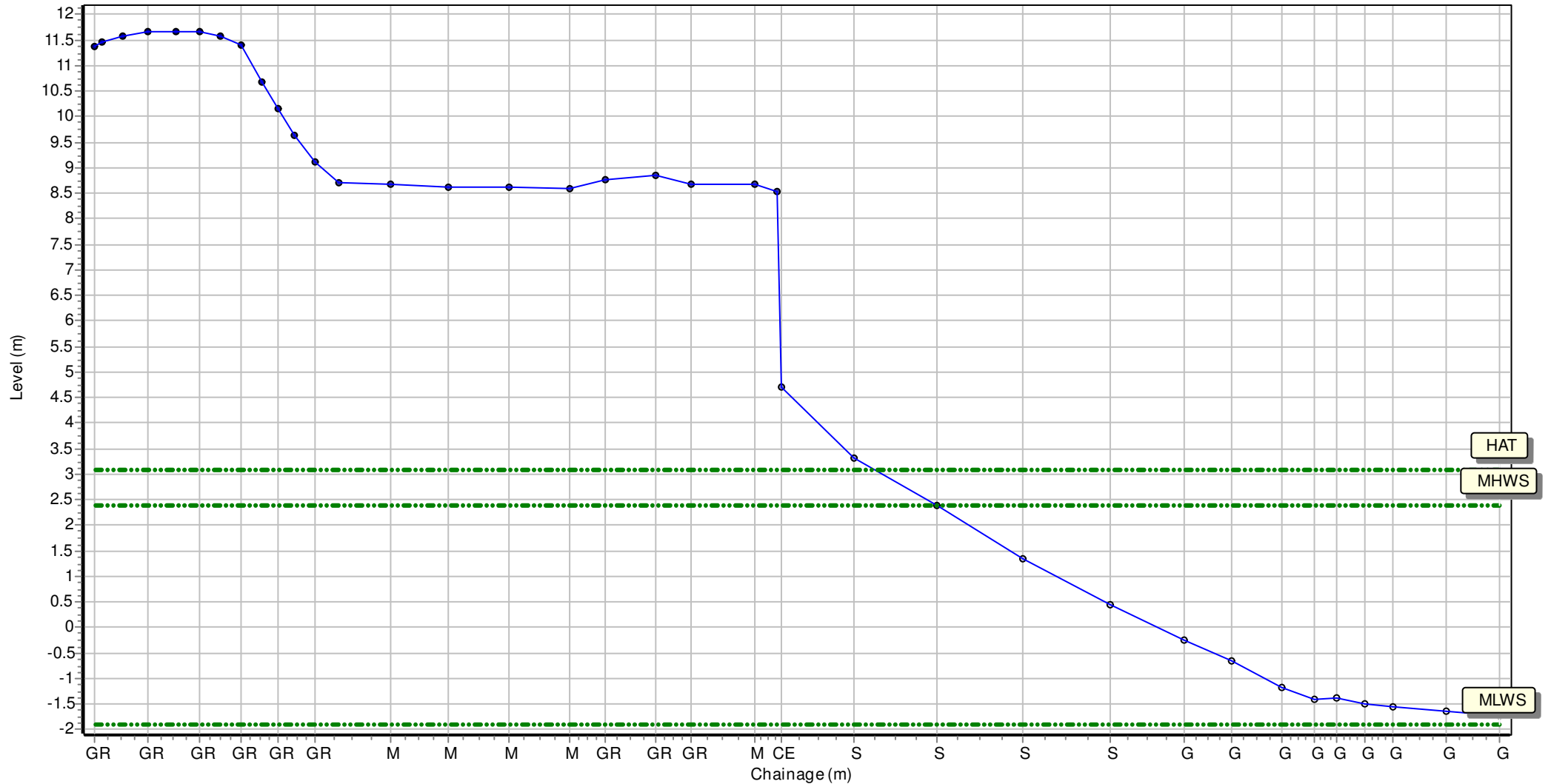
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430478.518 Northing: 590661.474 Profile Bearing: 58 ° from North



# Beach Profile

Location: 1aWDC02

Date: 30/10/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

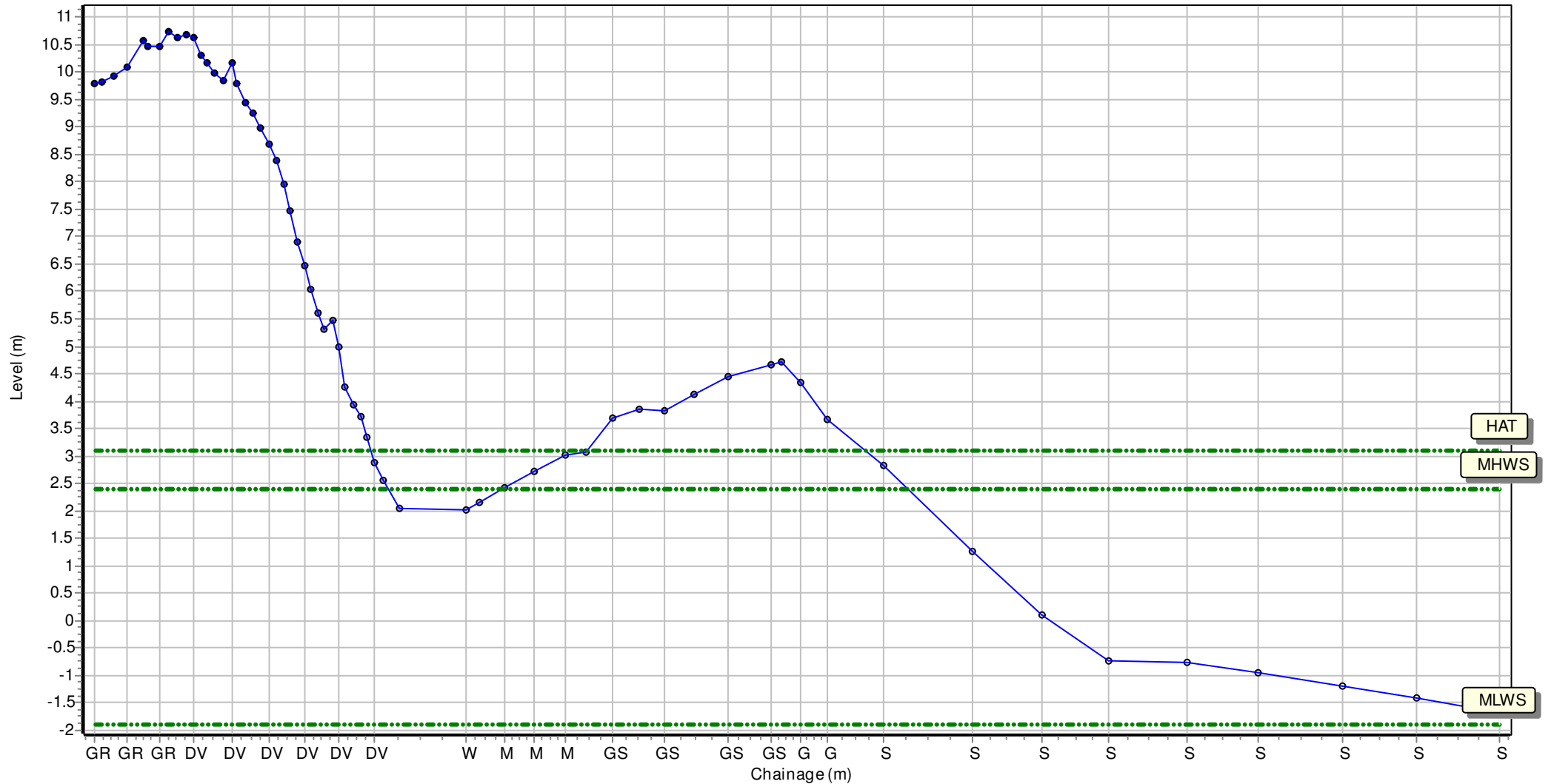
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430807.97 Northing: 589773.192 Profile Bearing: 59 ° from North



# Beach Profile

Location: 1aWDC03

Date: 30/10/2020 Inspector: AG

Low Tide:

Low Tide Time:

Wind

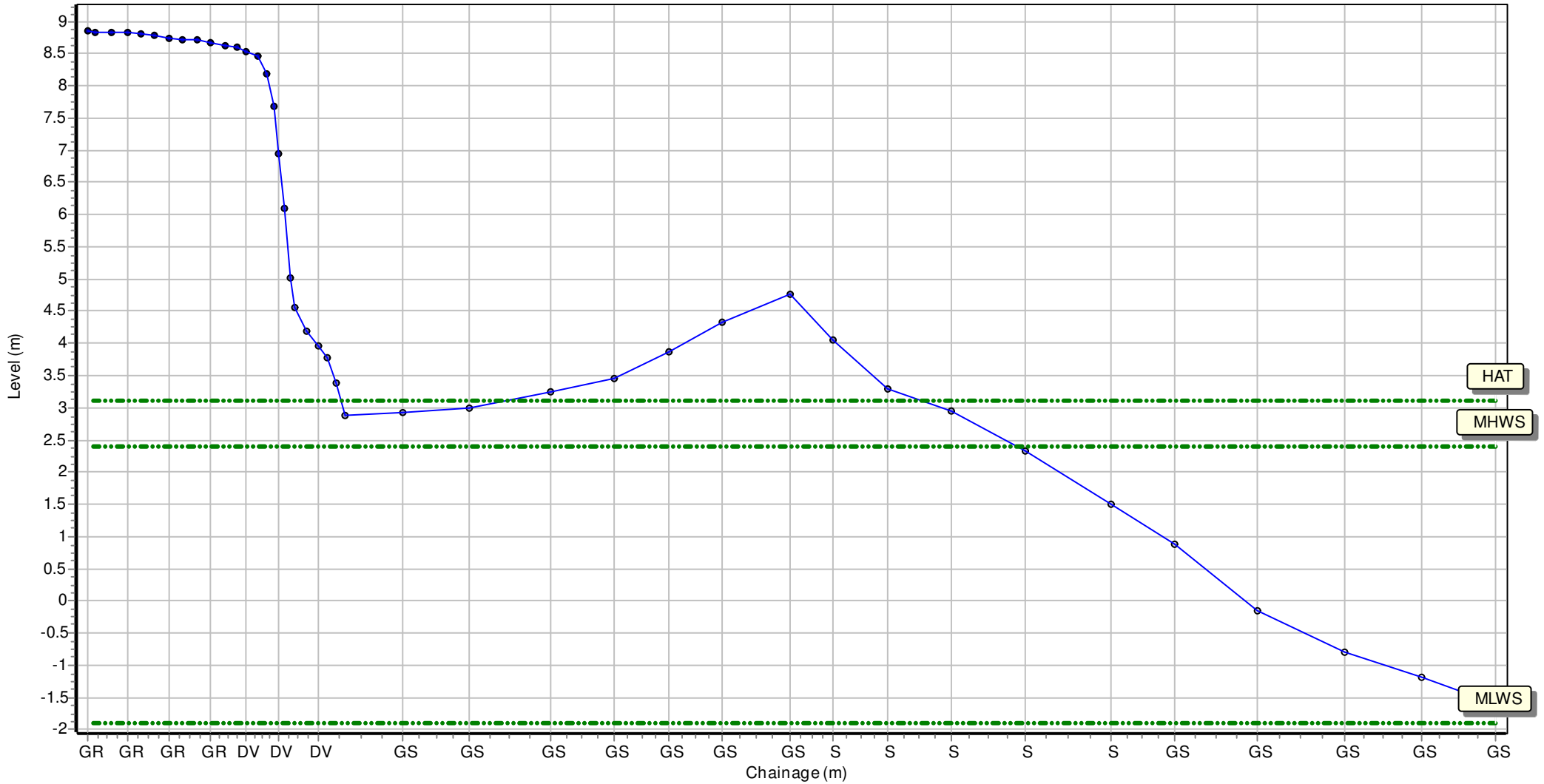
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430998.77 Northing: 589548.265 Profile Bearing: 58 ° from North



# Beach Profile

Location: 1aWDC04

Date: 01/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

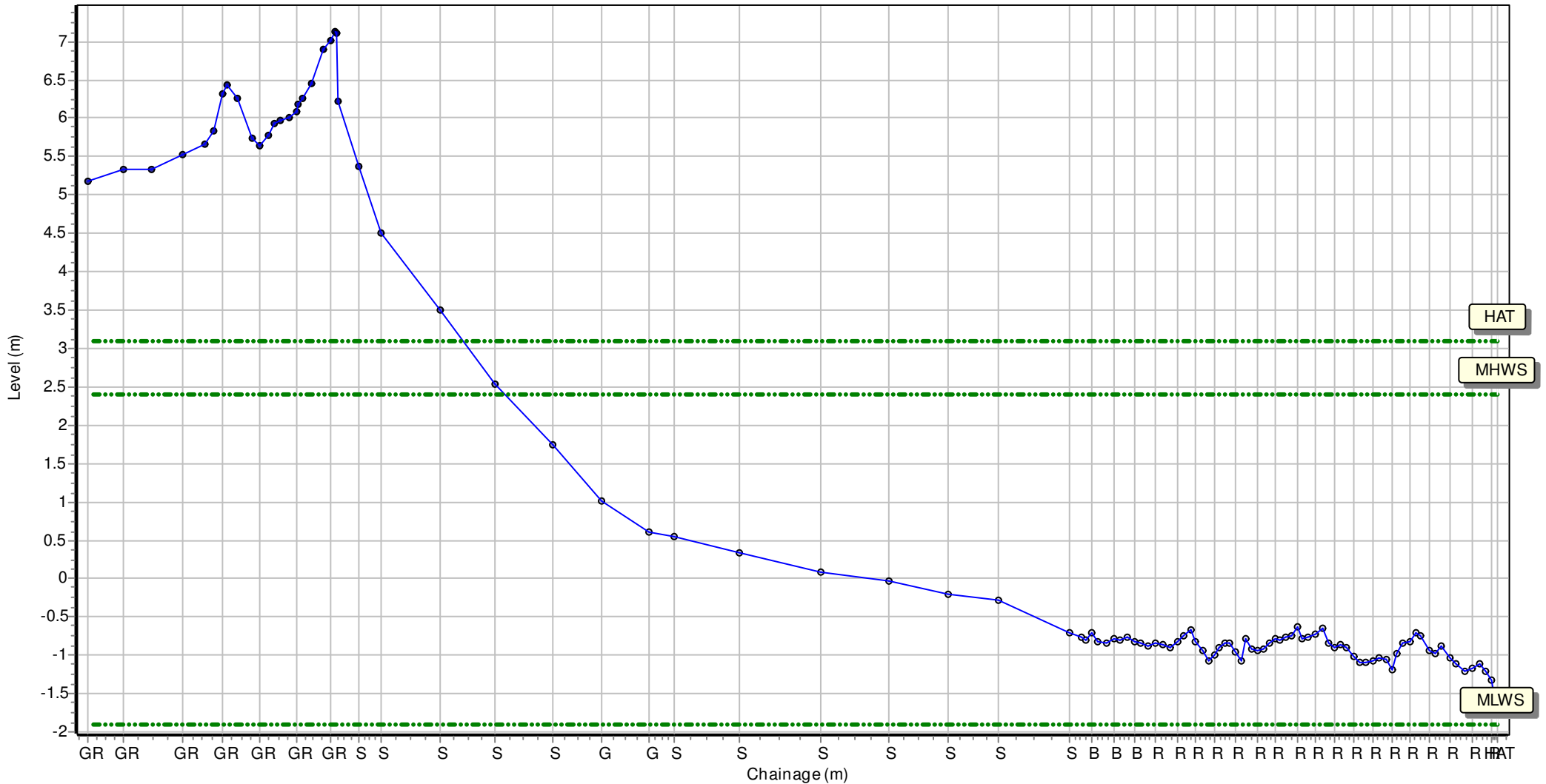
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431518.807 Northing: 588823.532 Profile Bearing: 92 ° from North



# Beach Profile

**Location:** 1aWDC05

**Date:** 01/09/2020

**Inspector:** AG

**Low Tide:**

**Low Tide Time:**

**Wind**

**Sea State:**

**Visibility:**

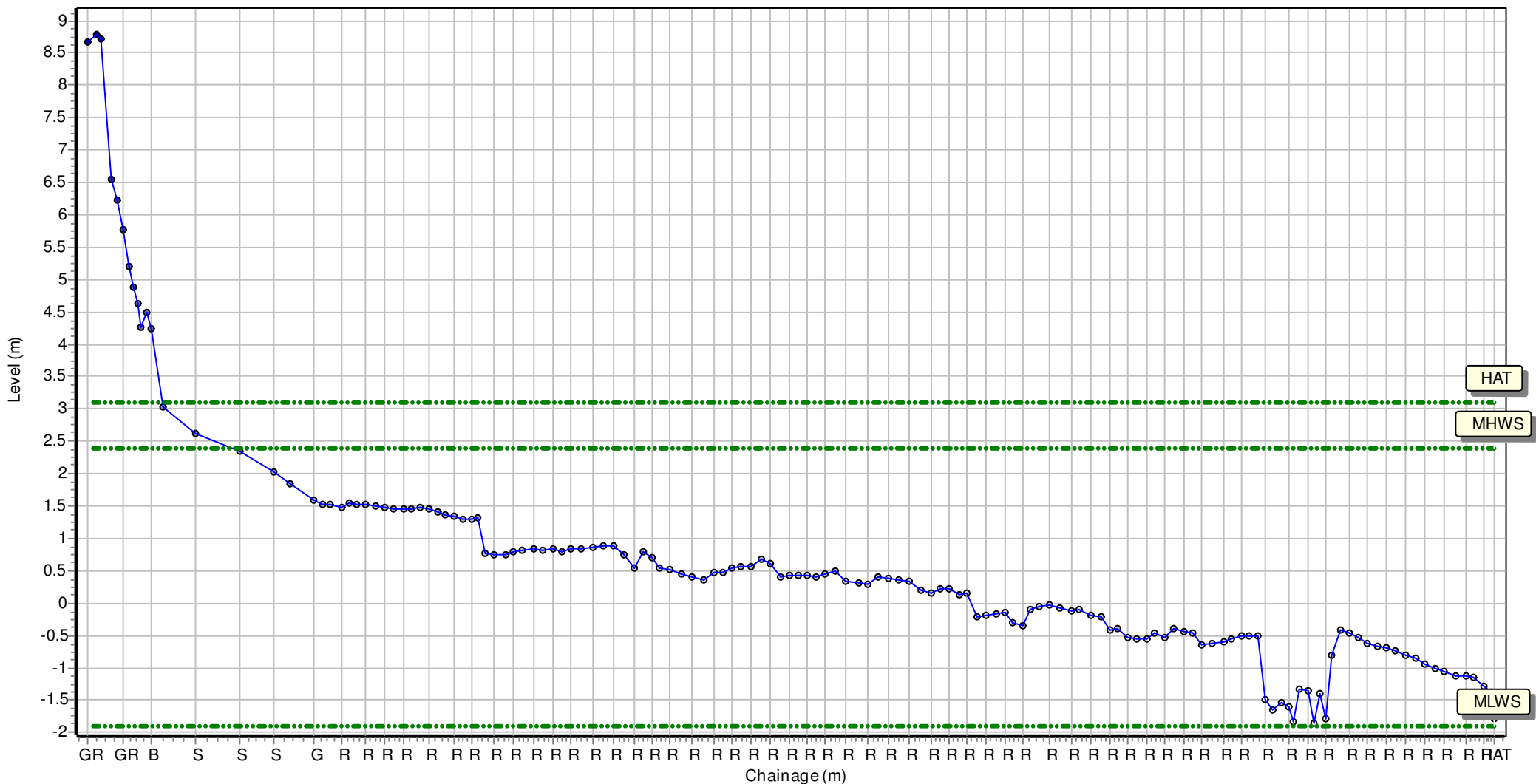
**Rain:**

**Summary:** 2020 Full Measures Topo Survey

**Easting:** 431750.615

**Northing:** 588299.035

**Profile Bearing:** 56 ° from North







# Beach Profile

Location: 1aWDC06

Date: 01/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

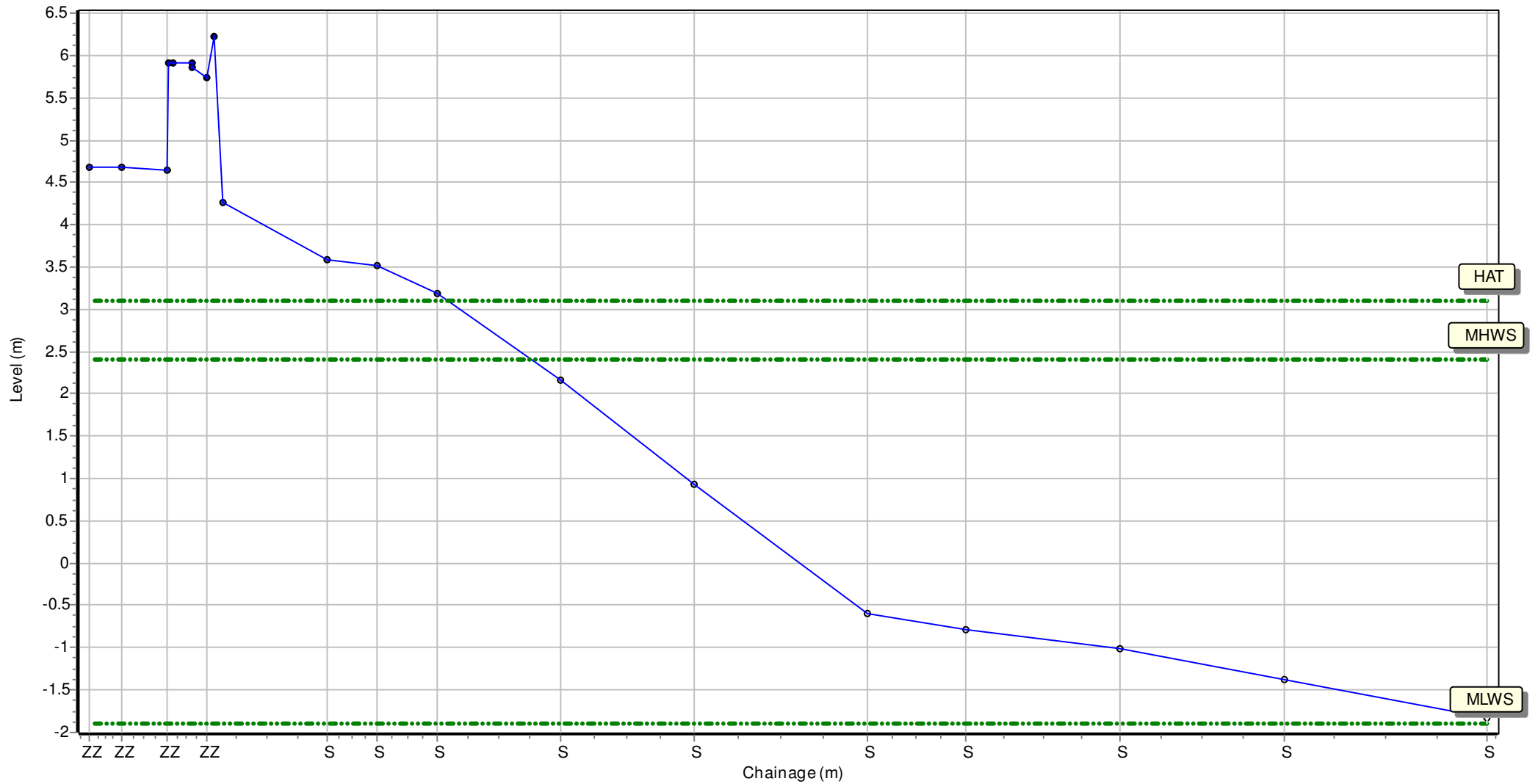
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431176.409 Northing: 587860.146 Profile Bearing: 125 ° from North



# Beach Profile

Location: 1aWDC06A

Date: 01/09/2020 Inspector: AG

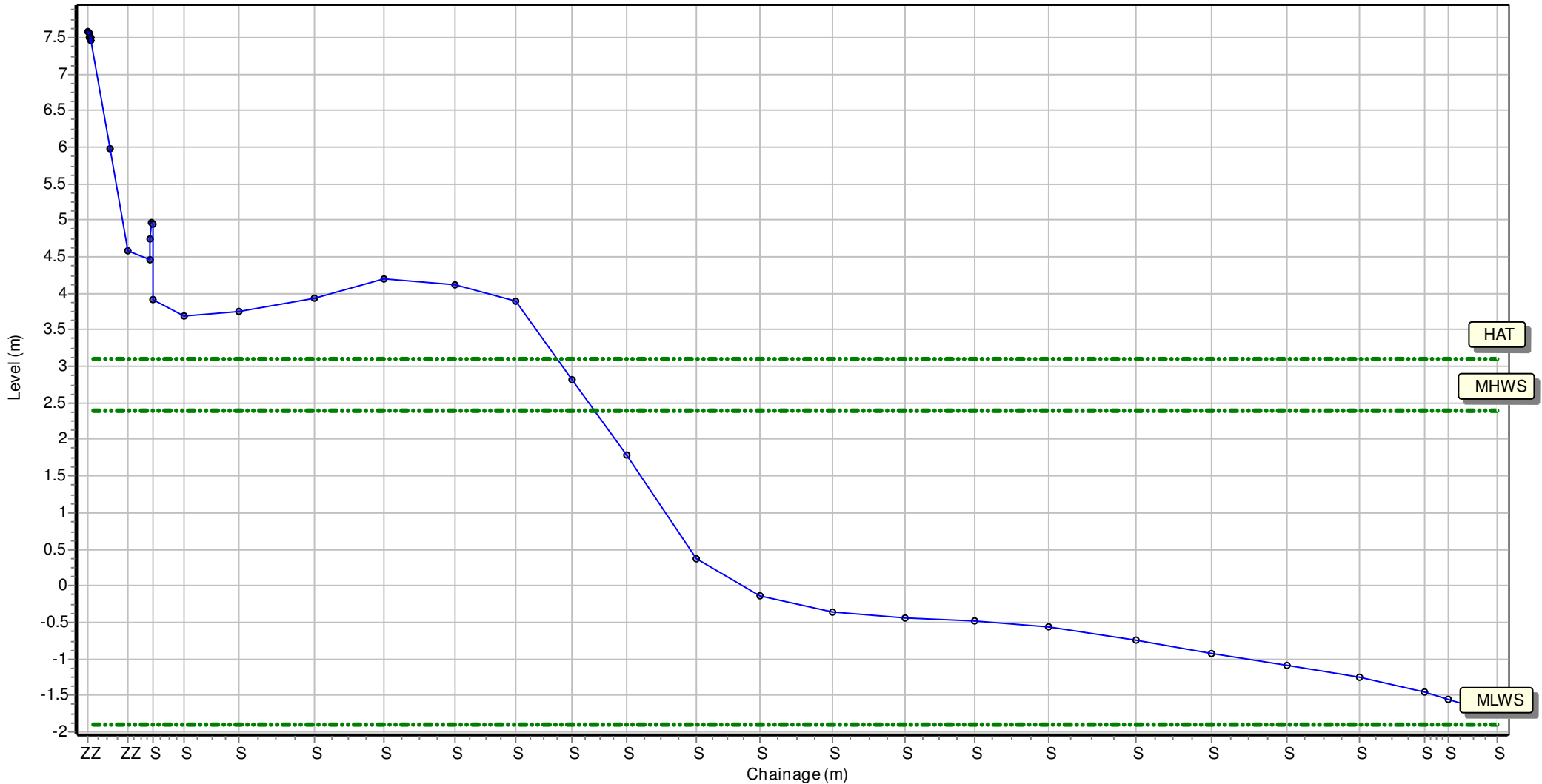
Low Tide: Low Tide Time:

Wind Sea State:

Visibility: Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431040.809 Northing: 587666.014 Profile Bearing: 114 ° from North



# Beach Profile

Location: 1aWDC07

Date: 01/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

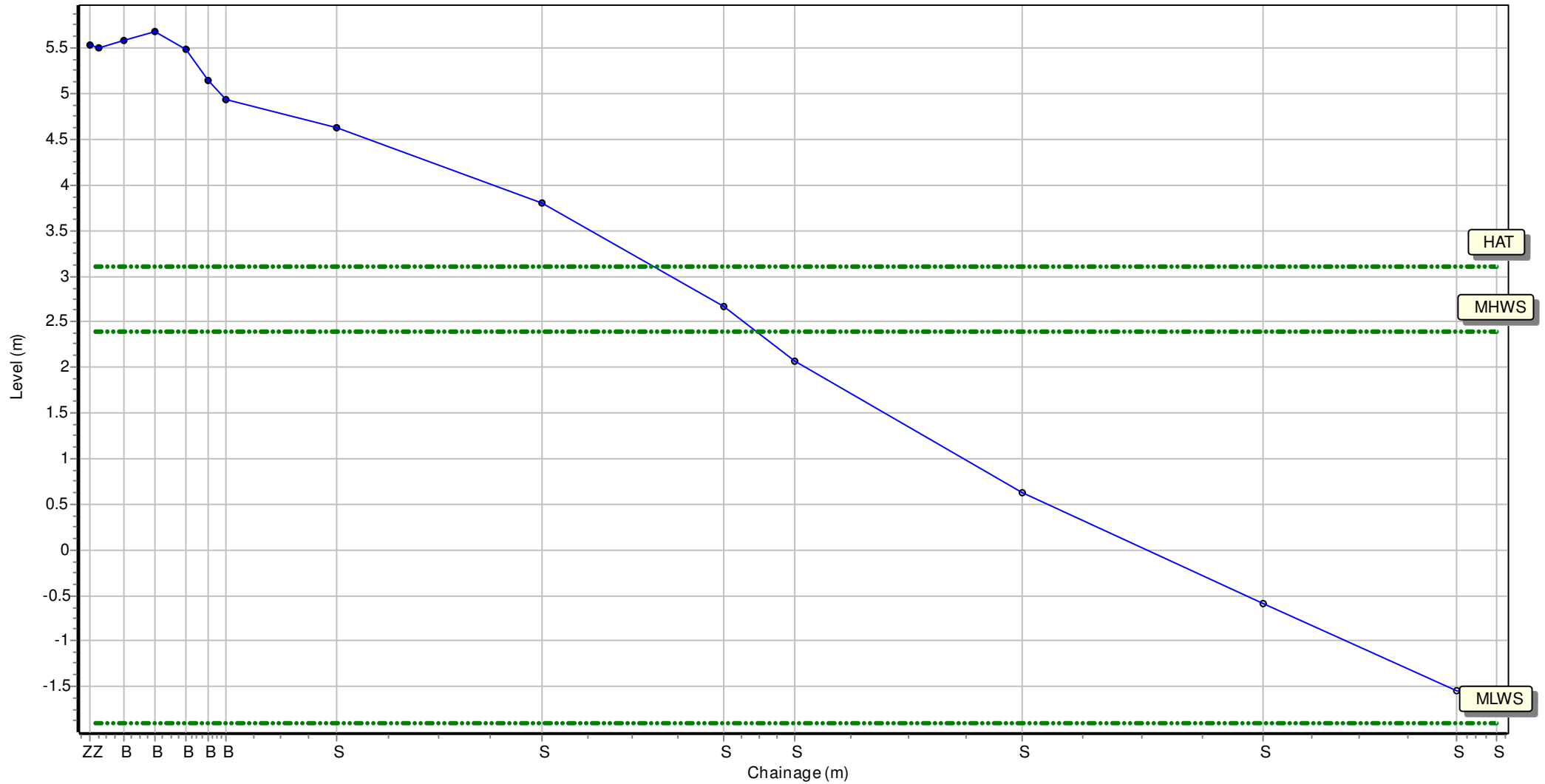
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430972.923 Northing: 587417.667 Profile Bearing: 103 ° from North



# Beach Profile

Location: 1aWDC08

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

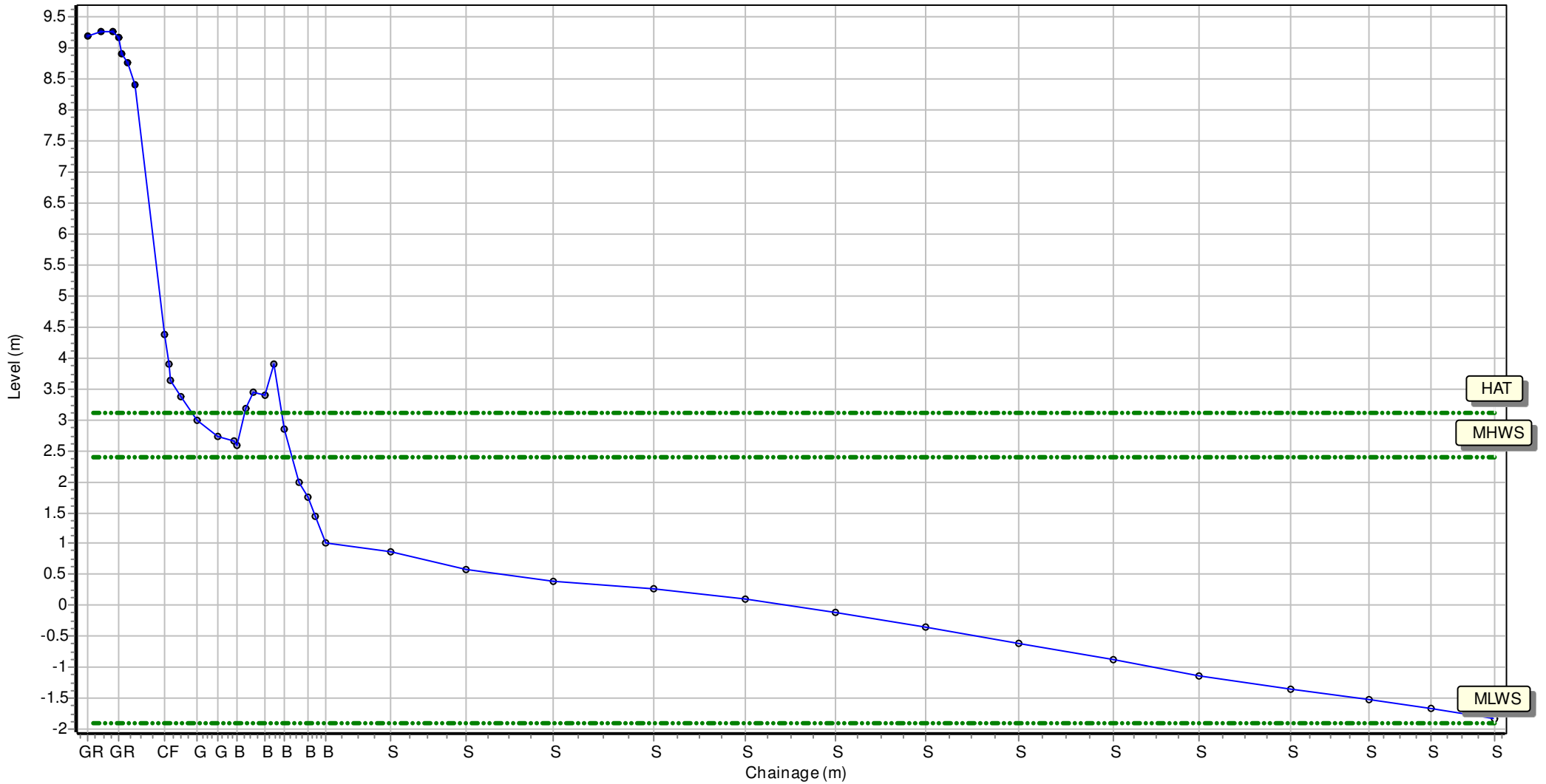
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430440.056 Northing: 585865.943 Profile Bearing: 105 ° from North



# Beach Profile

Location: 1aWDC09

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

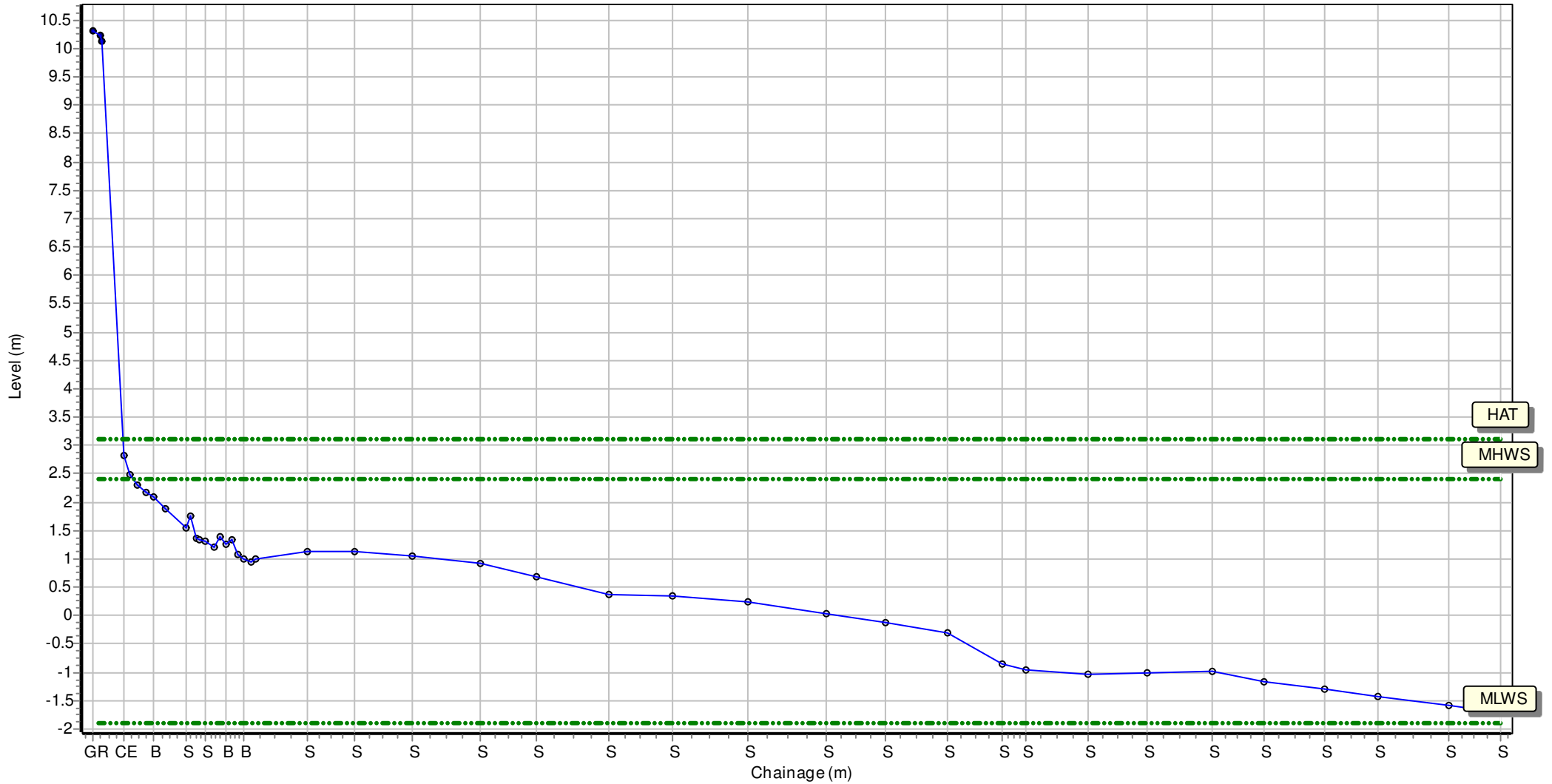
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430361.278 Northing: 585559.12 Profile Bearing: 130 ° from North



# Beach Profile

Location: 1aWDC10

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

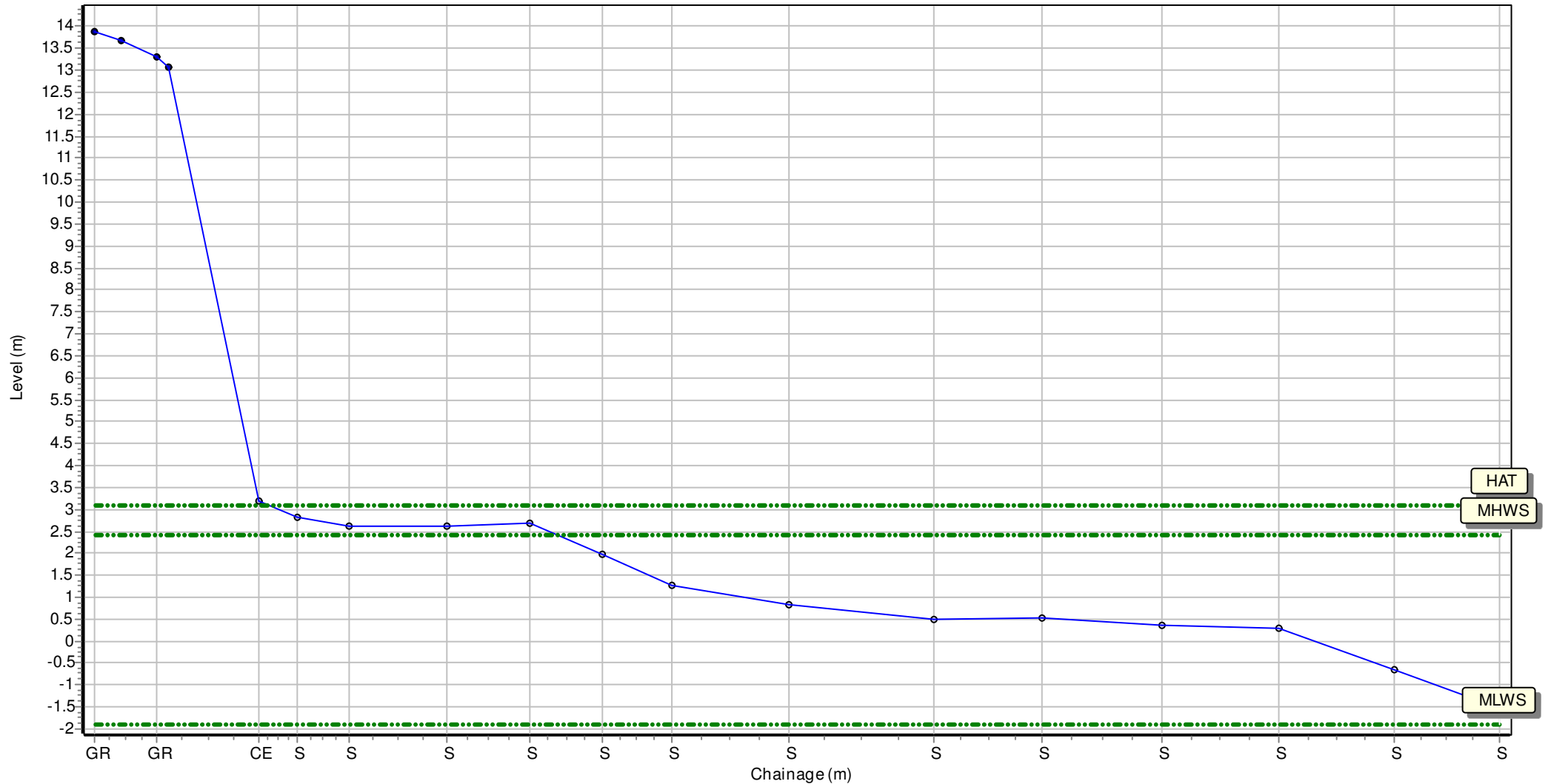
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430247.175 Northing: 585191.003 Profile Bearing: 71 ° from North



# Beach Profile

Location: 1aWDC11

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

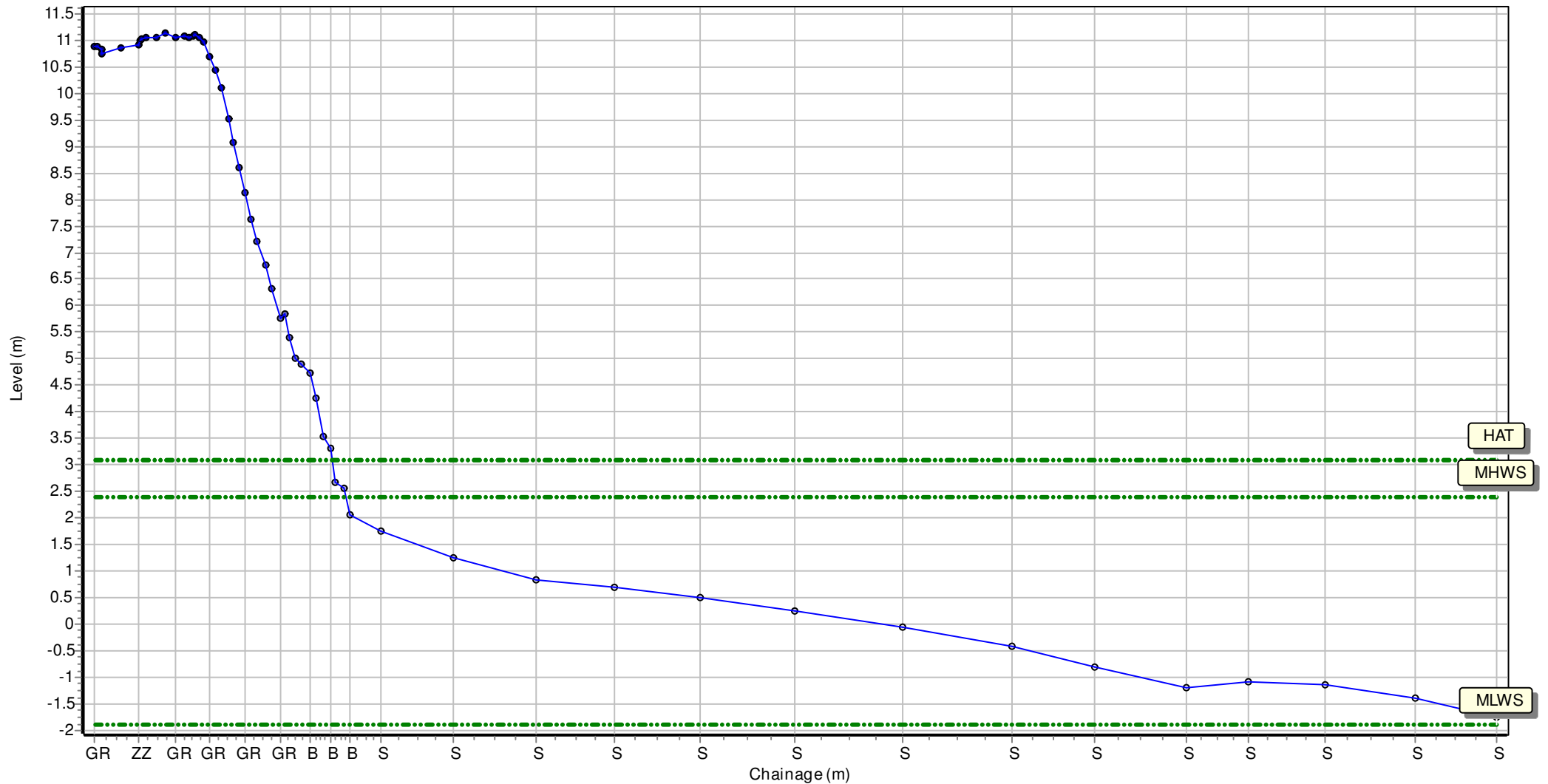
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430397.4 Northing: 584739.609 Profile Bearing: 74 ° from North





# Beach Profile

Location: 1aWDC12

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

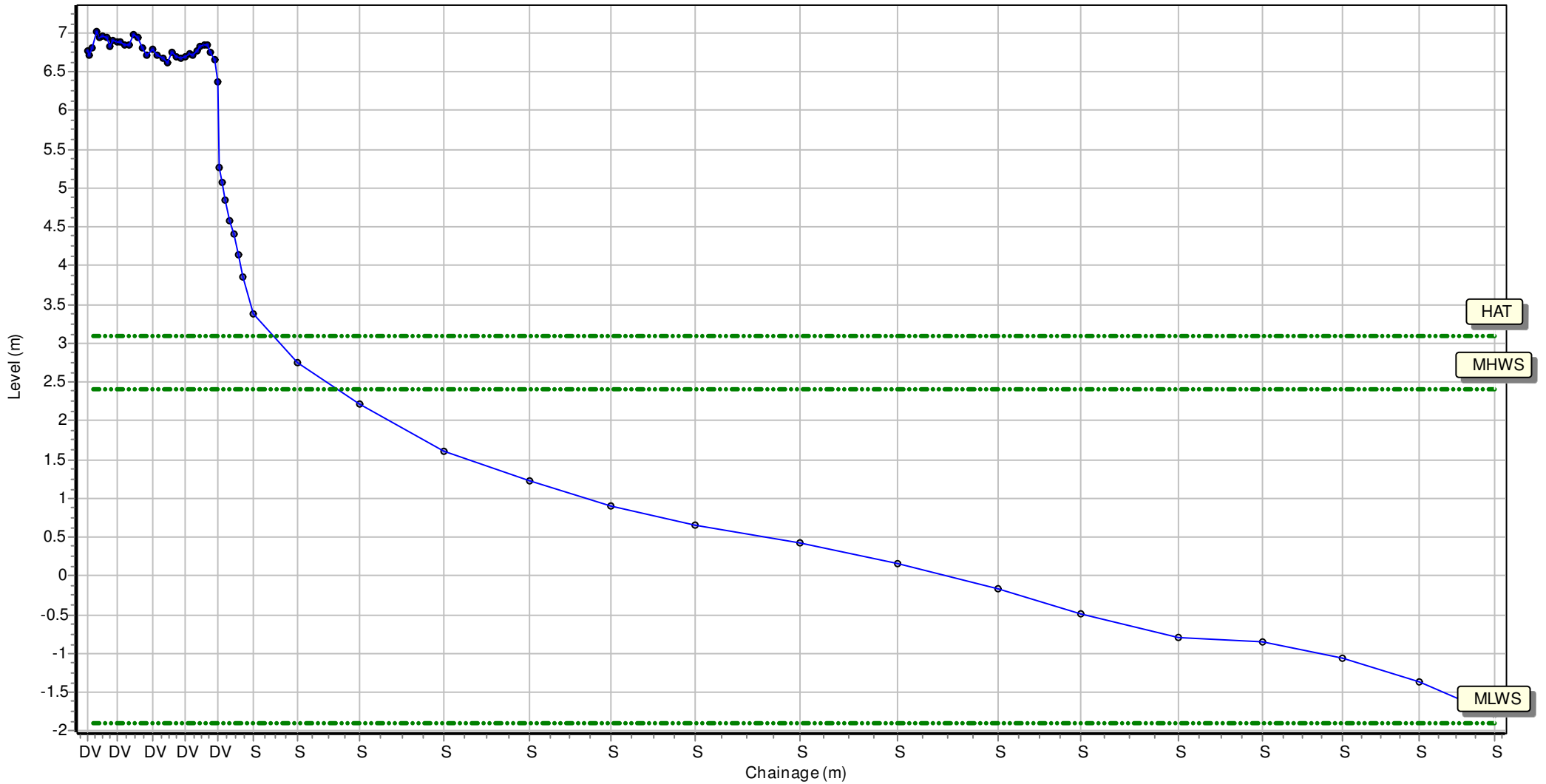
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430549.164 Northing: 584058.468 Profile Bearing: 73 ° from North



# Beach Profile

Location: 1aWDC13

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

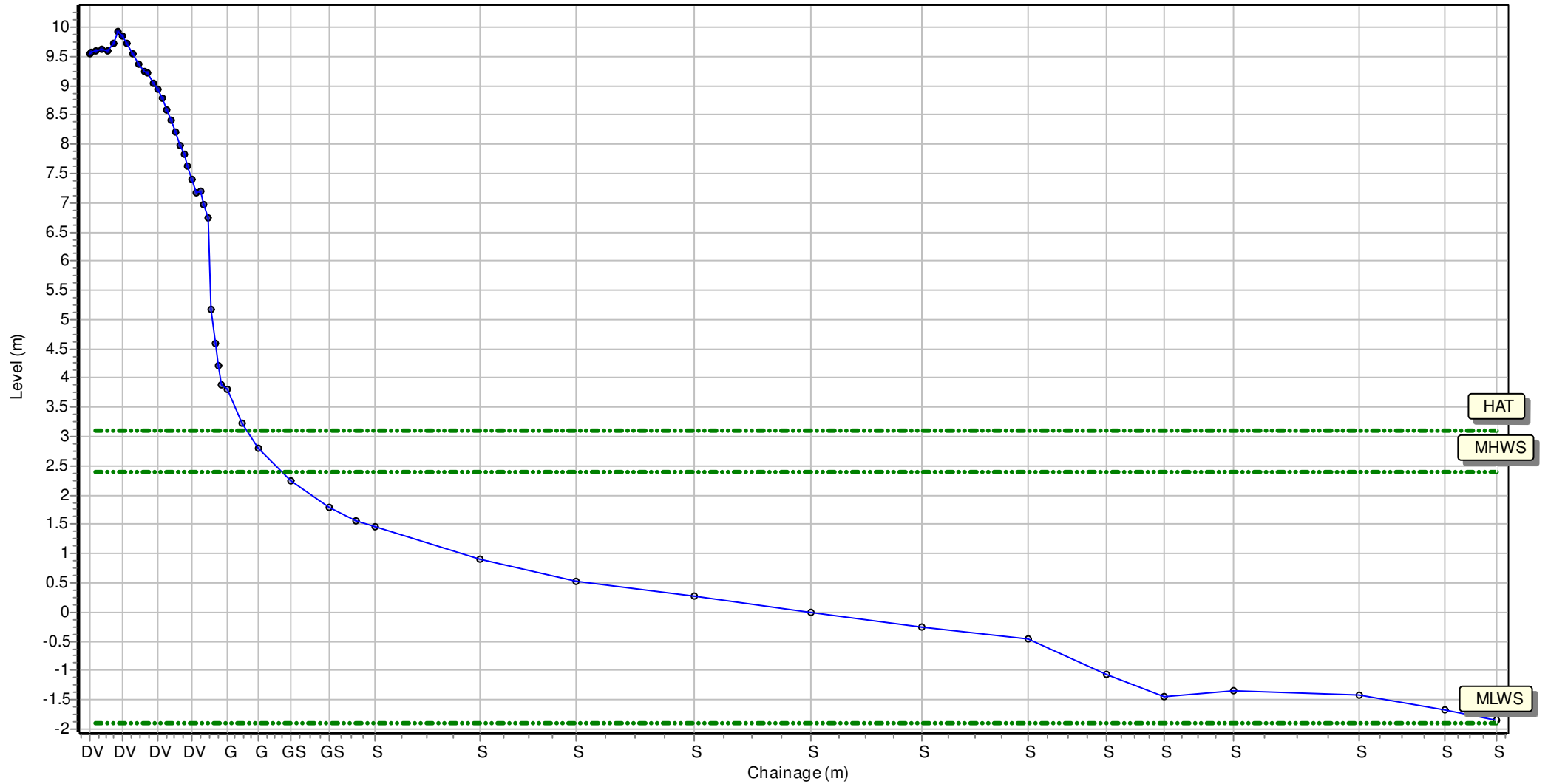
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430983.324 Northing: 583146.489 Profile Bearing: 62 ° from North



# Beach Profile

Location: 1aWDC14

Date: 02/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

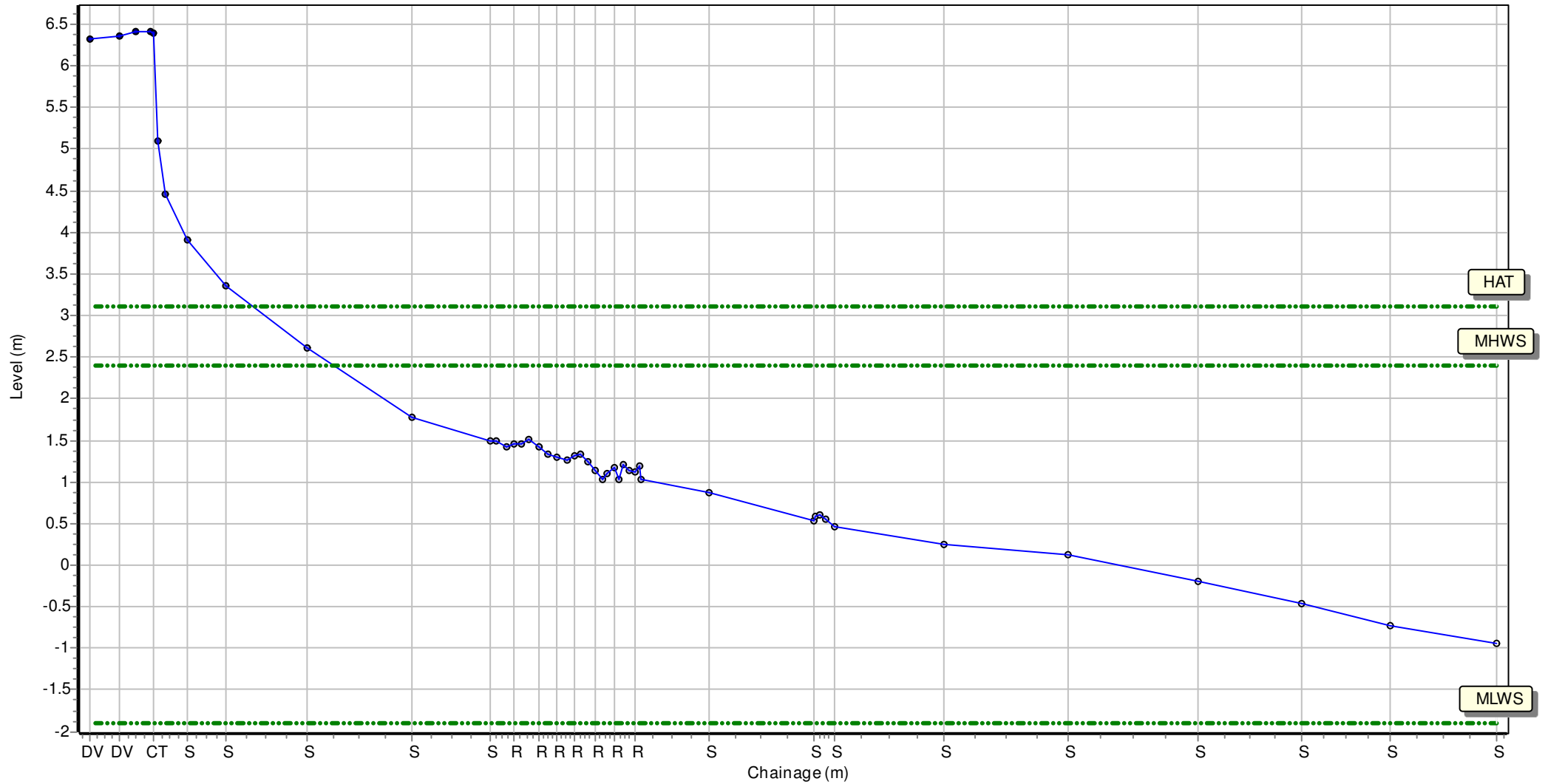
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431317.646 Northing: 582642.372 Profile Bearing: 62 ° from North



# Beach Profile

Location: 1aNWB1

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

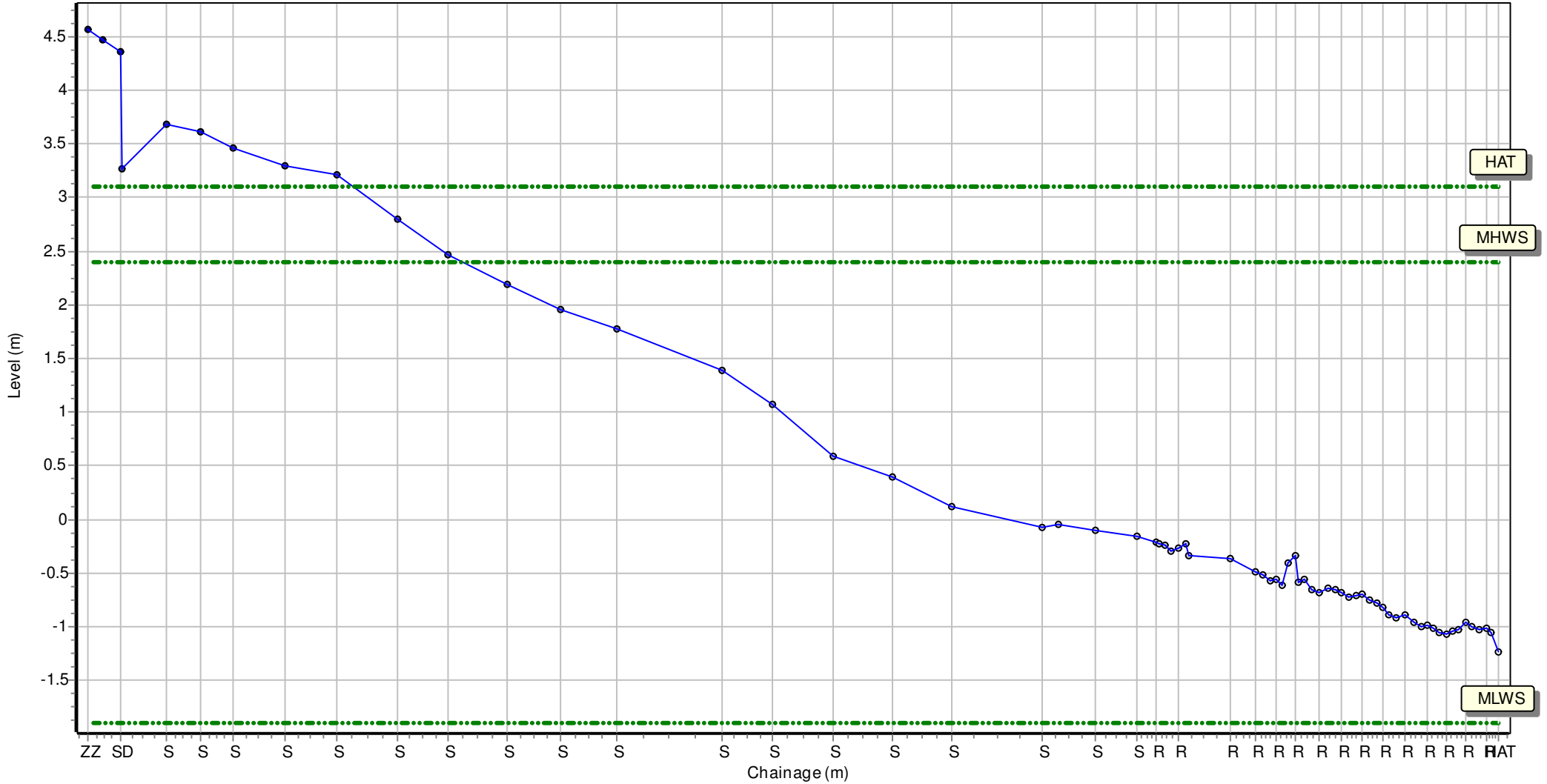
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431665.429 Northing: 588007.636 Profile Bearing: 212 ° from North



# Beach Profile

Location: 1aNWB2

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

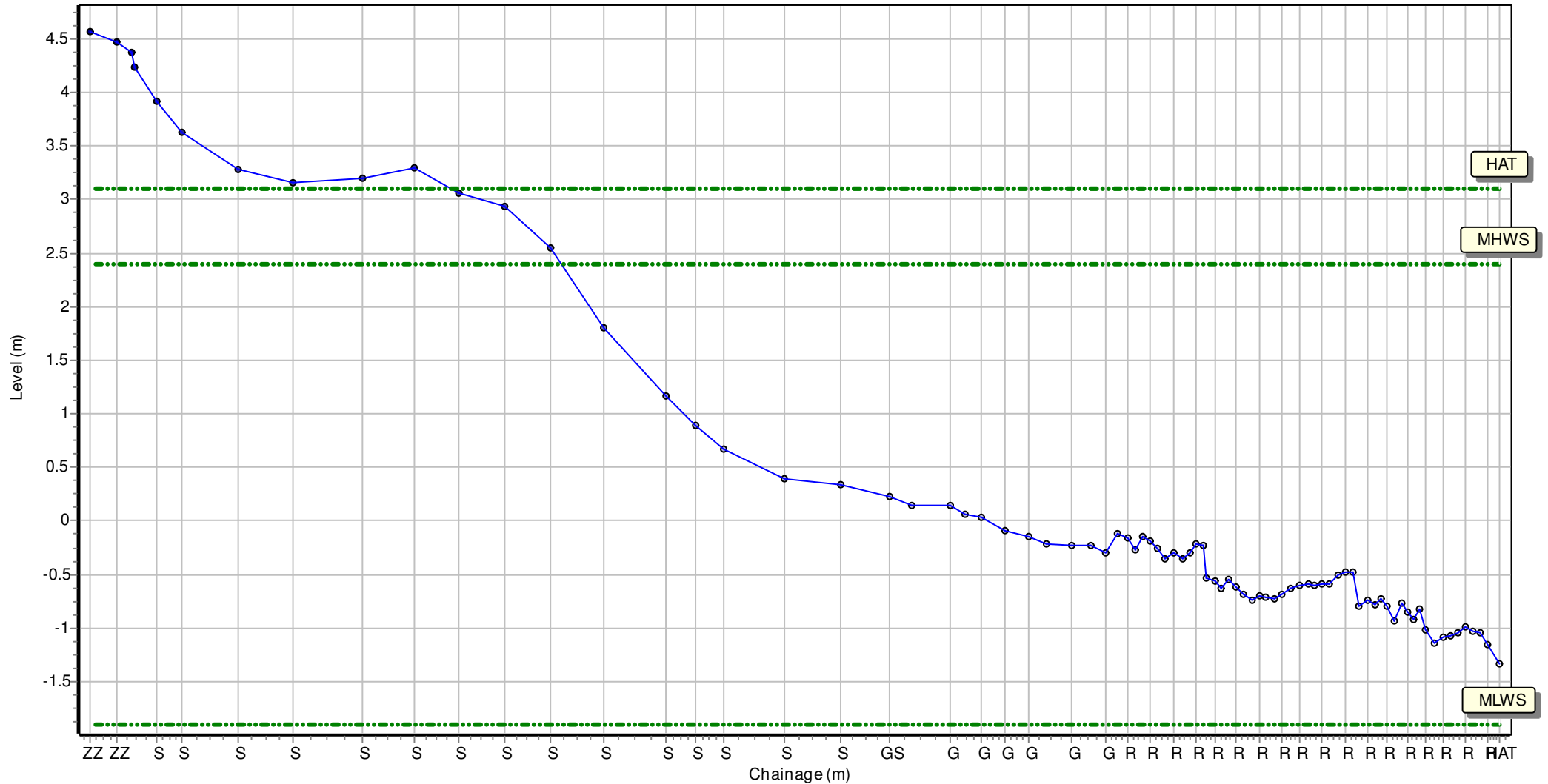
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431618.236 Northing: 588035.356 Profile Bearing: 202 ° from North



# Beach Profile

Location: 1aNWB3

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

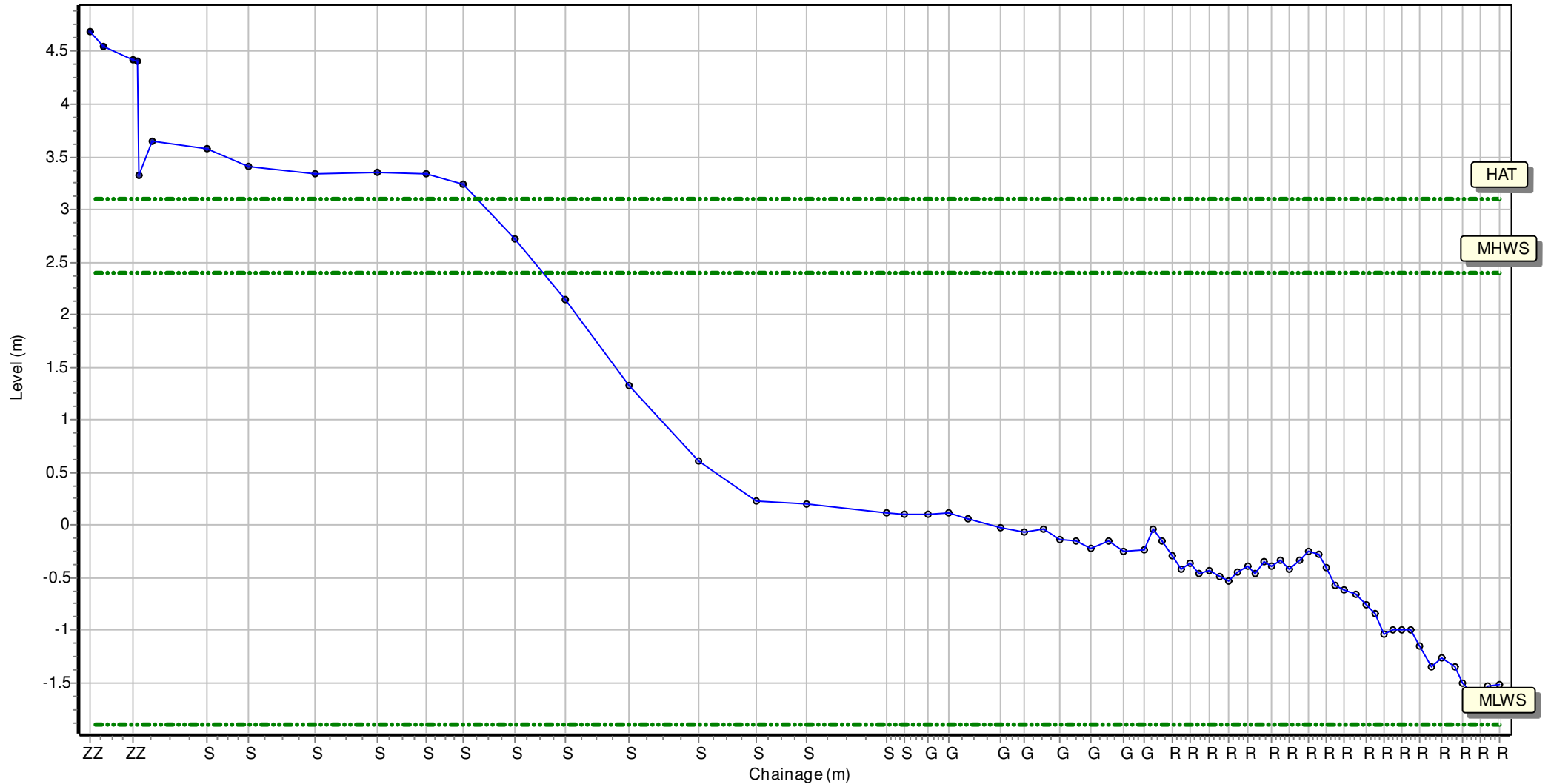
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431573.455 Northing: 588049.149 Profile Bearing: 193 ° from North



# Beach Profile

Location: 1aNWB4

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

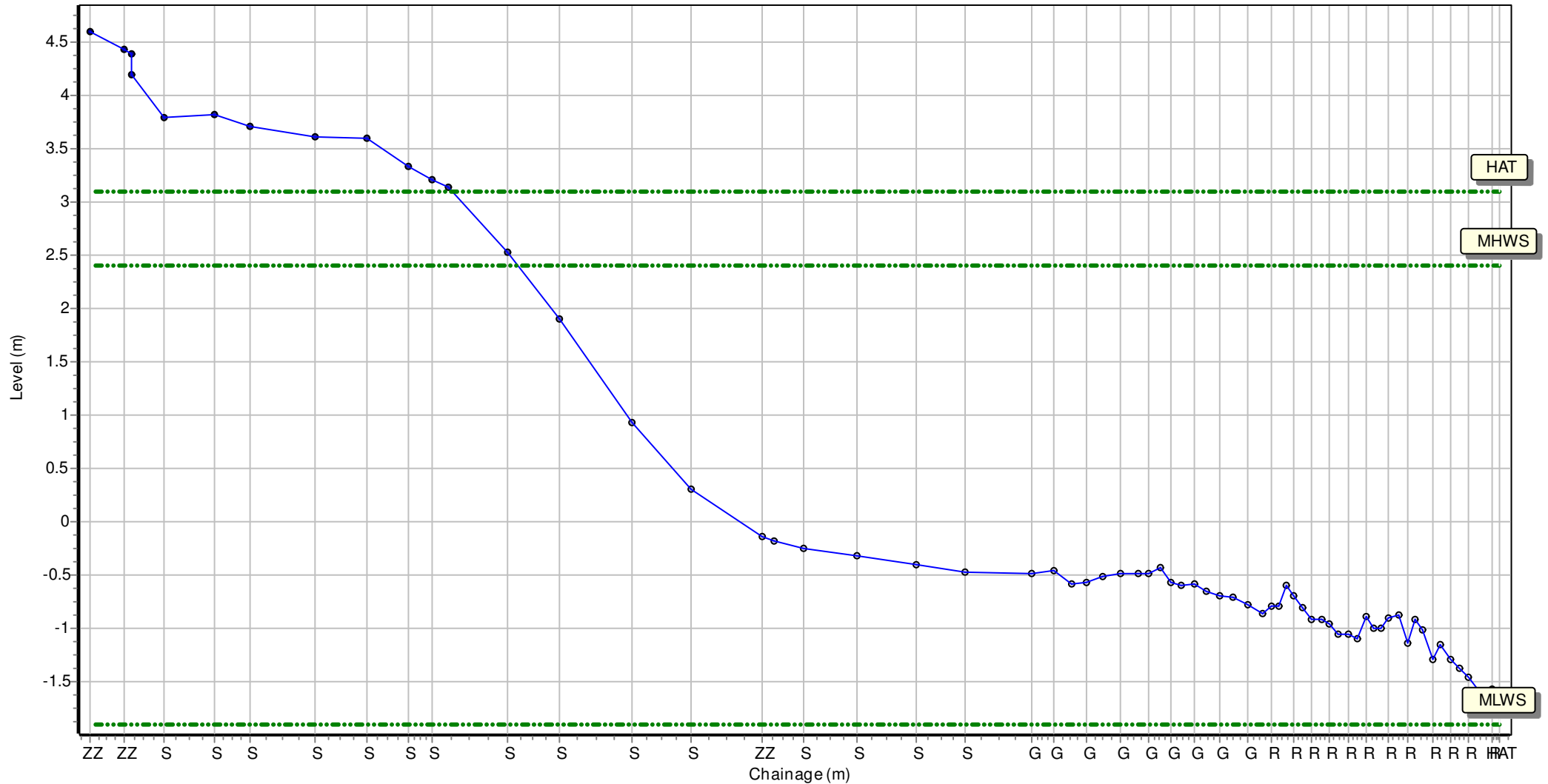
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431523.116 Northing: 588054.727 Profile Bearing: 184 ° from North



# Beach Profile

Location: 1aNWB5

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

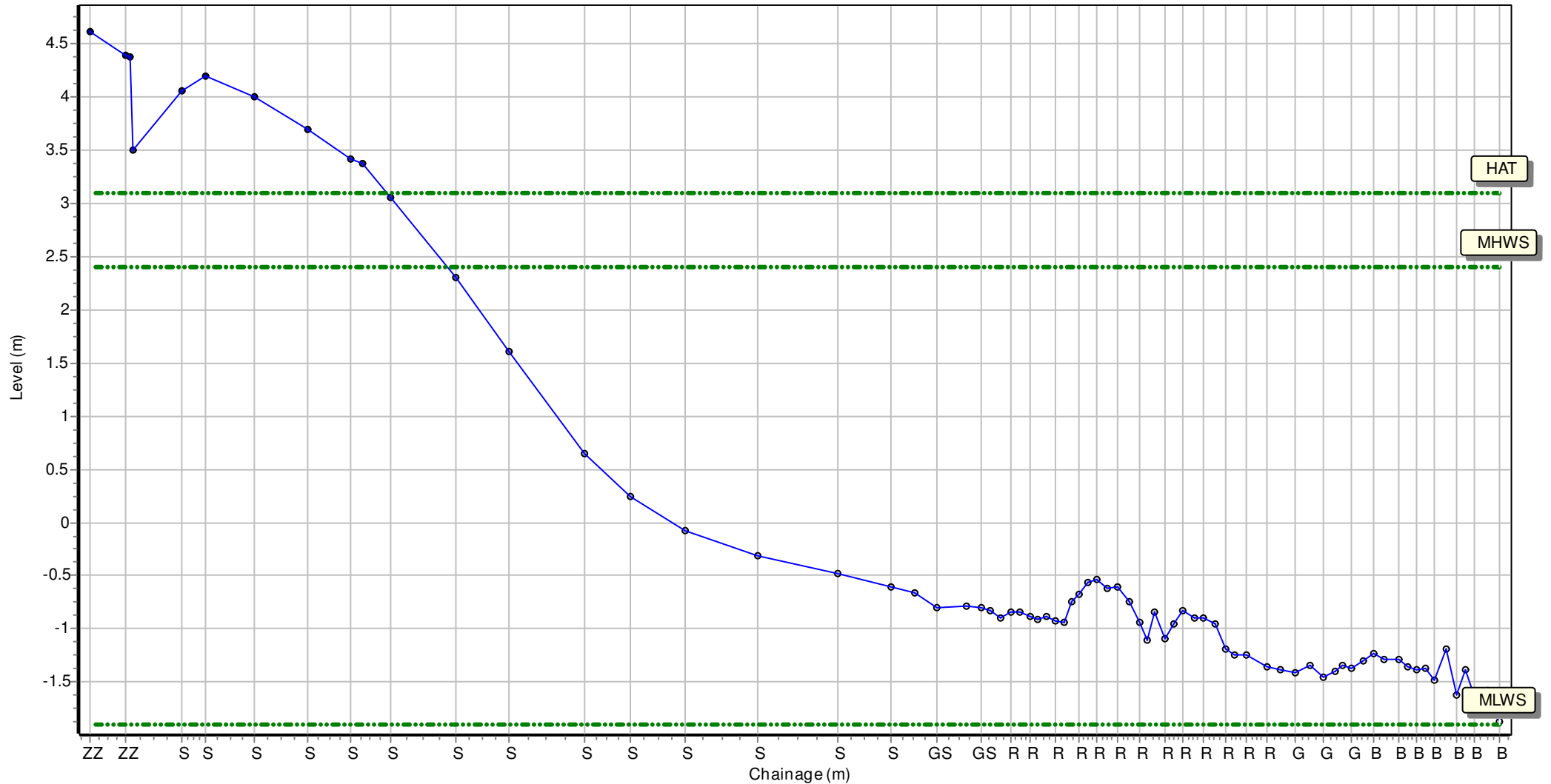
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431473.586 Northing: 588048.504 Profile Bearing: 174 ° from North





# Beach Profile

Location: 1aNWB6

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

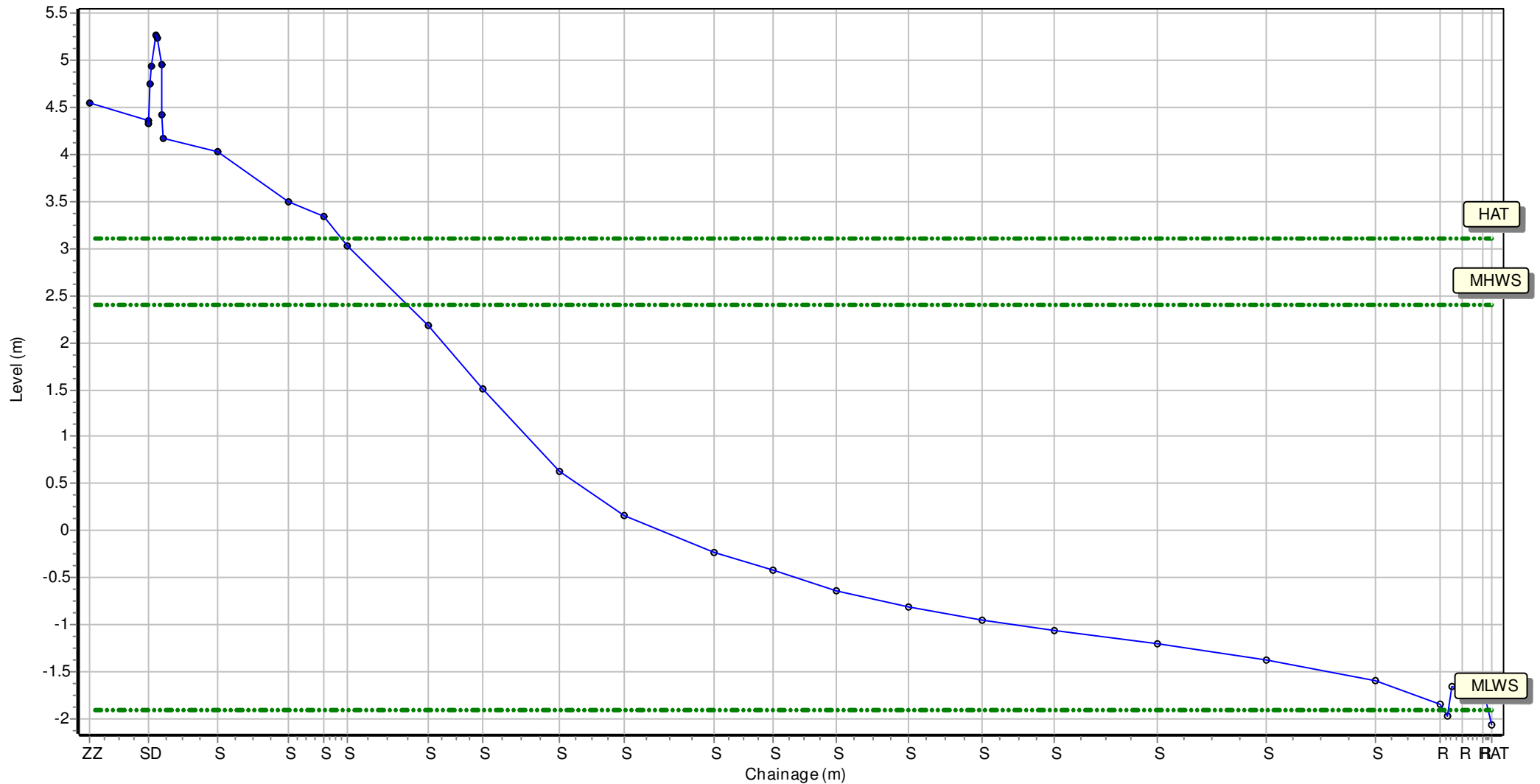
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431424.56 Northing: 588032.268 Profile Bearing: 164 ° from North



# Beach Profile

Location: 1aNWB7

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

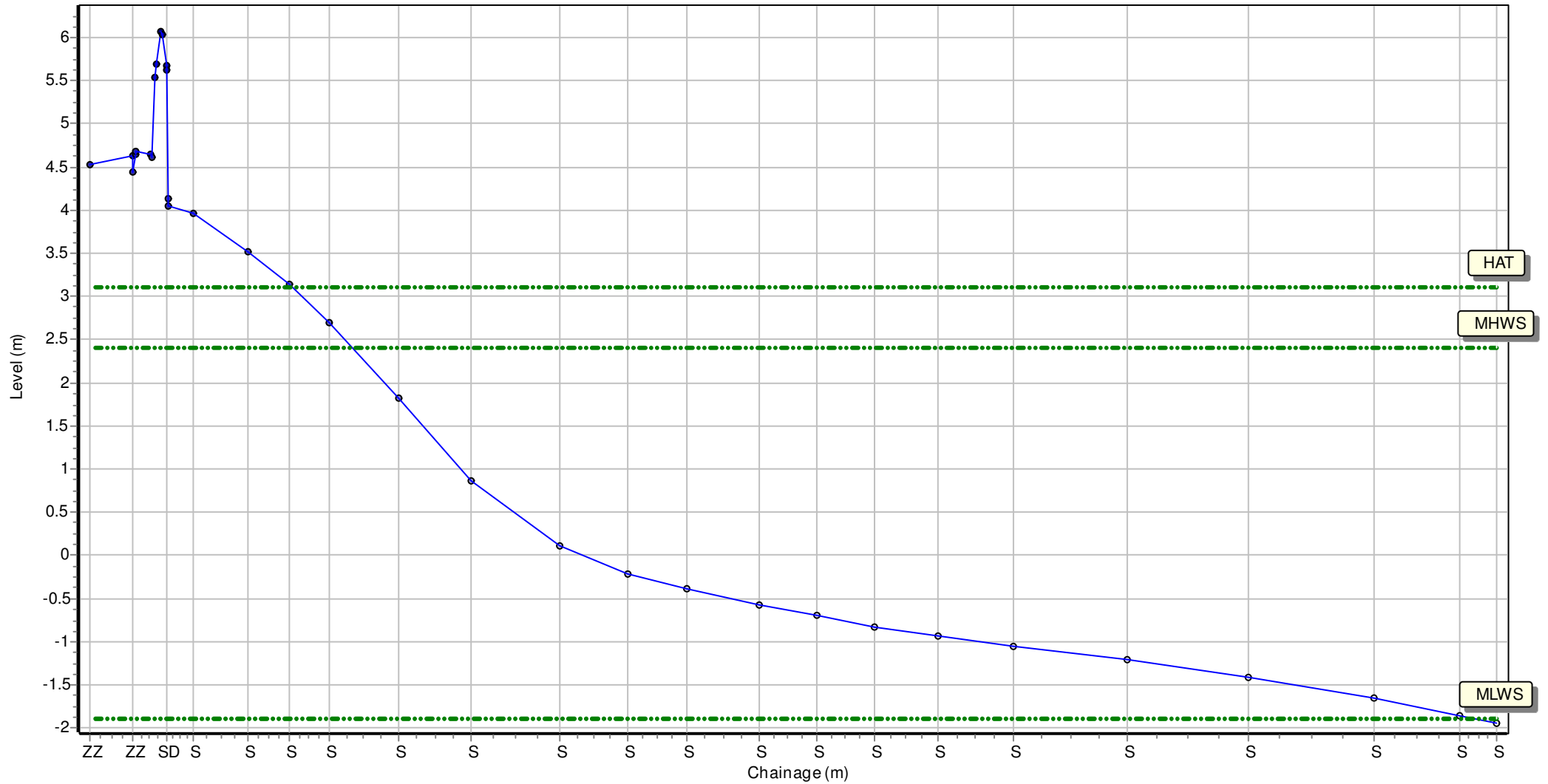
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431379.622 Northing: 588011.712 Profile Bearing: 165 ° from North



# Beach Profile

Location: 1aNWB8

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

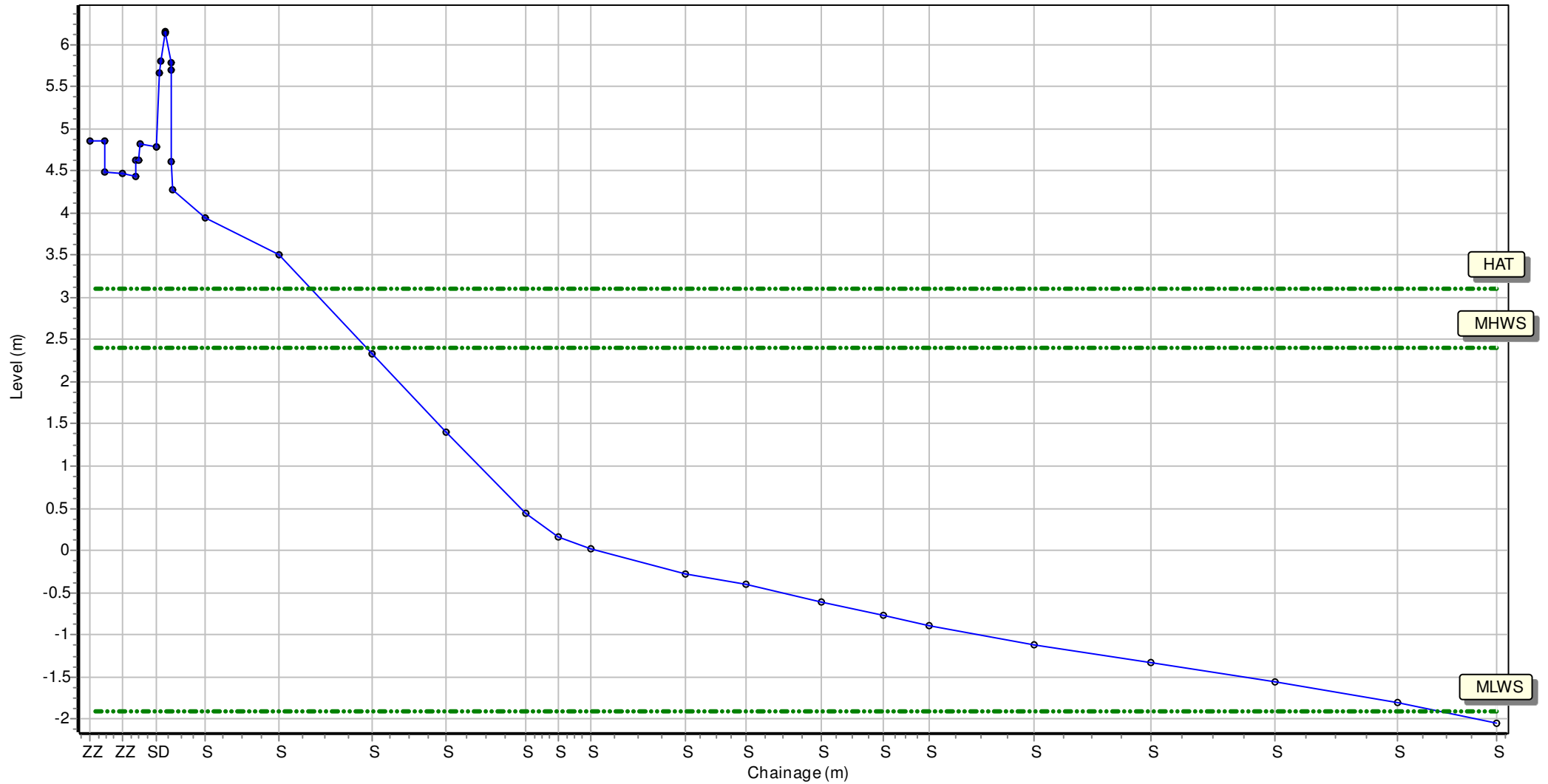
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431332.62 Northing: 587988.039 Profile Bearing: 144 ° from North



# Beach Profile

Location: 1aNWB9

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

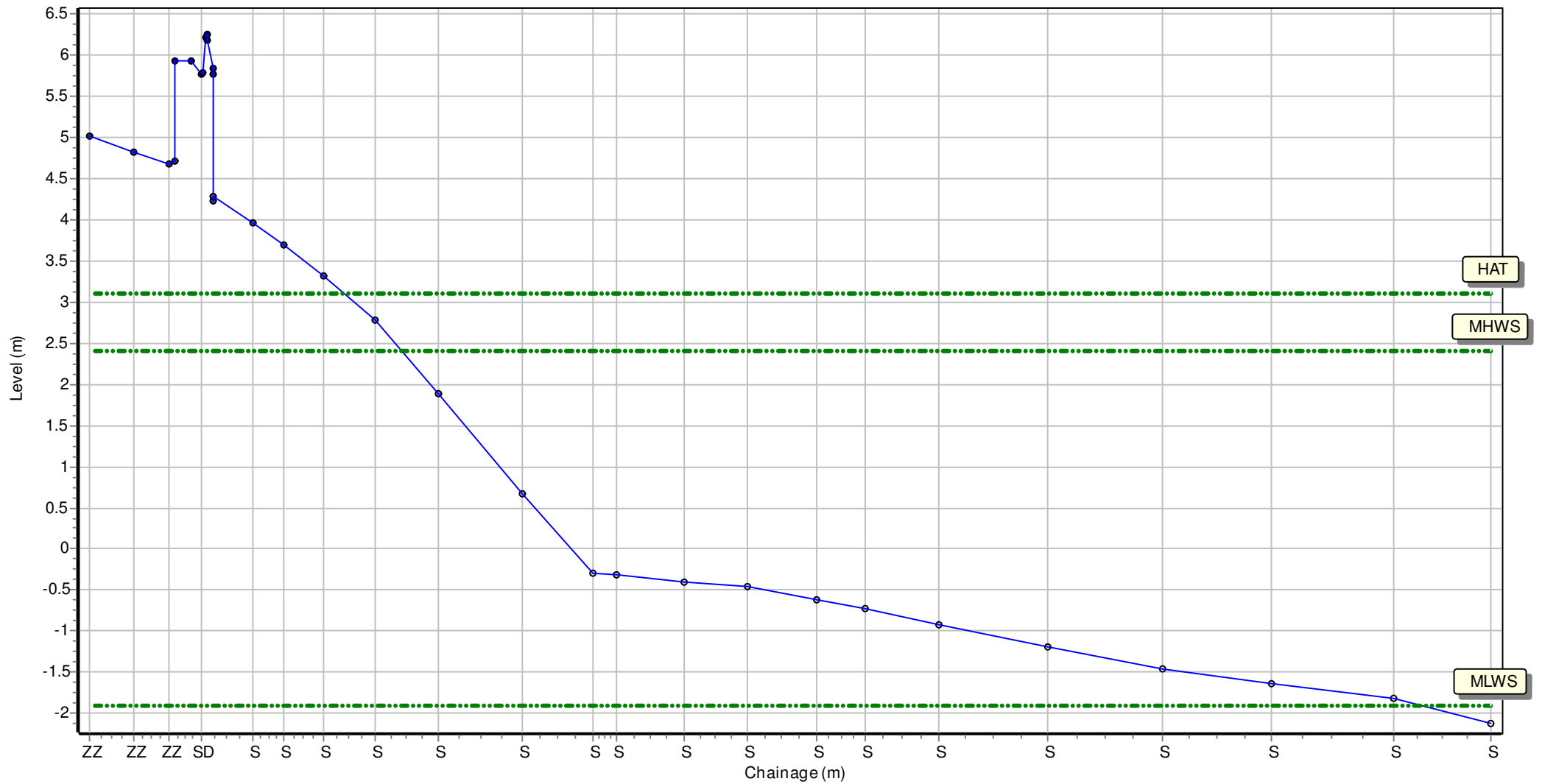
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431288.421 Northing: 587963.979 Profile Bearing: 142 ° from North



# Beach Profile

Location: 1aNWB10

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

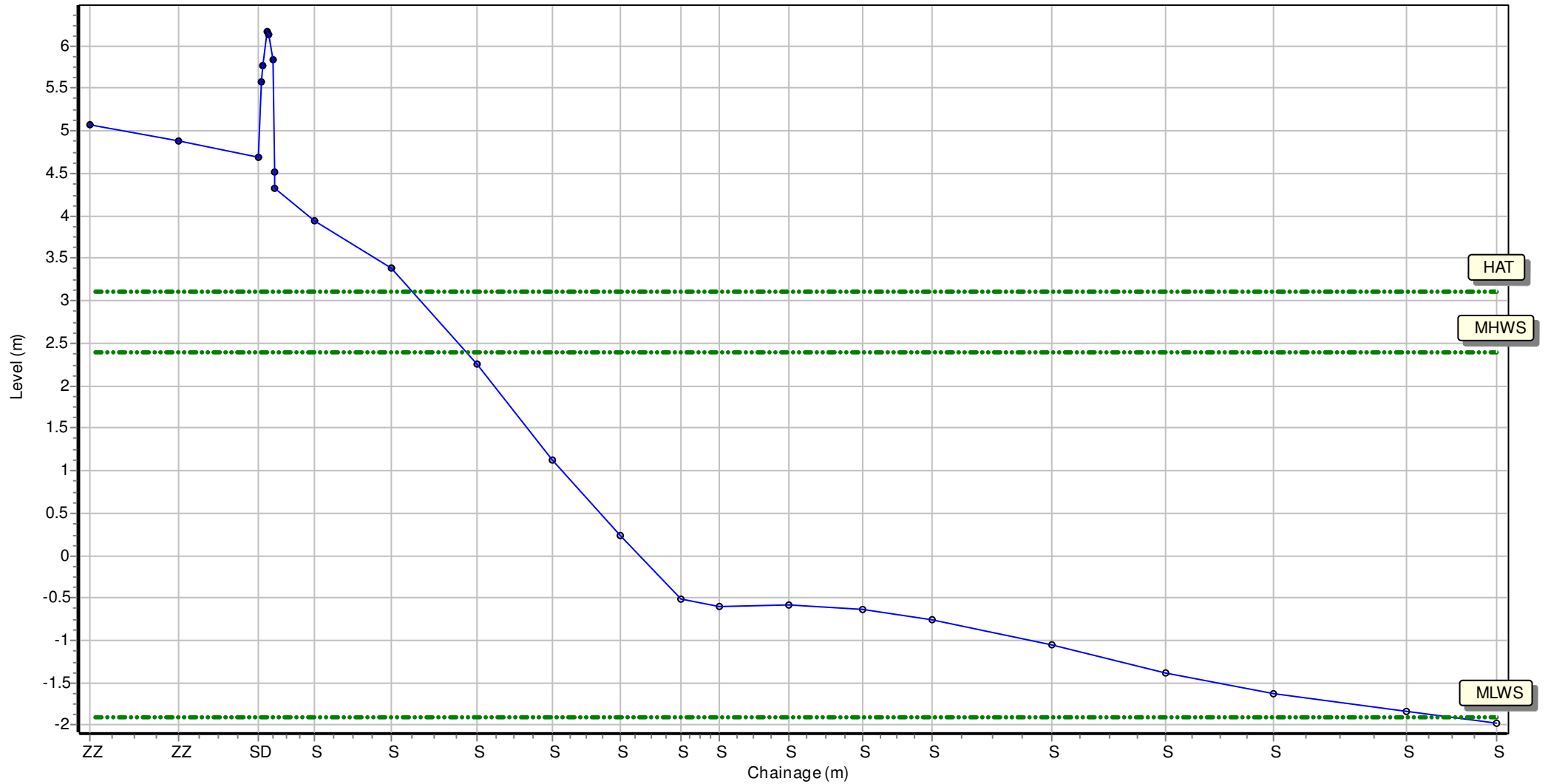
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431244.074 Northing: 587936.575 Profile Bearing: 139 ° from North



# Beach Profile

Location: 1aNWB11

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

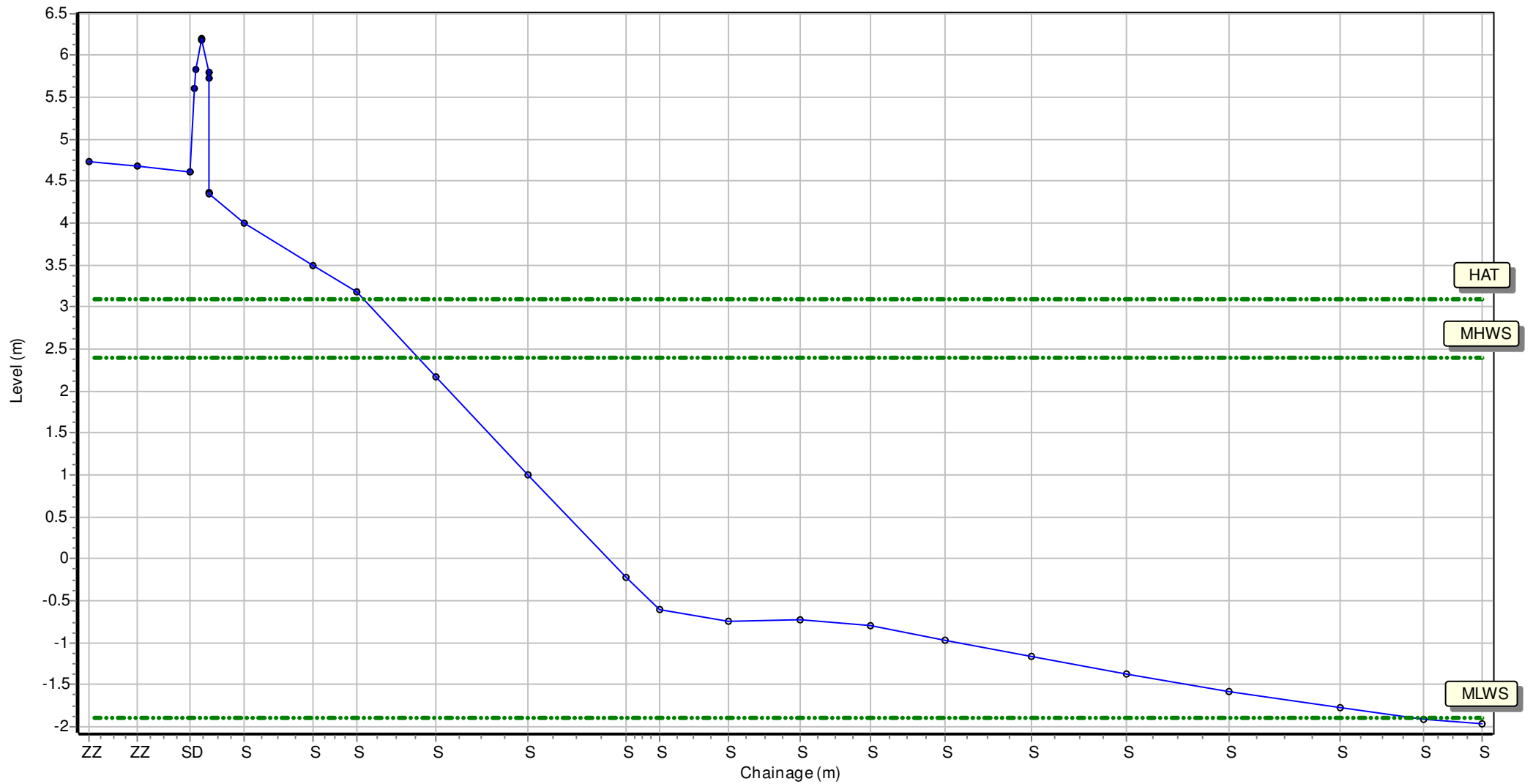
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431211.343 Northing: 587896.891 Profile Bearing: 135 ° from North



# Beach Profile

Location: 1aNWB12

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

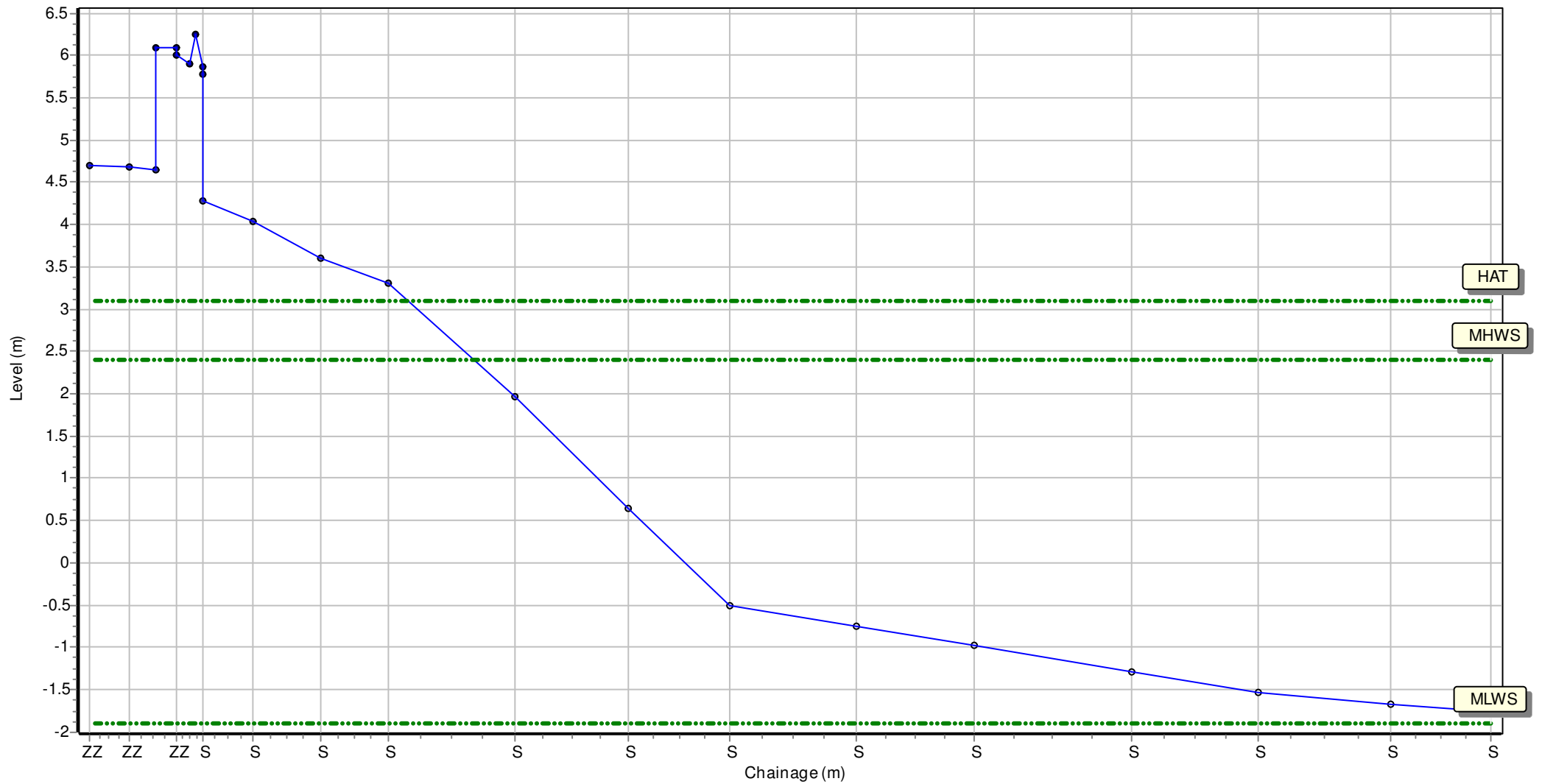
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431176.844 Northing: 587860.651 Profile Bearing: 132 ° from North



# Beach Profile

Location: 1aNWB13

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

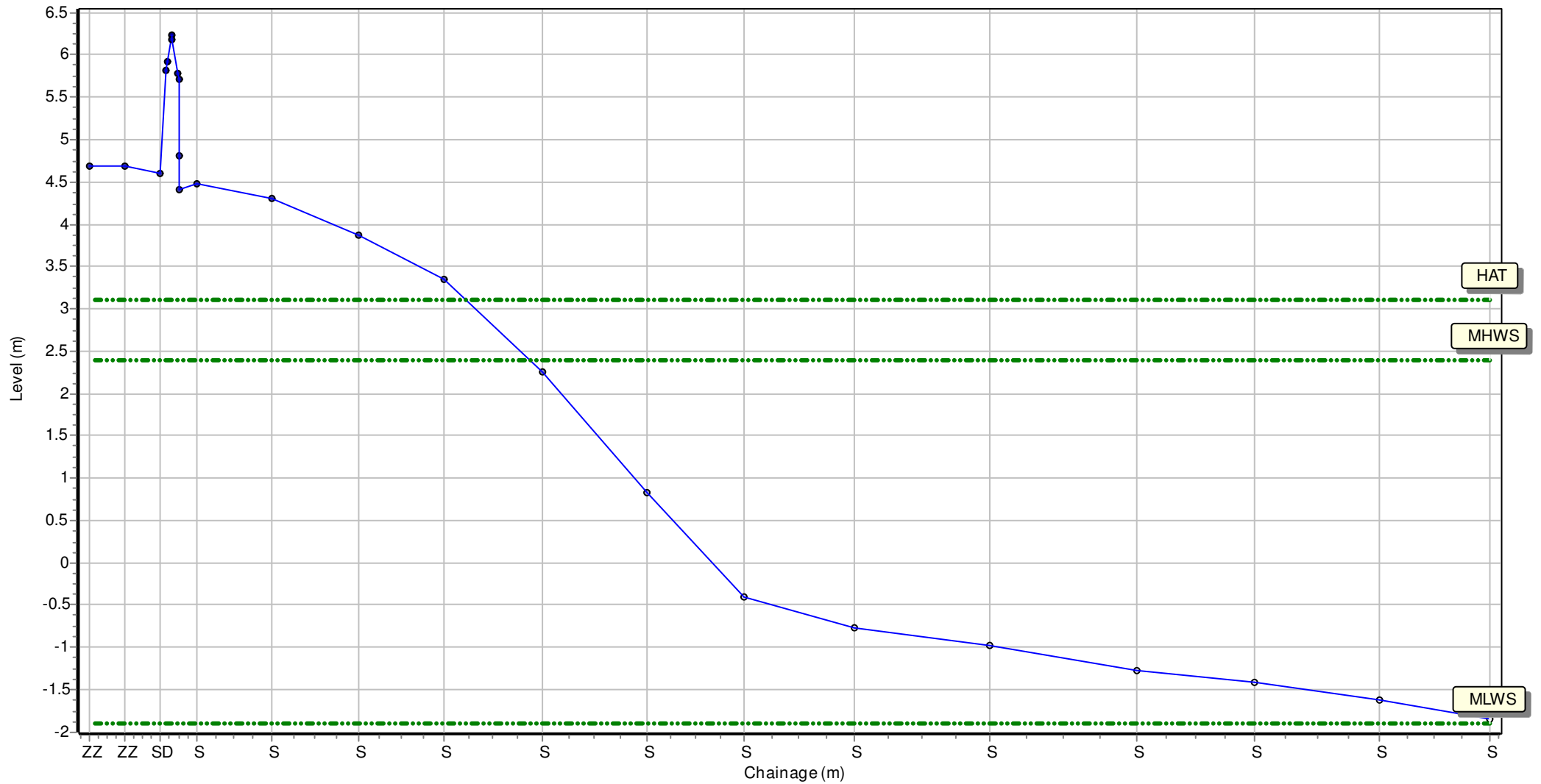
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431143.784 Northing: 587821.594 Profile Bearing: 129 ° from North





# Beach Profile

Location: 1aNWB14

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

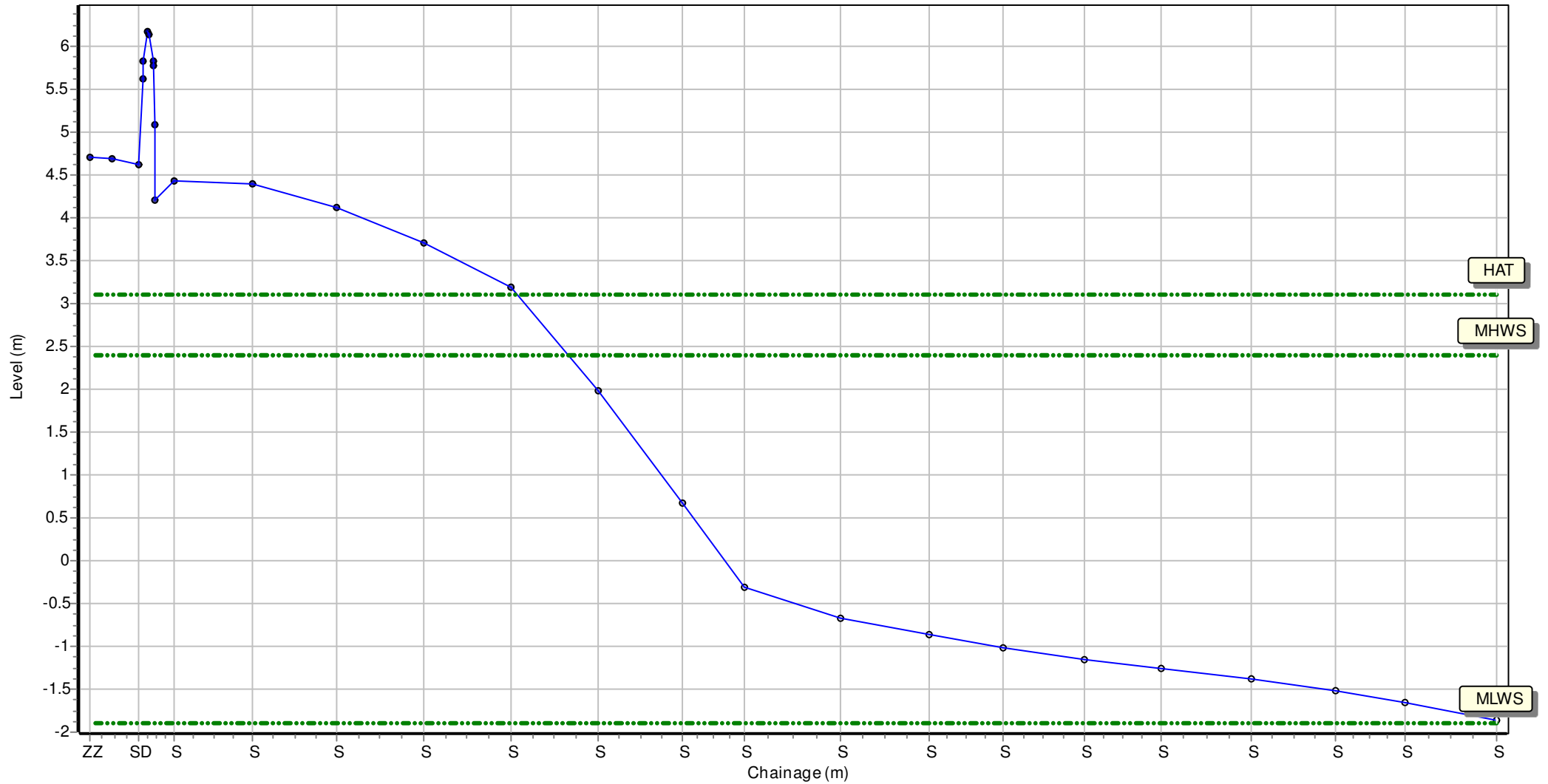
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431113.86 Northing: 587780.727 Profile Bearing: 115 ° from North



# Beach Profile

Location: 1aNWB15

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

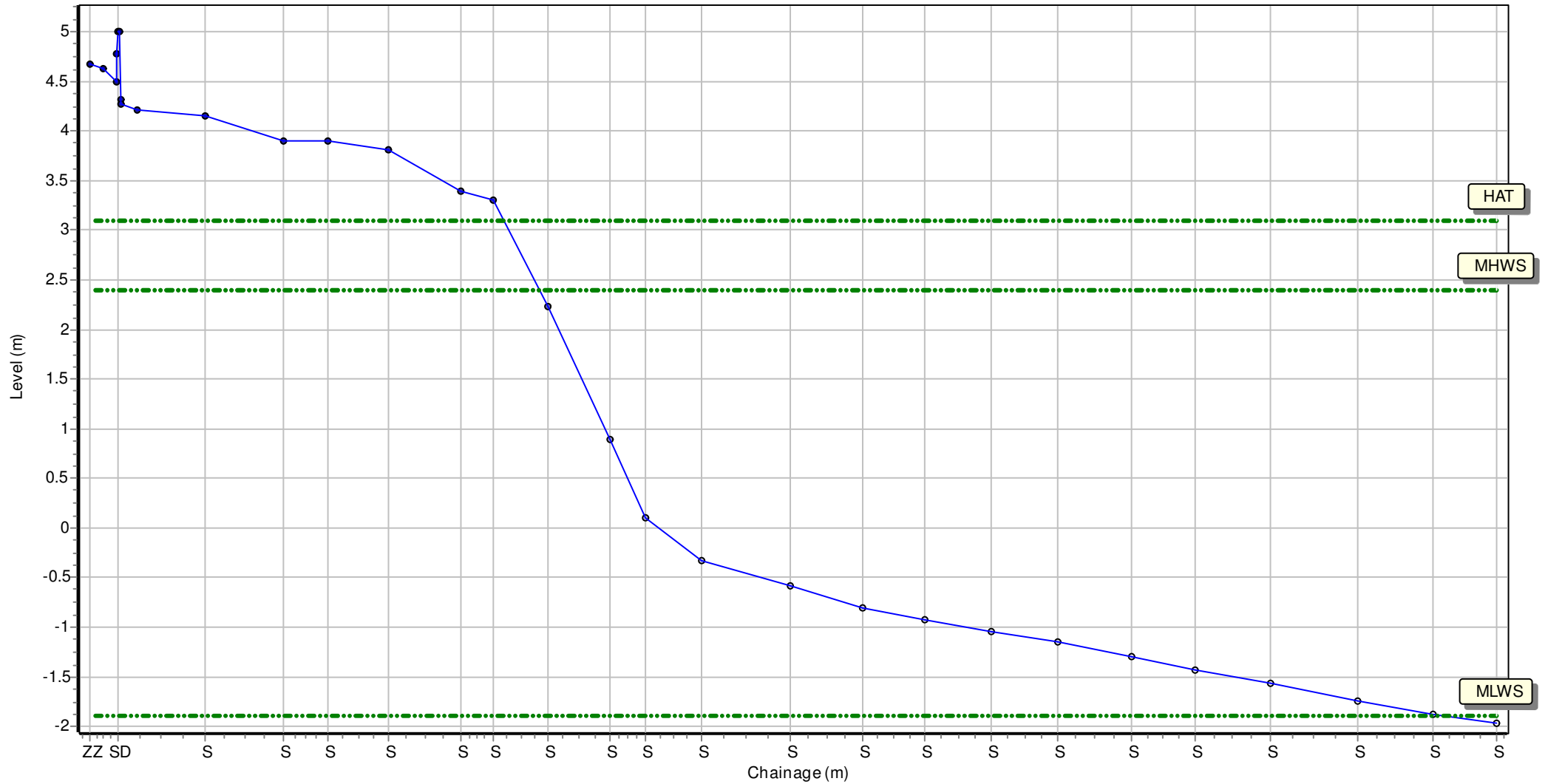
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431088.458 Northing: 587739.577 Profile Bearing: 125 ° from North



# Beach Profile

Location: 1aNWB16

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

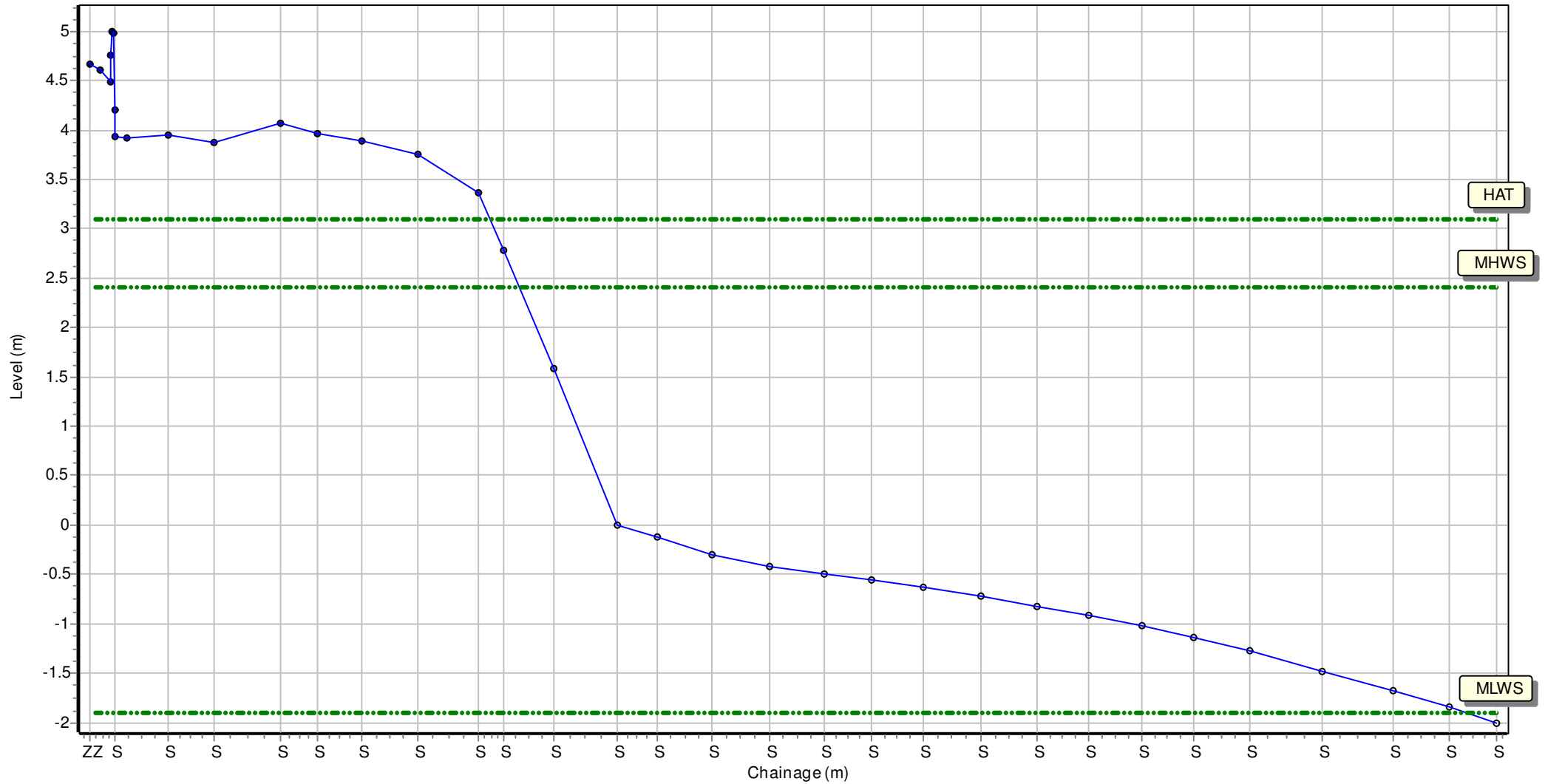
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431063.789 Northing: 587695.893 Profile Bearing: 119 ° from North



# Beach Profile

Location: 1aNWB17

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

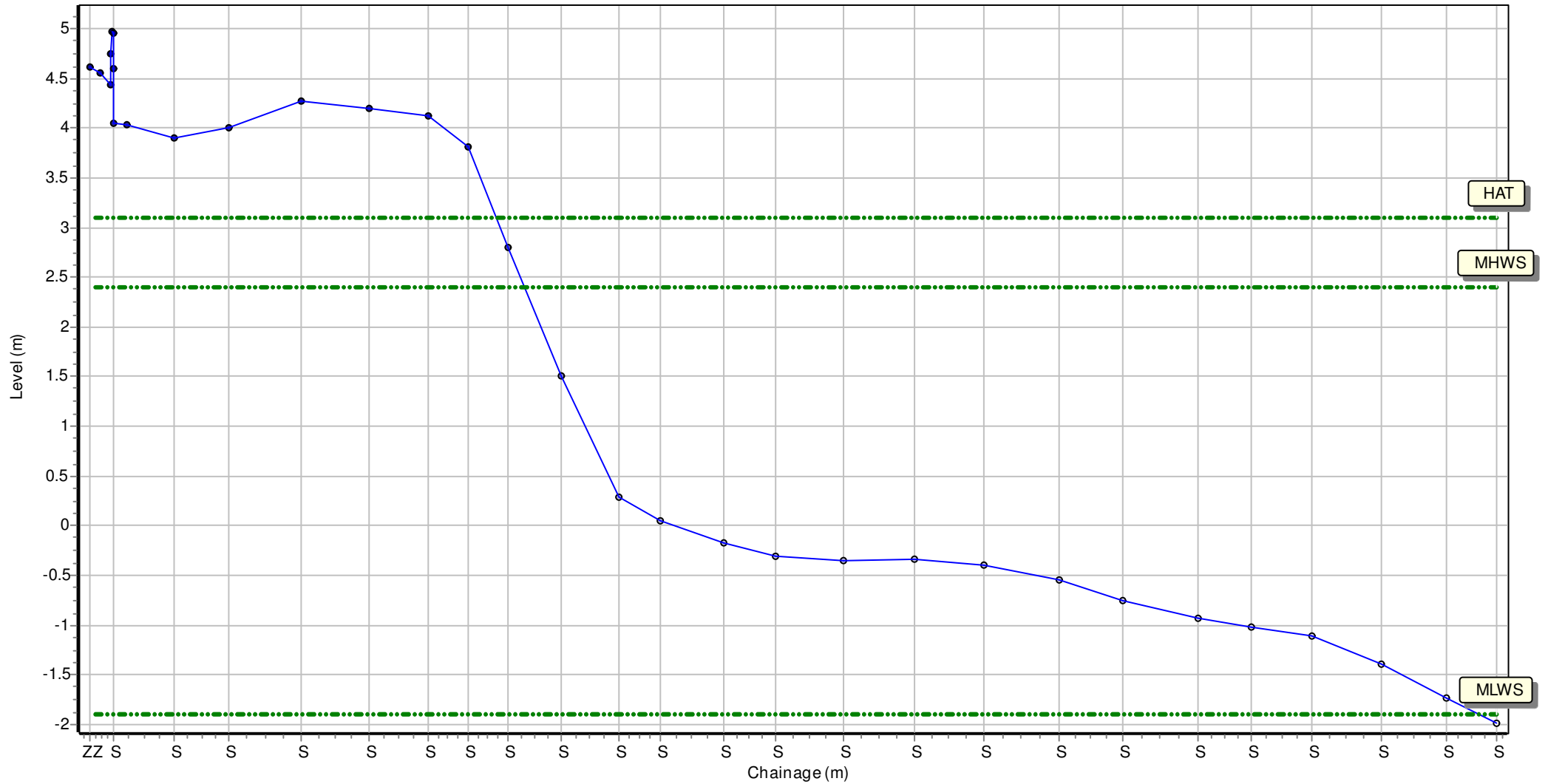
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431042.191 Northing: 587650.627 Profile Bearing: 116 ° from North



# Beach Profile

Location: 1aNWB18

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

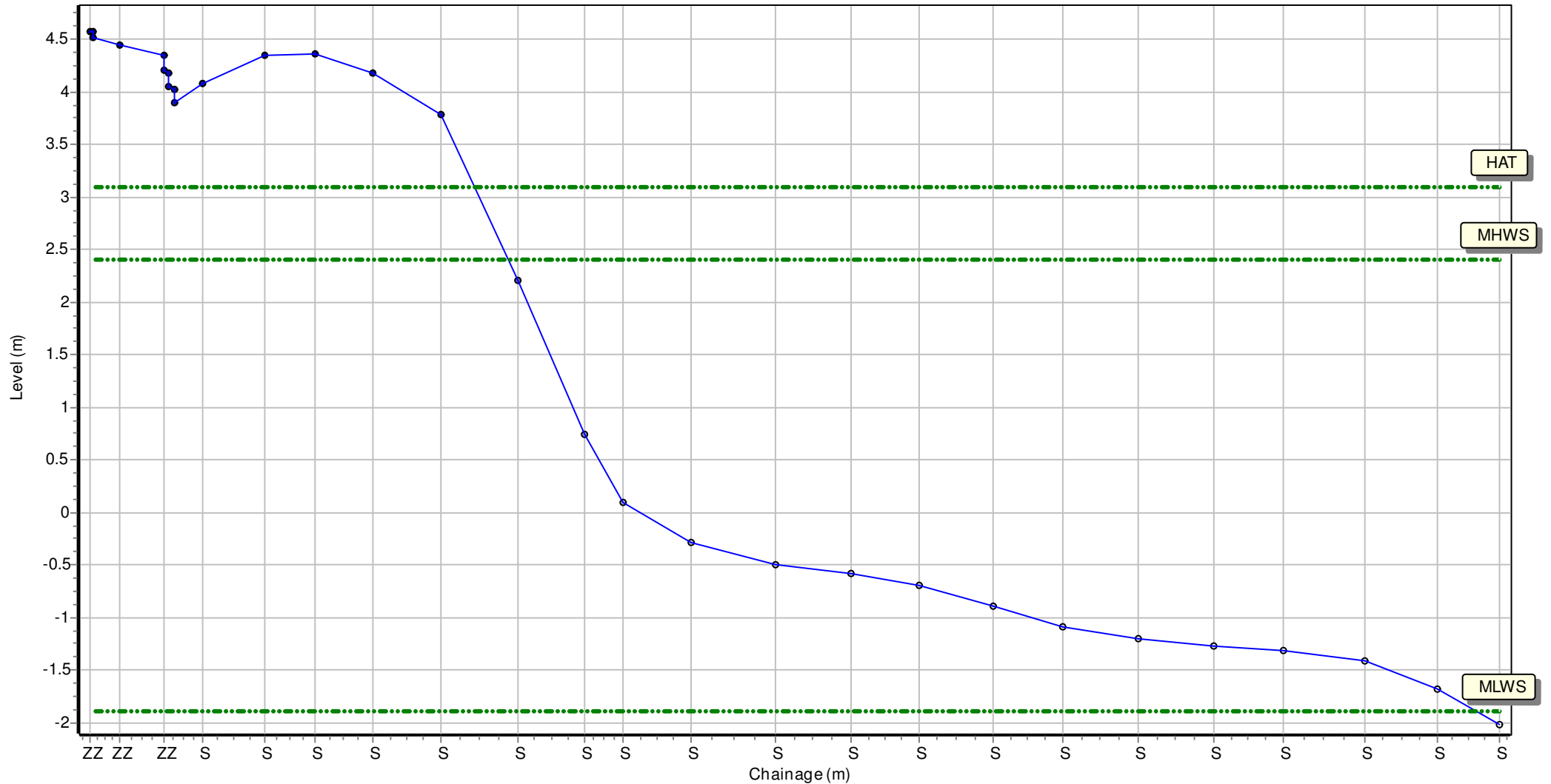
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431024.999 Northing: 587608.929 Profile Bearing: 113 ° from North



# Beach Profile

Location: 1aNWB19

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

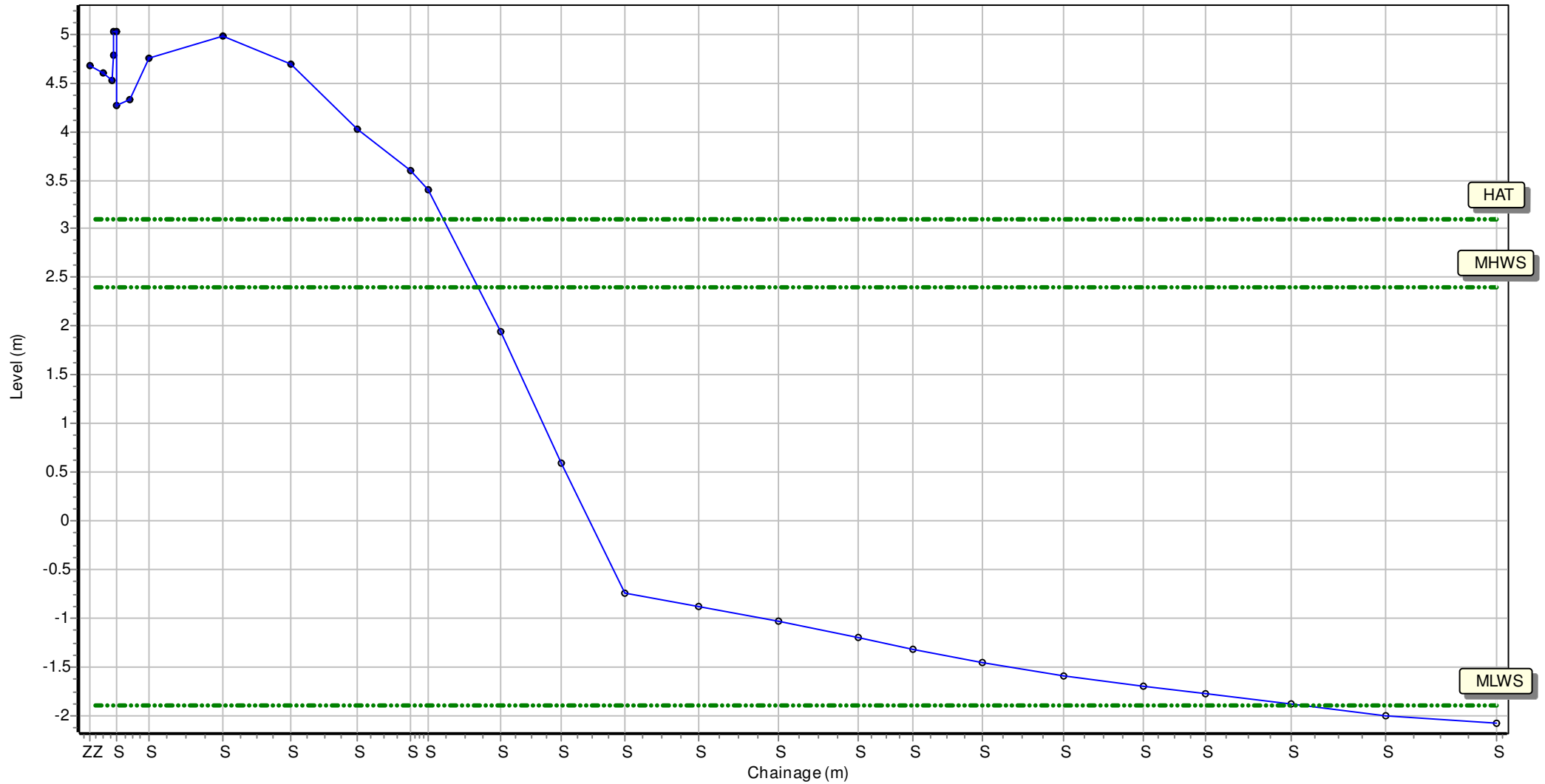
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 431007.485 Northing: 587556.656 Profile Bearing: 109 ° from North



# Beach Profile

Location: 1aNWB20

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

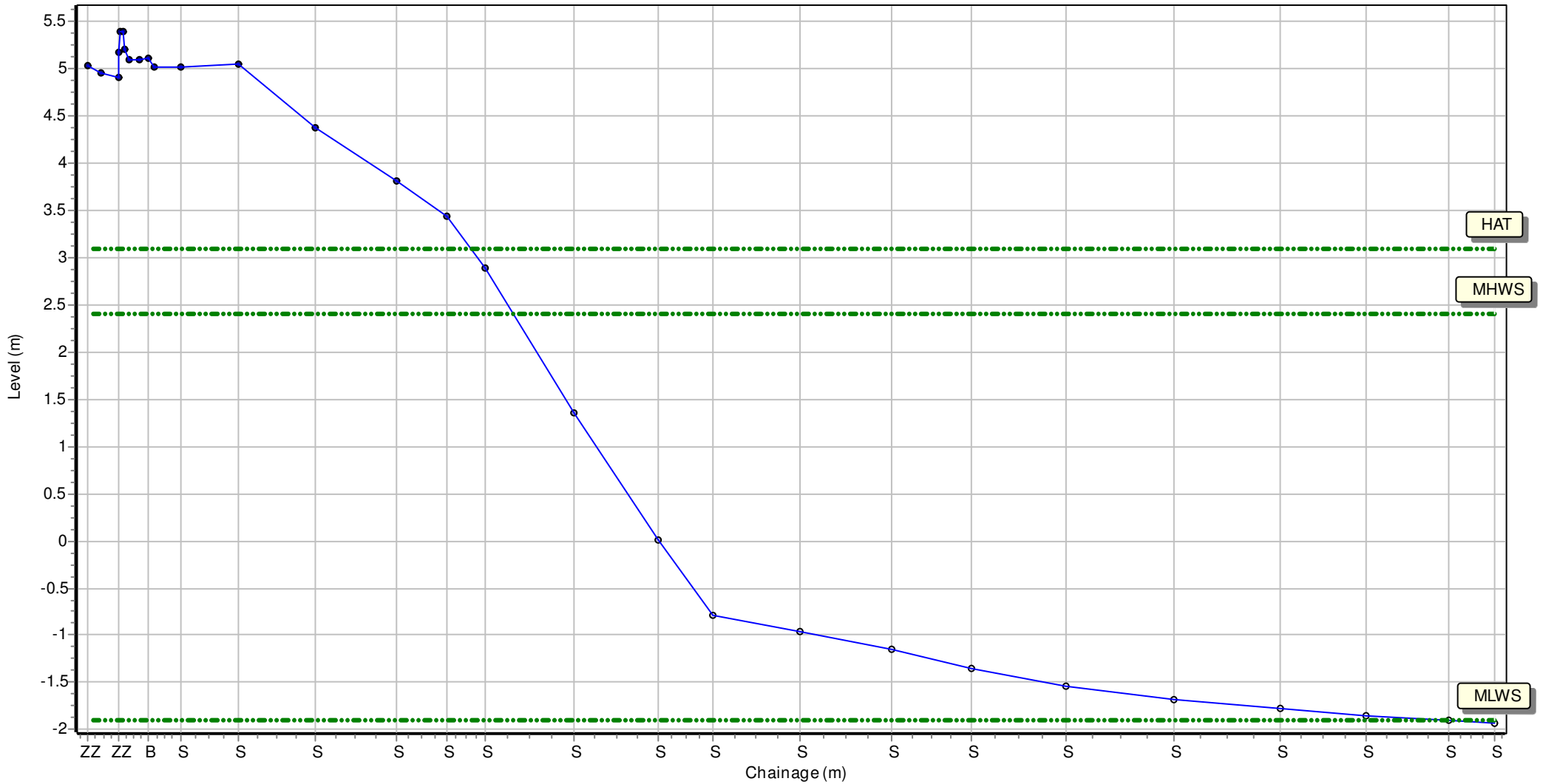
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430992.437 Northing: 587508.87 Profile Bearing: 102 ° from North



# Beach Profile

Location: 1aNWB21

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

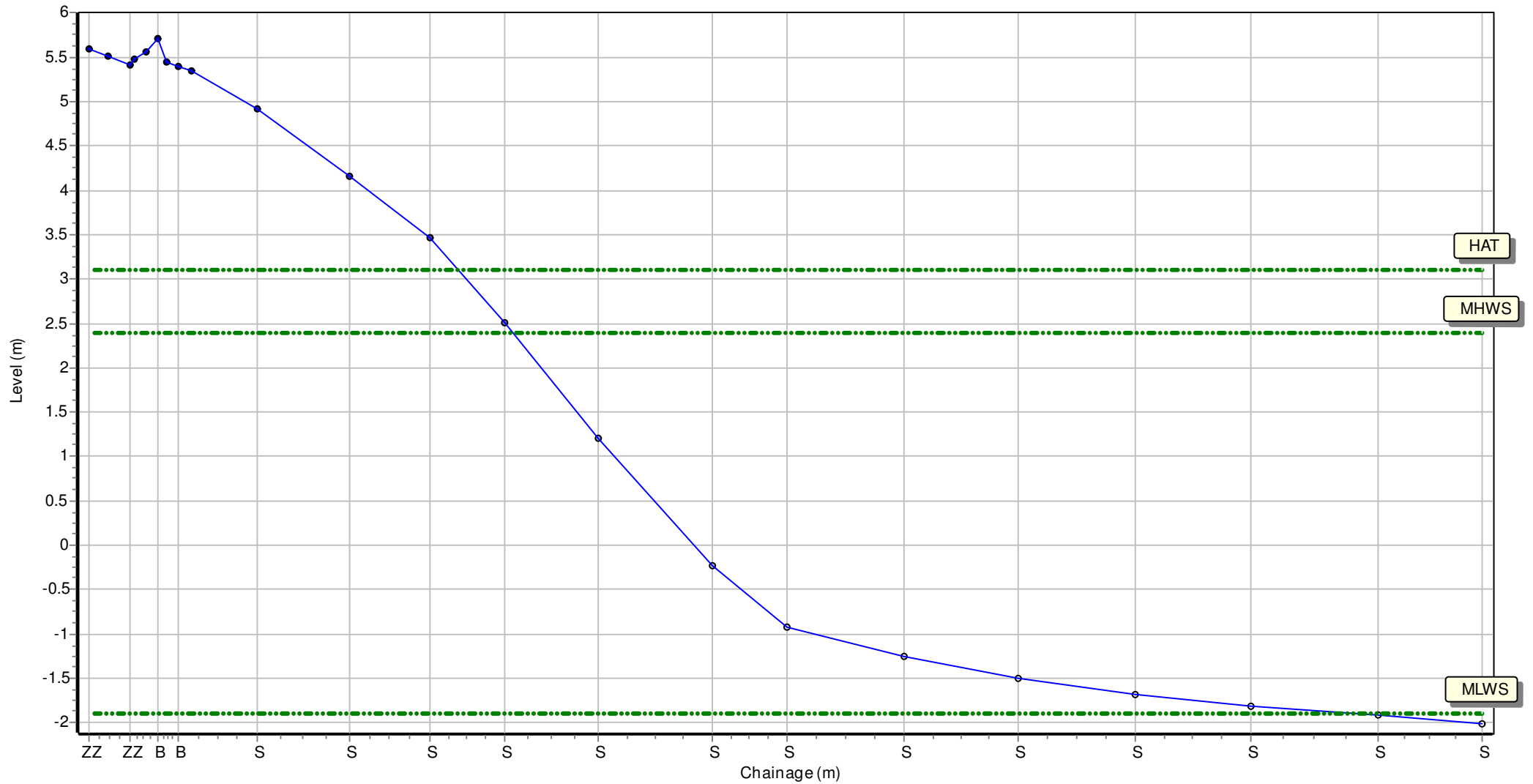
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430978.85 Northing: 587460.577 Profile Bearing: 102 ° from North





# Beach Profile

Location: 1aNWB22

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

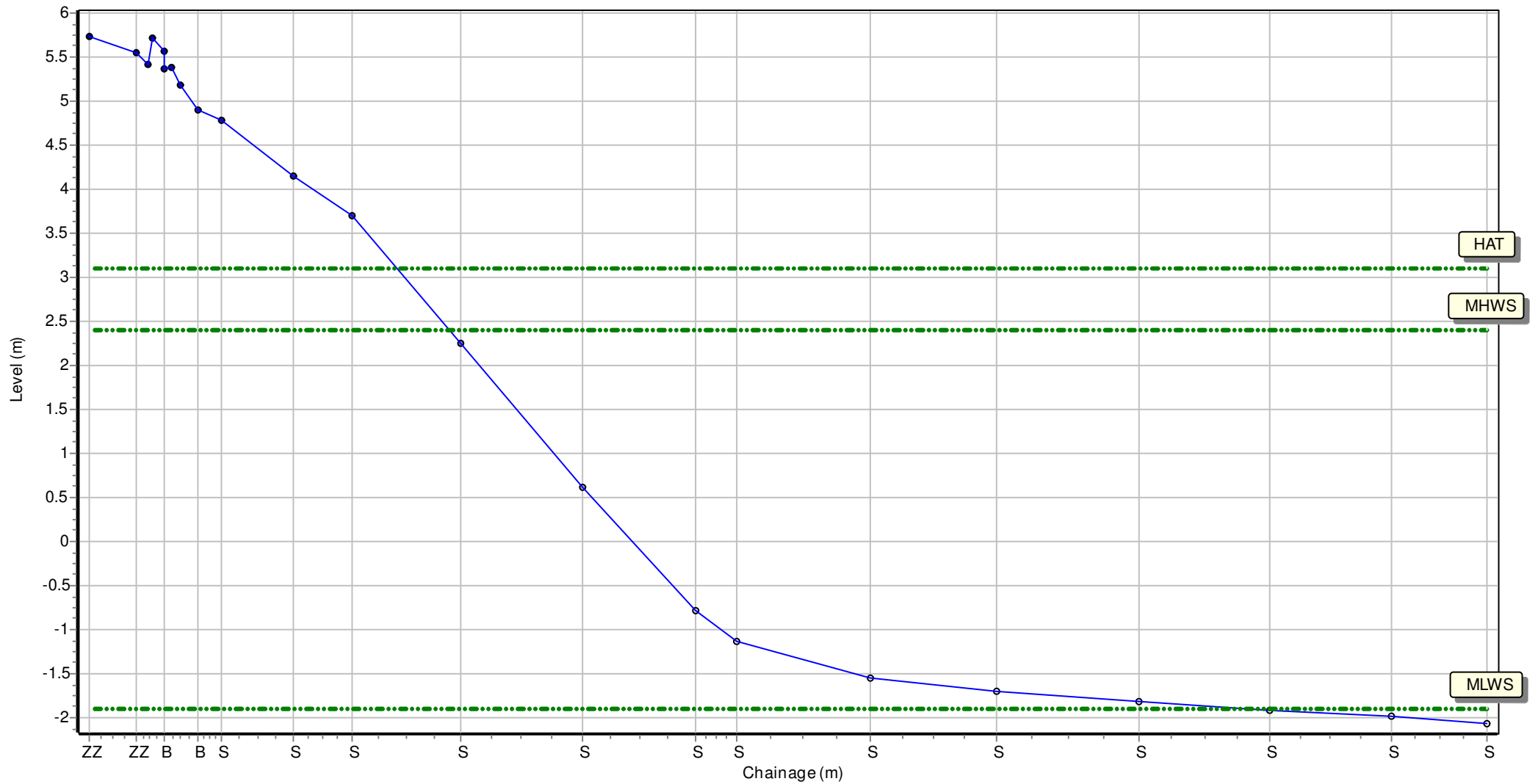
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430967.686 Northing: 587411.684 Profile Bearing: 99 ° from North



# Beach Profile

Location: 1aNWB23

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

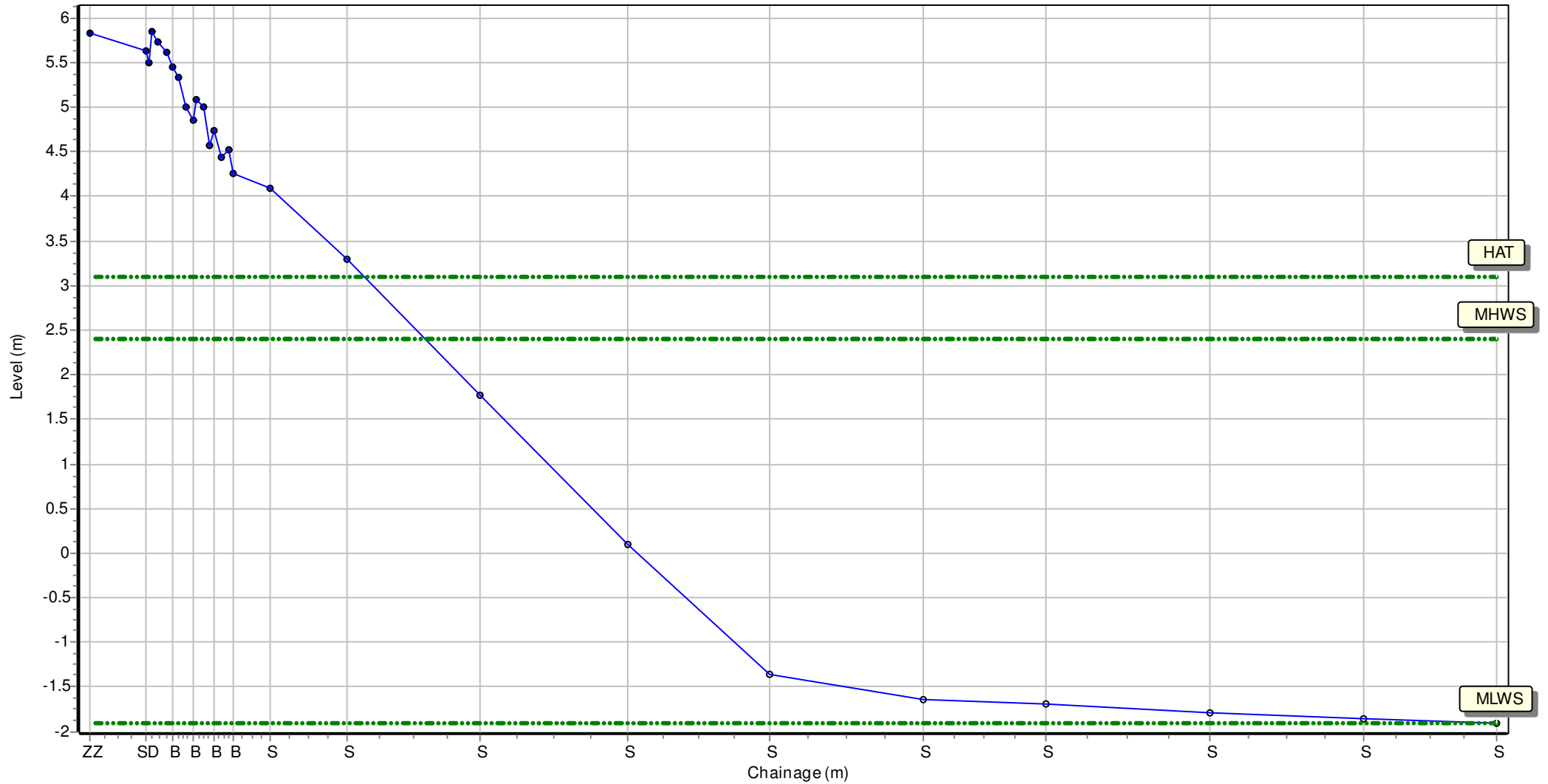
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430959.877 Northing: 587362.168 Profile Bearing: 96 ° from North



# Beach Profile

Location: 1aNWB24

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

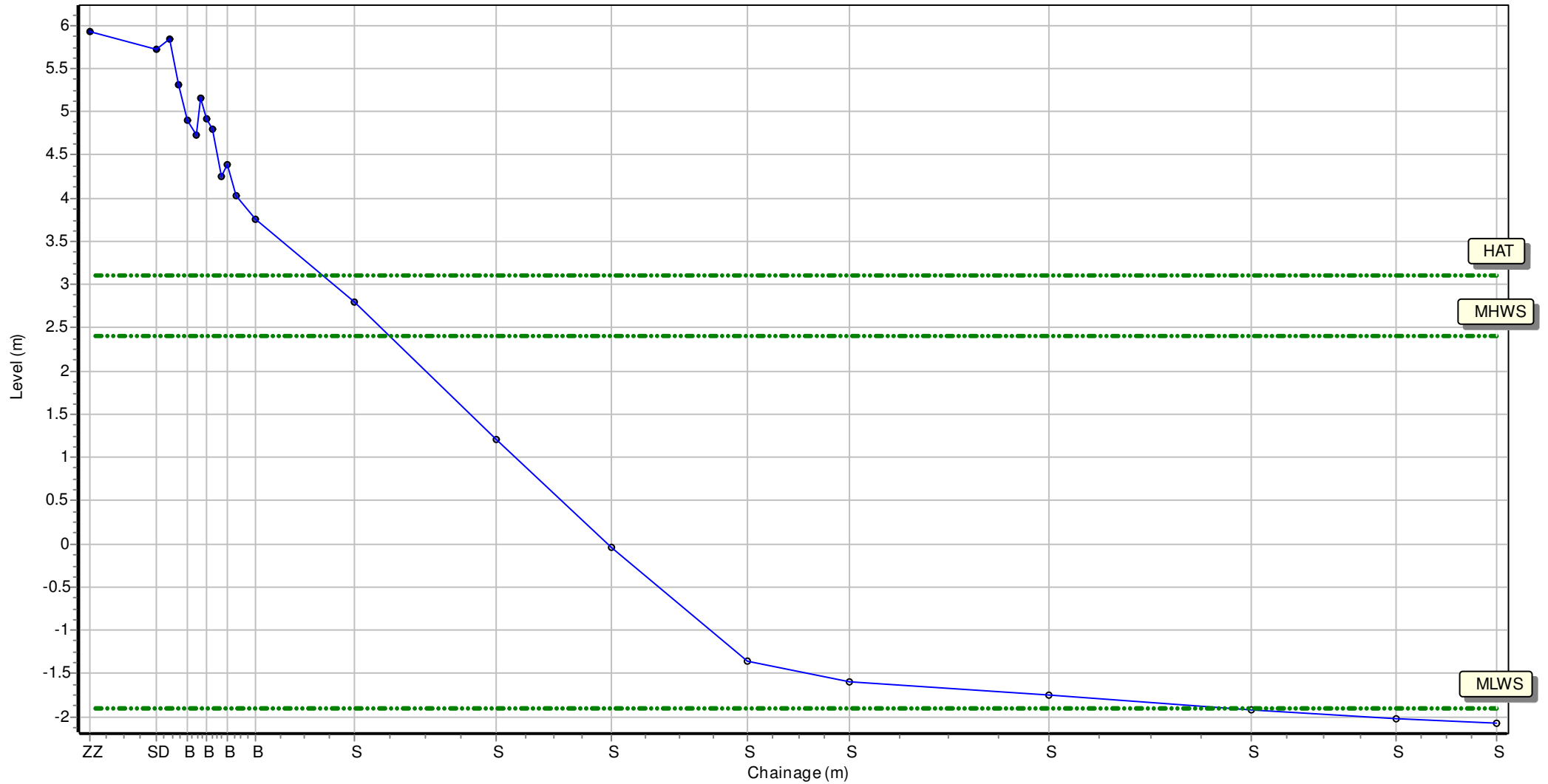
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430956.511 Northing: 587312.153 Profile Bearing: 92 ° from North



# Beach Profile

Location: 1aNWB25

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

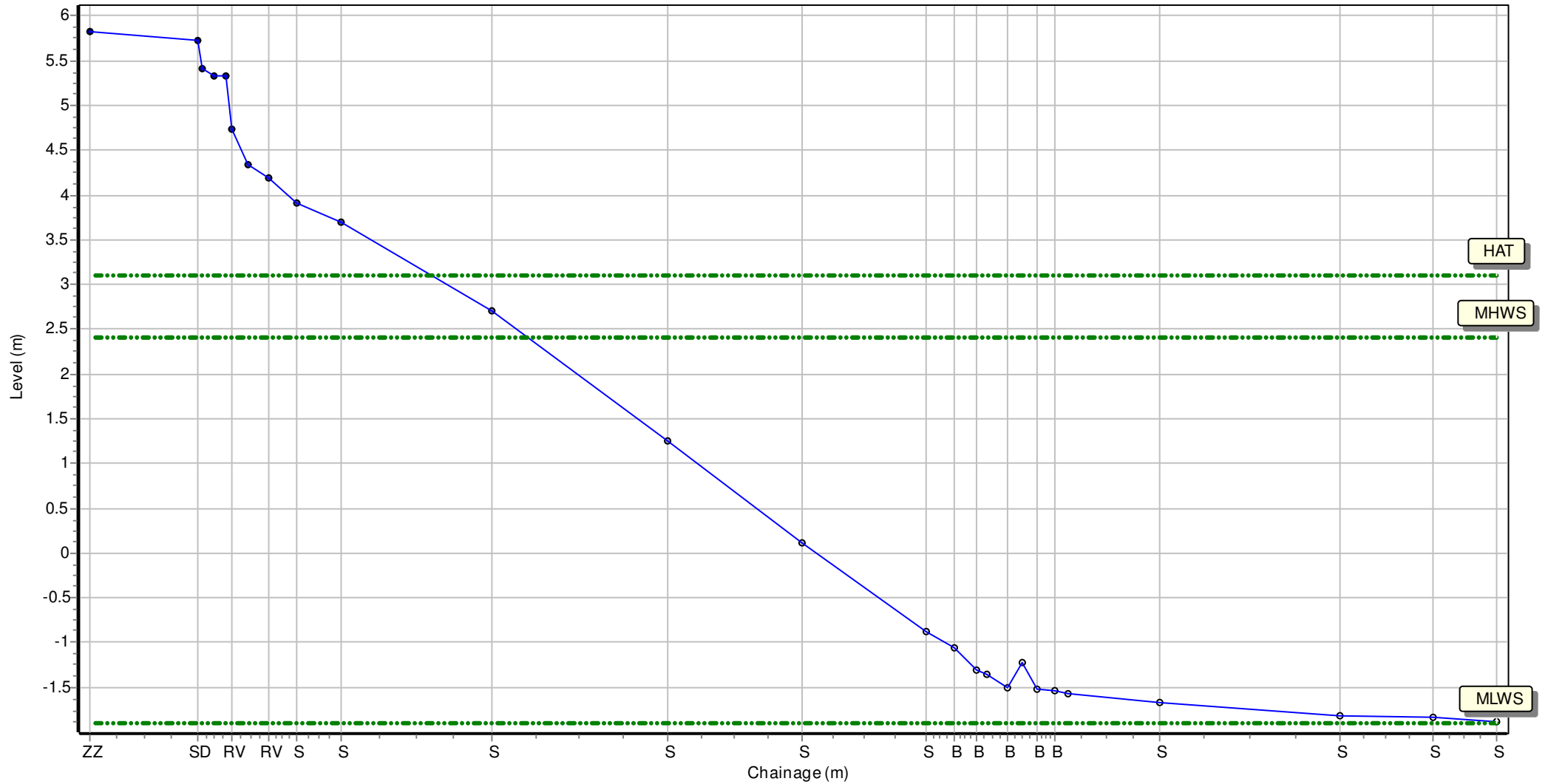
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430953.984 Northing: 587261.982 Profile Bearing: 89 ° from North



# Beach Profile

Location: 1aNWB26

Date: 21/08/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

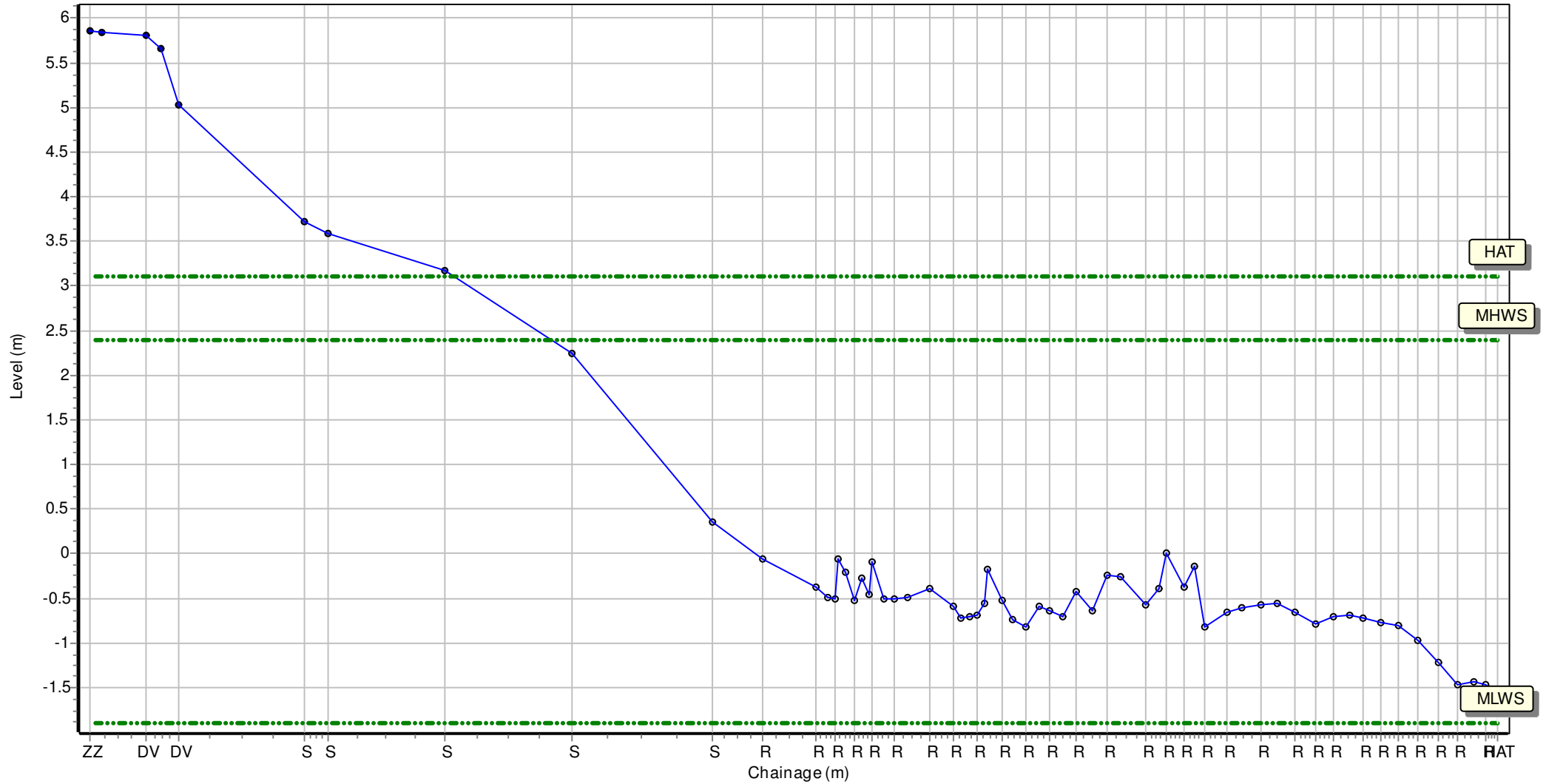
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 430960.828 Northing: 587212.152 Profile Bearing: 86 ° from North



# Beach Profile

Location: 1aBVBC01

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

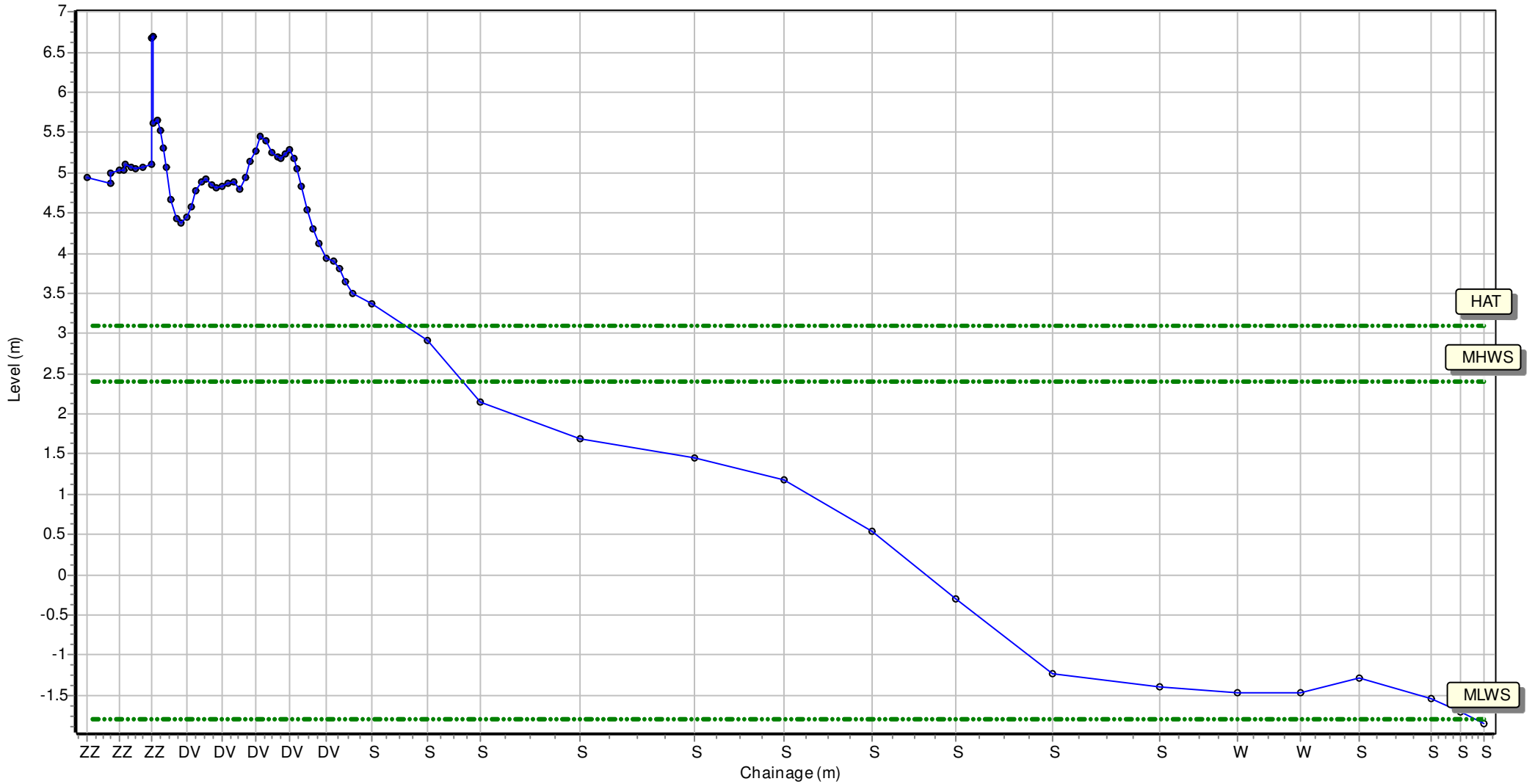
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 432171.107 Northing: 580411.515 Profile Bearing: 113 ° from North



# Beach Profile

Location: 1aBVBC02

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

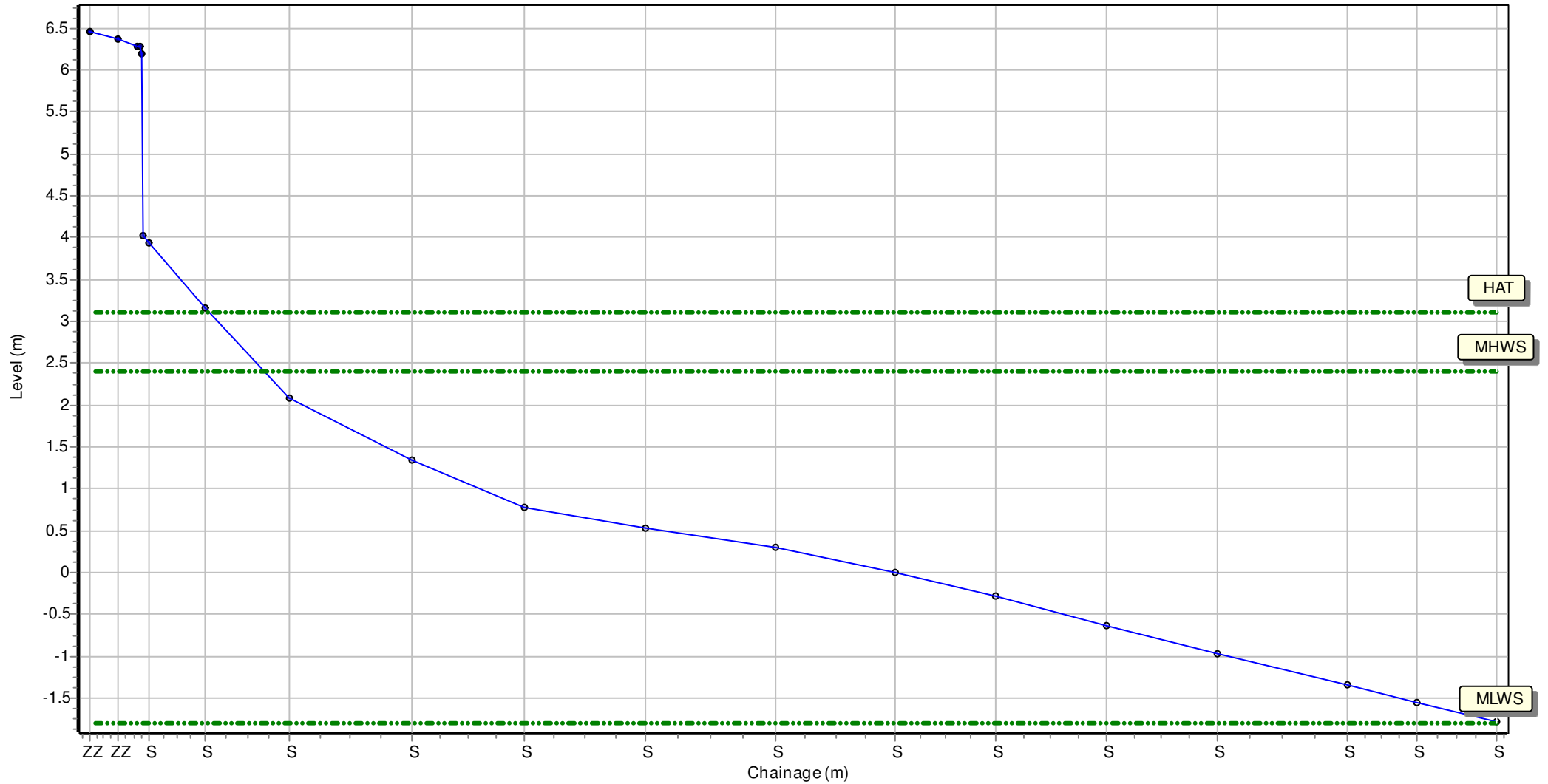
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 432072.788 Northing: 579668.162 Profile Bearing: 77 ° from North



# Beach Profile

Location: 1aBVBC03

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

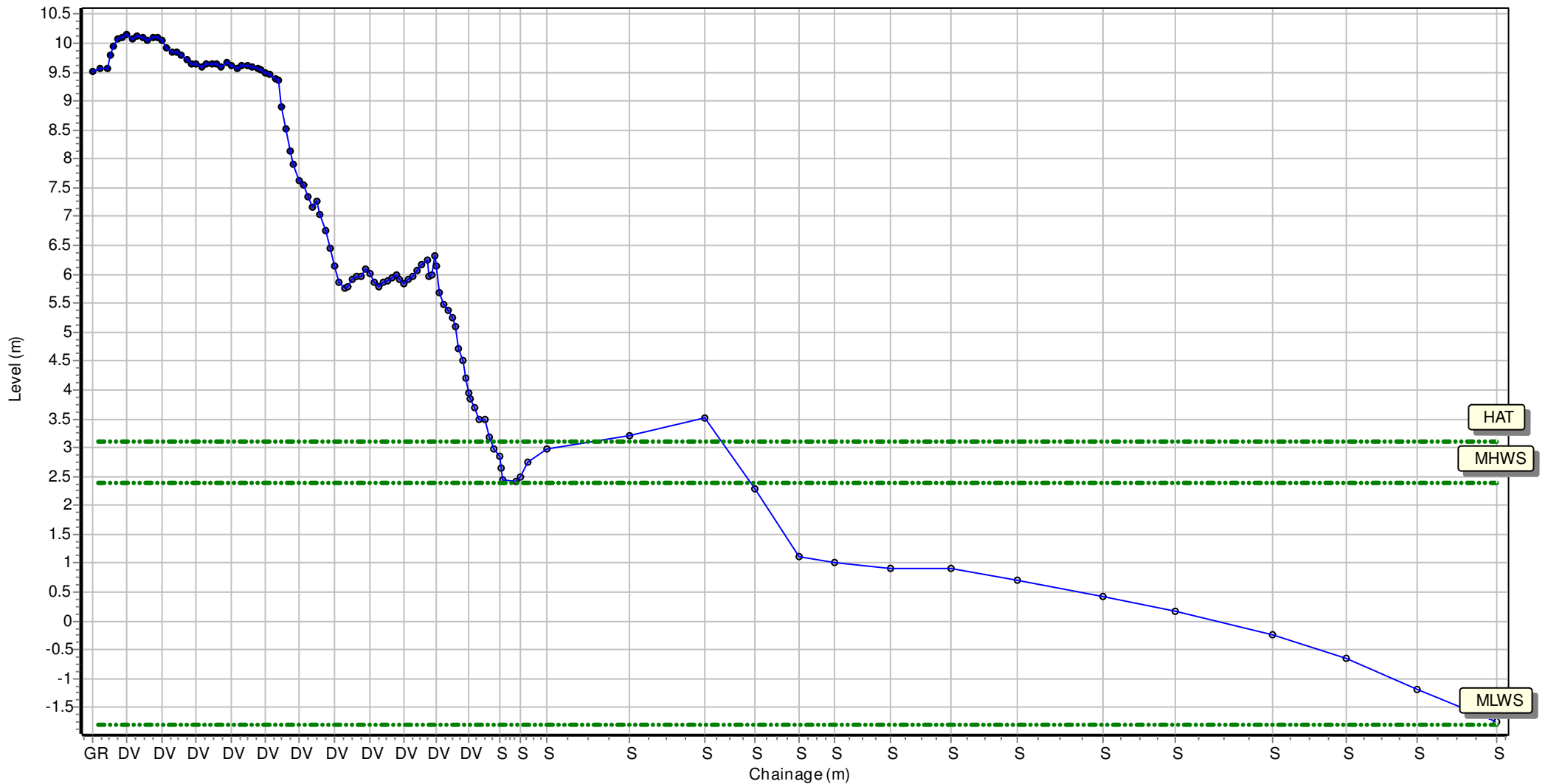
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 432120.659 Northing: 578982.375 Profile Bearing: 71 ° from North





# Beach Profile

Location: 1aBVBC04

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

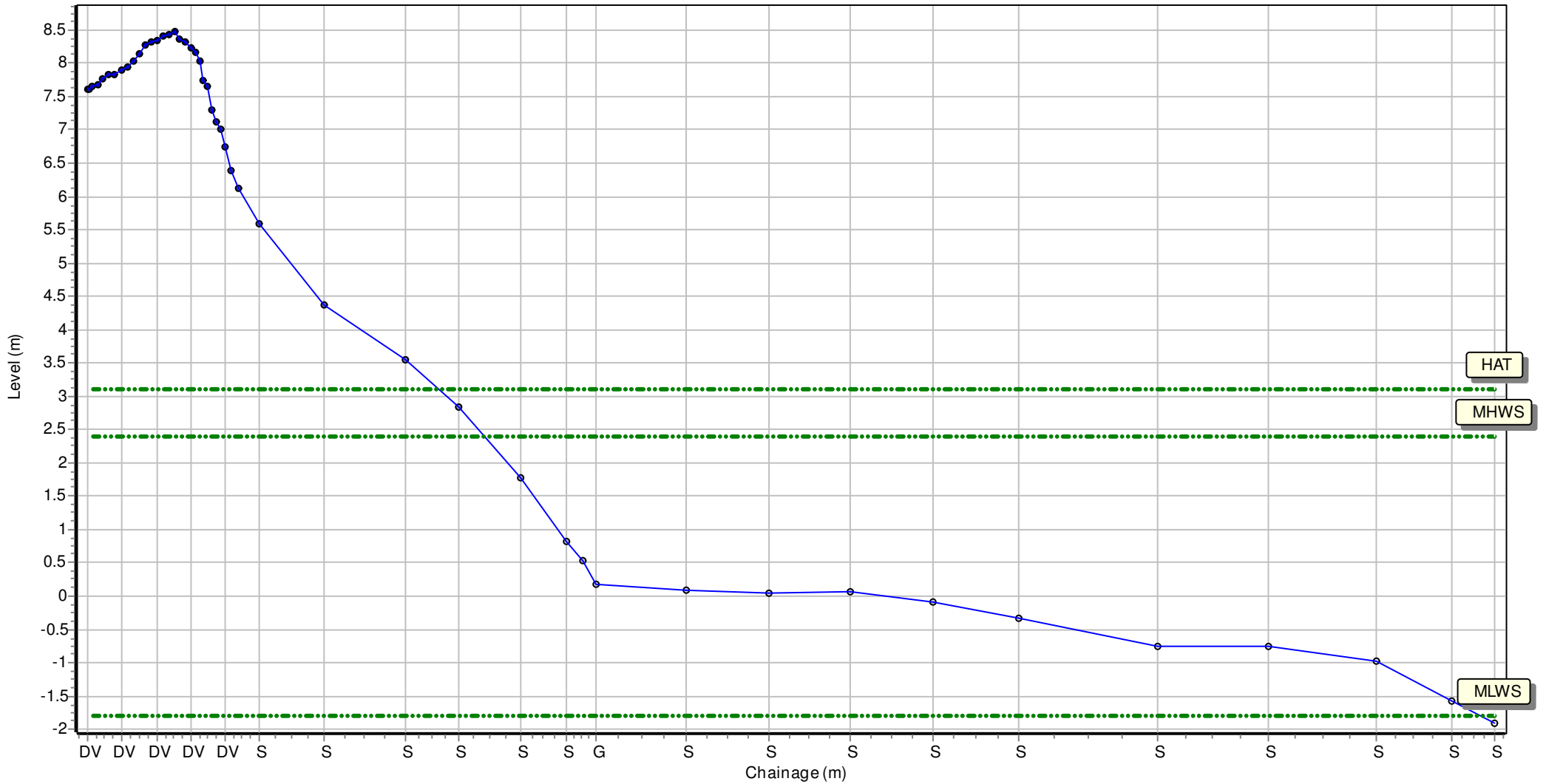
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 432398.19 Northing: 578463.878 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1aBVBC05

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

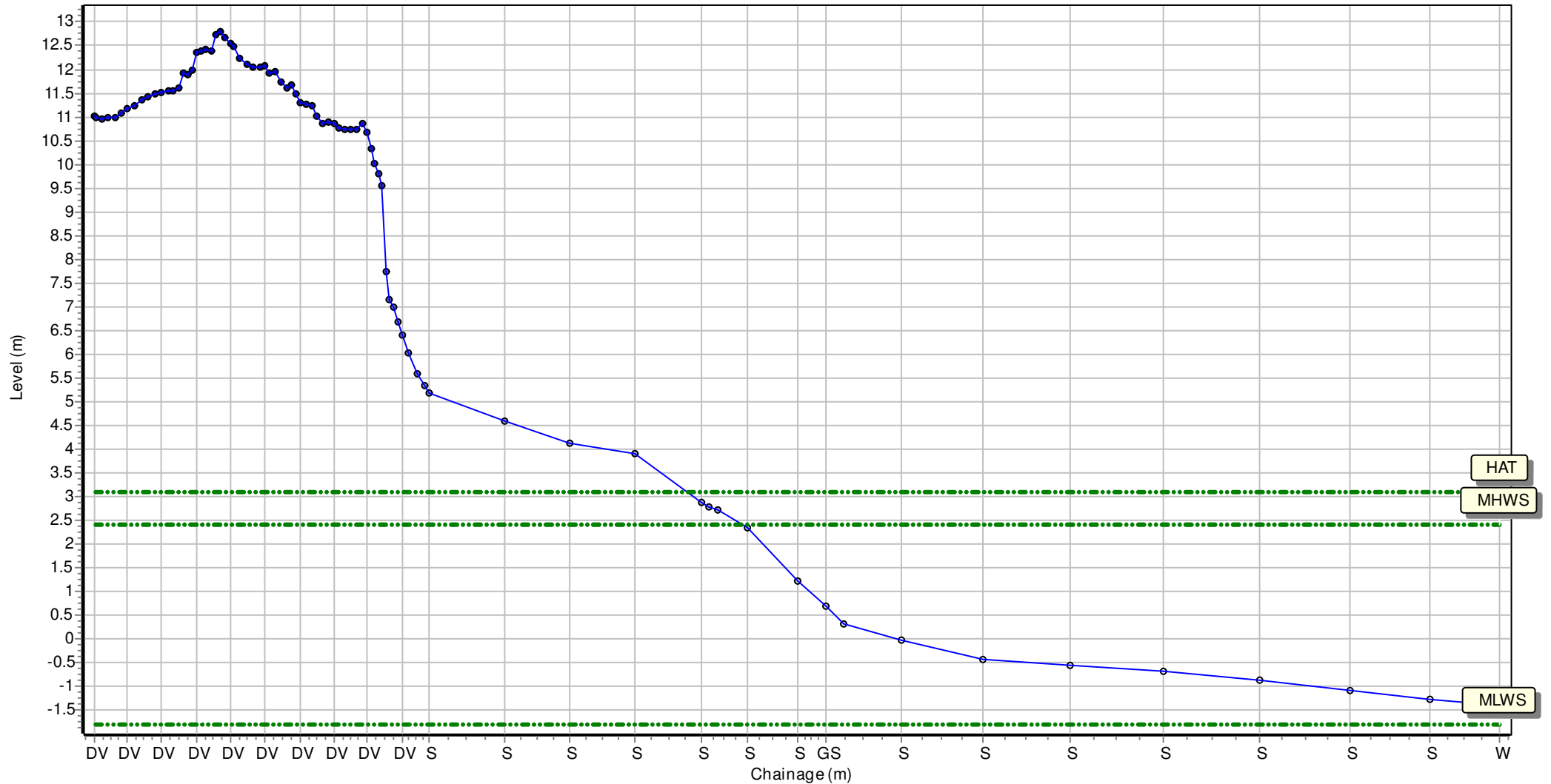
Sea State:

Visibility:

Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 432667.046 Northing: 577891.873 Profile Bearing: 60 ° from North



# Beach Profile

Location: 1aBVBC06

Date: 03/09/2020

Inspector: AG

Low Tide:

Low Tide Time:

Wind

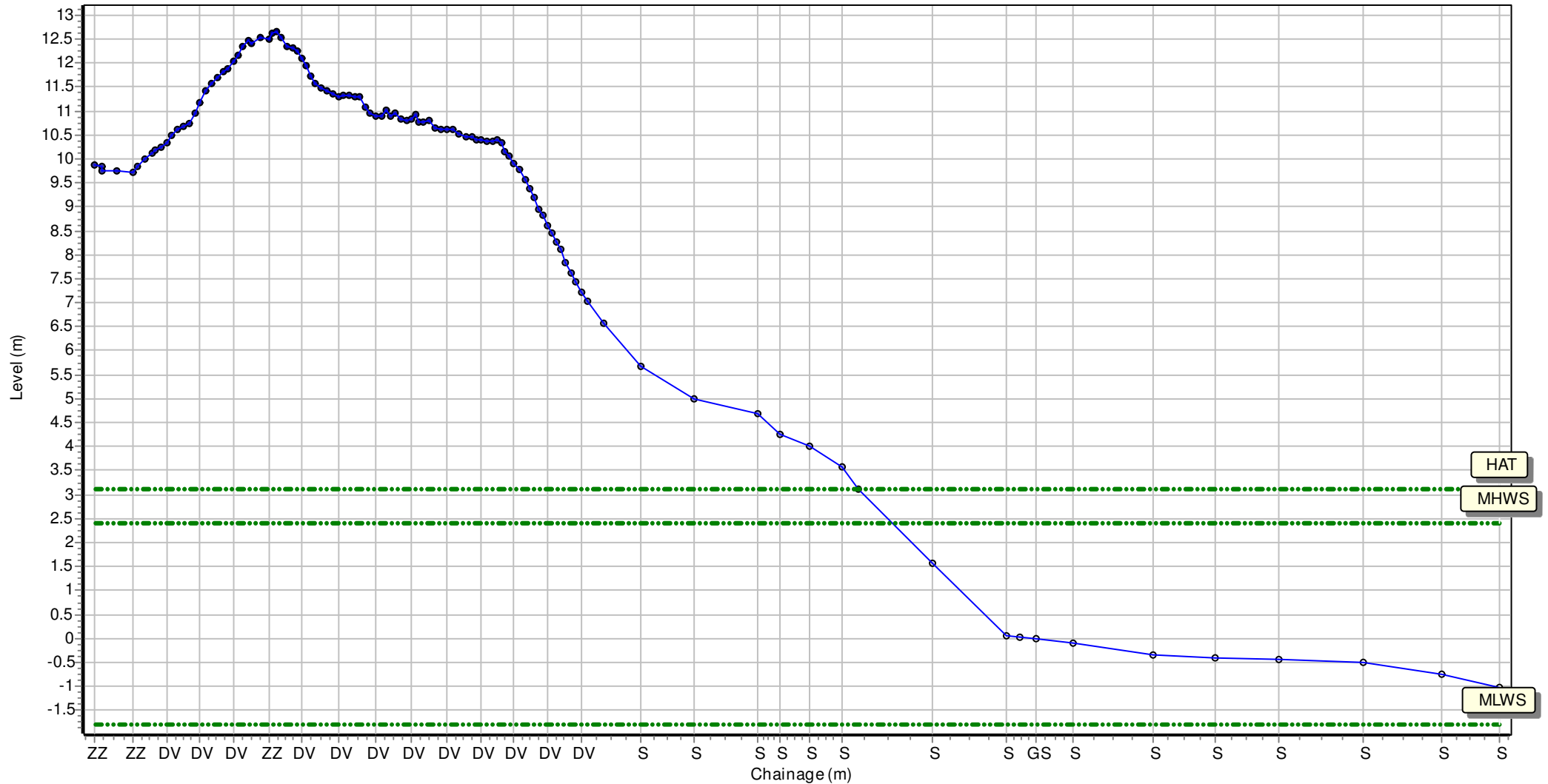
Sea State:

Visibility:

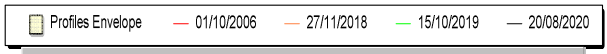
Rain:

Summary: 2020 Full Measures Topo Survey

Easting: 433247.516 Northing: 577032.054 Profile Bearing: 53 ° from North



Beach Profiles: 1aBTBC01



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC02



Profiles Envelope 01/04/2006 15/10/2019 06/05/2020 20/08/2020

HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC03



Profiles Envelope 01/10/2006 27/11/2018 15/10/2019 20/08/2020

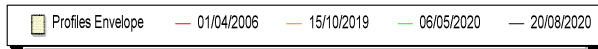
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC04



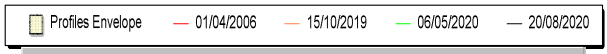
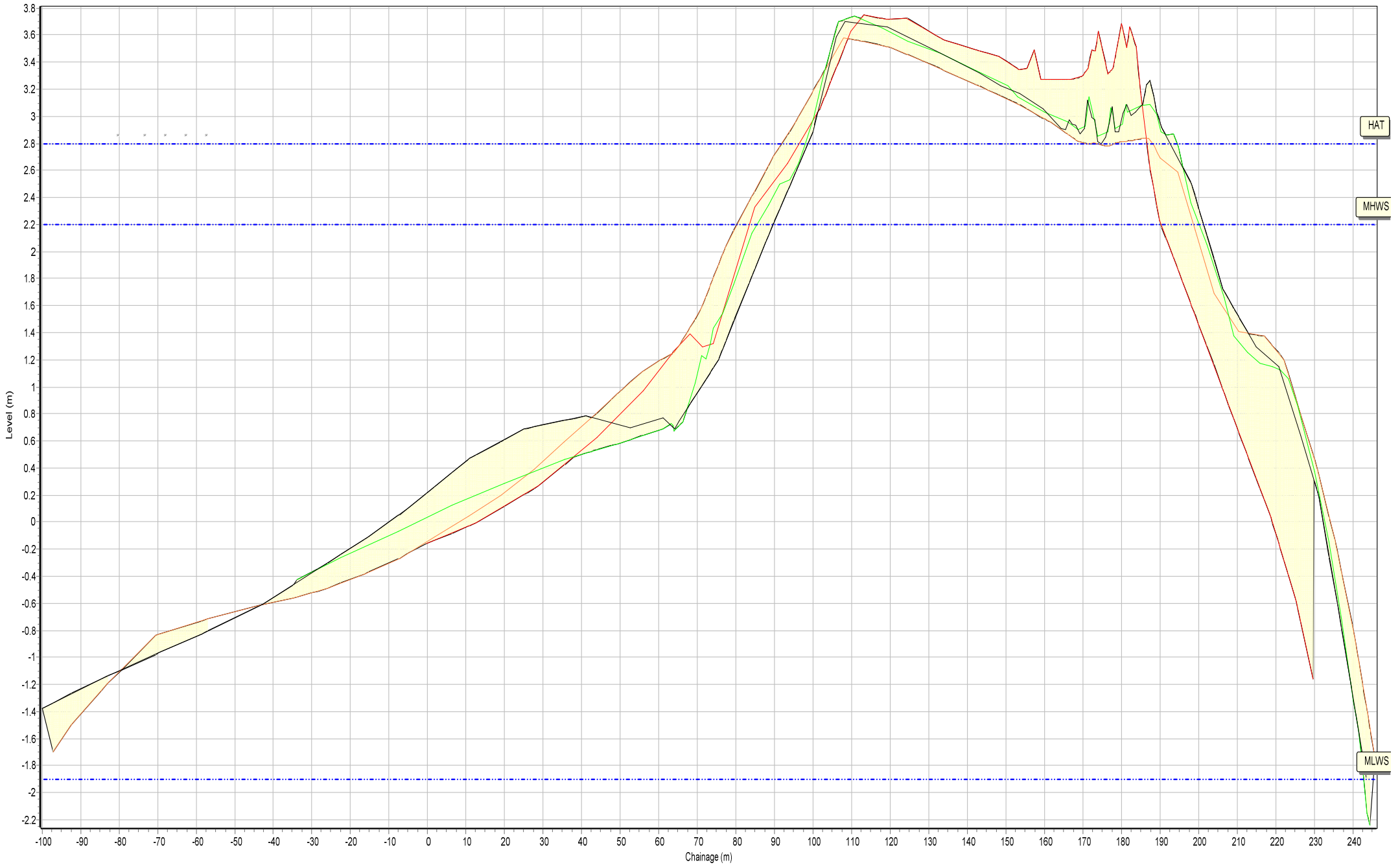
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC05



HAT

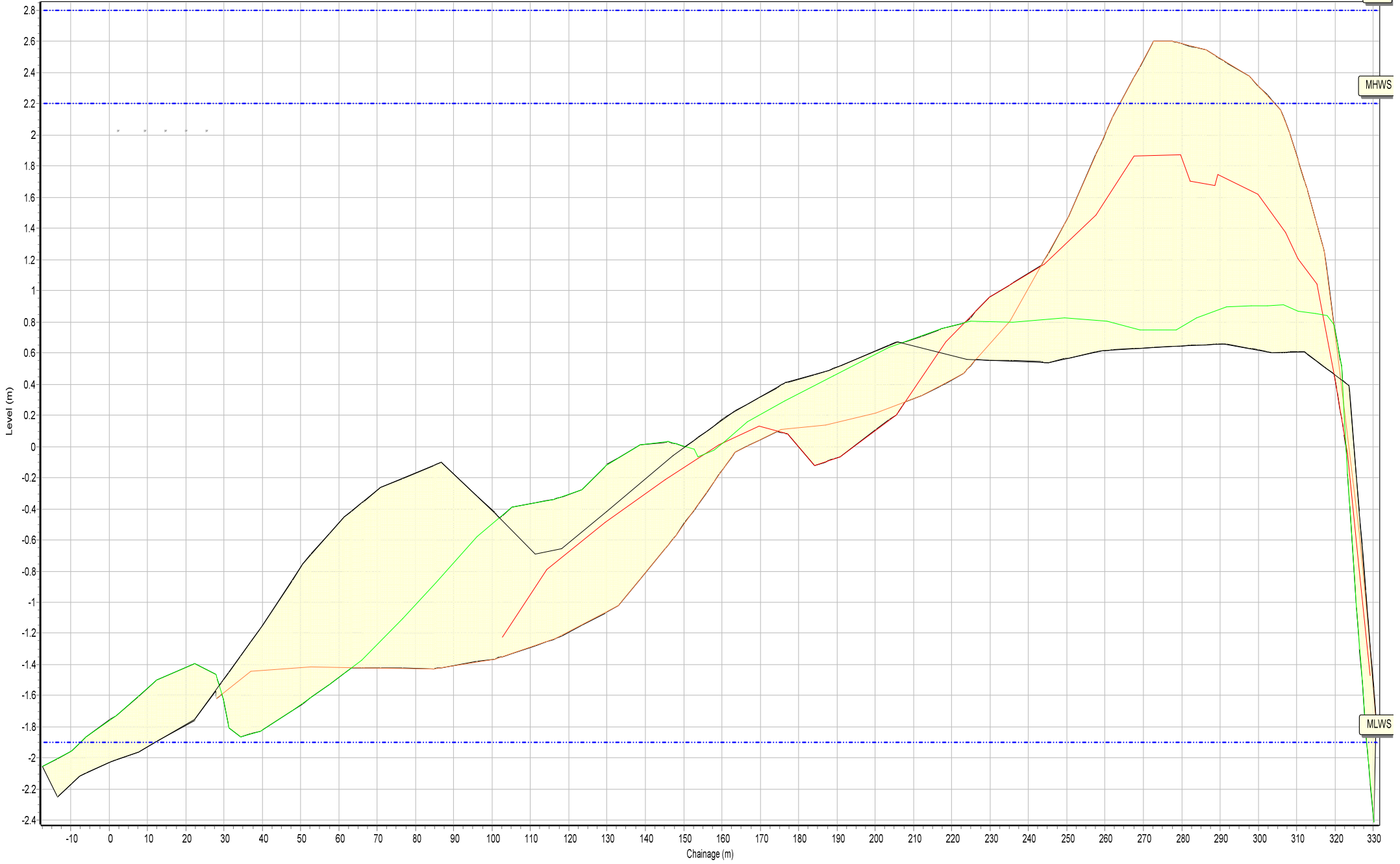
MHWS

MLWS

SANDS



Beach Profiles: 1aBTBC06



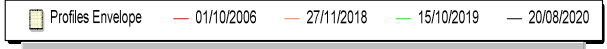
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC07



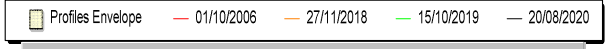
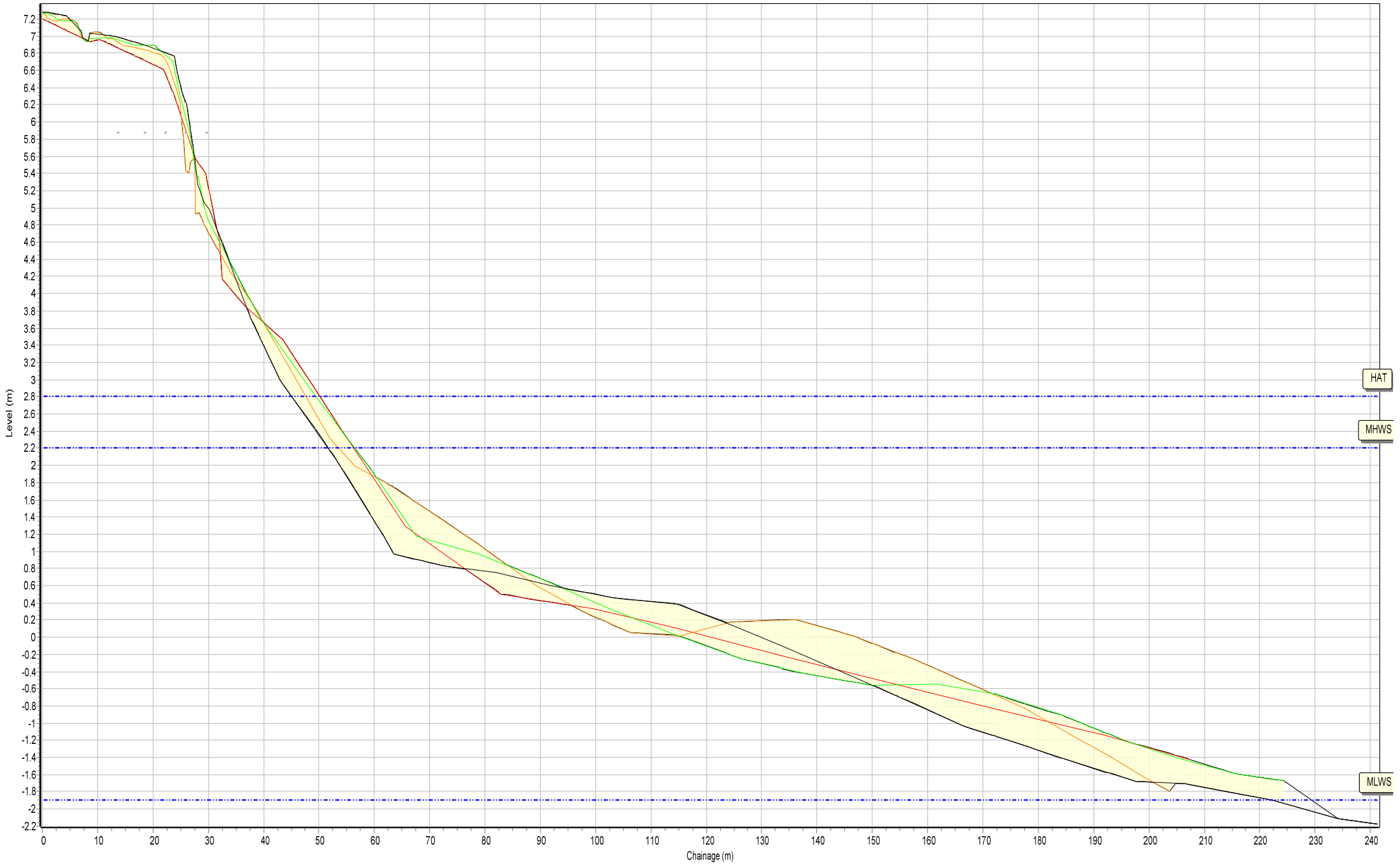
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC08



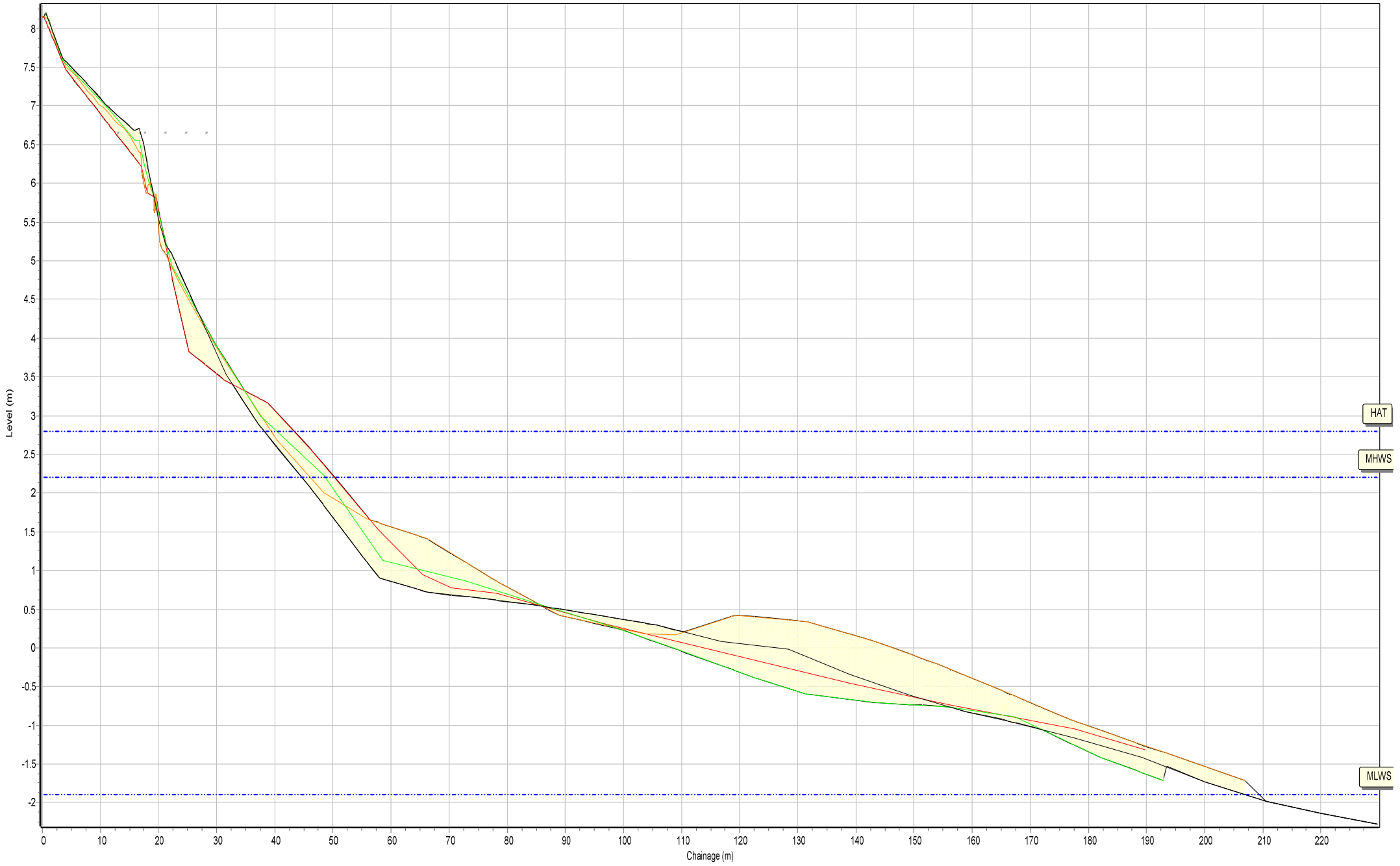
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC09



Profiles Envelope 01/10/2006 27/11/2018 15/10/2019 20/08/2020

HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC10



Profiles Envelope 01/10/2006 27/11/2018 15/10/2019 20/08/2020

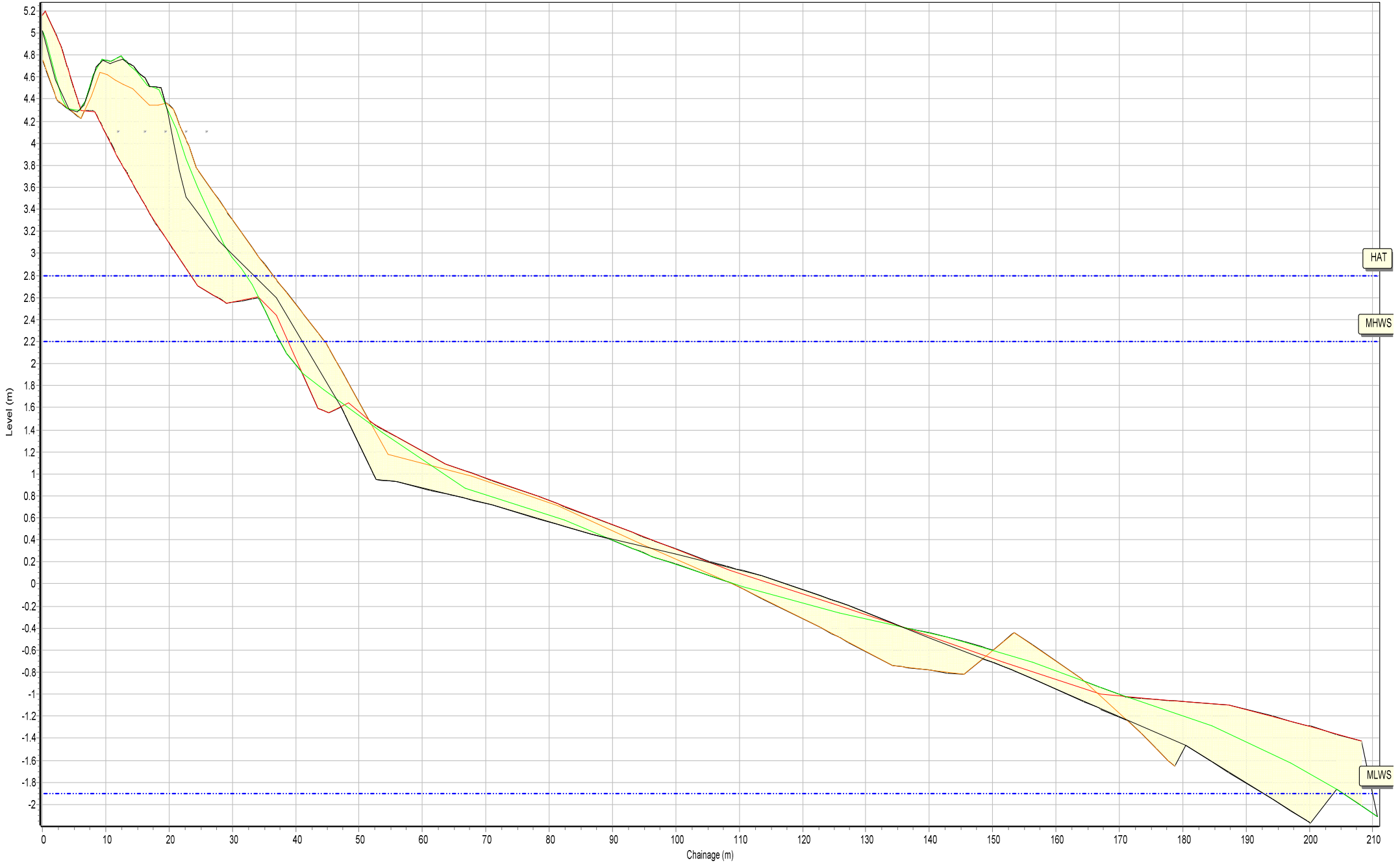
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC11



Profiles Envelope 01/04/2006 15/10/2019 06/05/2020 20/08/2020

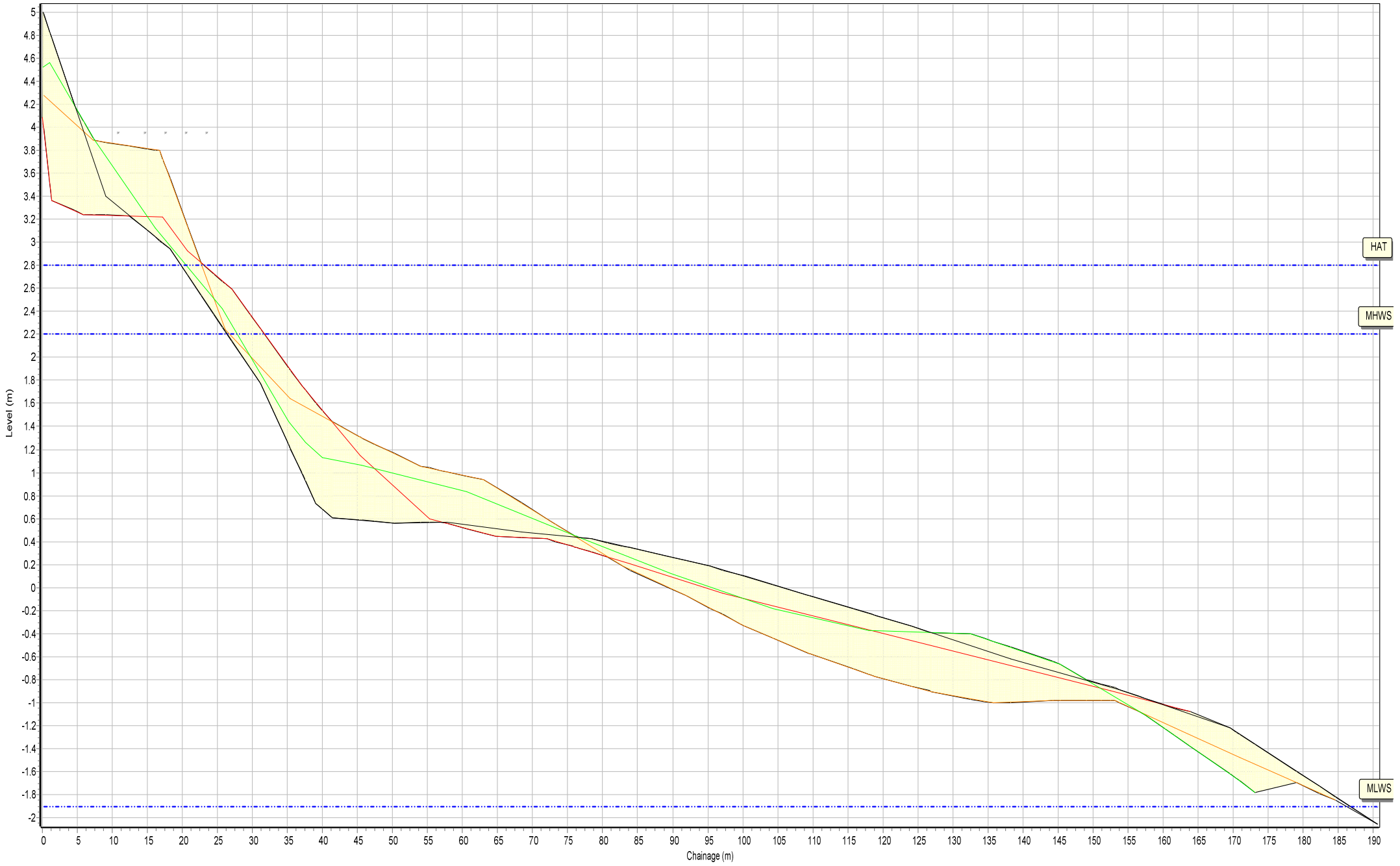
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC12



Profiles Envelope 01/10/2006 27/11/2018 15/10/2019 20/08/2020

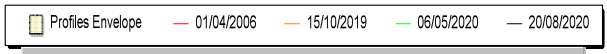
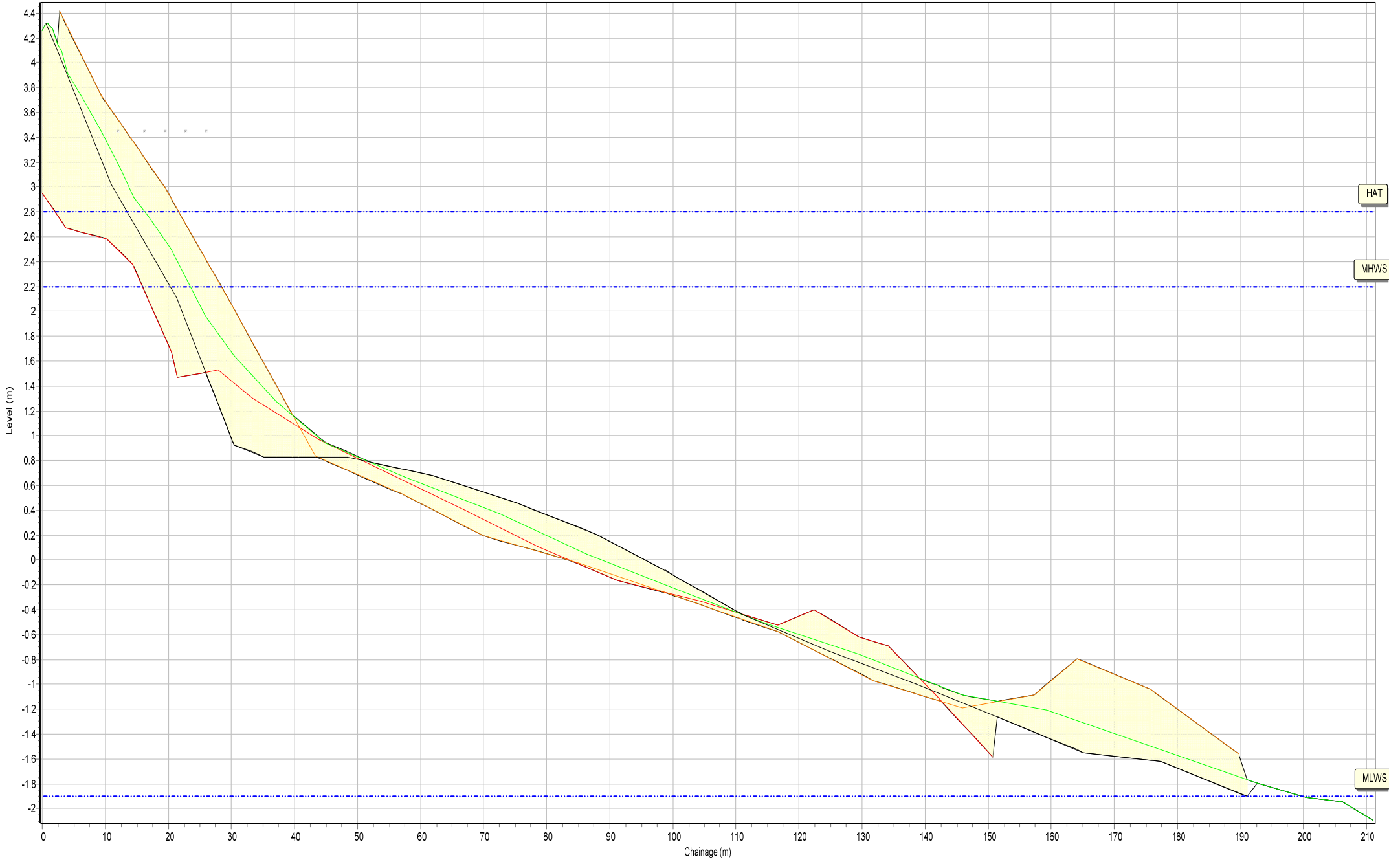
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC13



HAT

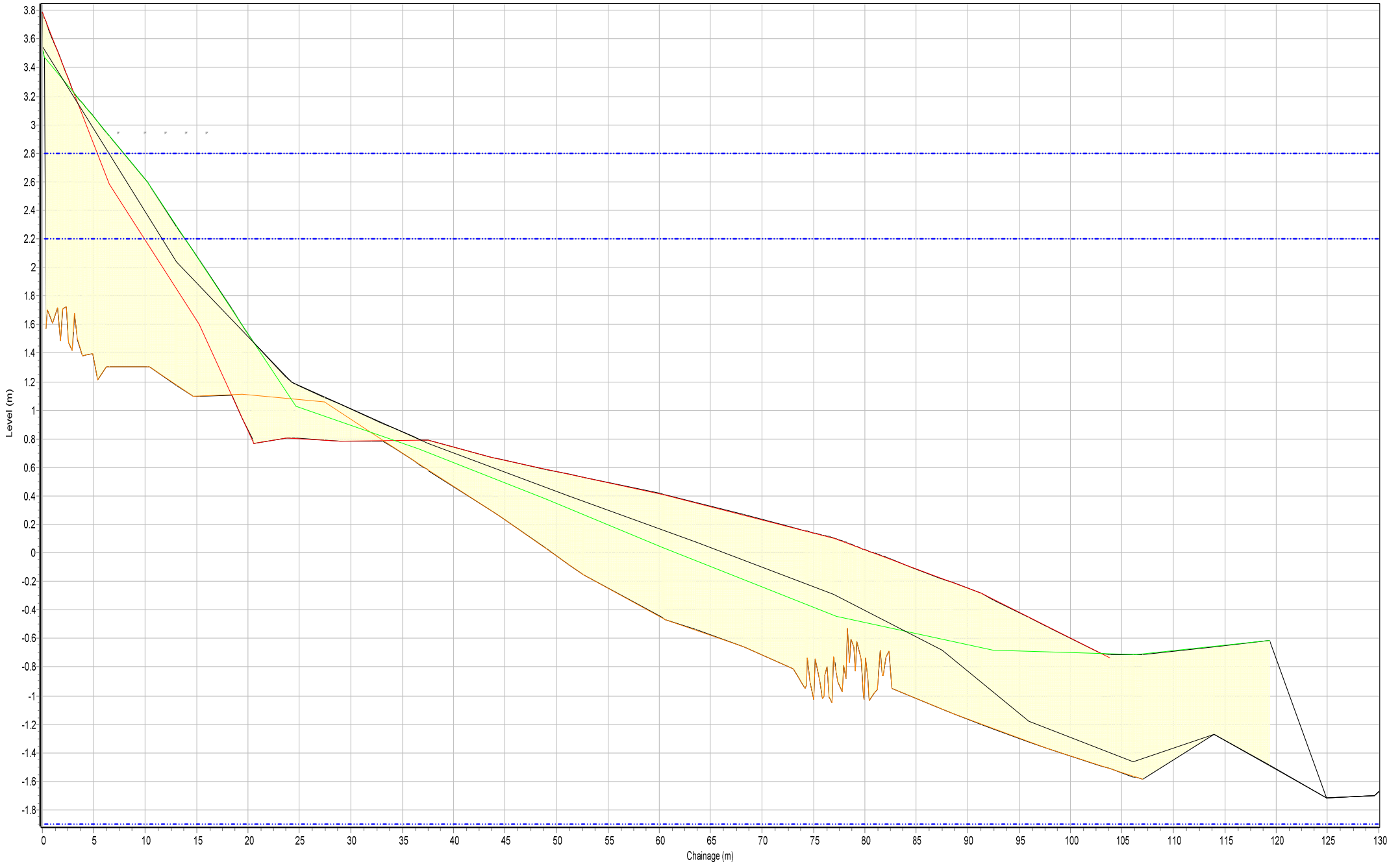
MHWS

MLWS

SANDS



Beach Profiles: 1aBTC14



Beach Profiles: 1aBTBC15



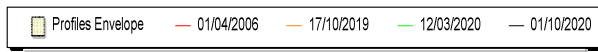
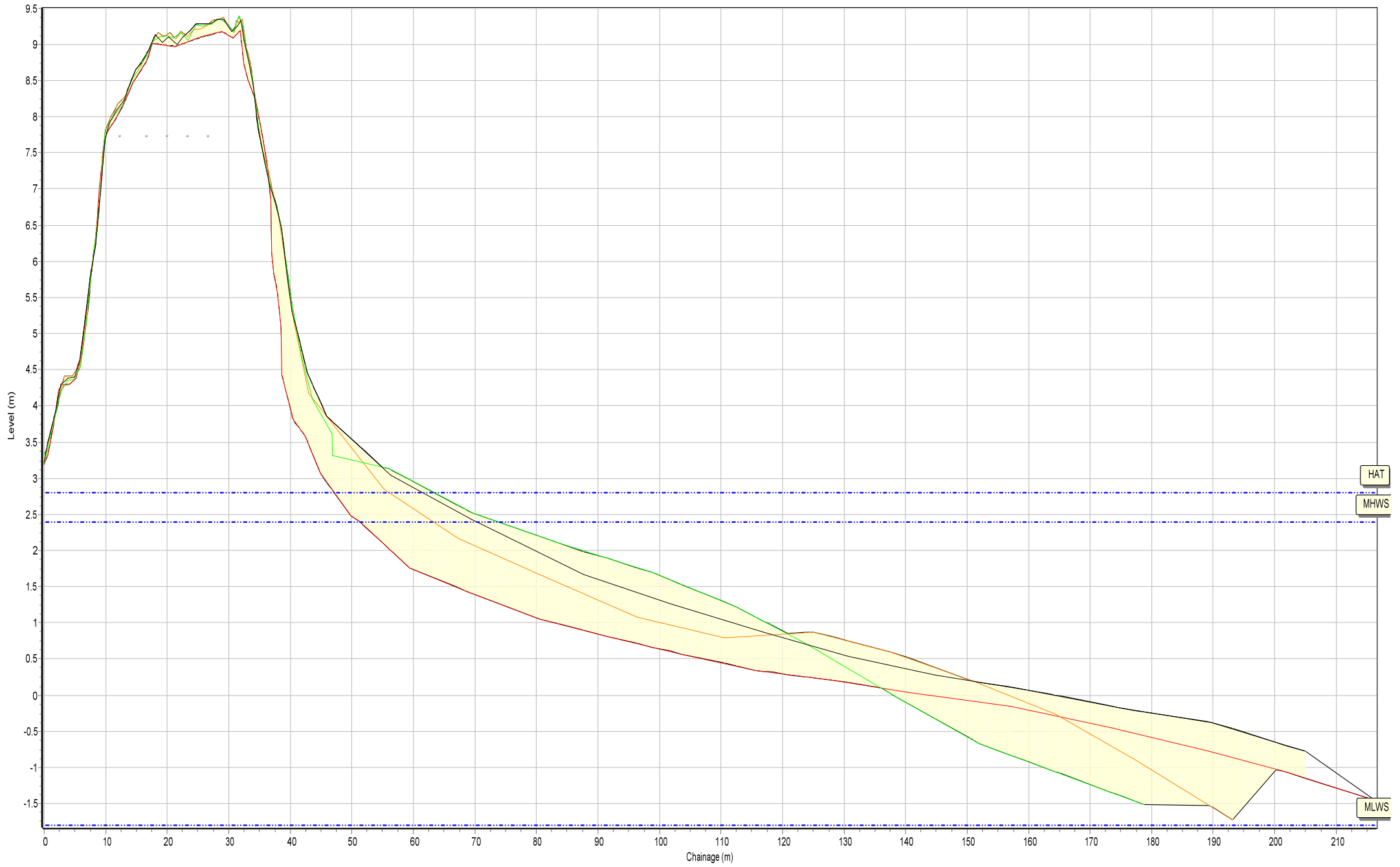
Profiles Envelope 01/10/2006 26/11/2018 17/10/2019 01/10/2020

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC16



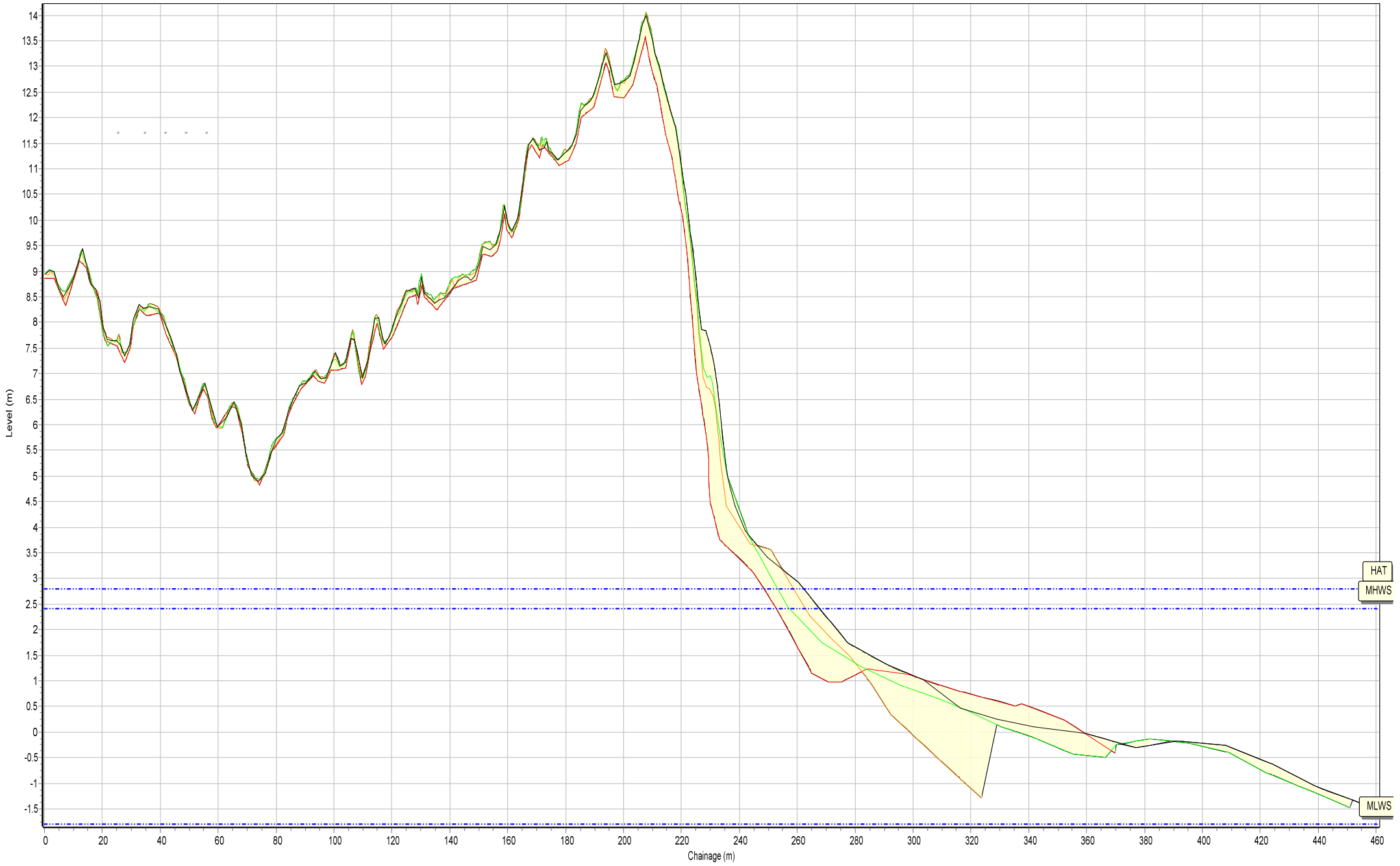
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC17



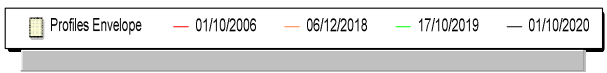
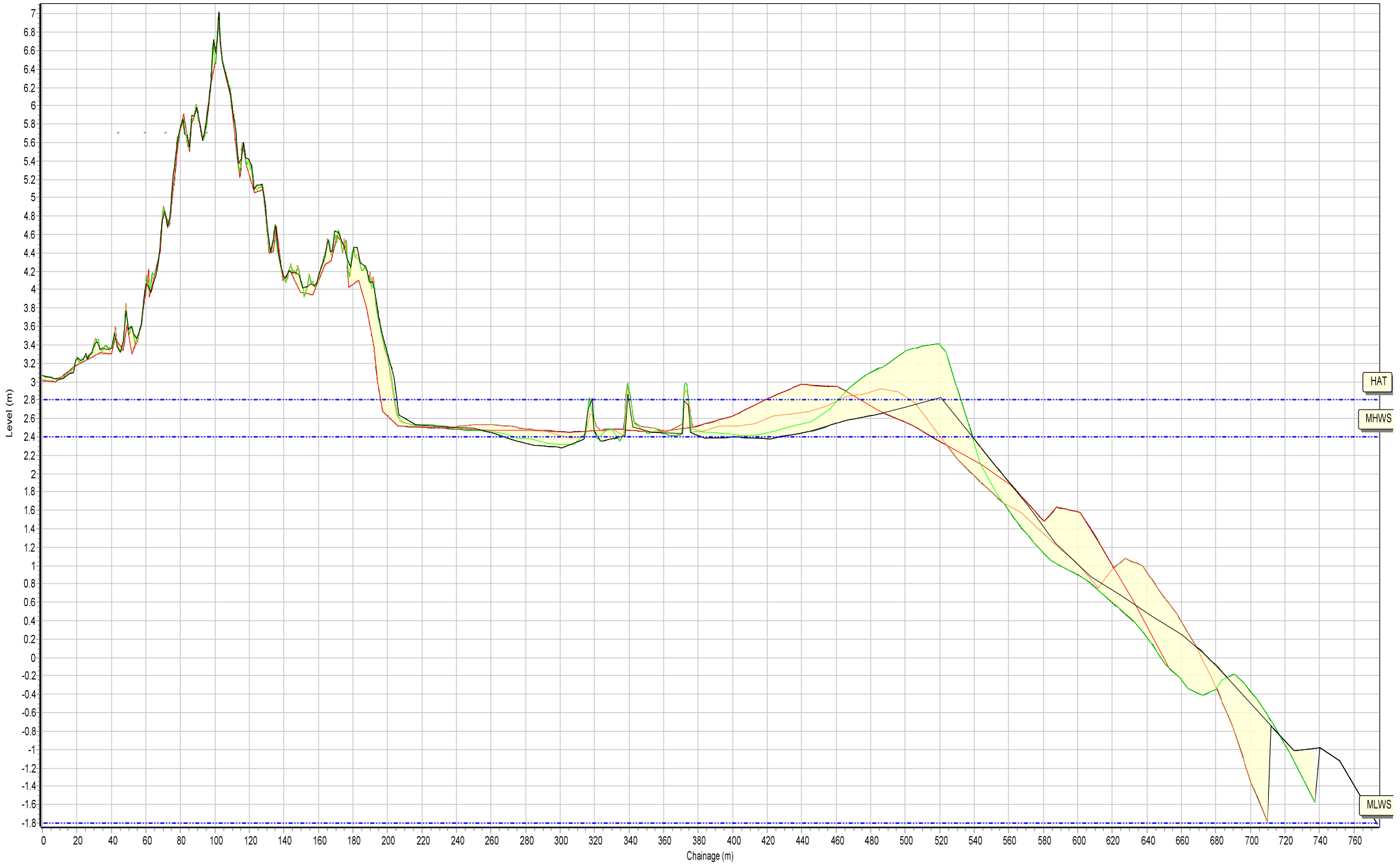
Profiles Envelope 01/10/2006 26/11/2018 17/10/2019 01/10/2020

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC18



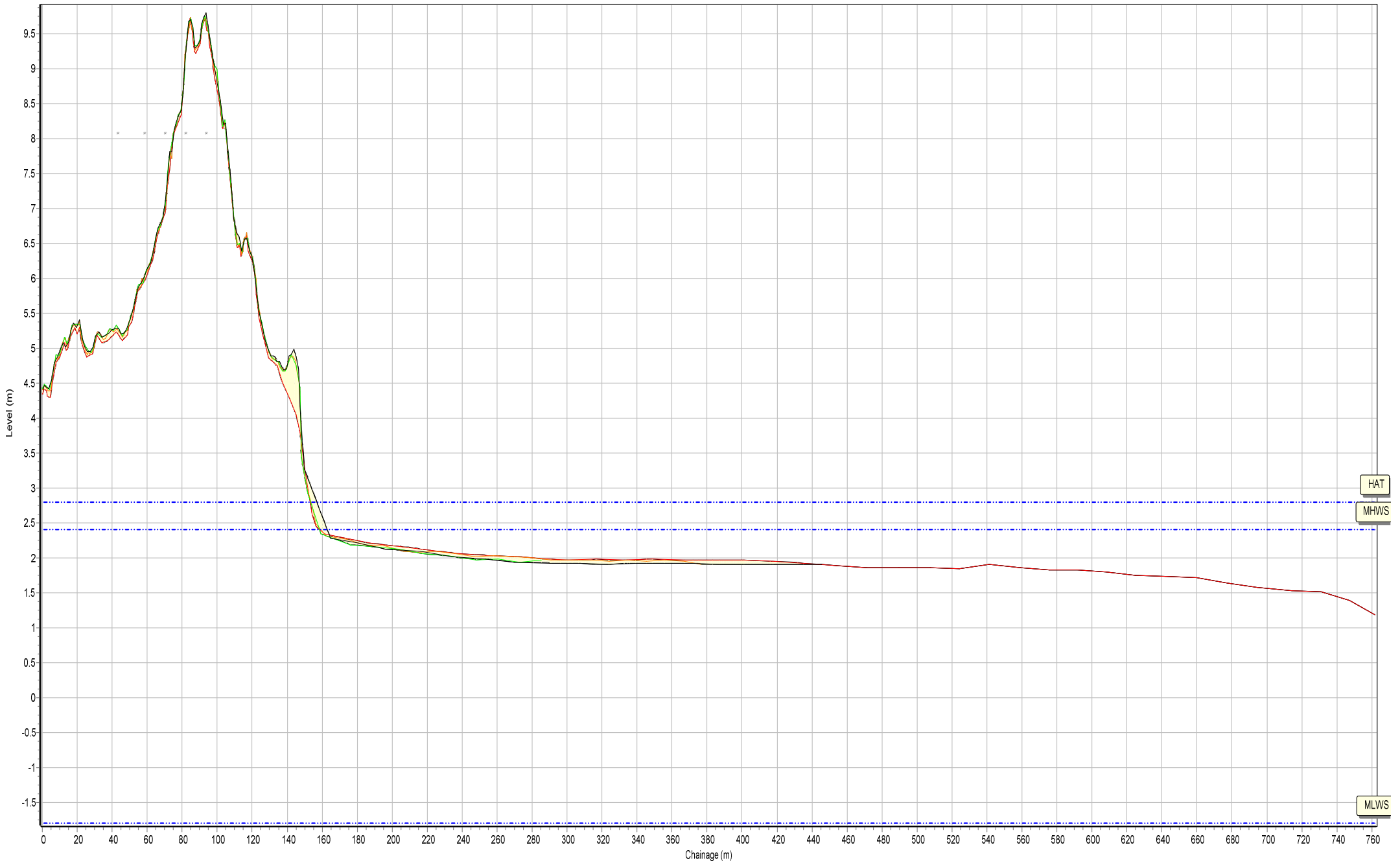
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC19



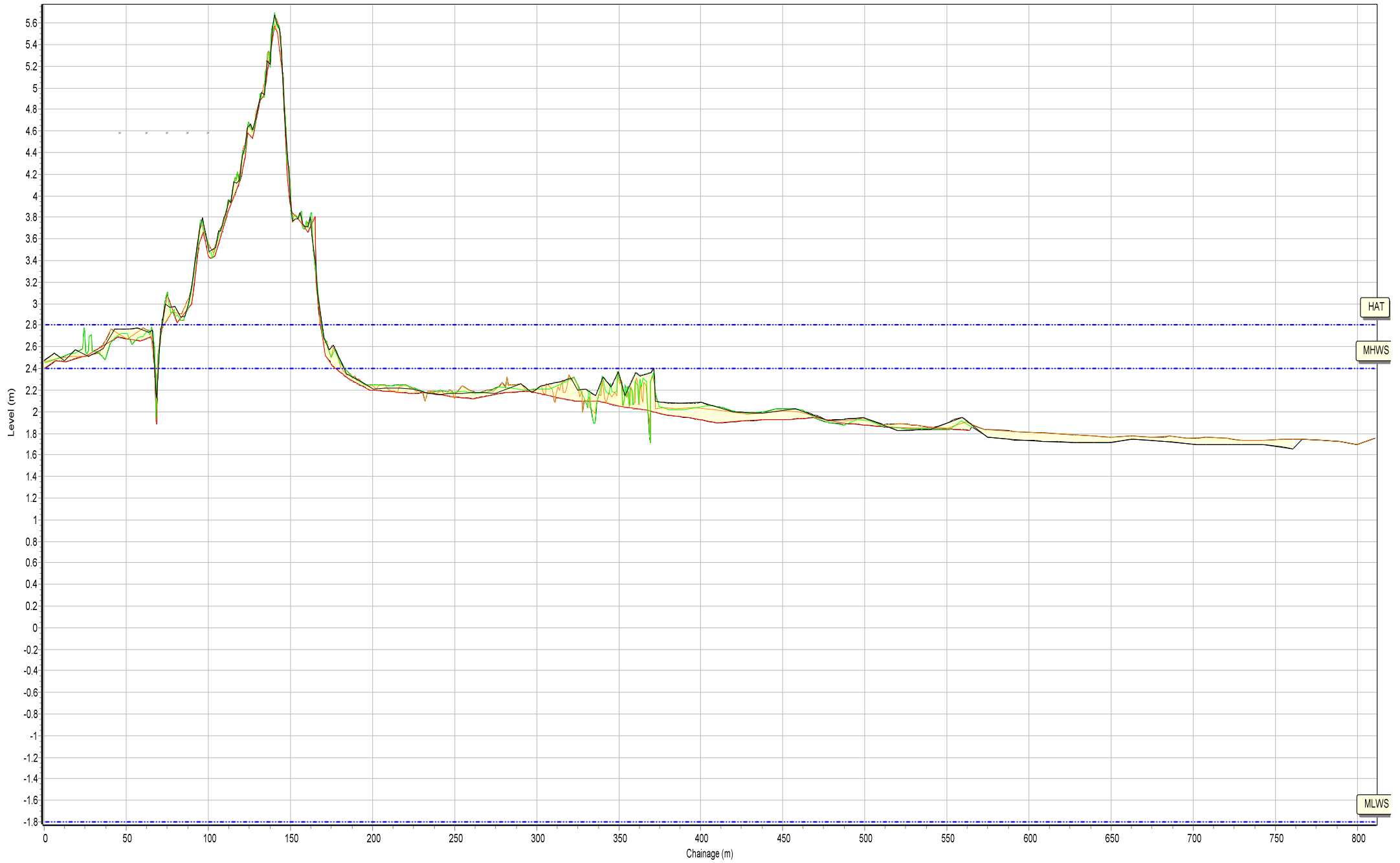
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aBTBC20



Profiles Envelope 01/10/2007 06/12/2018 17/10/2019 01/10/2020

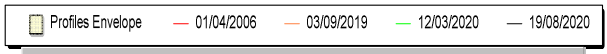
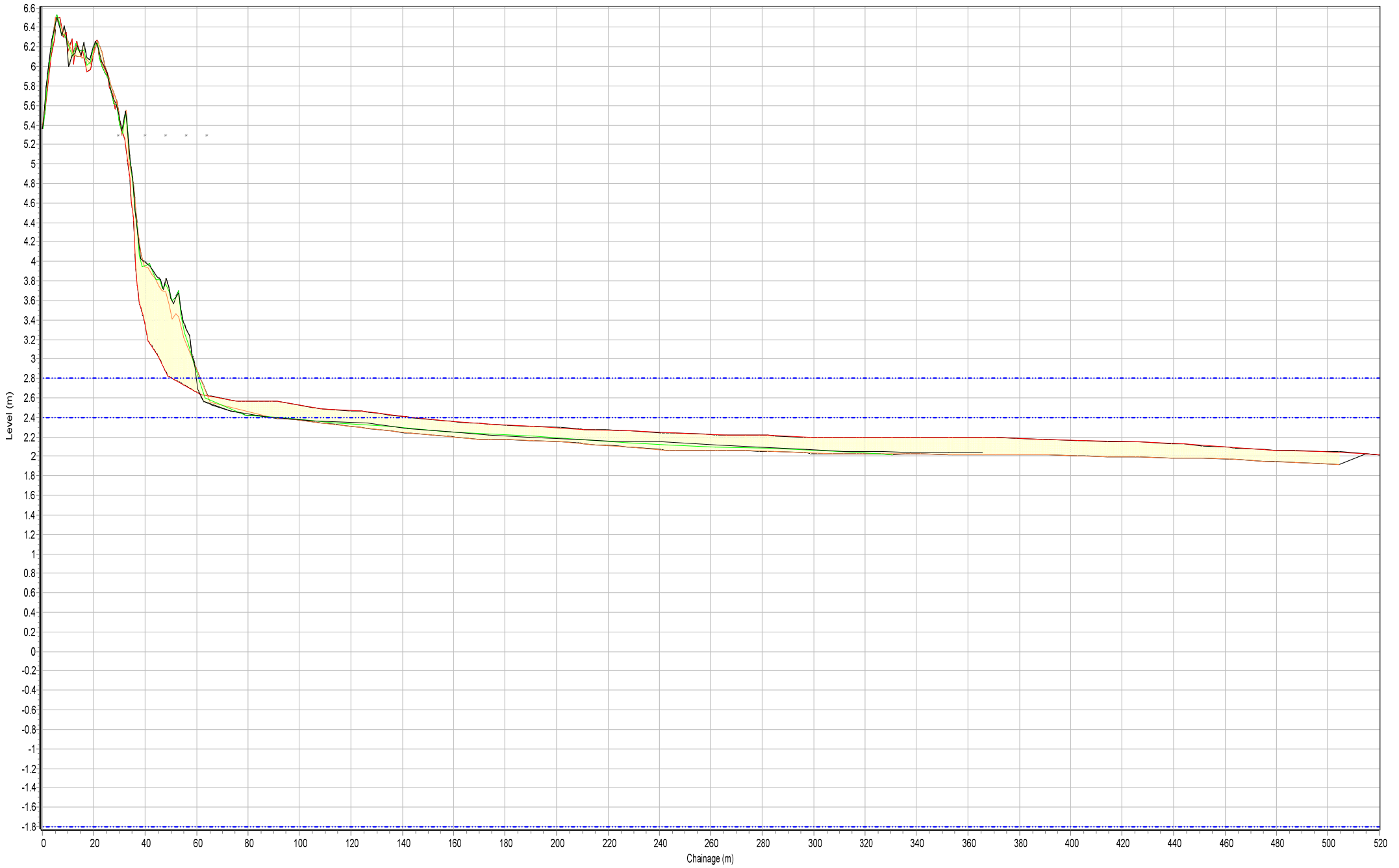
HAT

MHWS

MLWS

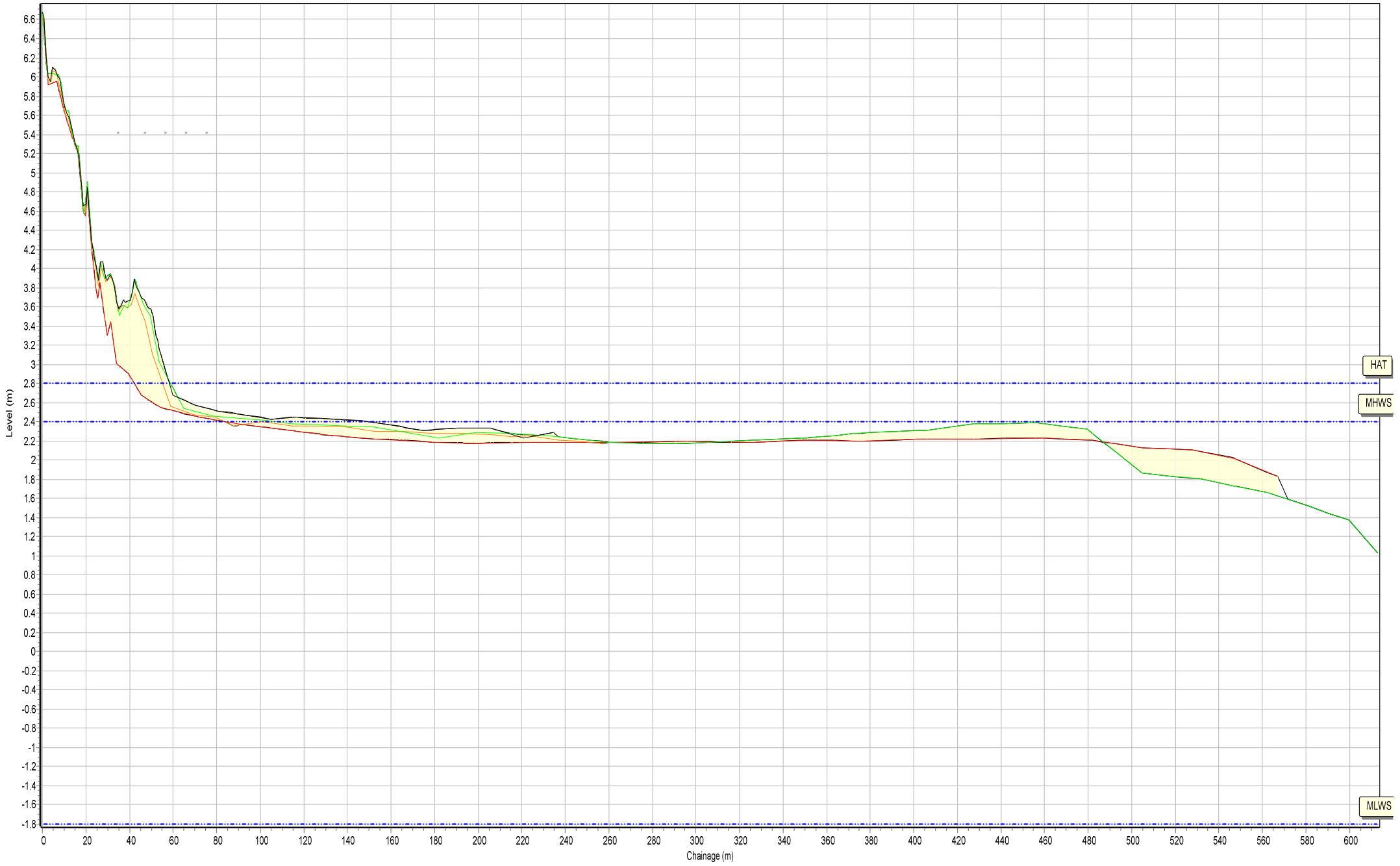
SANDS

Beach Profiles: 1aBTBC21





Beach Profiles: 1aBTBC22



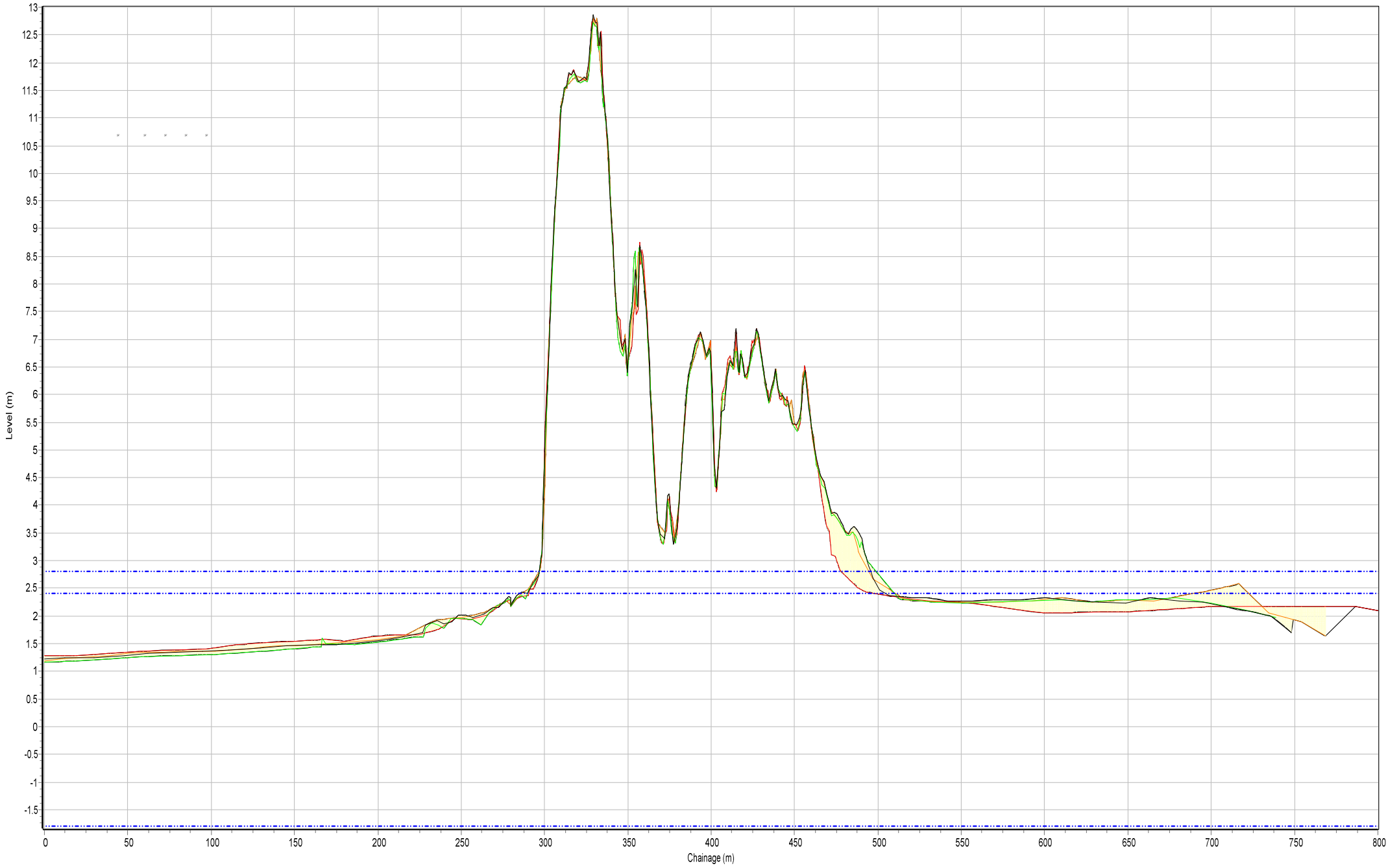
HAT

MHWs

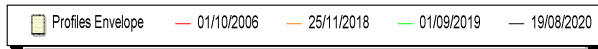
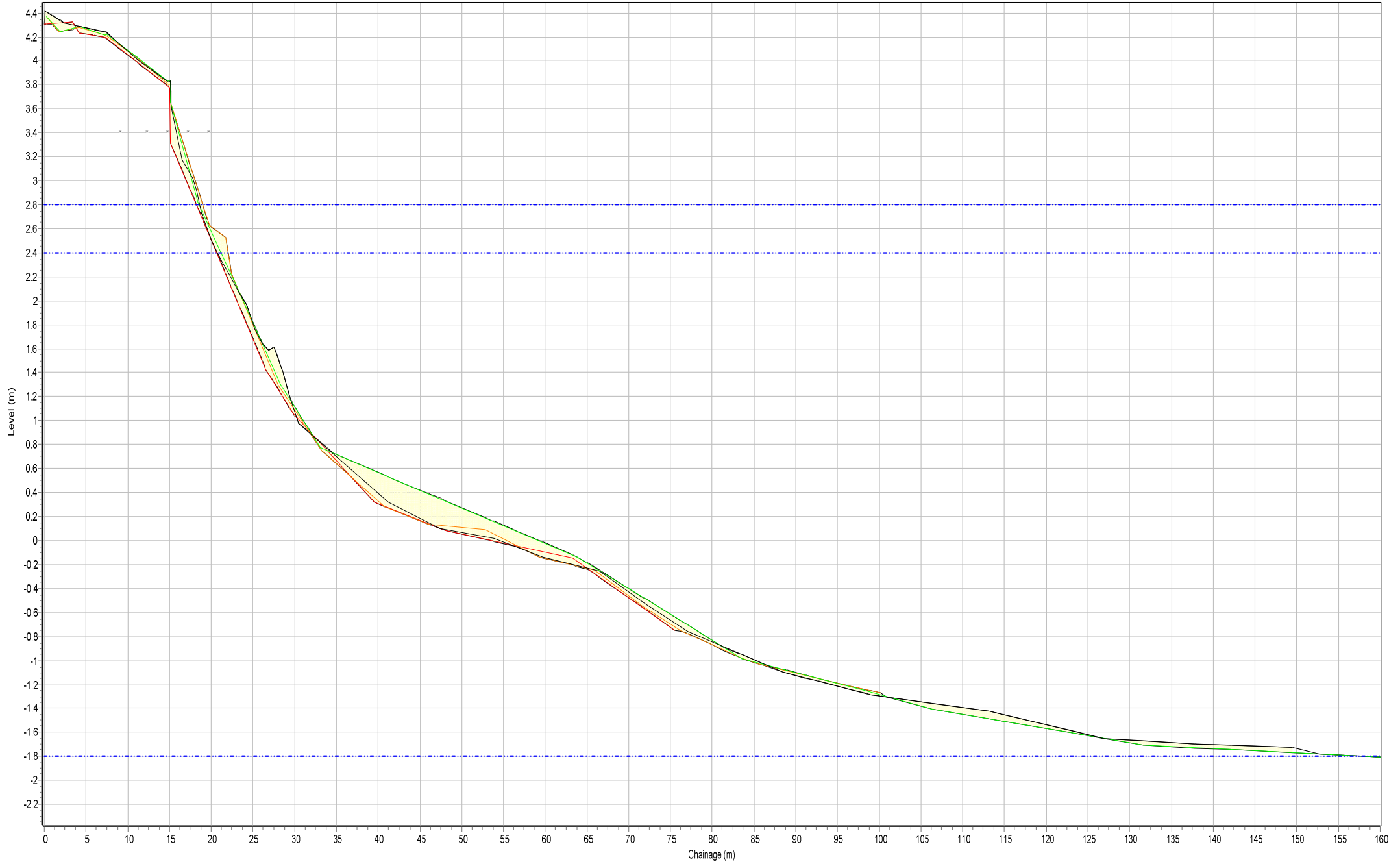
MLWS

SANDS

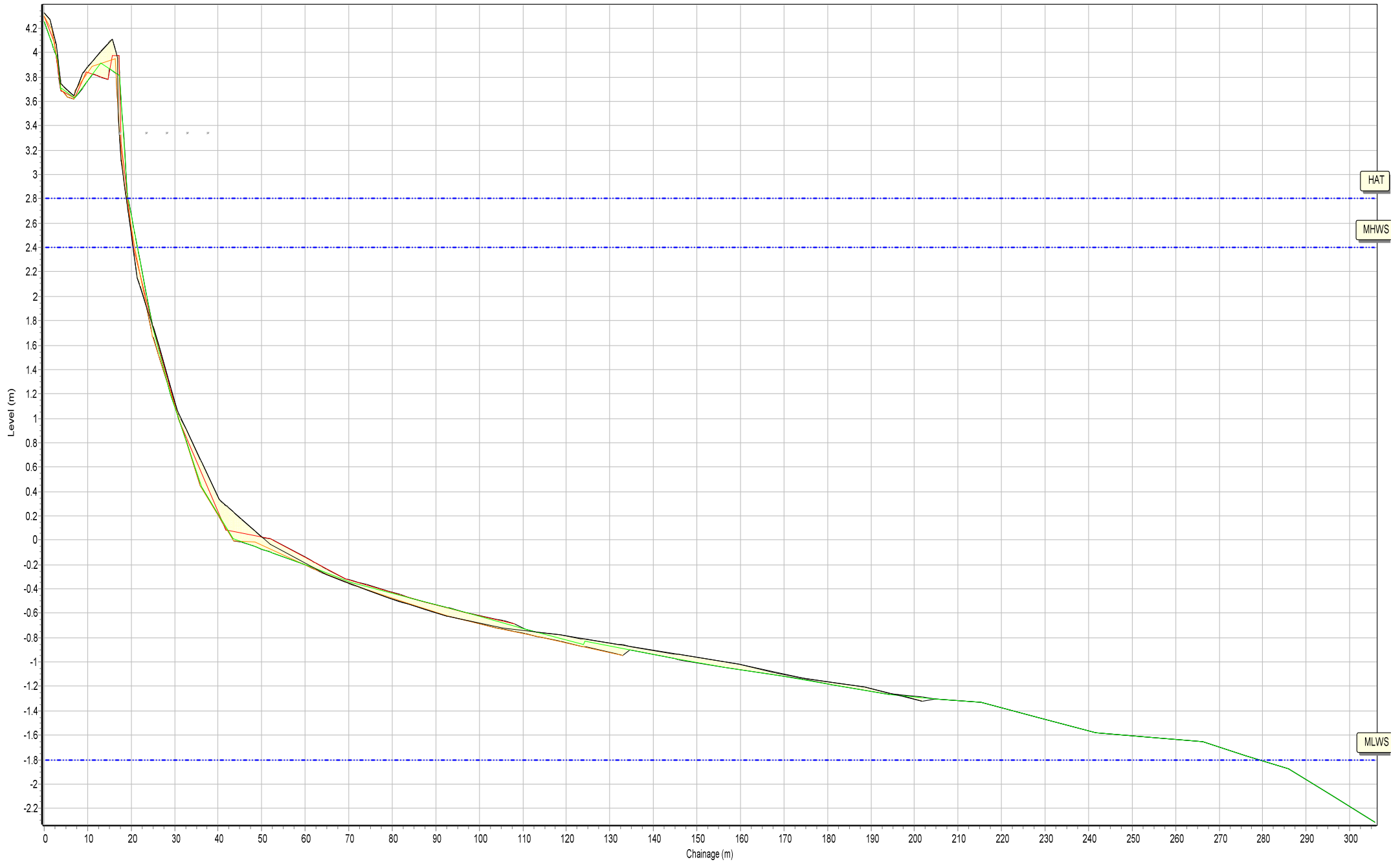
Beach Profiles: 1aBTBC23



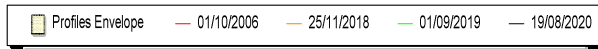
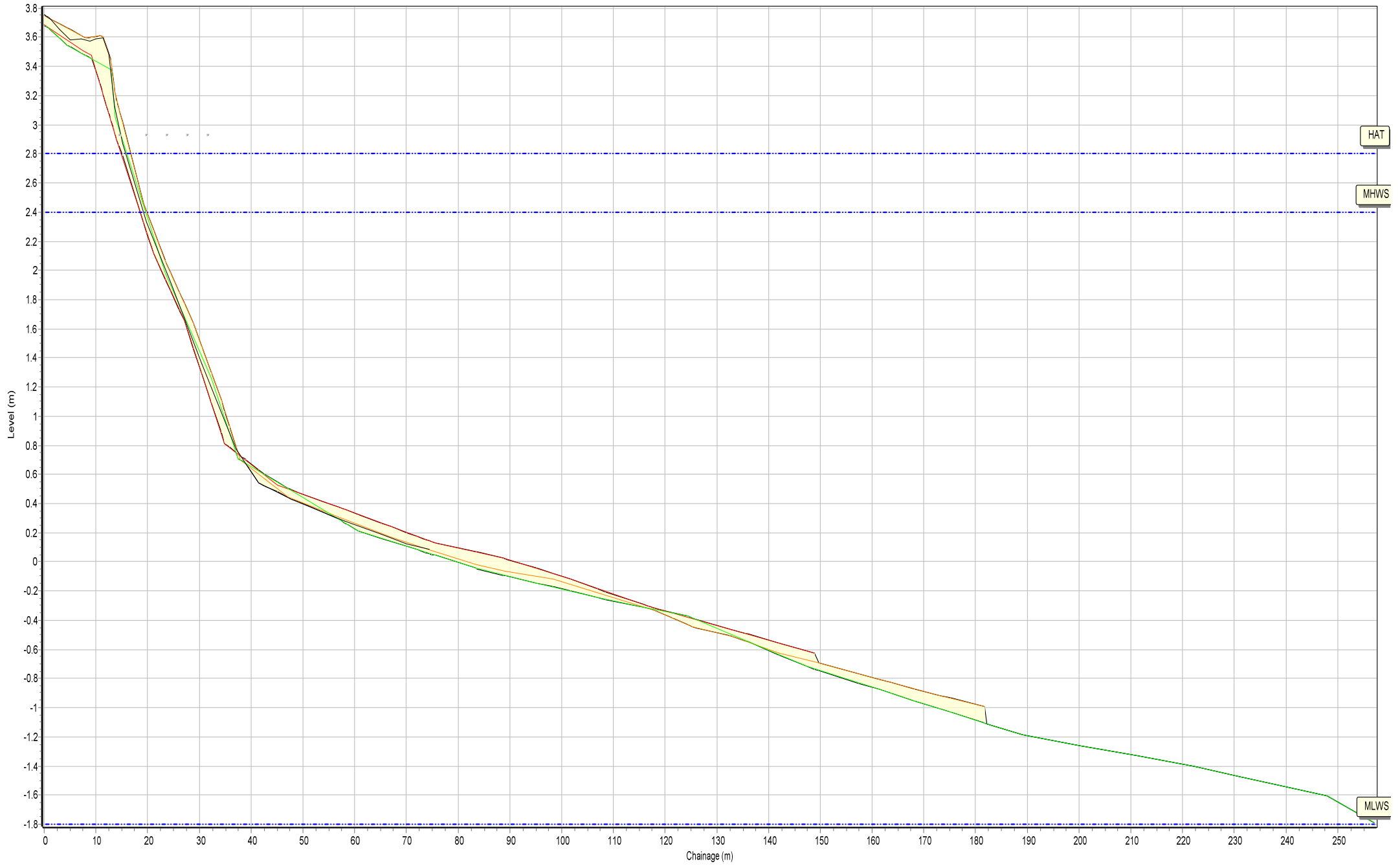
# Beach Profiles: 1aBTBC24



# Beach Profiles: 1aBTBC25



Beach Profiles: 1aBTC26



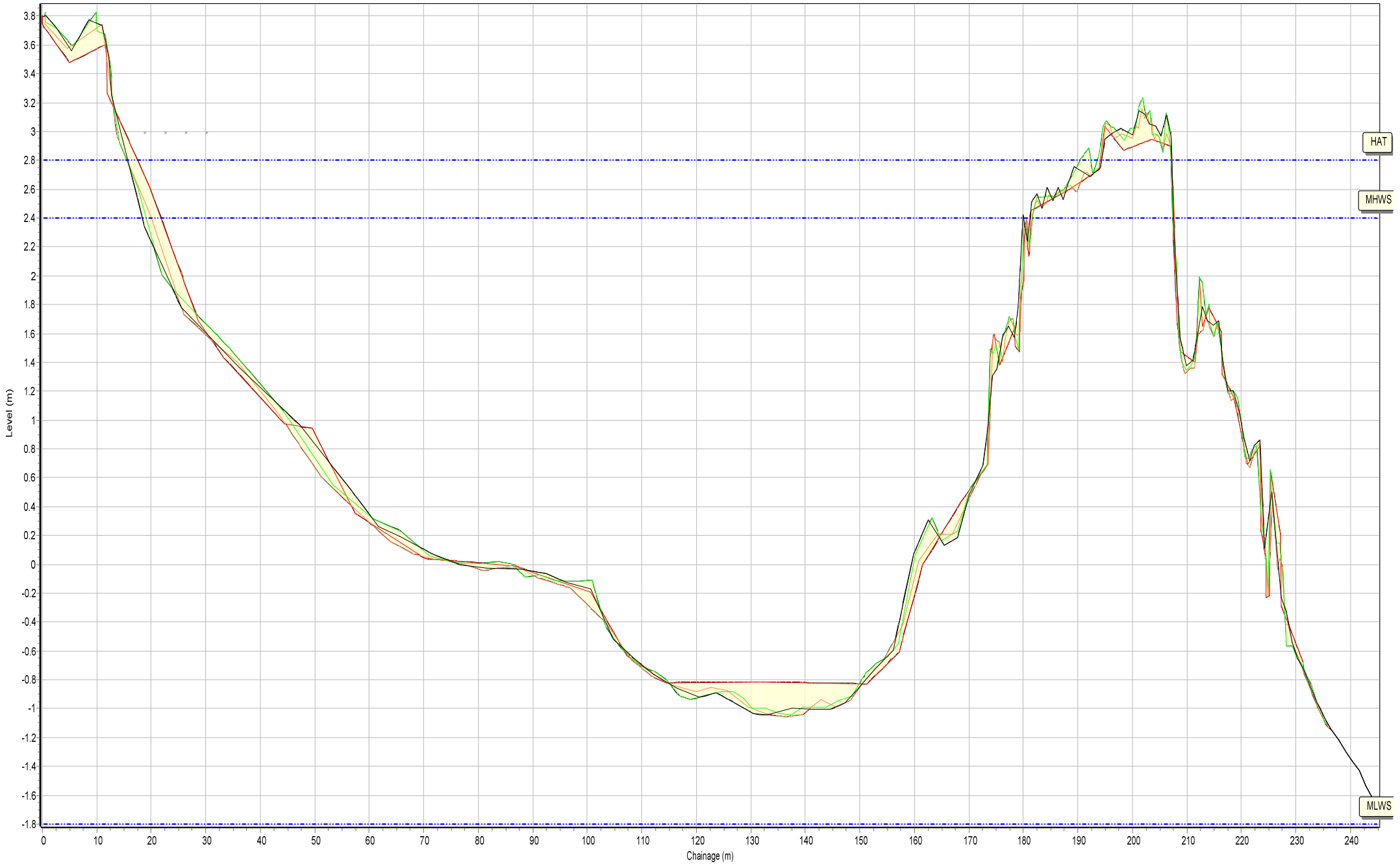
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC27



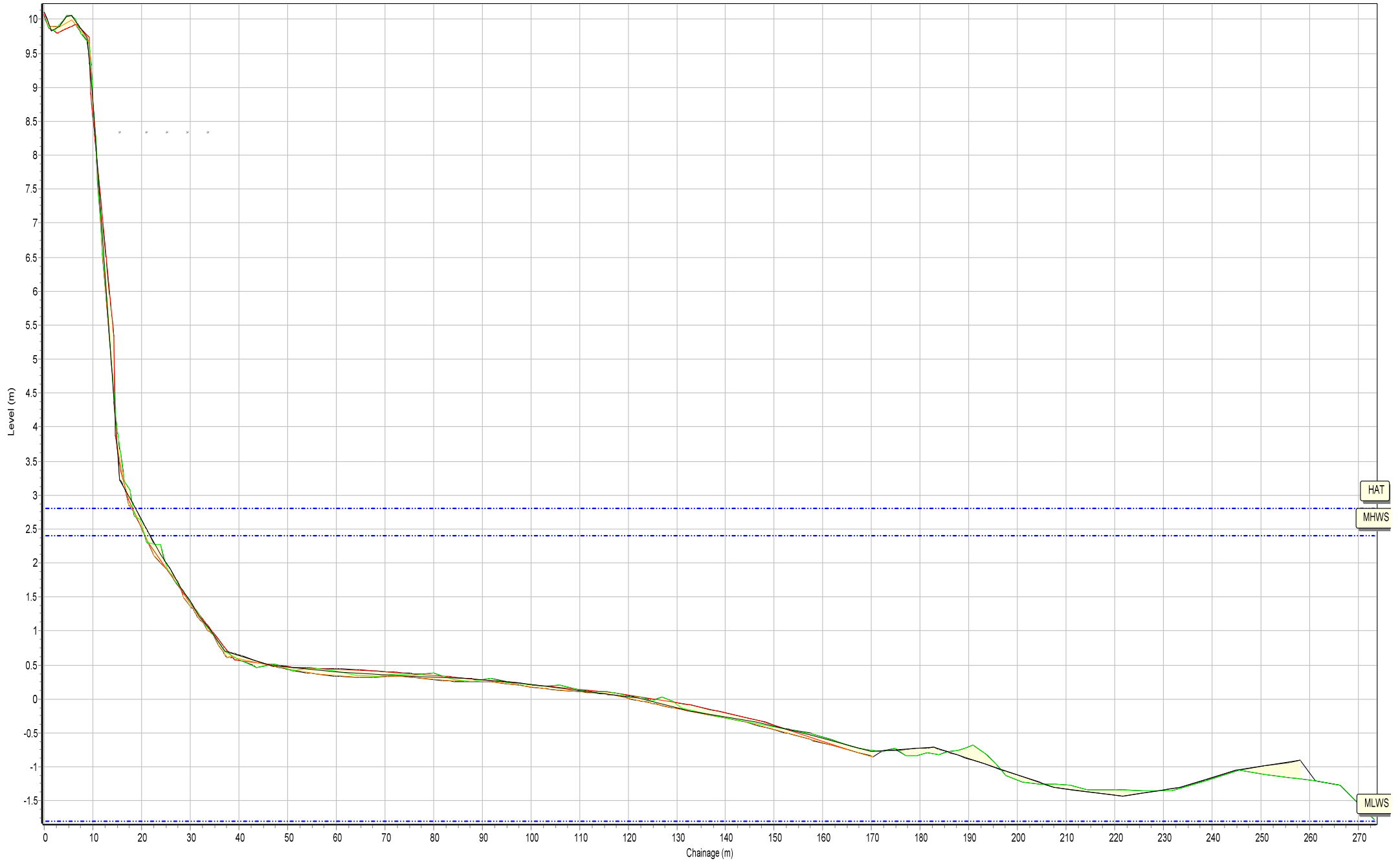
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC28



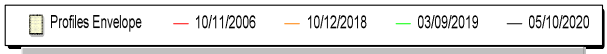
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC29



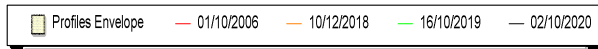
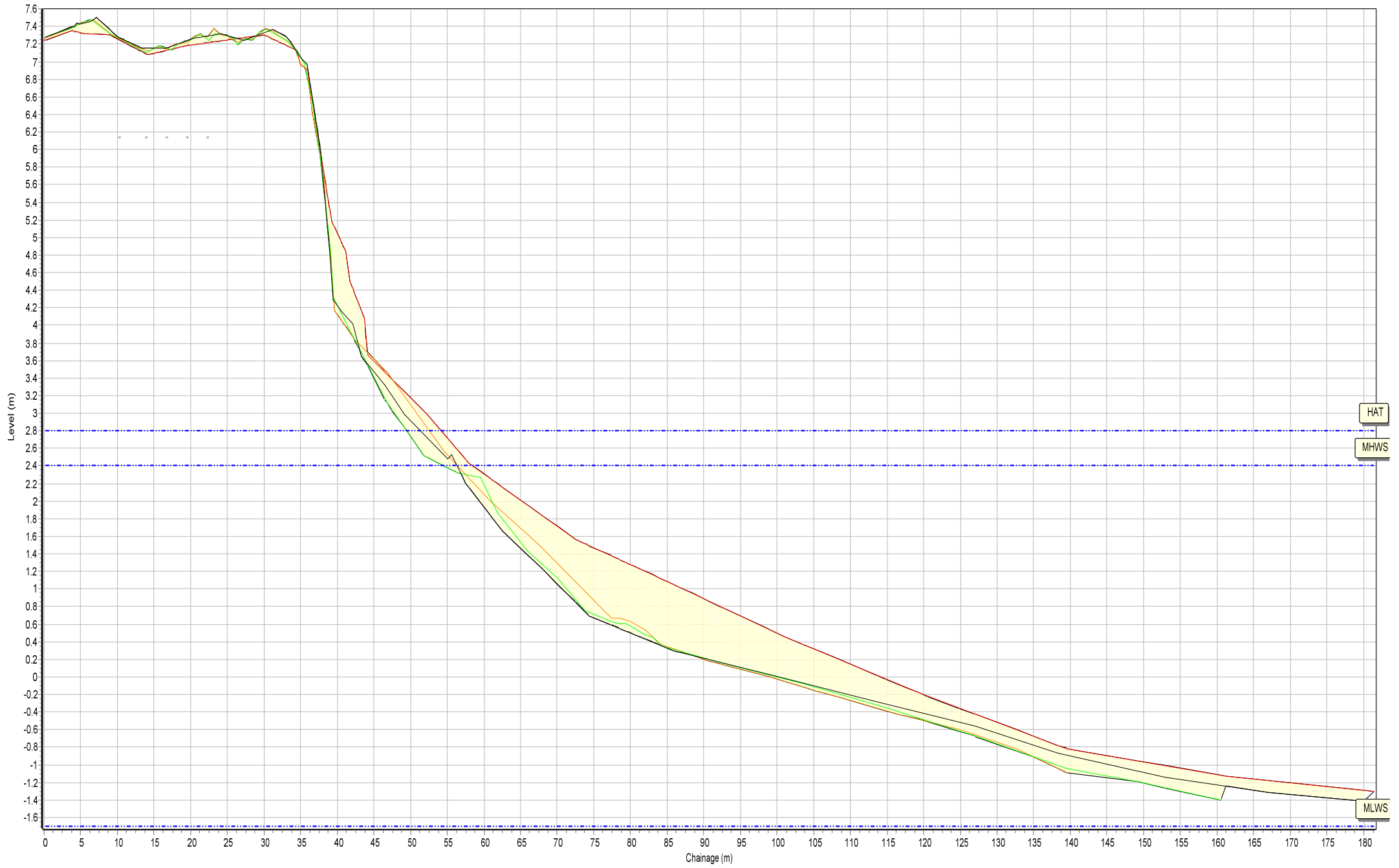
HAT  
MHWS

MLWS

SANDS



# Beach Profiles: 1aBTBC30



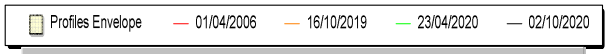
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aBTBC31



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aBTC32



Profiles Envelope 01/10/2006 07/12/2018 16/10/2019 02/10/2020

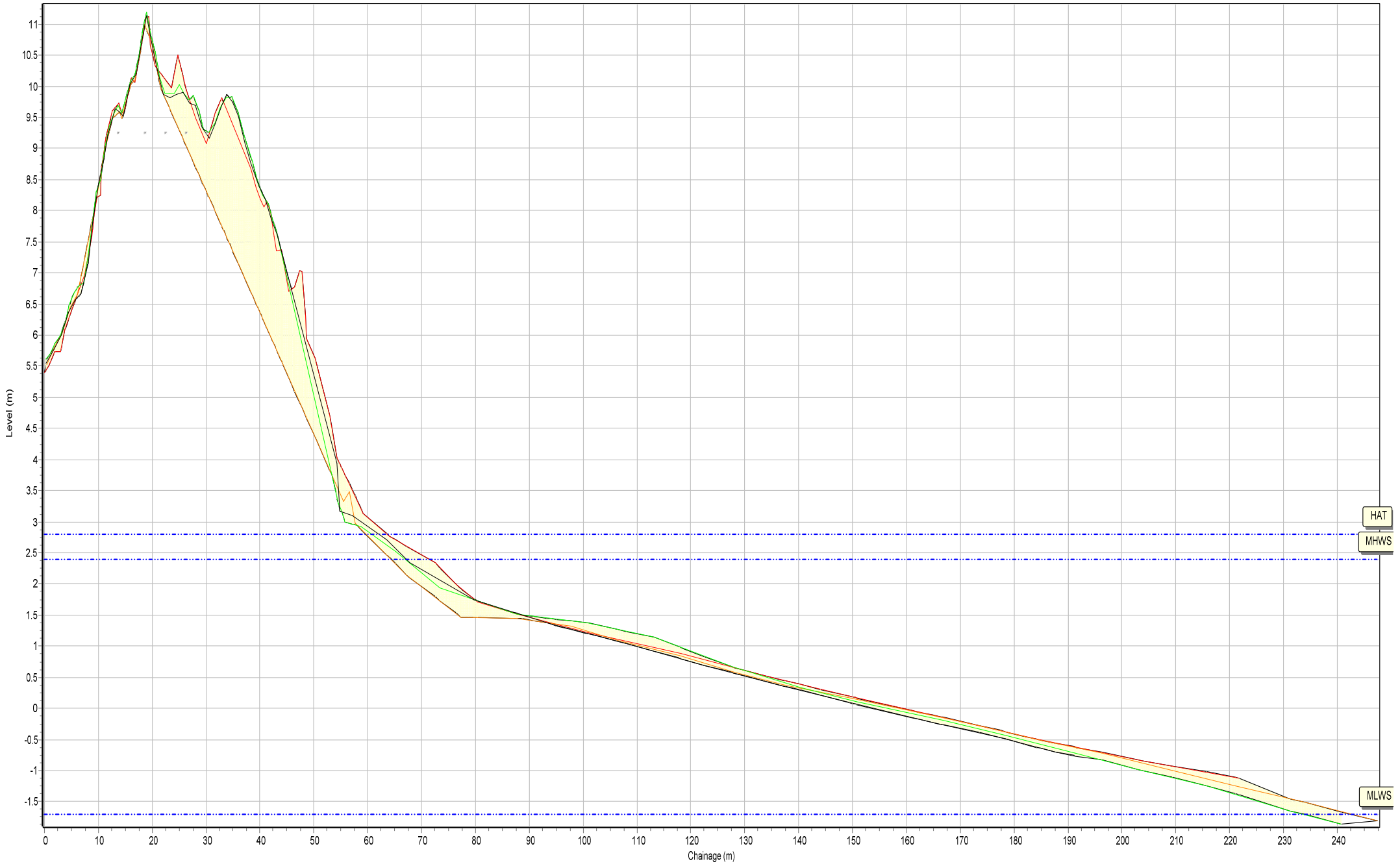
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTC33



Profiles Envelope 01/04/2006 16/10/2019 23/04/2020 02/10/2020

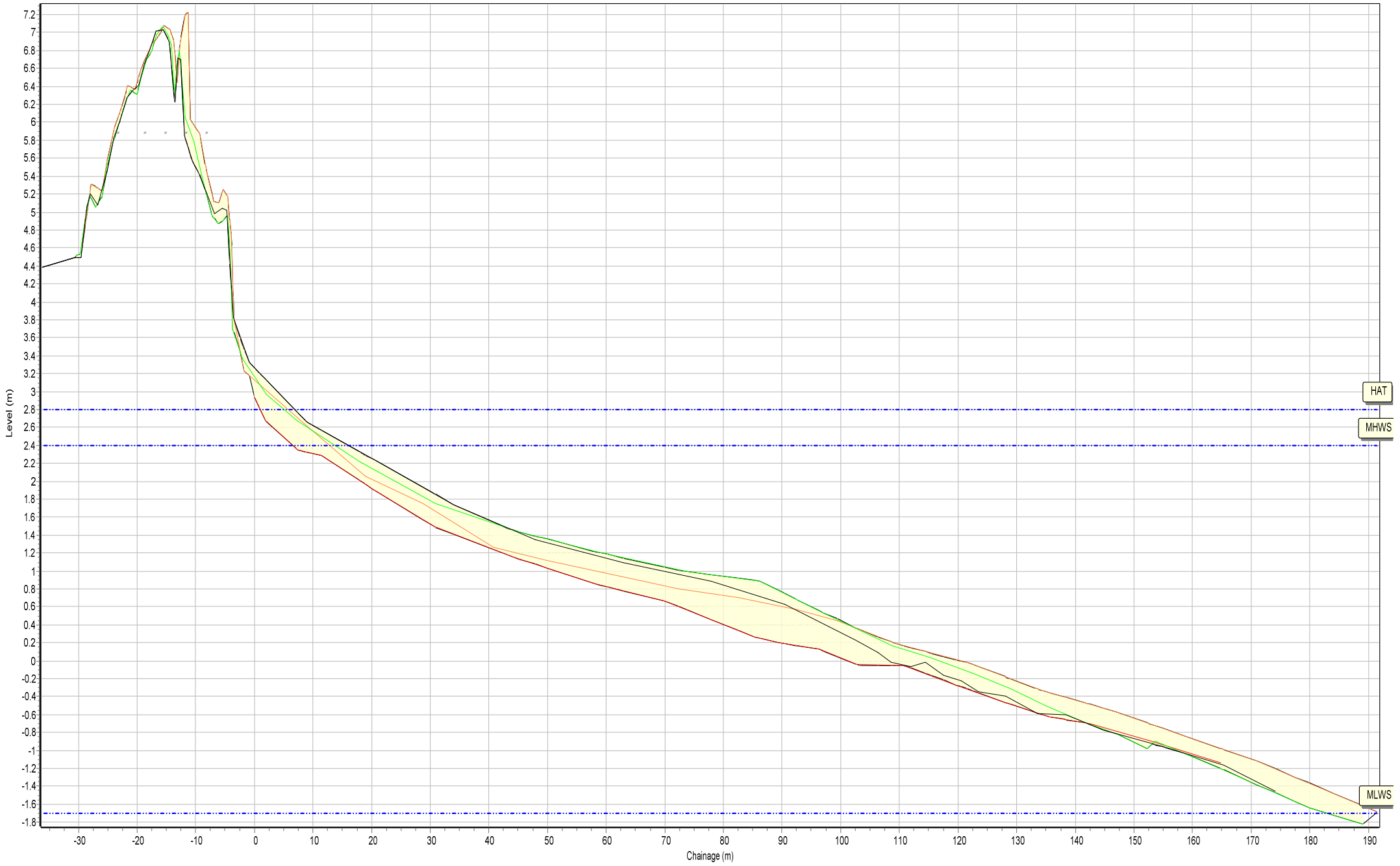
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC34



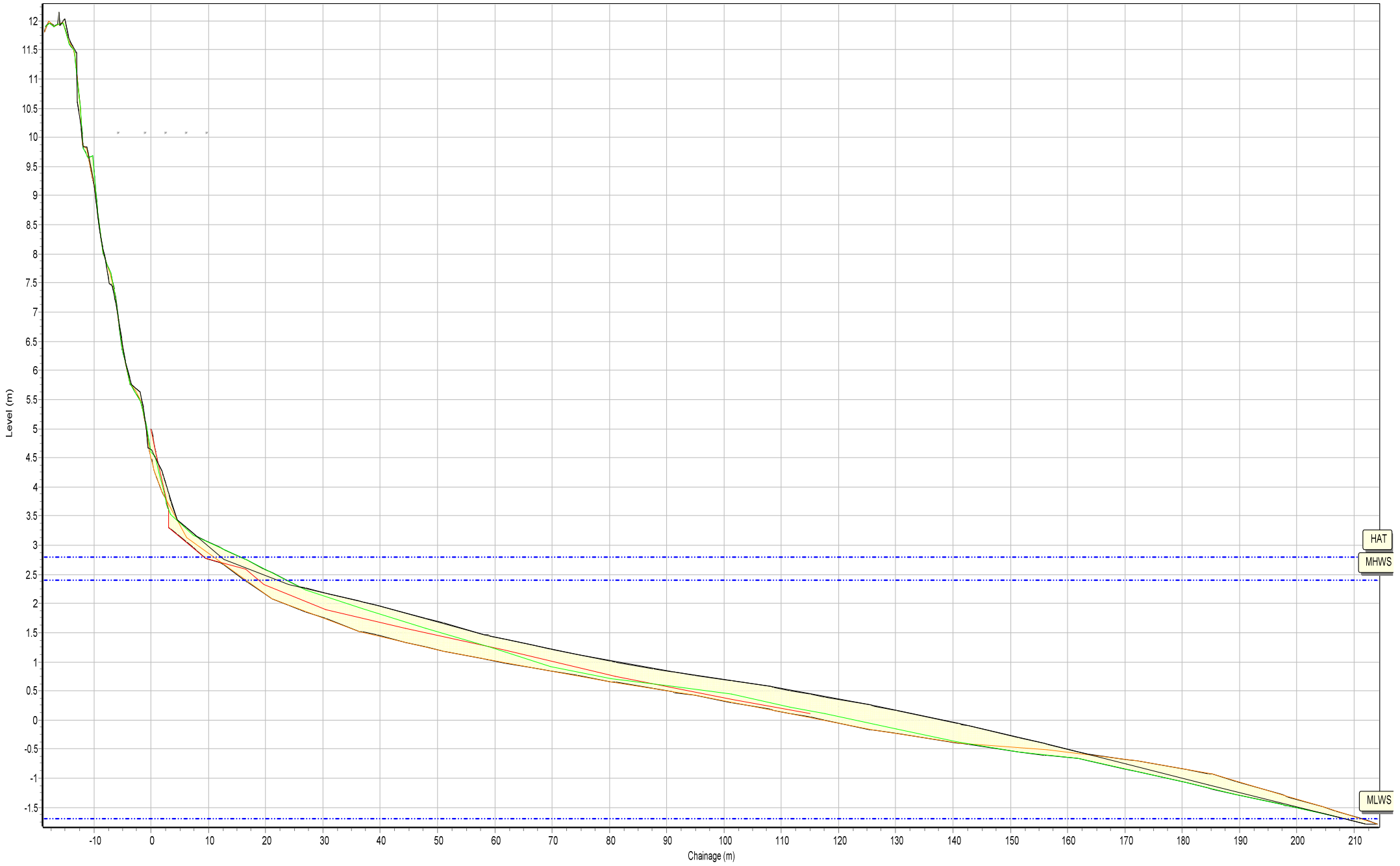
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC35



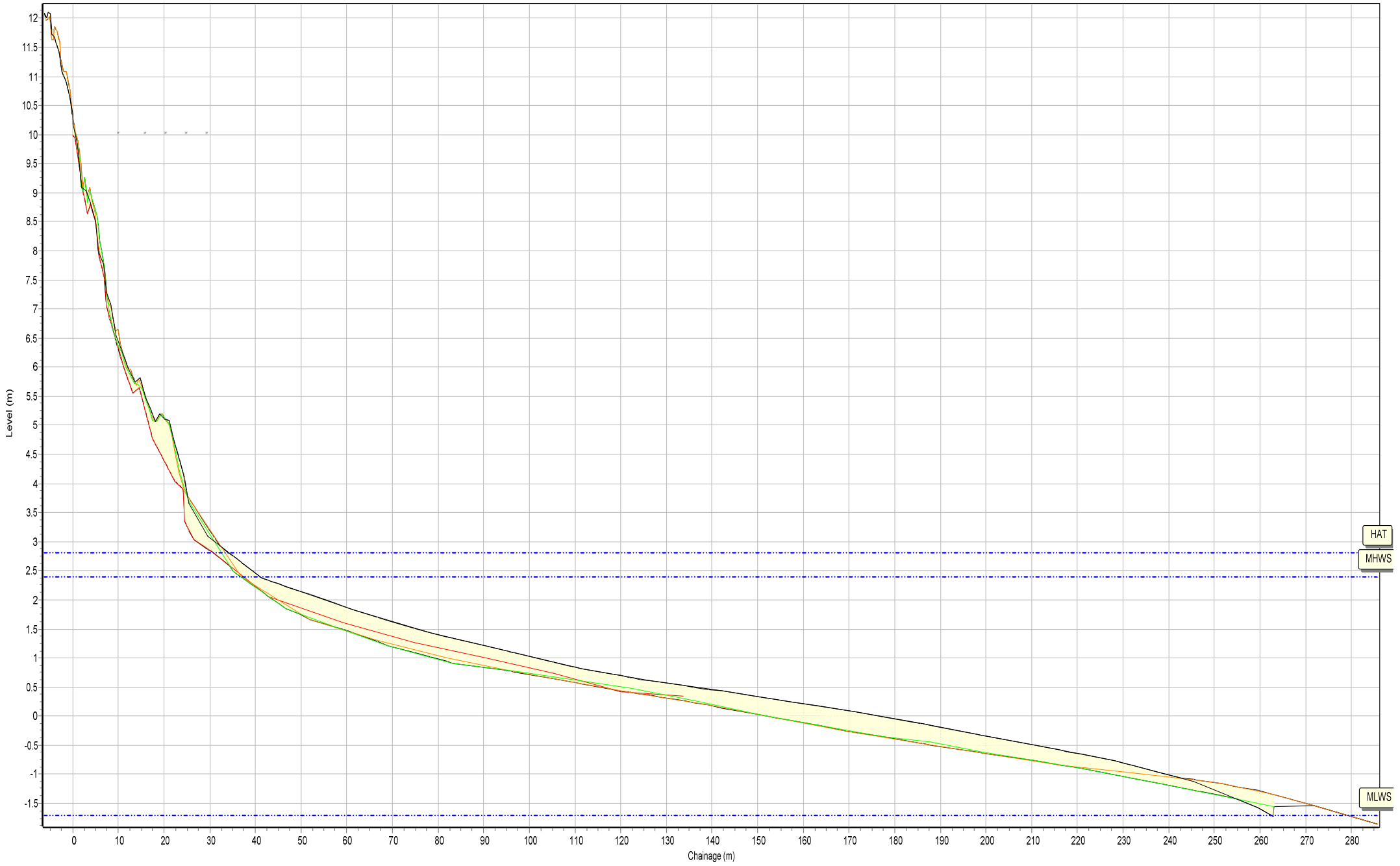
Profiles Envelope 01/10/2006 07/12/2018 16/10/2019 02/10/2020

HAT  
MHWS

MLWS

SANDS

Beach Profiles: 1aBTC36



Profiles Envelope 01/10/2006 07/12/2018 16/10/2019 02/10/2020

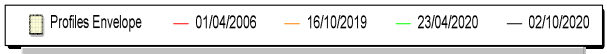
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBTBC37



HAT  
MHWS

MLWS

SANDS



Beach Profiles: 1aBTC38



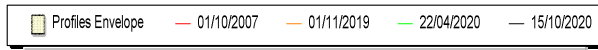
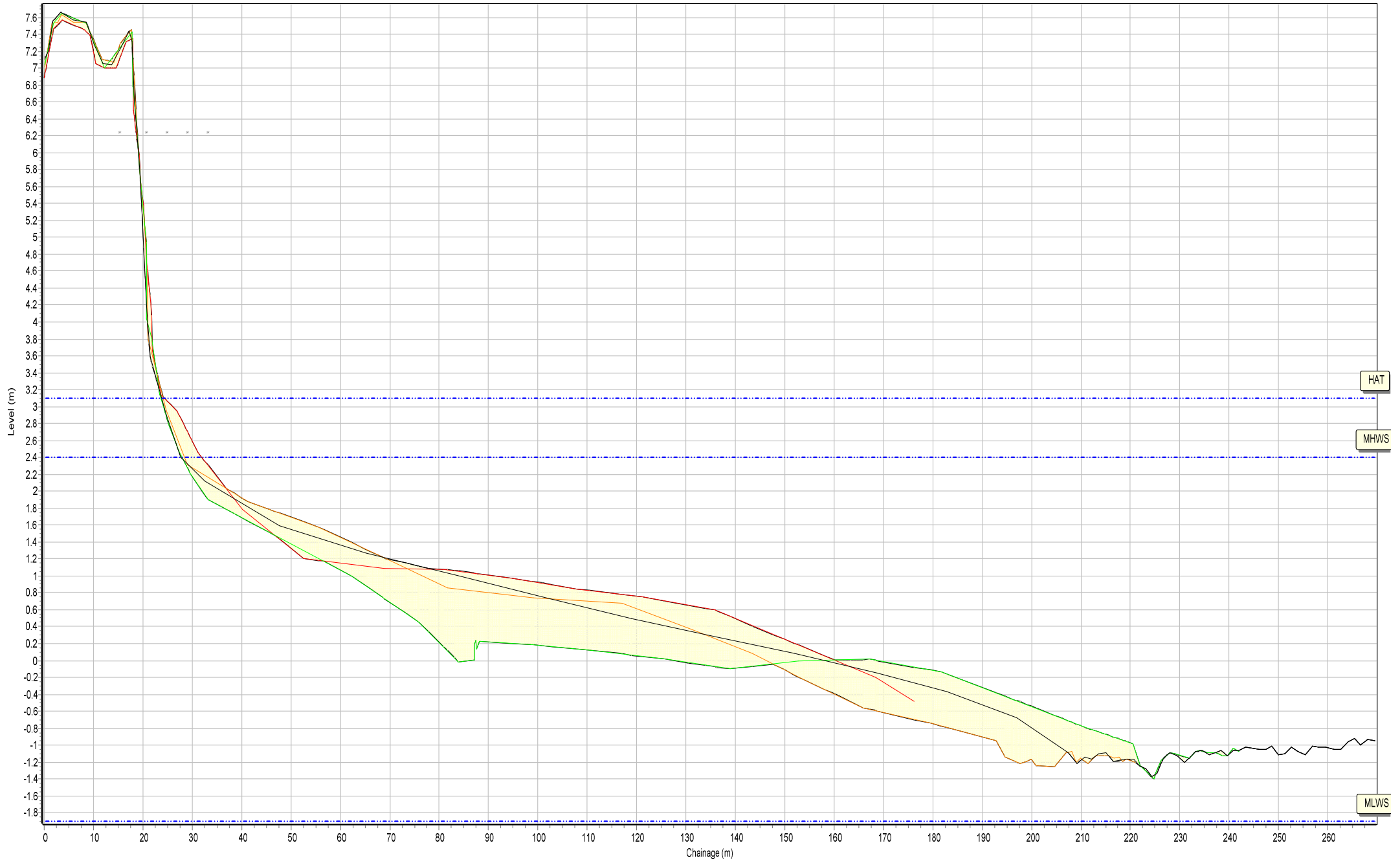
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC17A



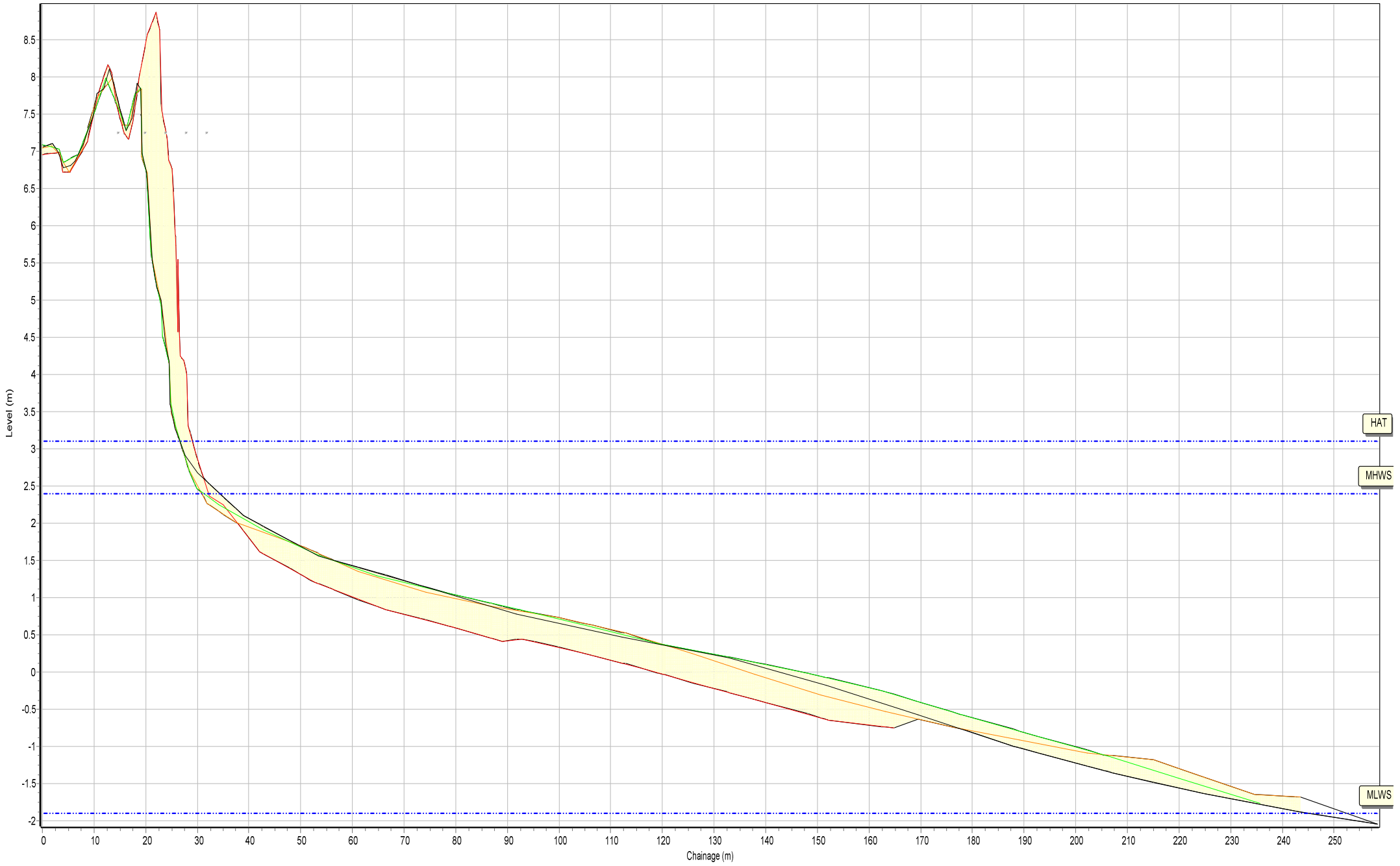
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC17



Profiles Envelope 01/04/2006 01/11/2019 22/04/2020 15/10/2020

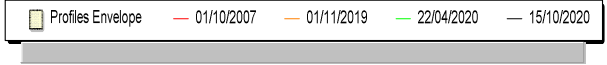
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC16B



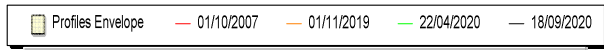
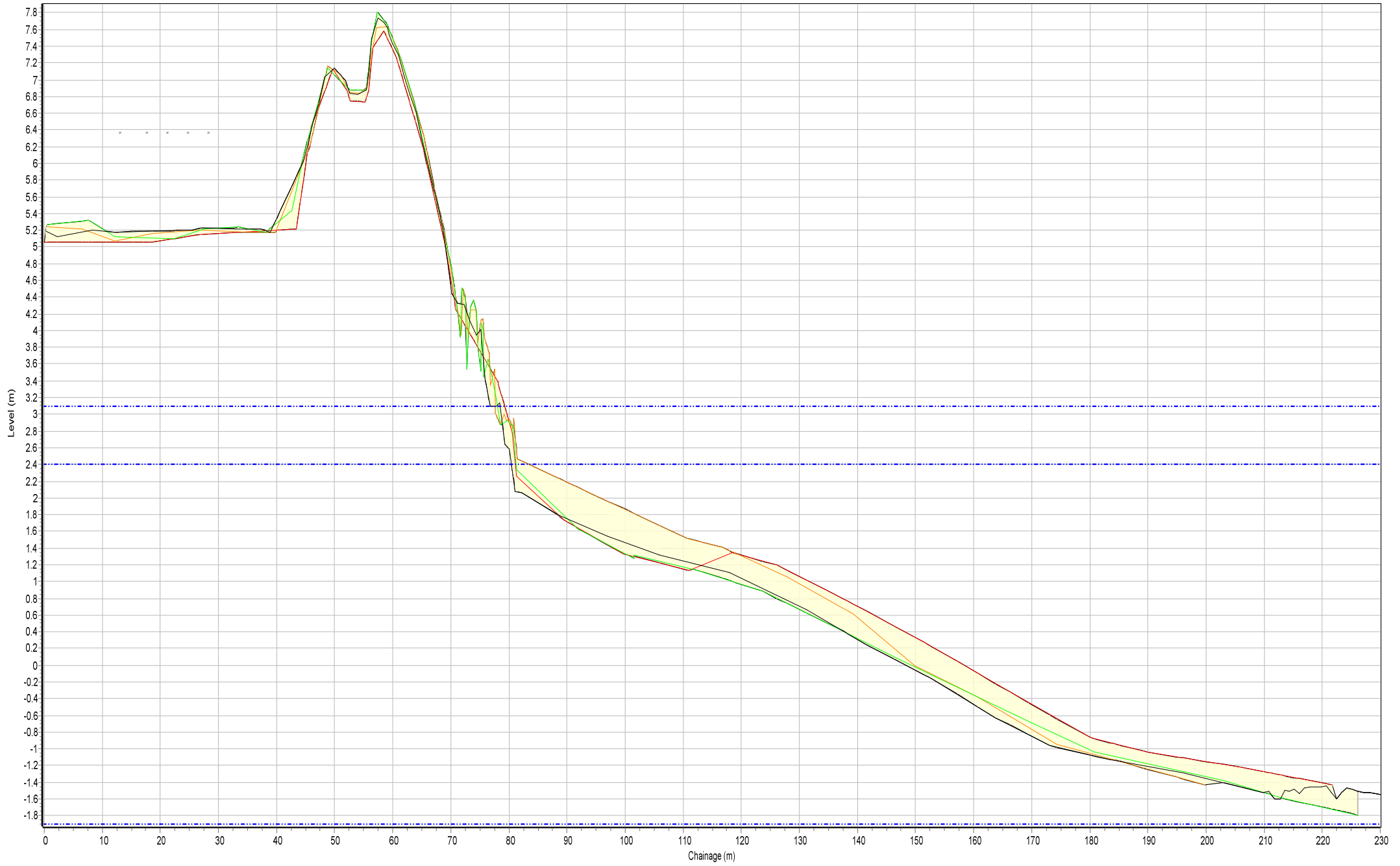
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC16A

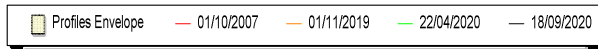


# Beach Profiles: 1aADC16



Profiles Envelope 01/04/2006 01/11/2019 22/04/2020 18/09/2020

# Beach Profiles: 1aADC15A



Beach Profiles: 1aADC15



HAT

MHWS

MLWS

SANDS



# Beach Profiles: 1aADC14



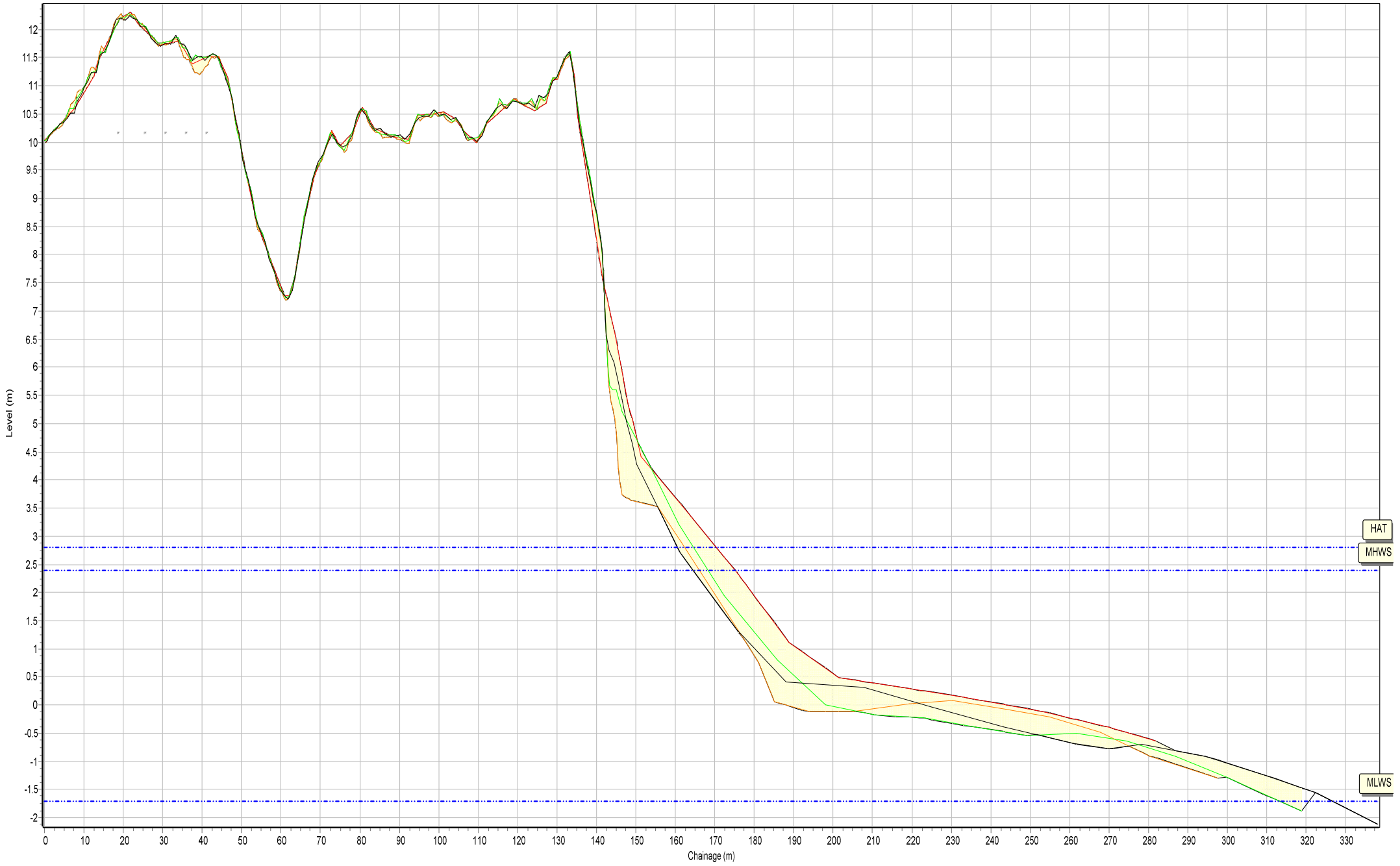
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC13



Profiles Envelope 01/10/2006 22/09/2018 31/10/2019 17/09/2020

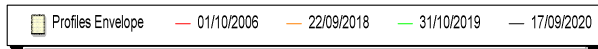
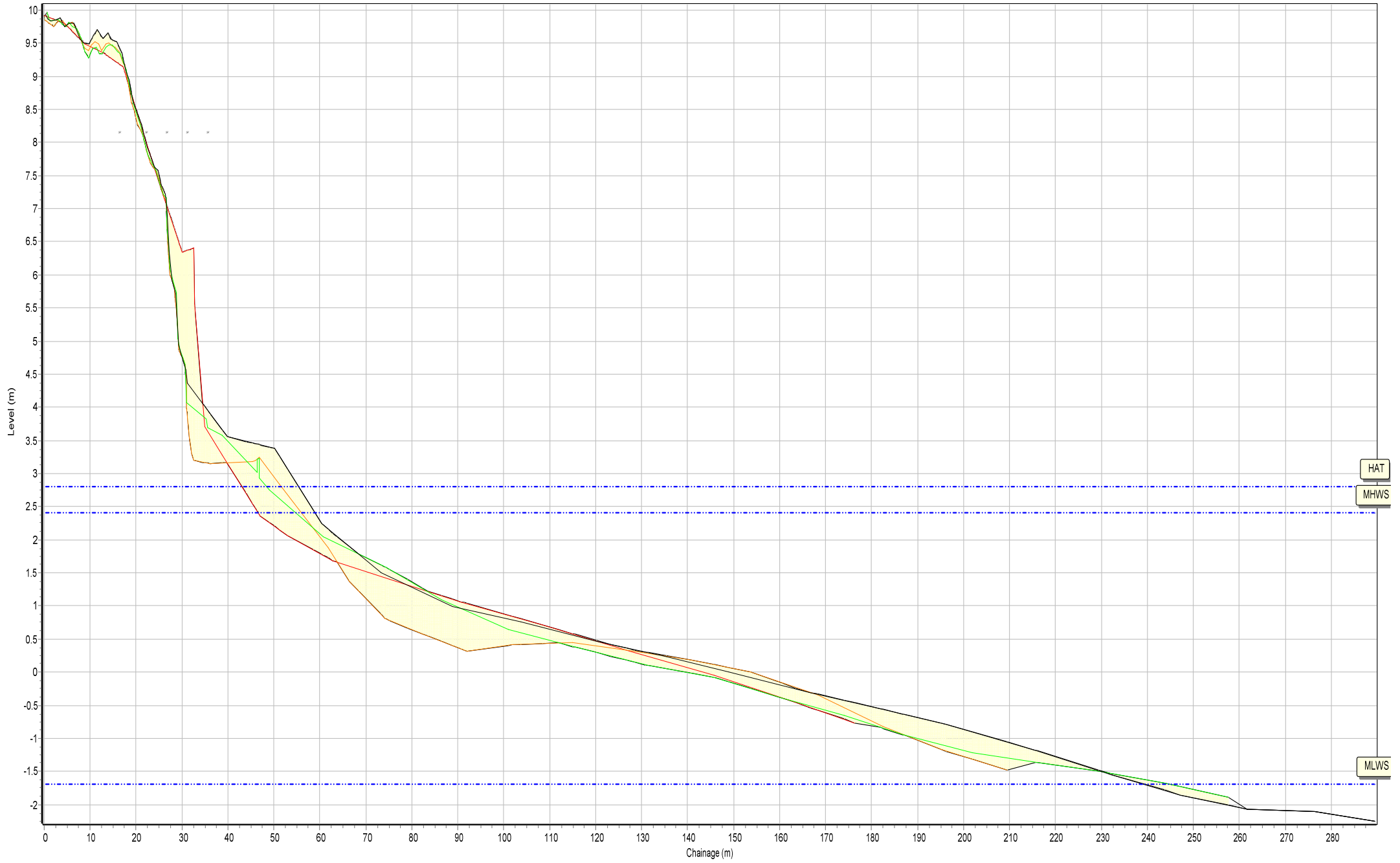
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC12



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC11



Profiles Envelope 01/10/2006 22/09/2018 31/10/2019 17/09/2020

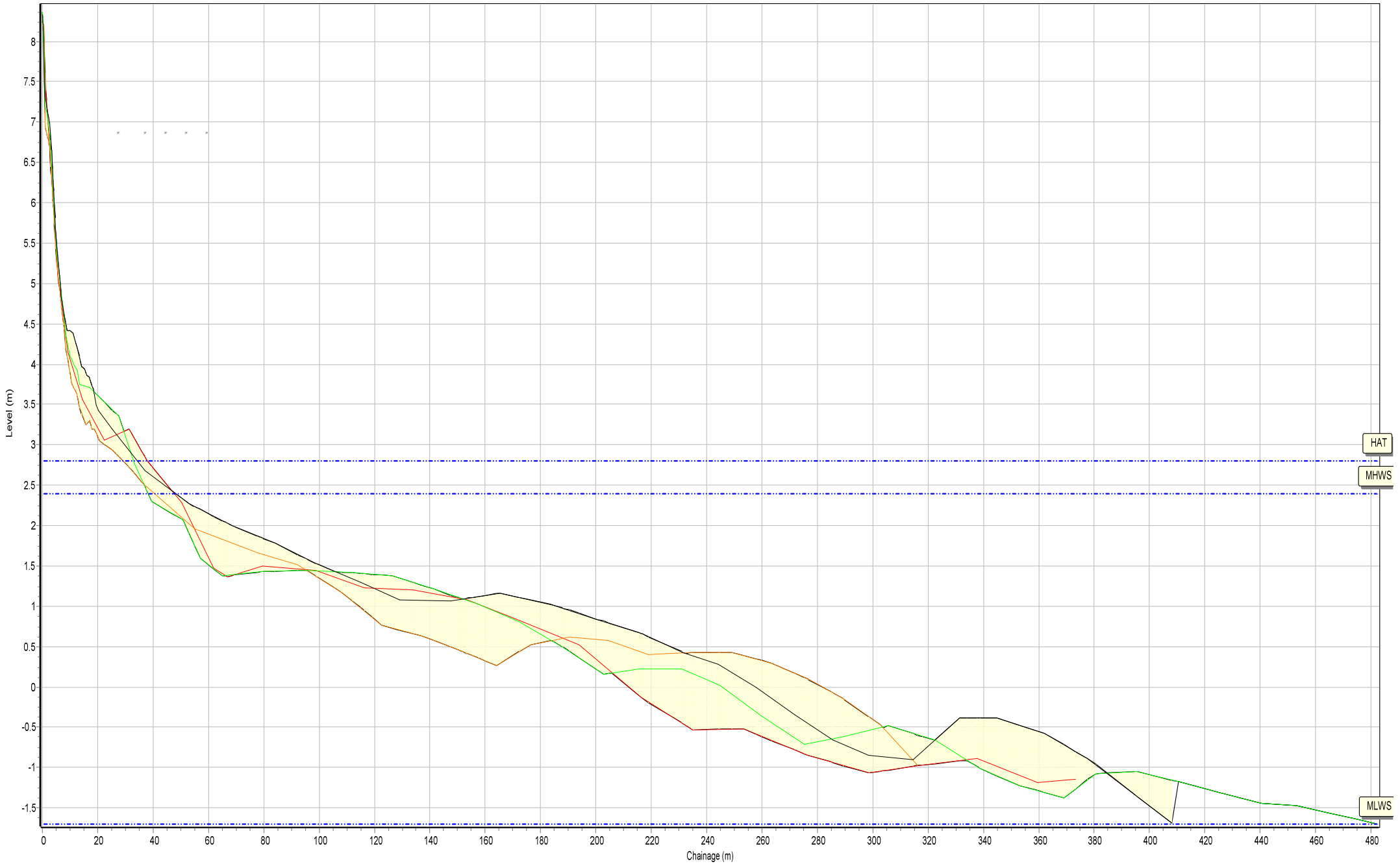
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC10

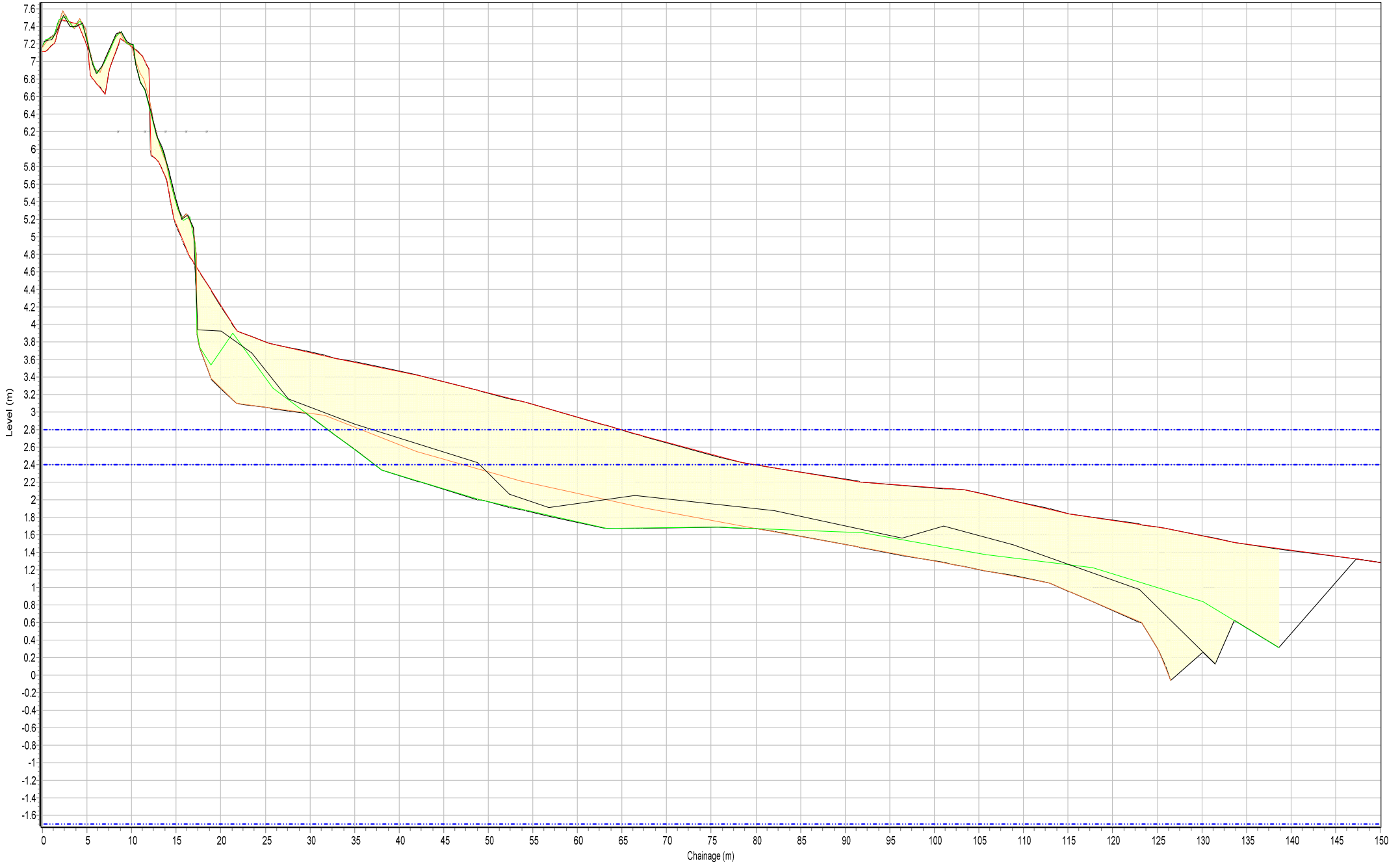


HAT  
MLWS

MLWS

SANDS

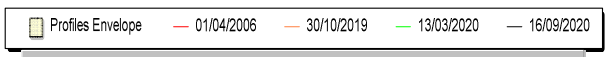
Beach Profiles: 1aADC09



# Beach Profiles: 1aADC08



Beach Profiles: 1aADC07



HAT

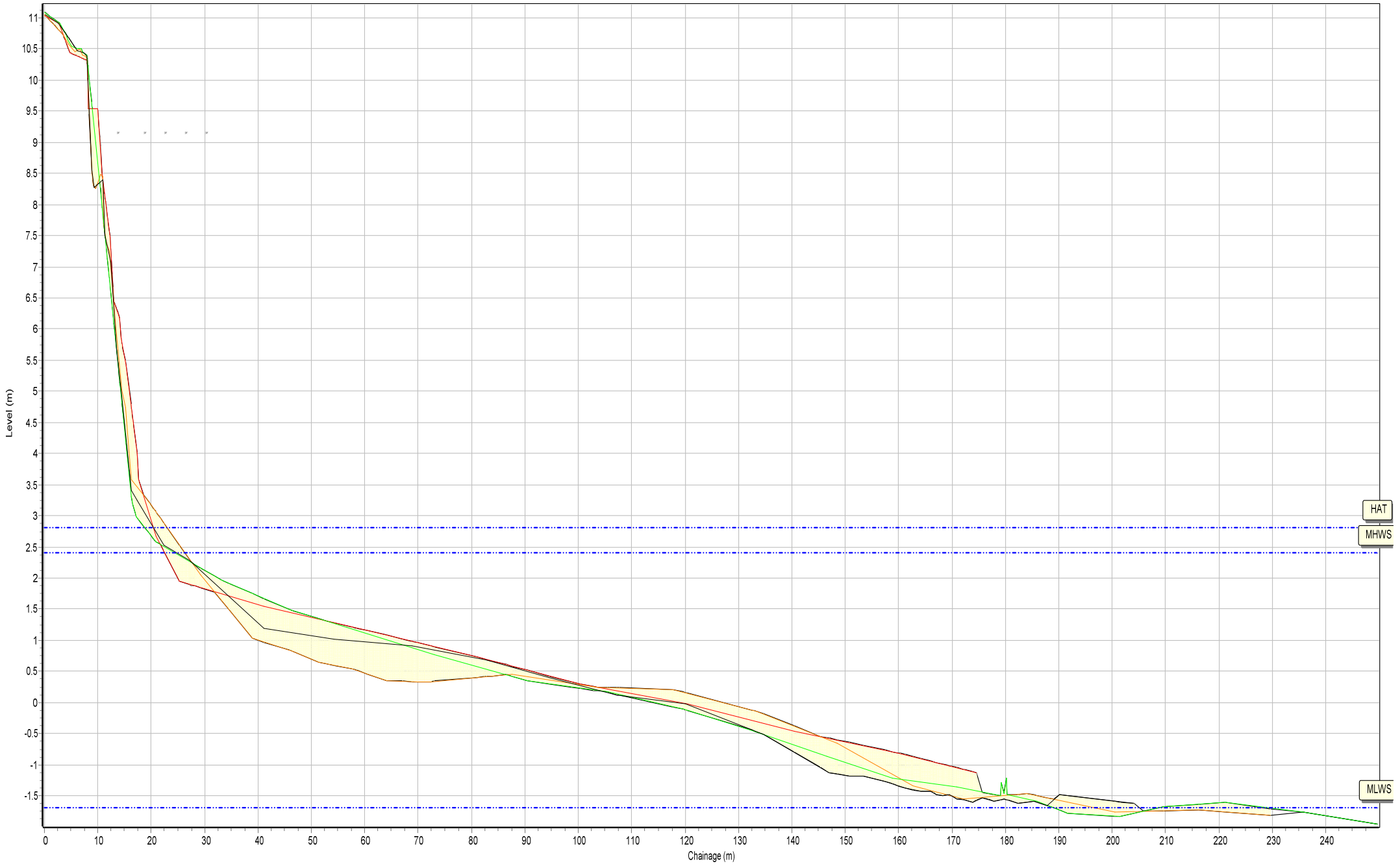
MHWS

MLWS

SANDS



# Beach Profiles: 1aADC06



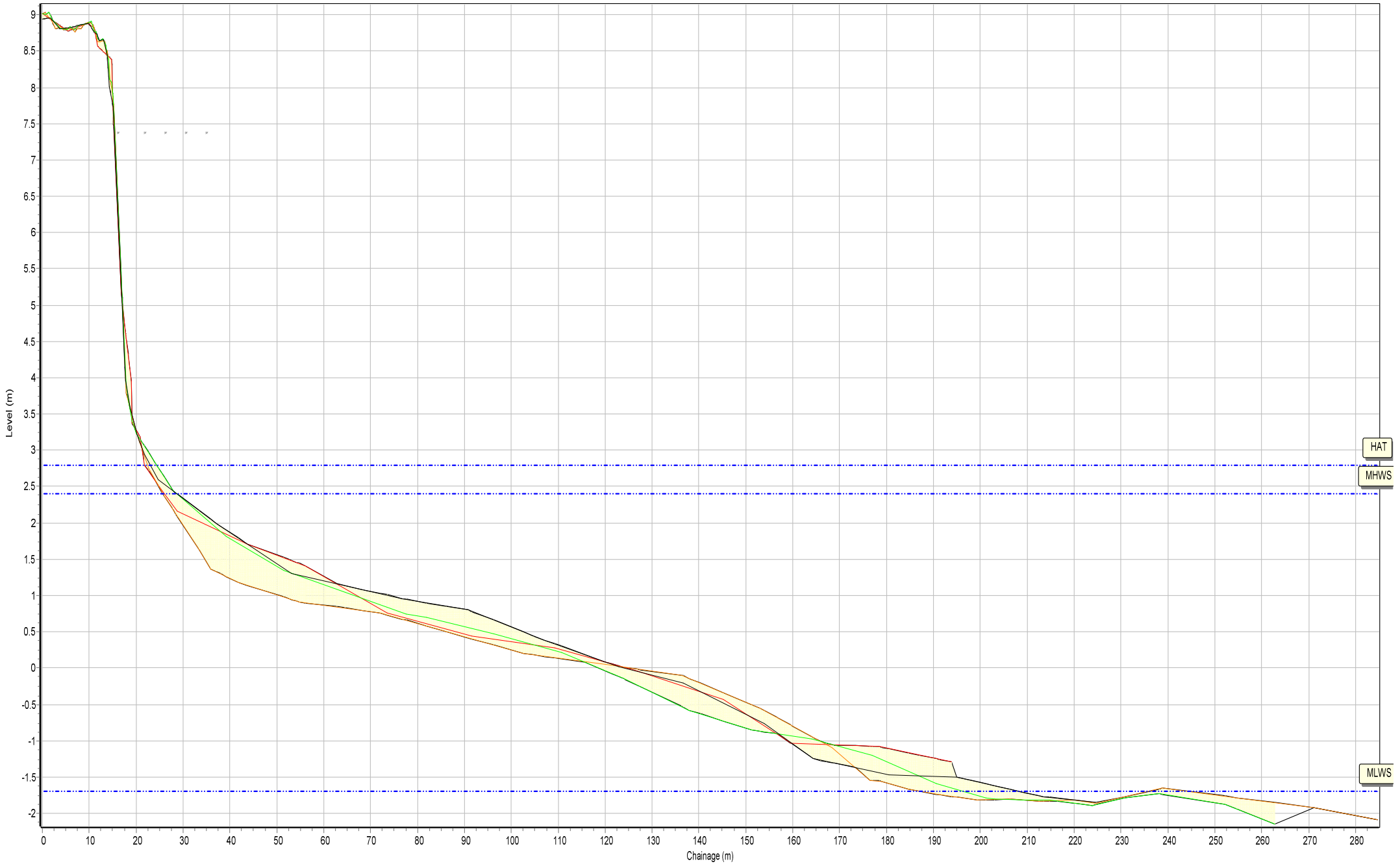
HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aADC05

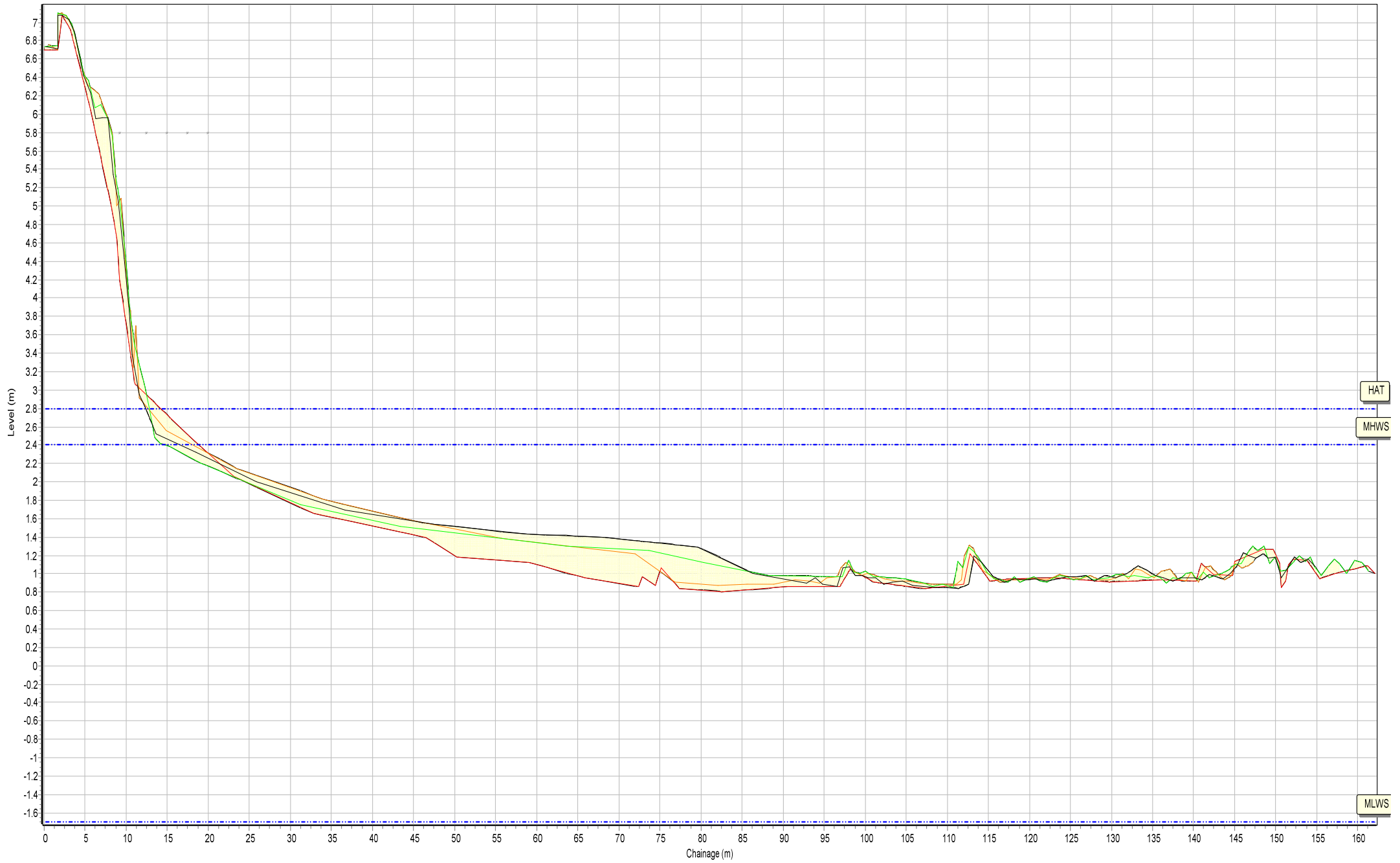


HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aADC04B



Beach Profiles: 1aADC04A



Profiles Envelope 01/10/2007 30/10/2019 13/03/2020 16/09/2020

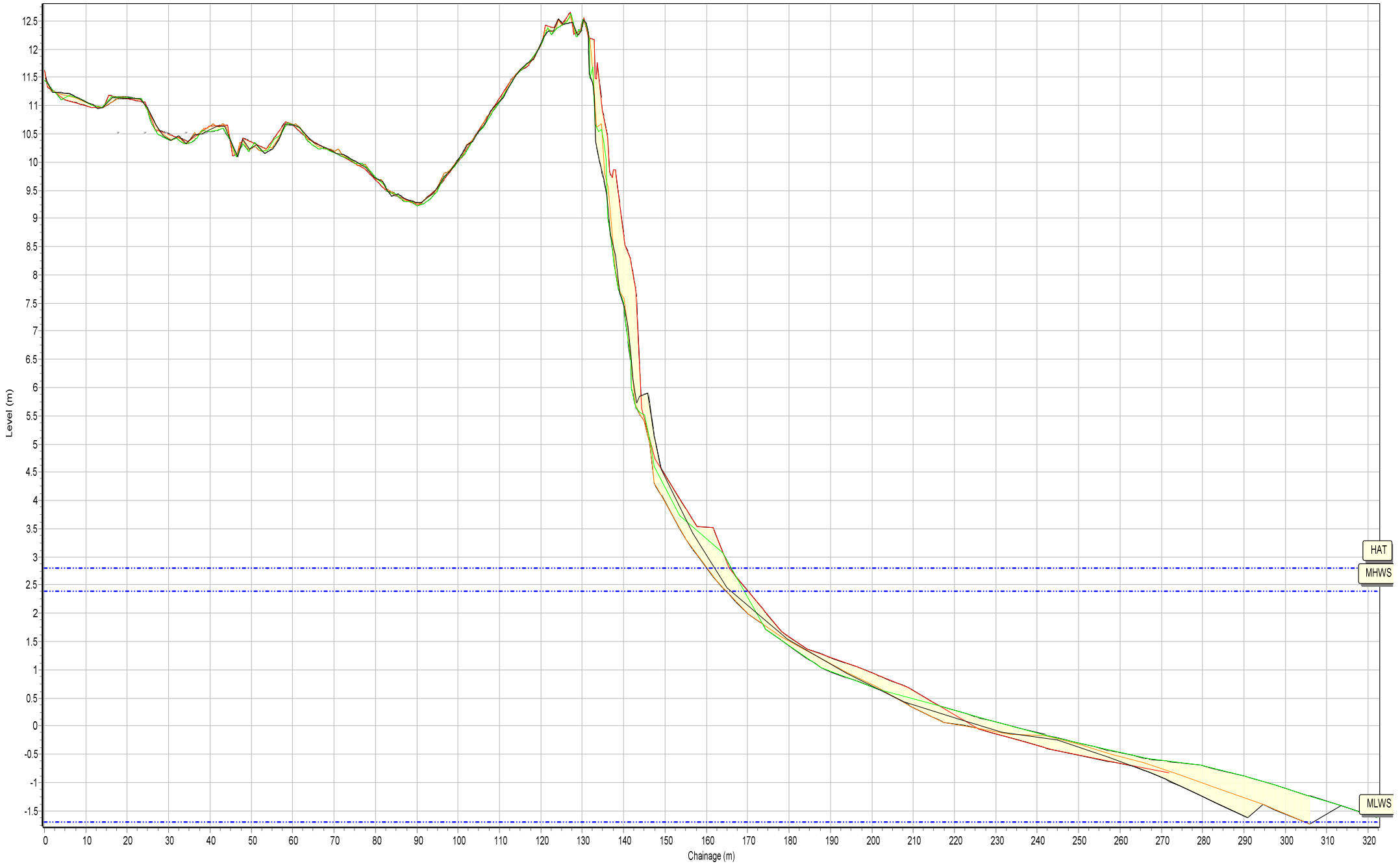
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC04



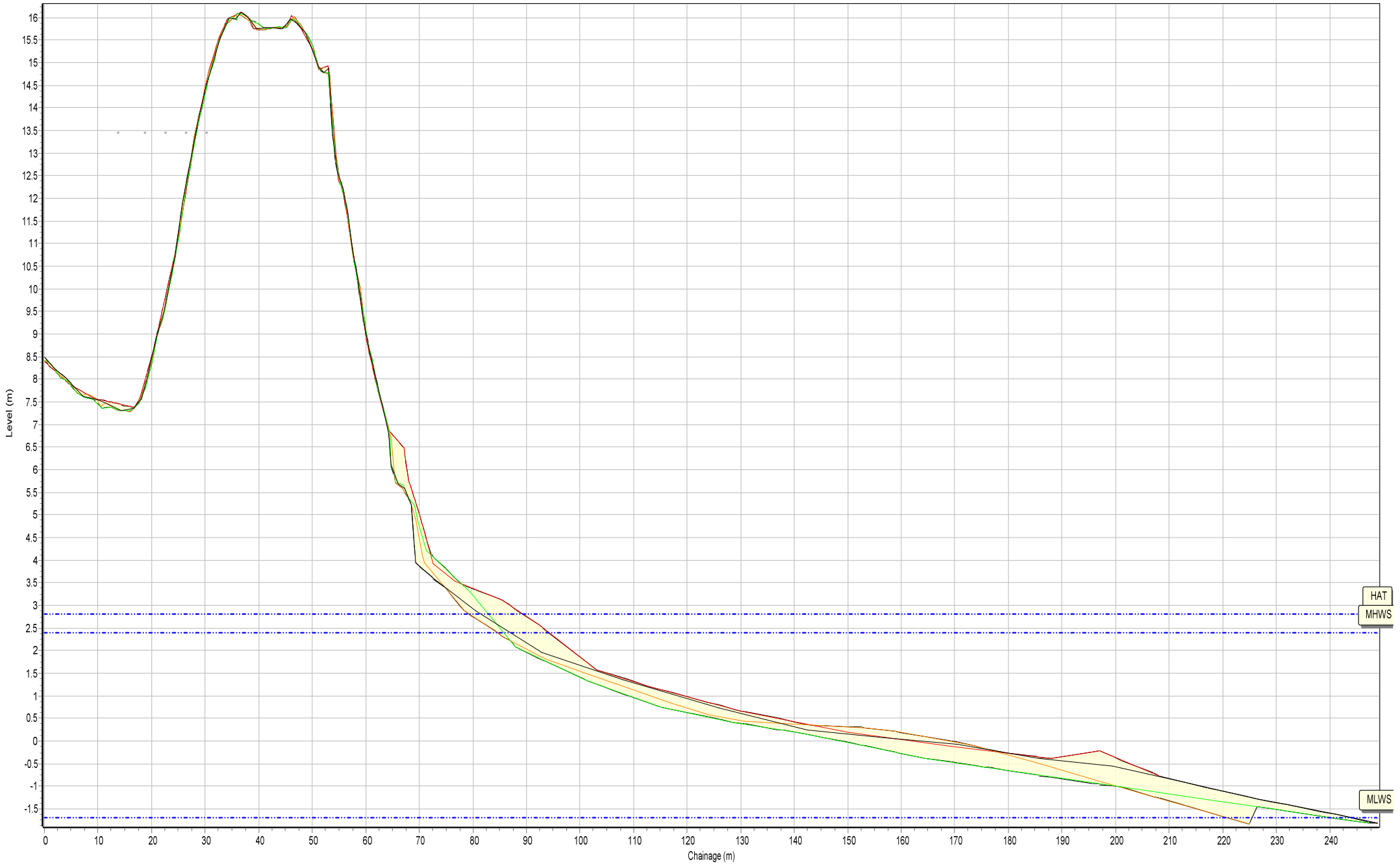
Profiles Envelope 01/10/2006 28/10/2018 18/10/2019 05/10/2020

HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aADC03



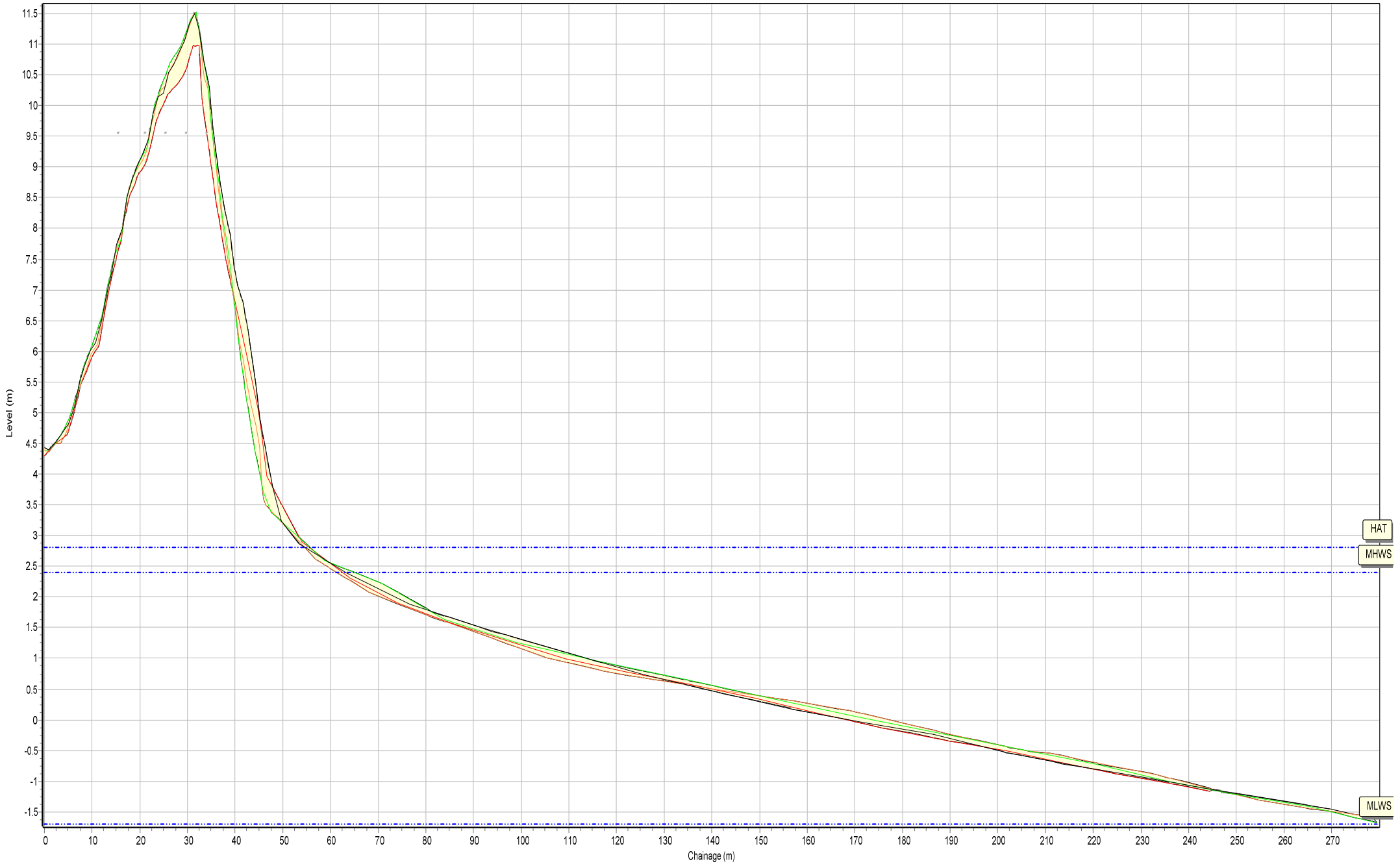
Profiles Envelope 01/10/2006 28/10/2018 18/10/2019 05/10/2020

HAT  
MHWS

MLWS

SANDS

# Beach Profiles: 1aADC02



Profiles Envelope 01/04/2006 16/10/2019 23/04/2020 02/10/2020

HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aADC01



Profiles Envelope 01/04/2006 16/10/2019 23/04/2020 02/10/2020

HAT

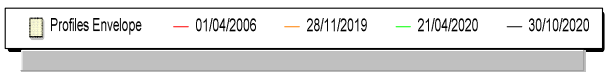
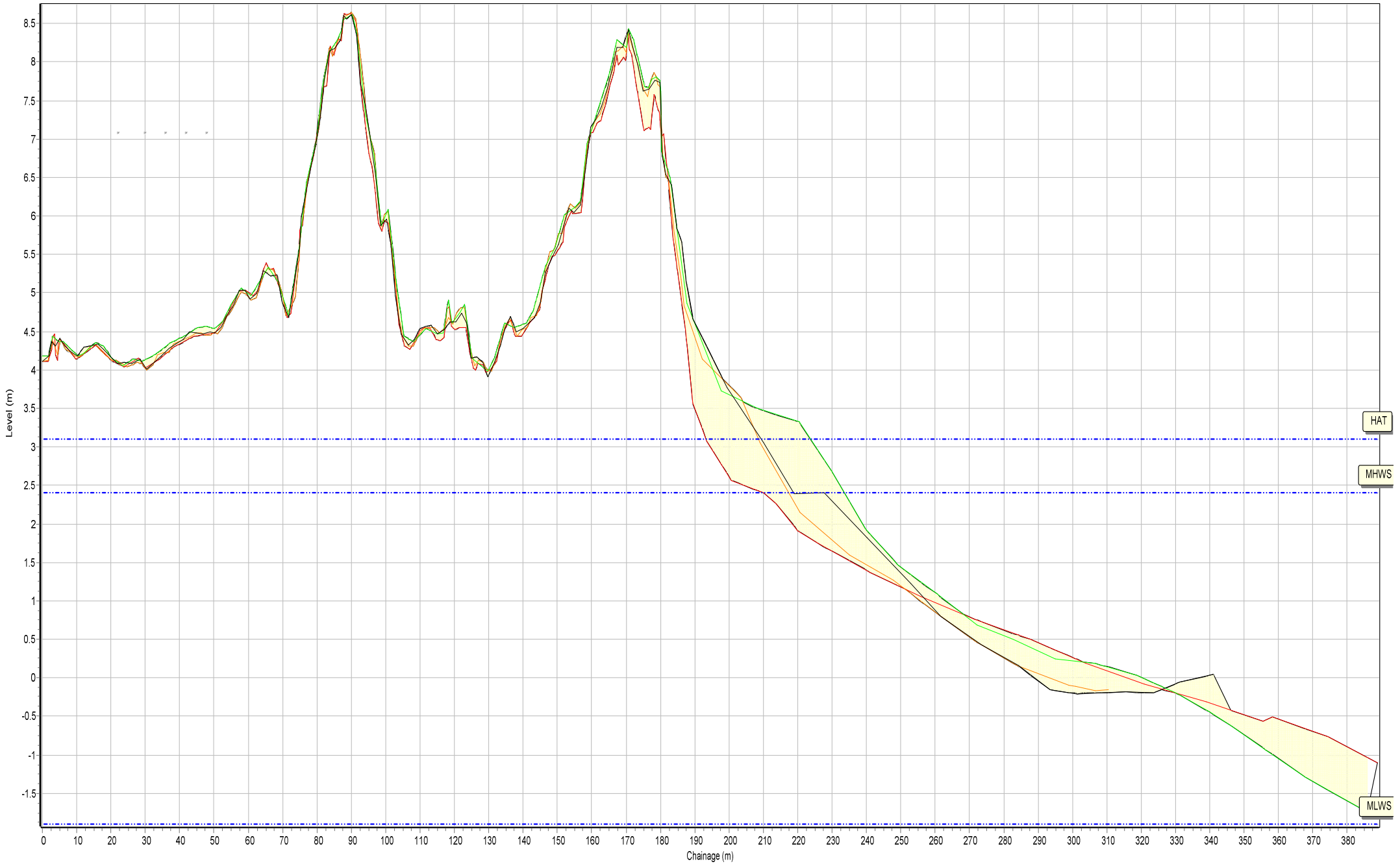
MHWS

MLWS

SANDS



Beach Profiles: 1aCMBC01



# Beach Profiles: 1aCMB02



Profiles Envelope 01/04/2006 28/11/2019 21/04/2020 30/10/2020

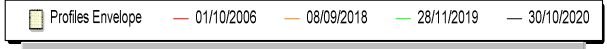
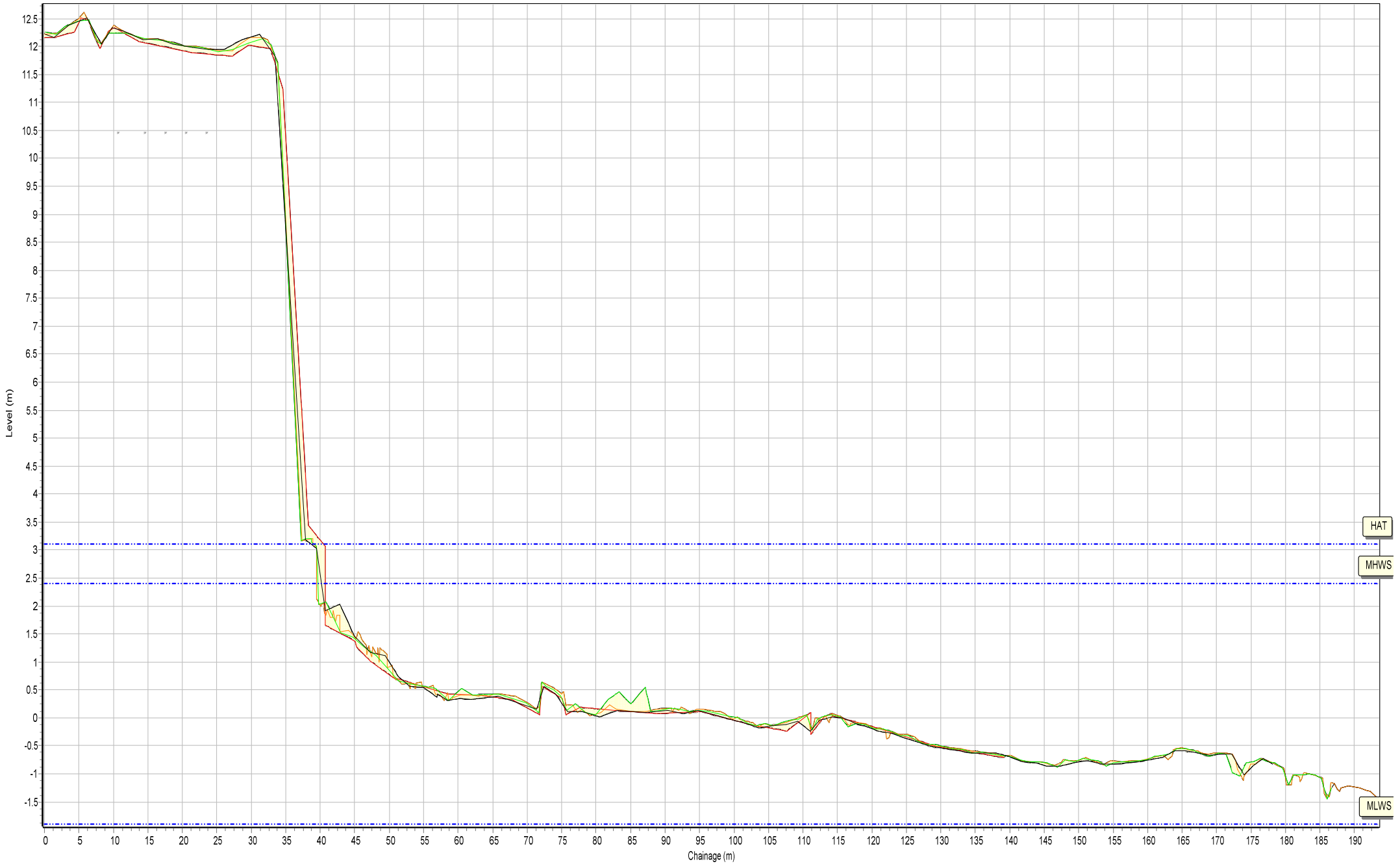
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aCMBC03



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aCMBC03A



Profiles Envelope 01/10/2007 28/11/2019 21/04/2020 30/10/2020

HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aCMBC03B



01/10/2007 28/11/2019 21/04/2020 30/10/2020

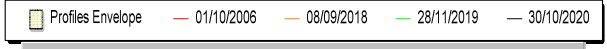
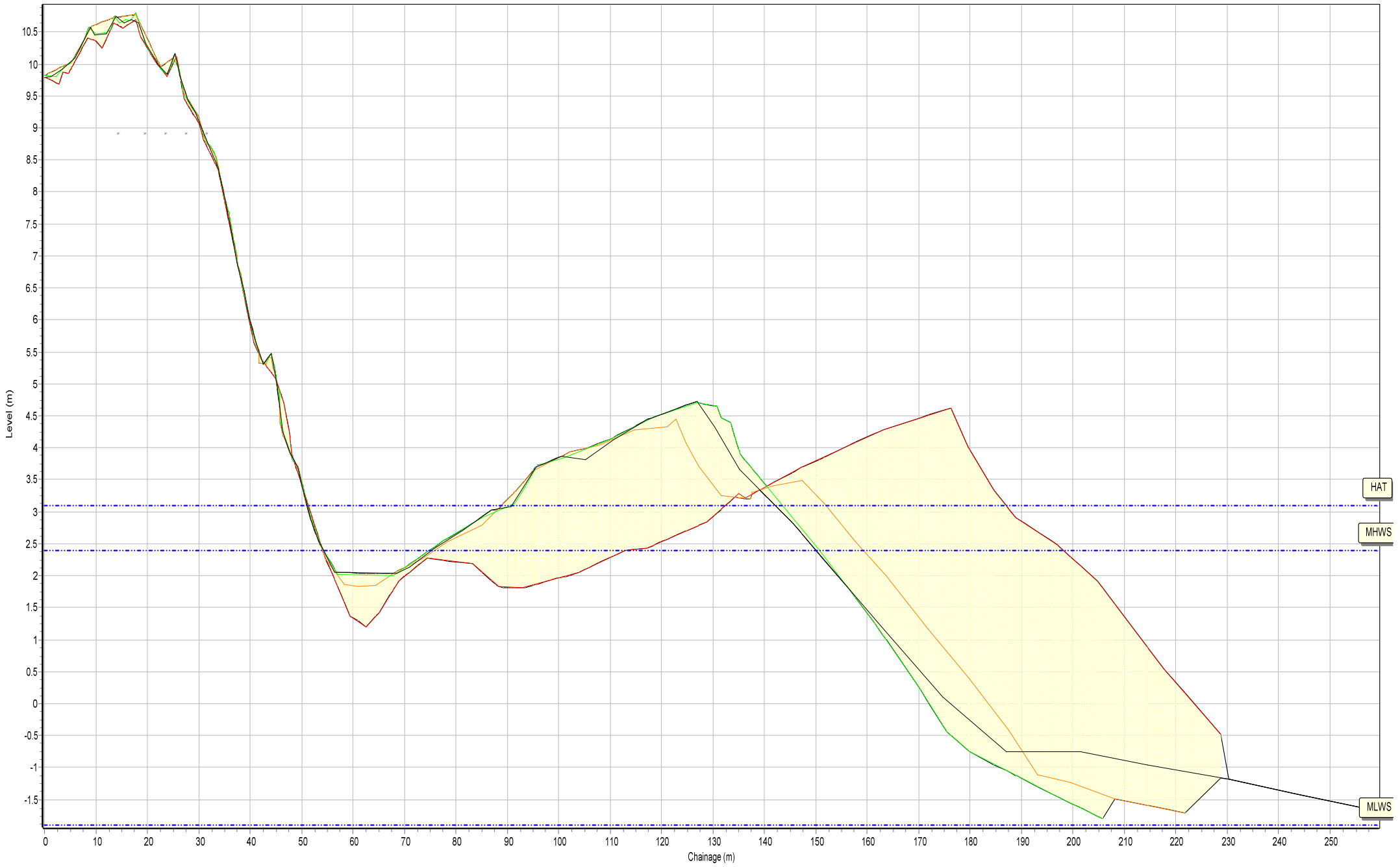
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC02



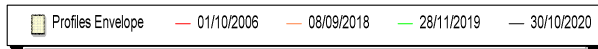
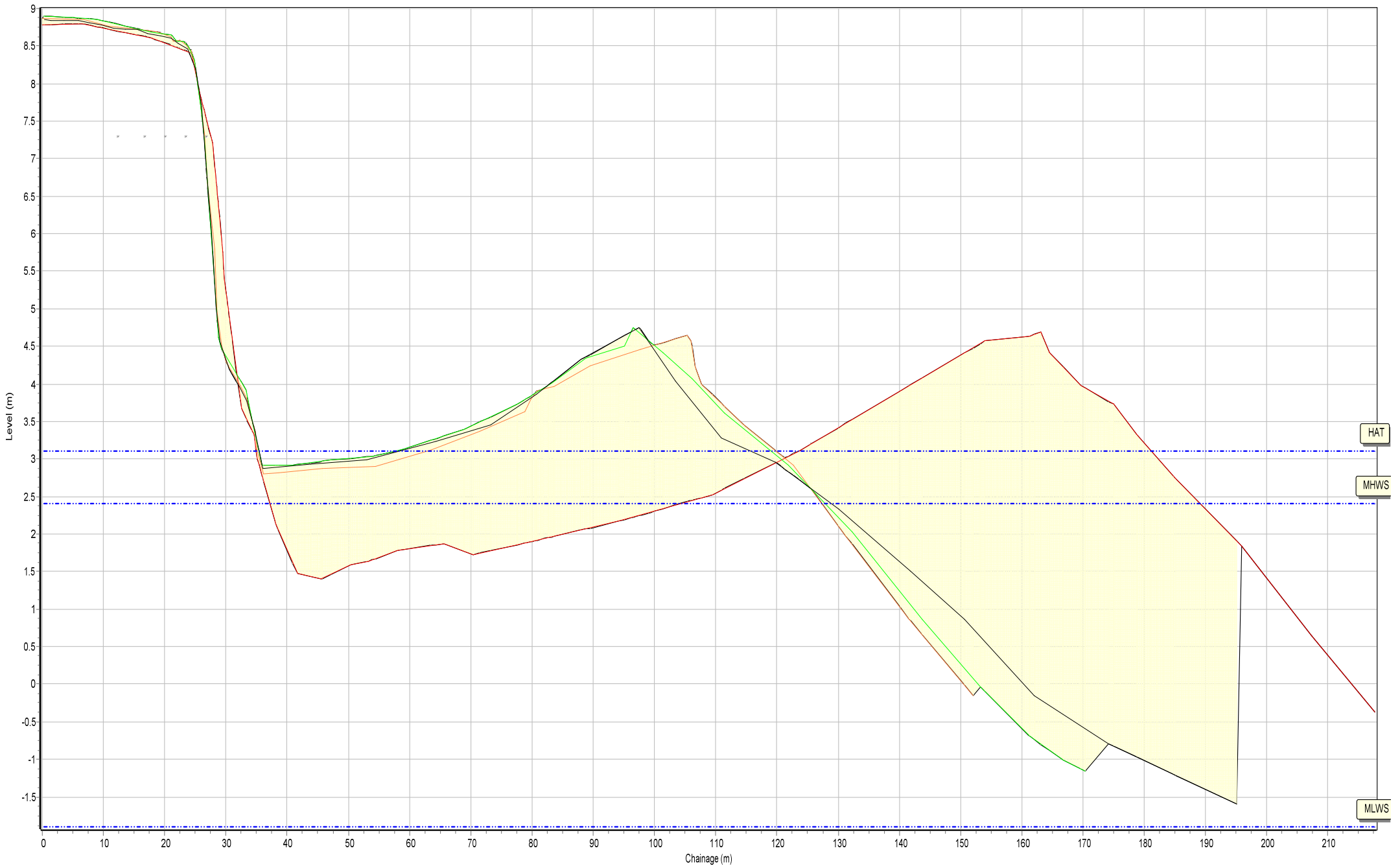
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aWDC03



HAT

MLWS

MLWS

SANDS

Beach Profiles: 1aWDC04



HAT

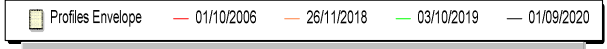
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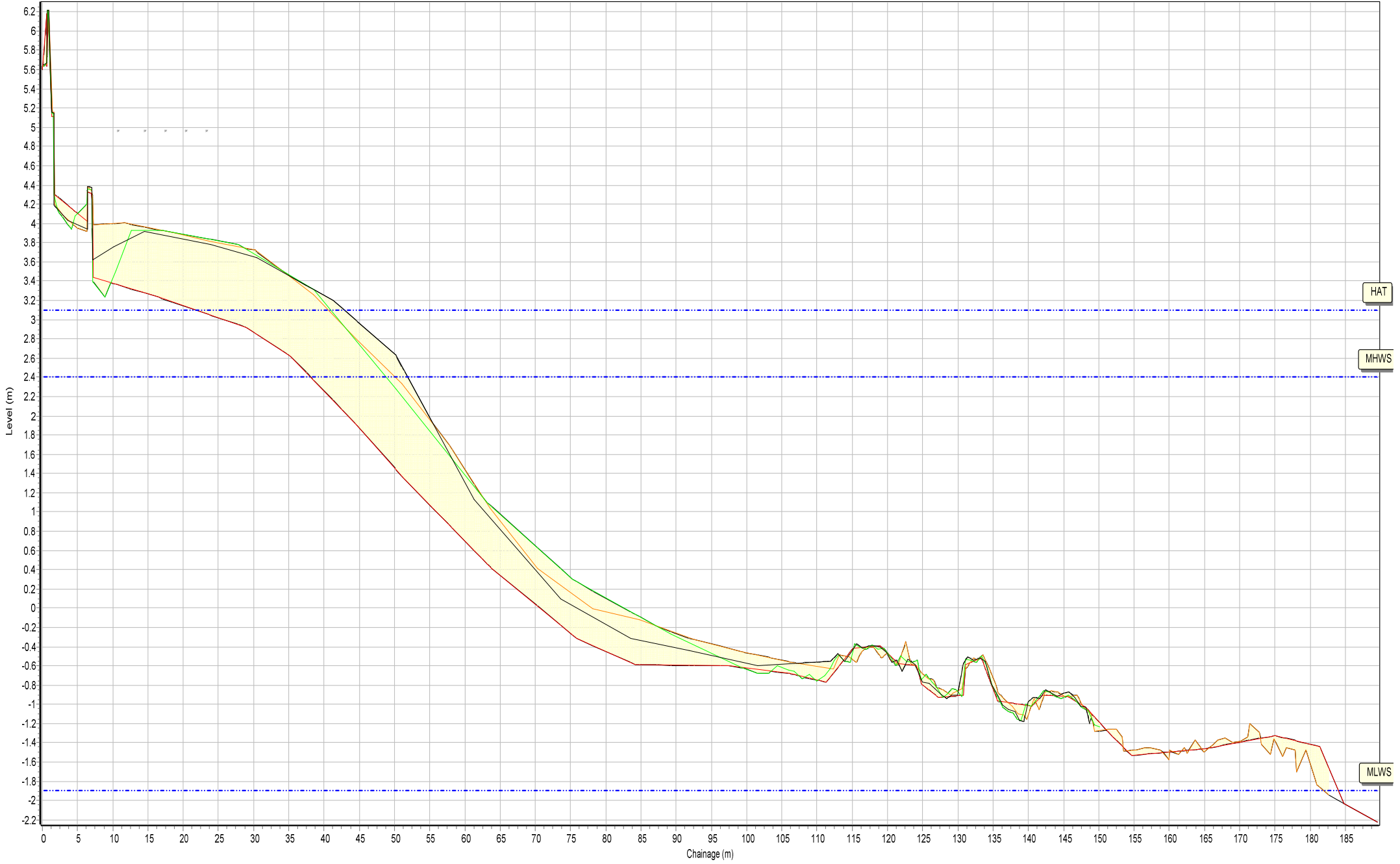
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Beach Profiles: 1aWDC05



Beach Profiles: 1aWDC05A



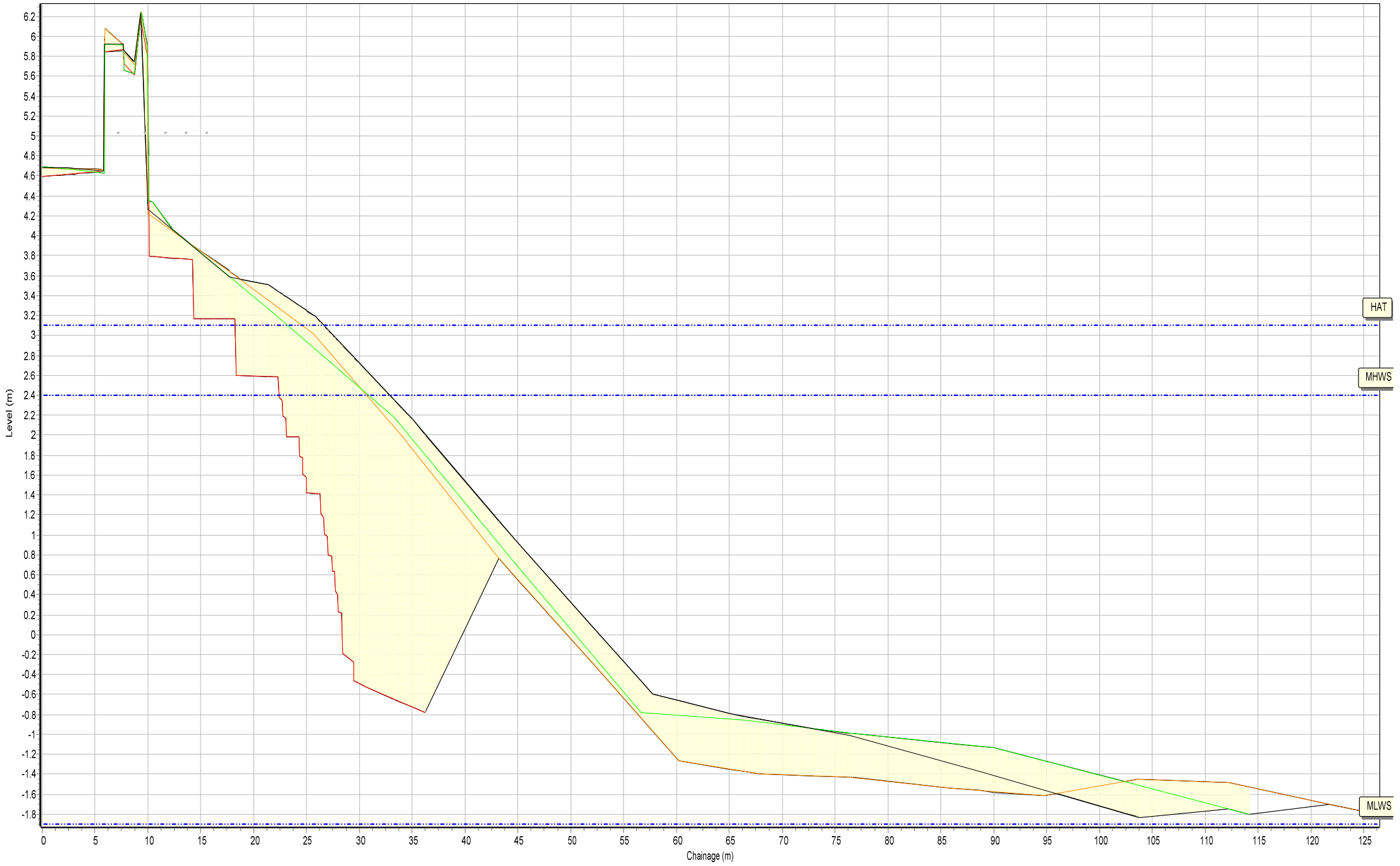
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MLWS

SANDS

Beach Profiles: 1aWDC06



Profiles Envelope 01/10/2006 03/10/2019 14/03/2020 01/09/2020

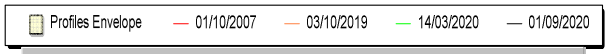
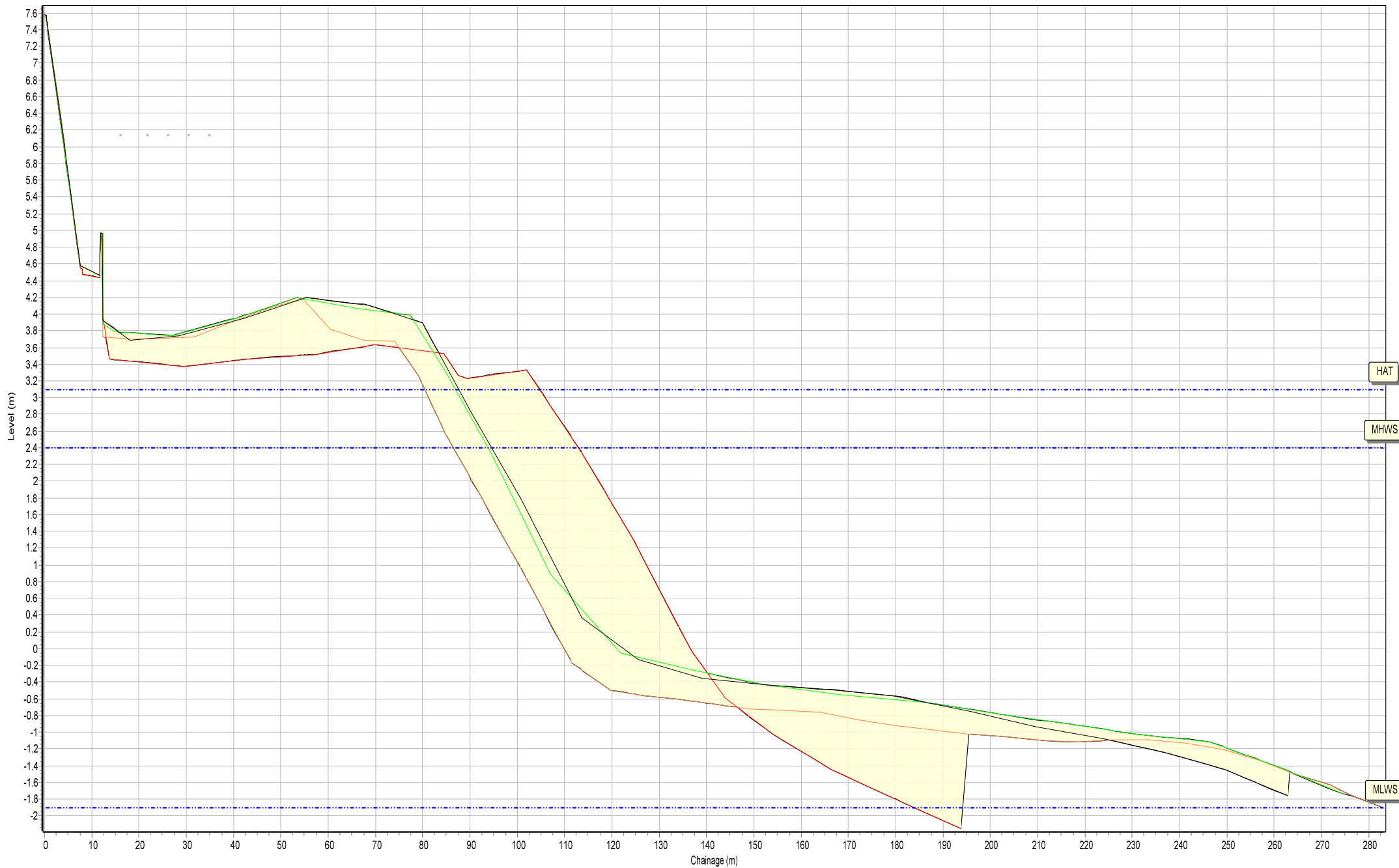
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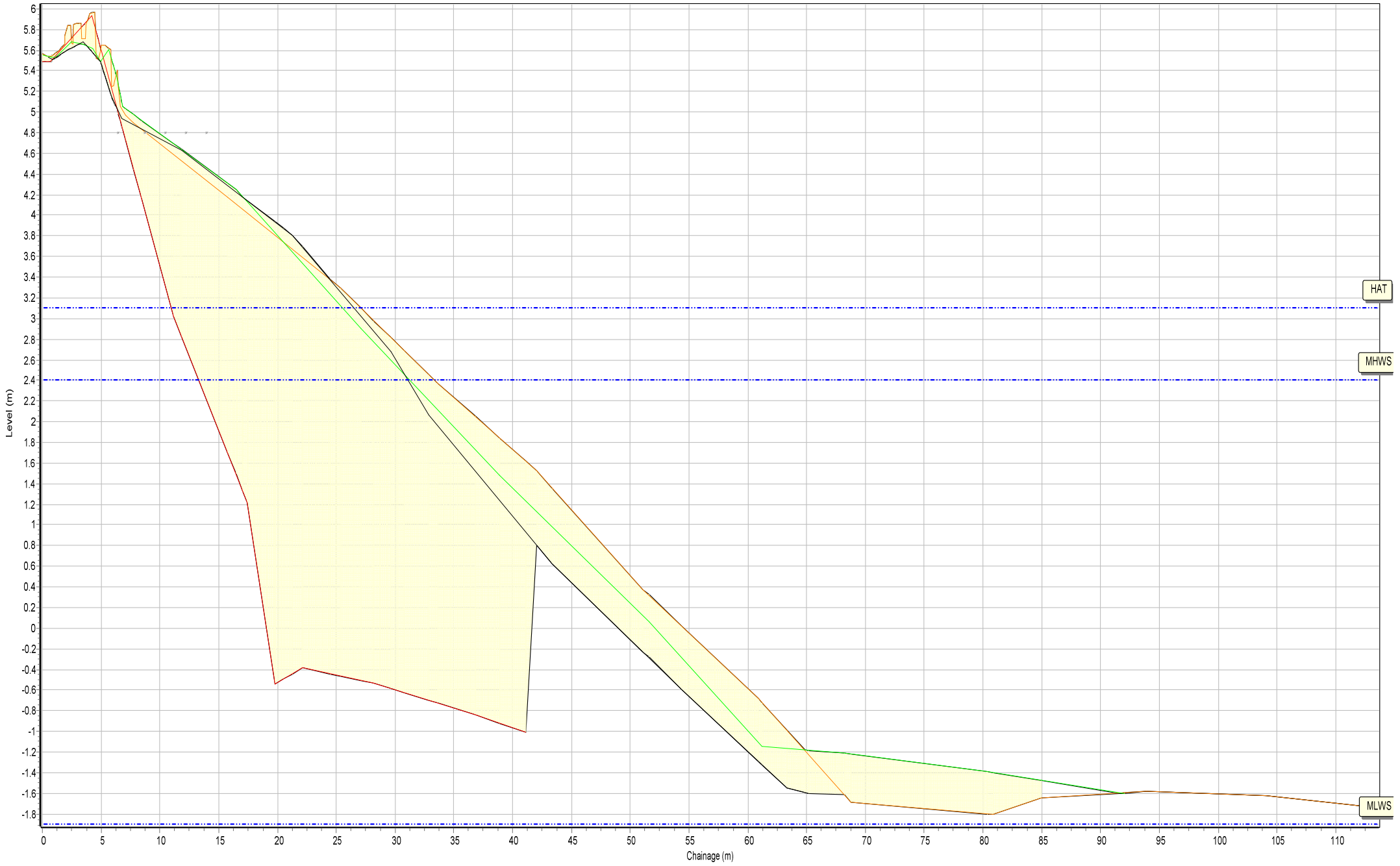
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SANDS

Beach Profiles: 1aWDC06A



Beach Profiles: 1aWDC07



Profiles Envelope 01/10/2006 03/10/2019 14/03/2020 01/09/2020

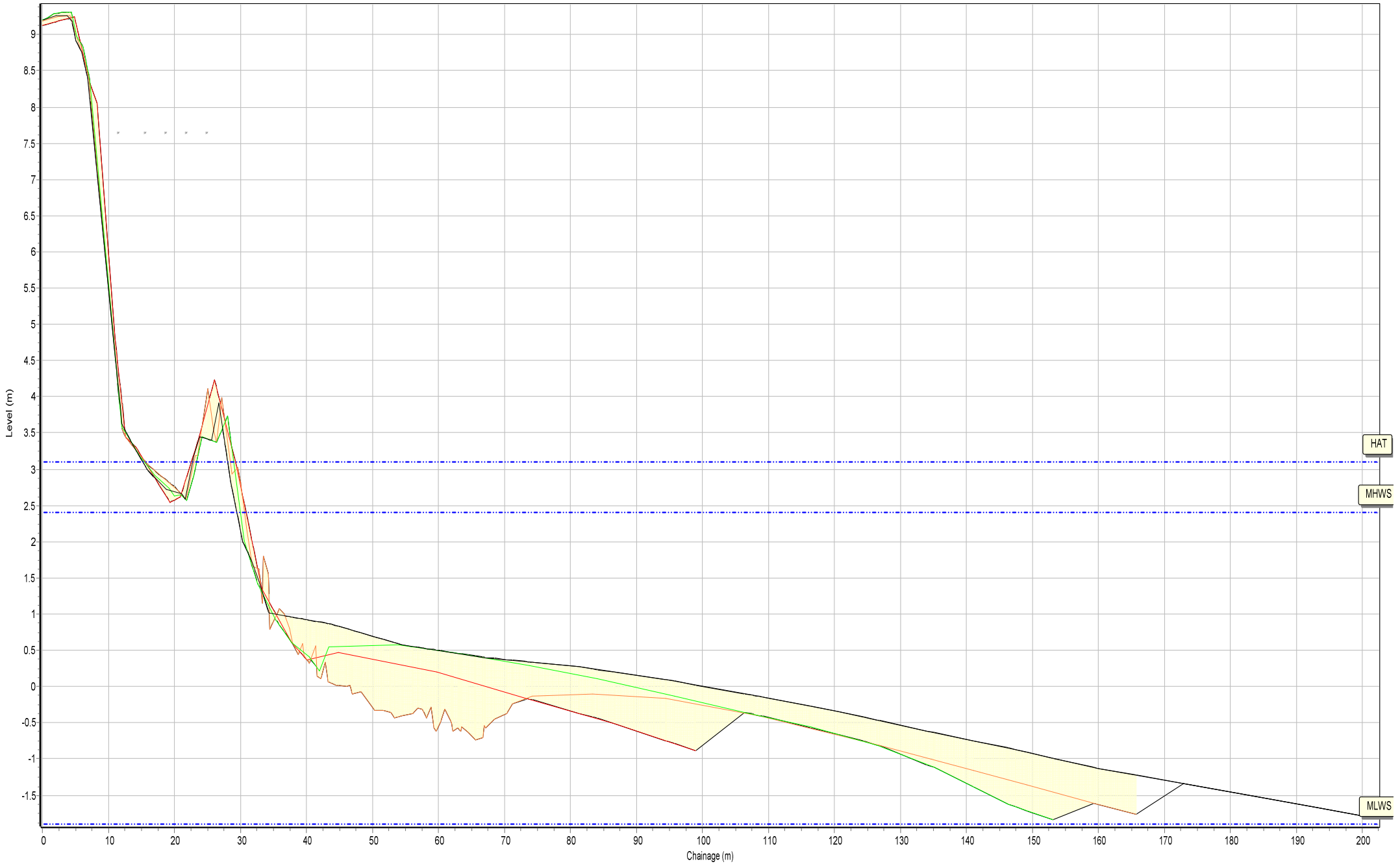
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MHWS

MLWS

SANDS

Beach Profiles: 1aWDC08



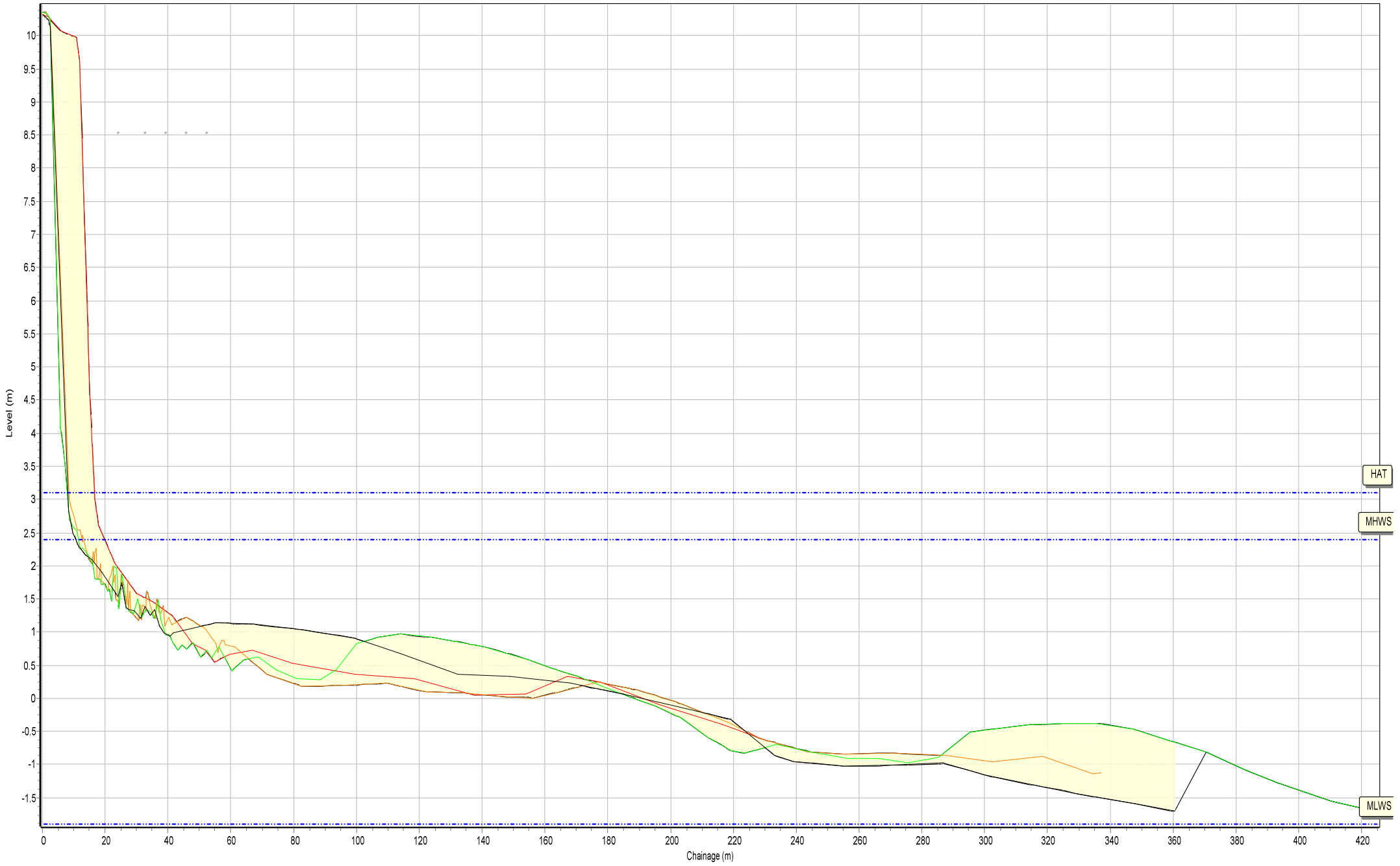
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MLWS

MLW

SANDS

Beach Profiles: 1aWDC09



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC10



HAT  
MHWS  
MLWS  
SANDS



# Beach Profiles: 1aWDC11



Beach Profiles: 1aWDC12



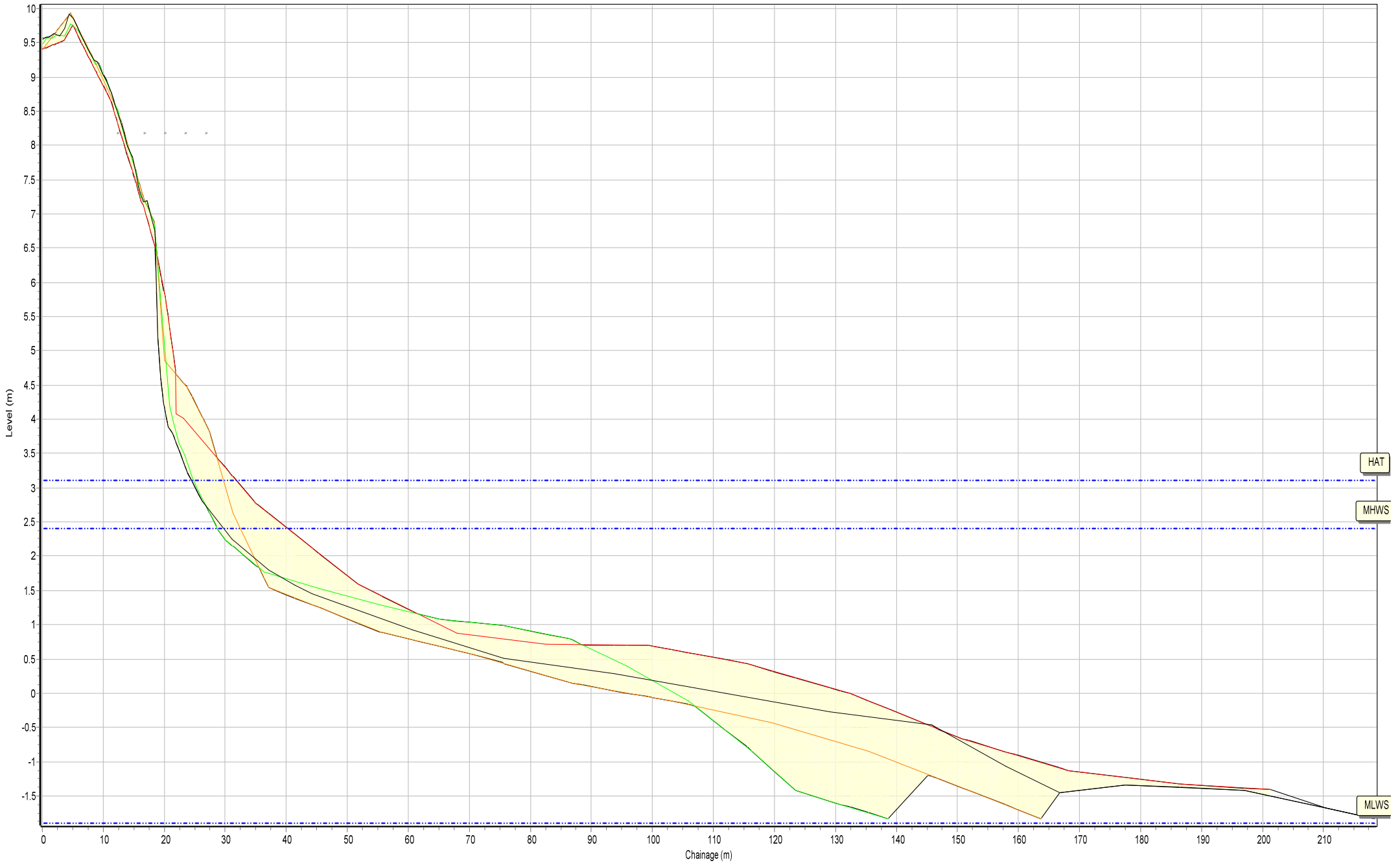
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SANDS

# Beach Profiles: 1aWDC13



HAT

MHWS

MLWS

SANDS

# Beach Profiles: 1aWDC14



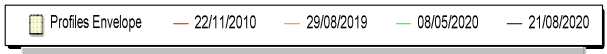
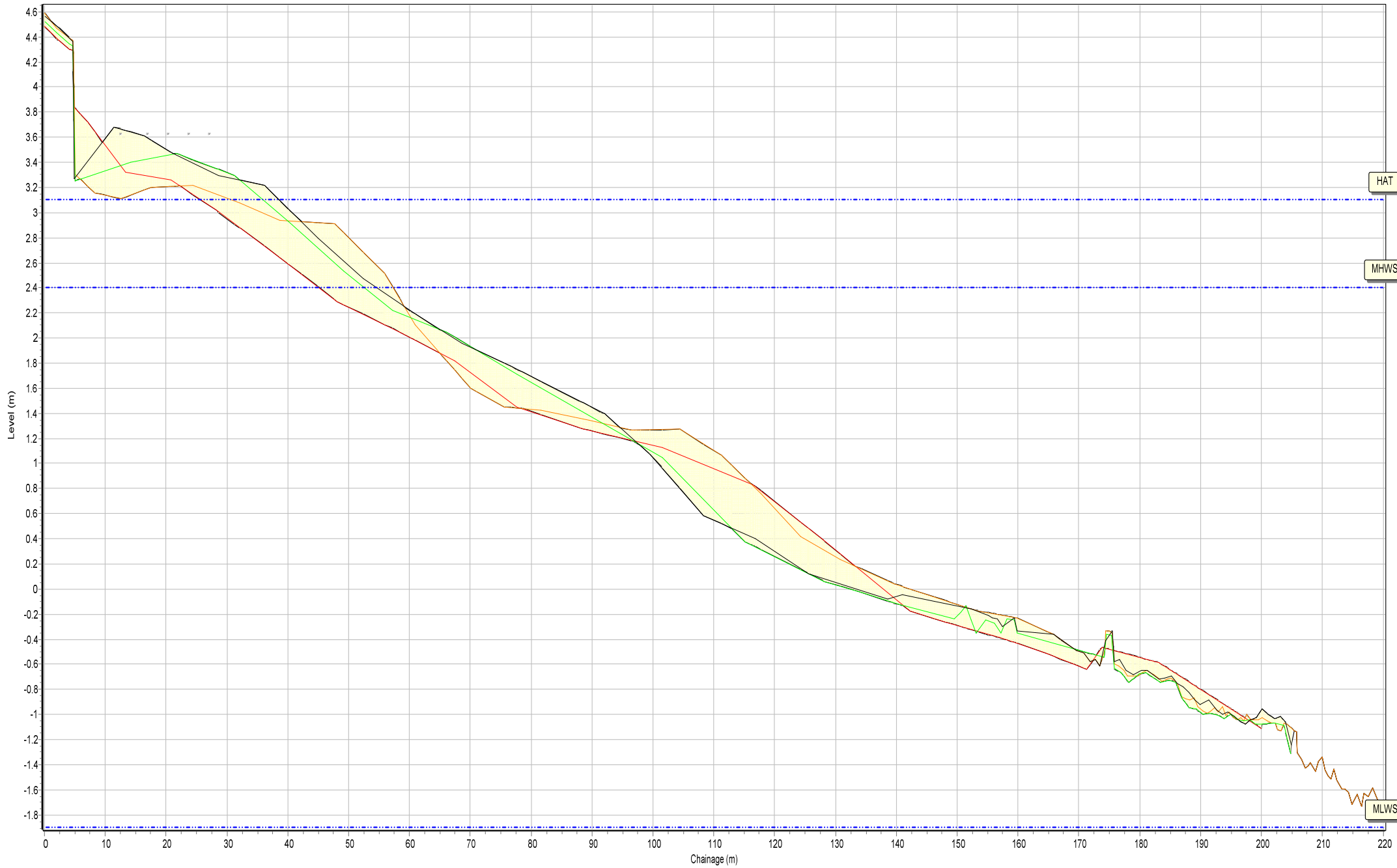
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MHWS

MLWS

SANDS

Beach Profiles: 1aNBW1



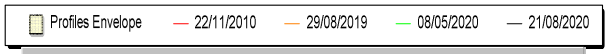
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MLWS

SANDS

Beach Profiles: 1aNBW2



HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB3



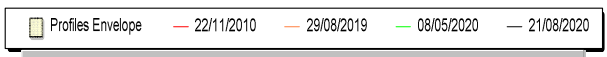
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MLWS

MLWS

SANDS

Beach Profiles: 1aNWB4



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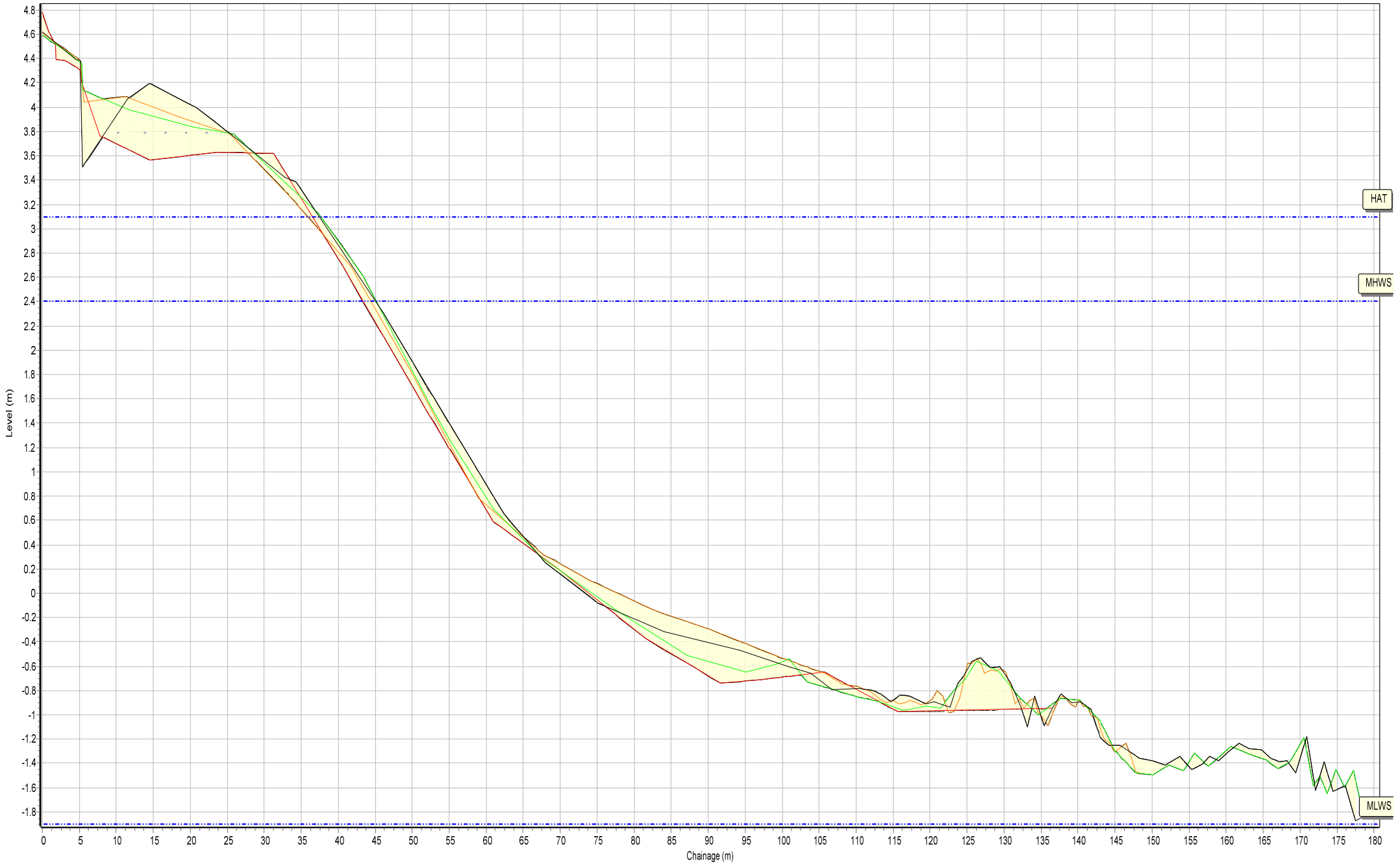
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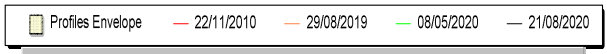
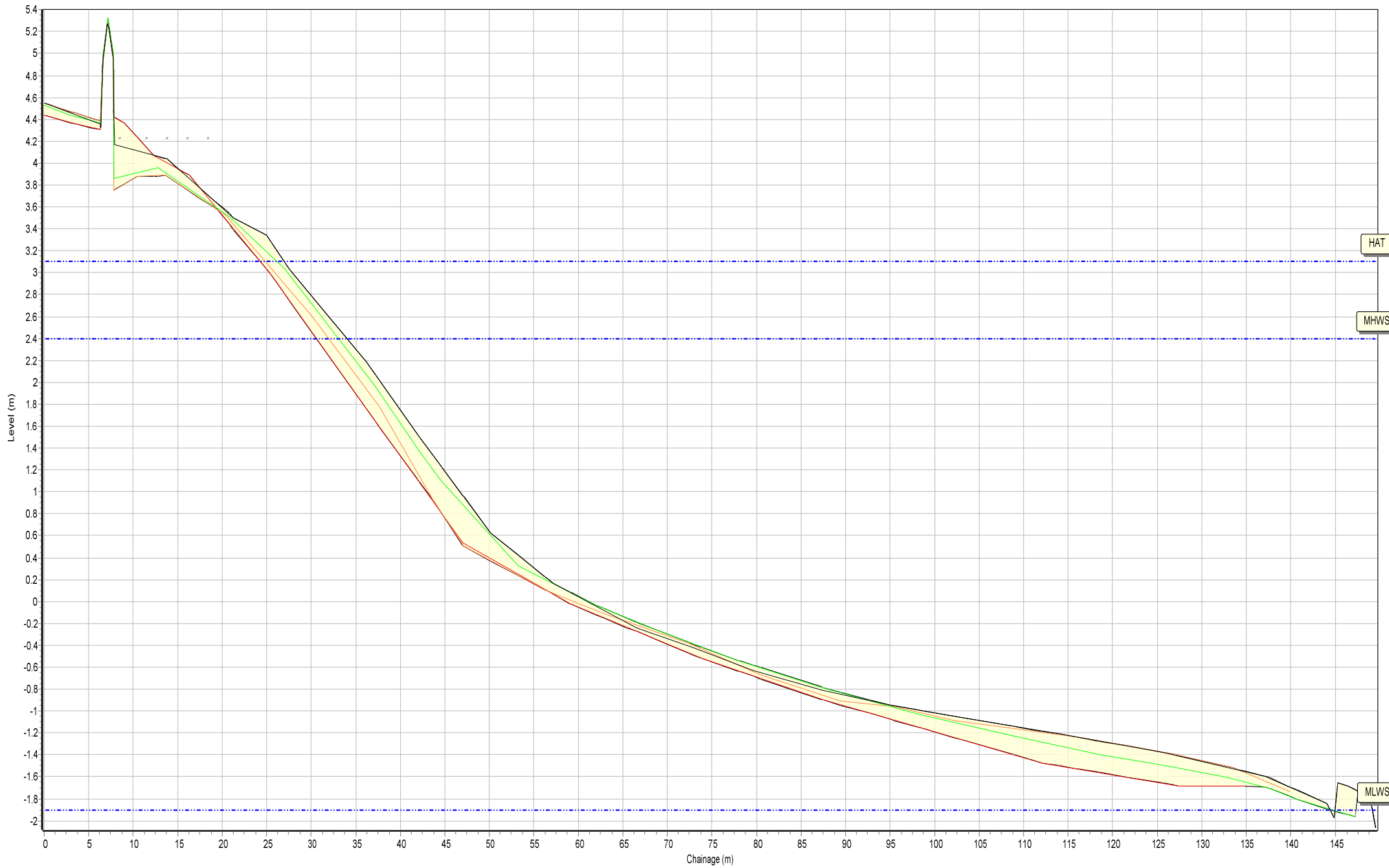
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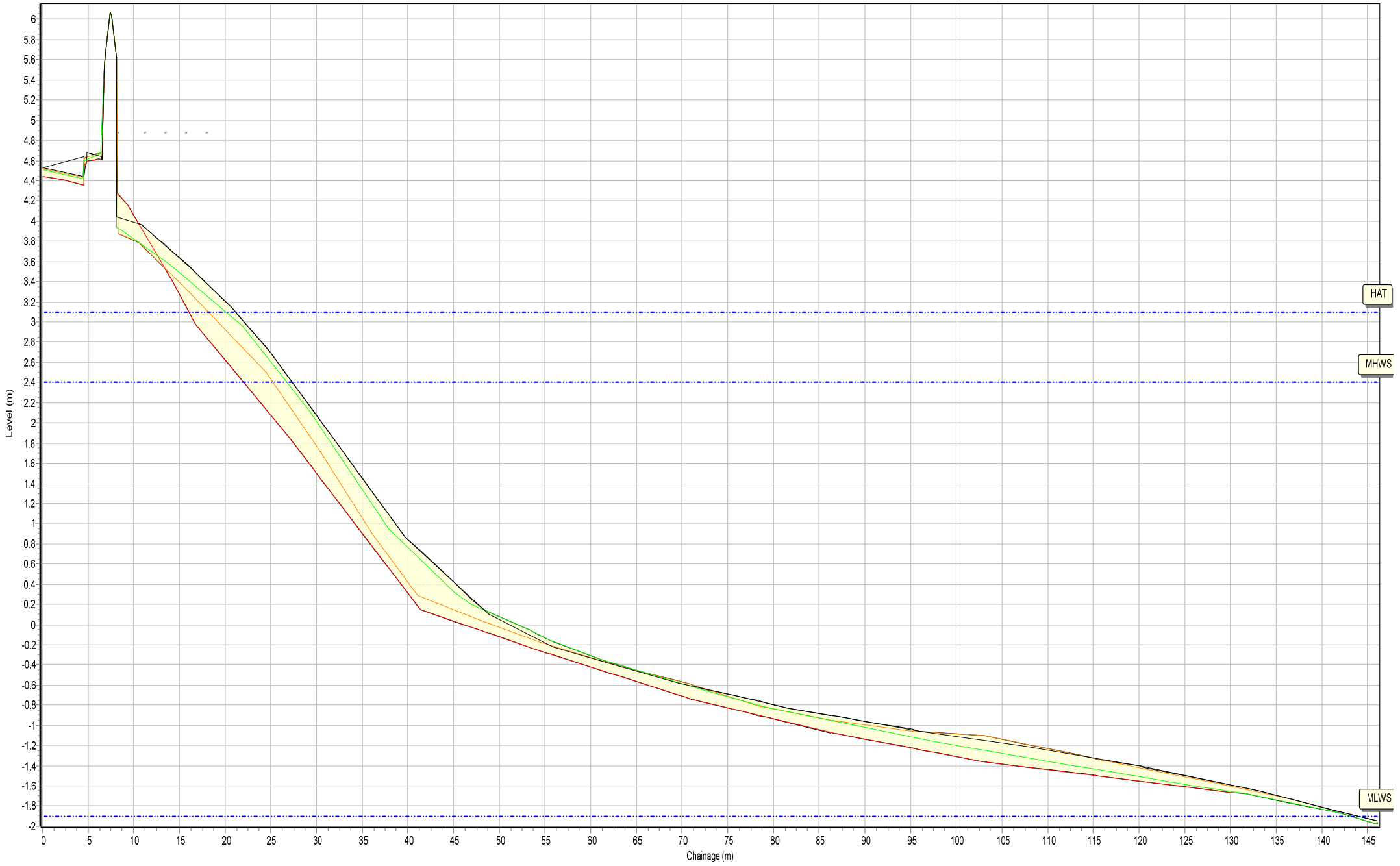
Beach Profiles: 1aNWB5



Beach Profiles: 1aNWB6



# Beach Profiles: 1aNBW7



Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

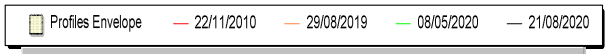
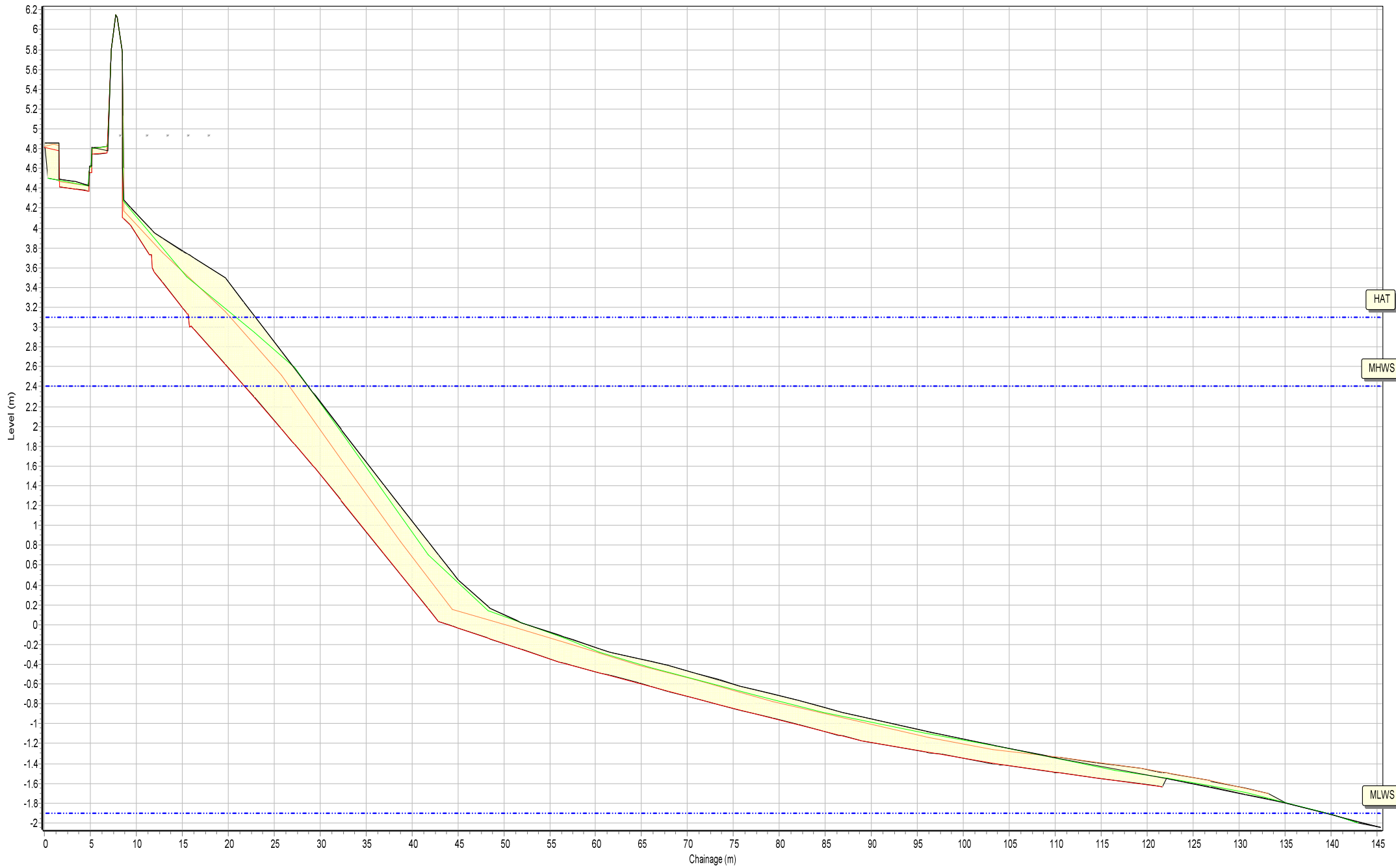
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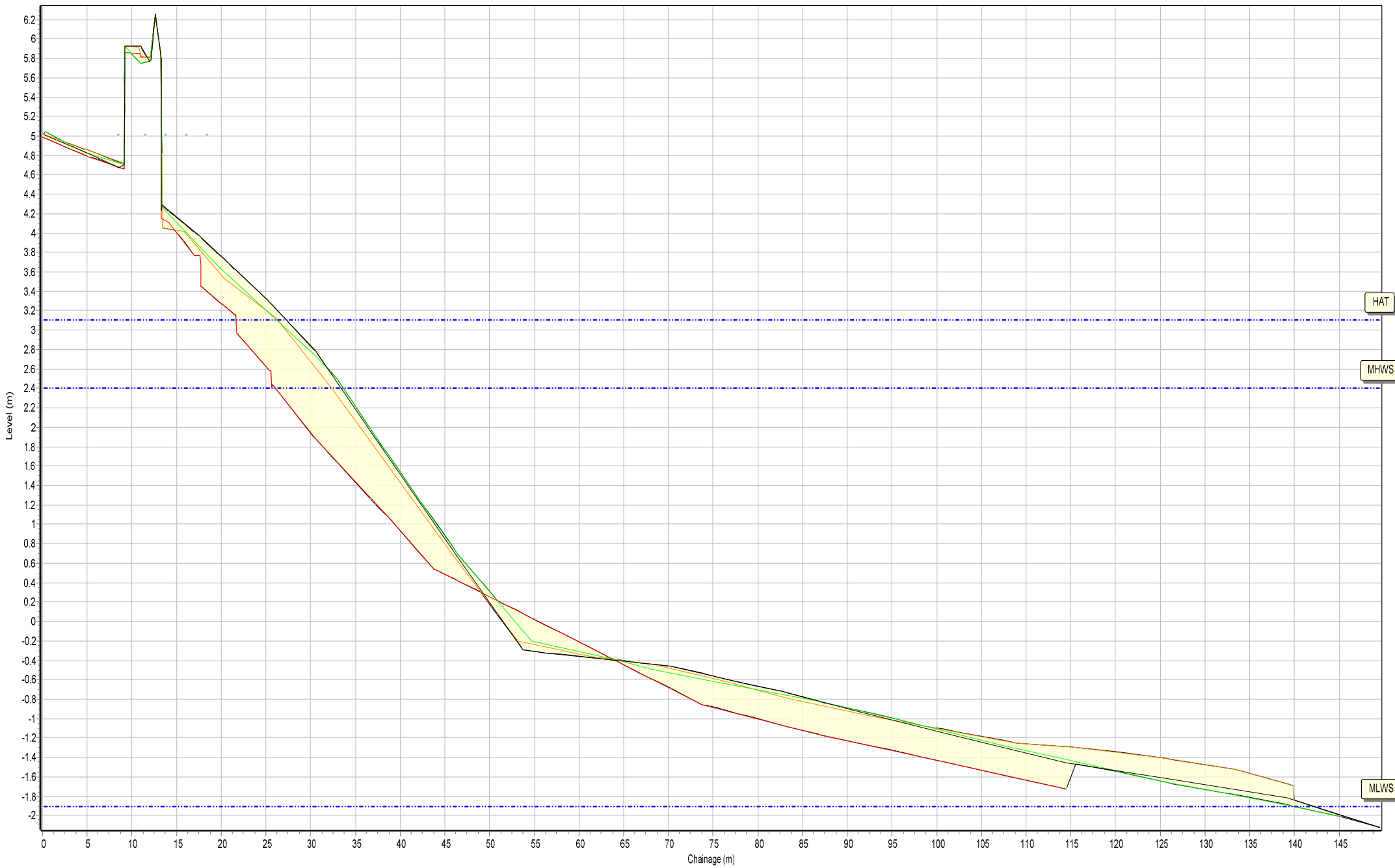
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SANDS

Beach Profiles: 1aNWB8

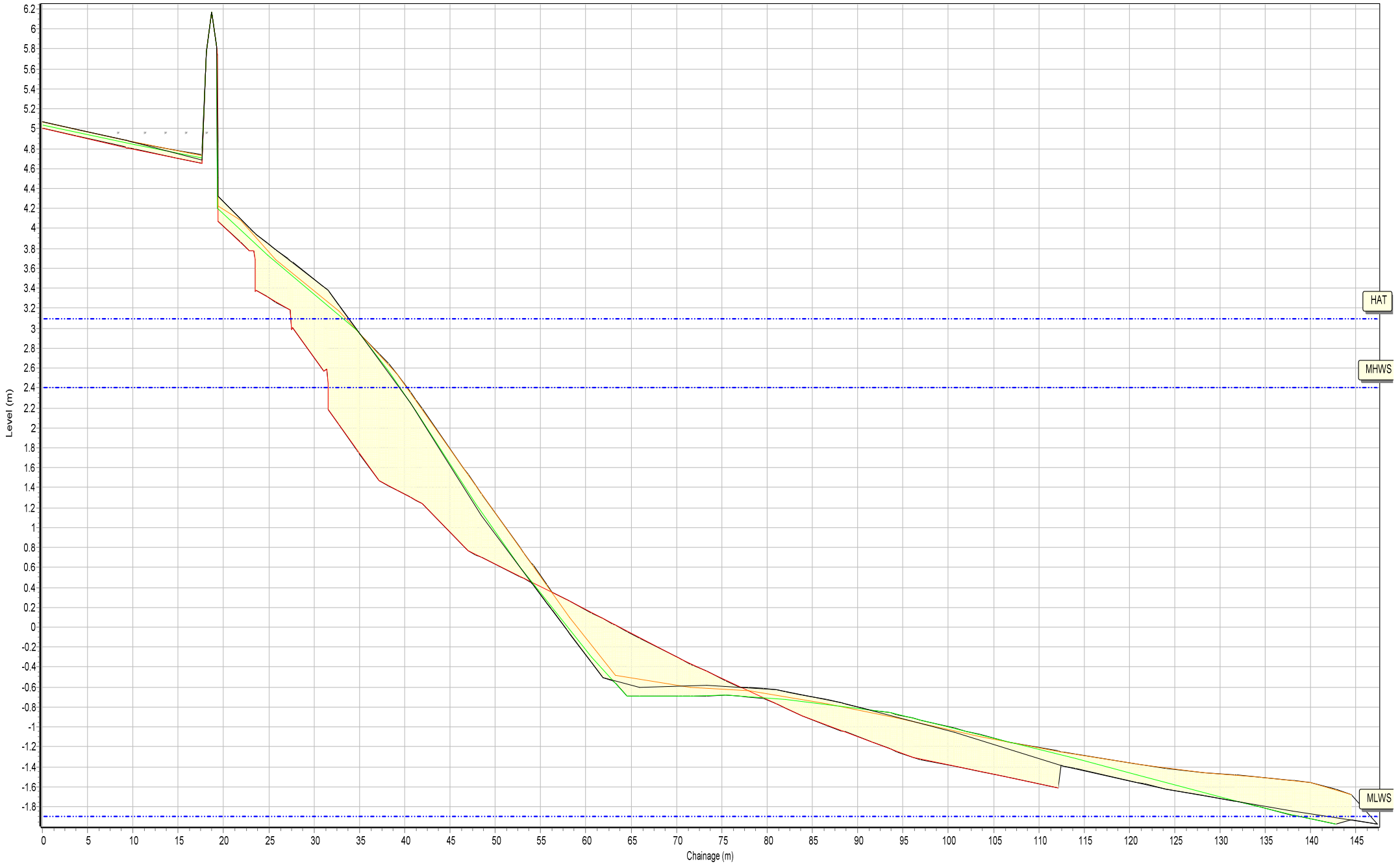


Beach Profiles: 1aNWB9



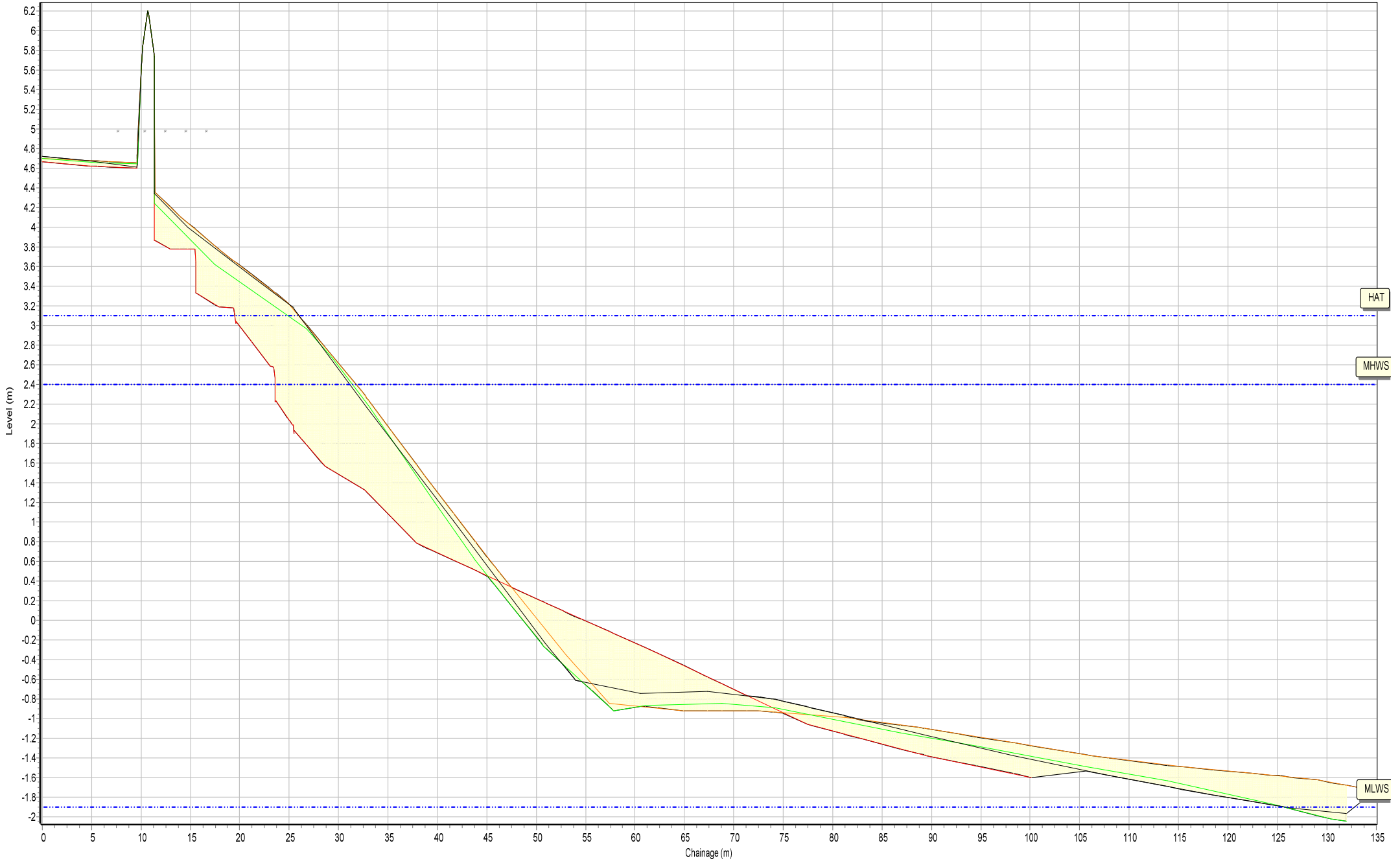
Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

# Beach Profiles: 1aNWB10



Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

Beach Profiles: 1aNWB11



Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

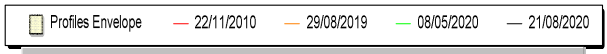
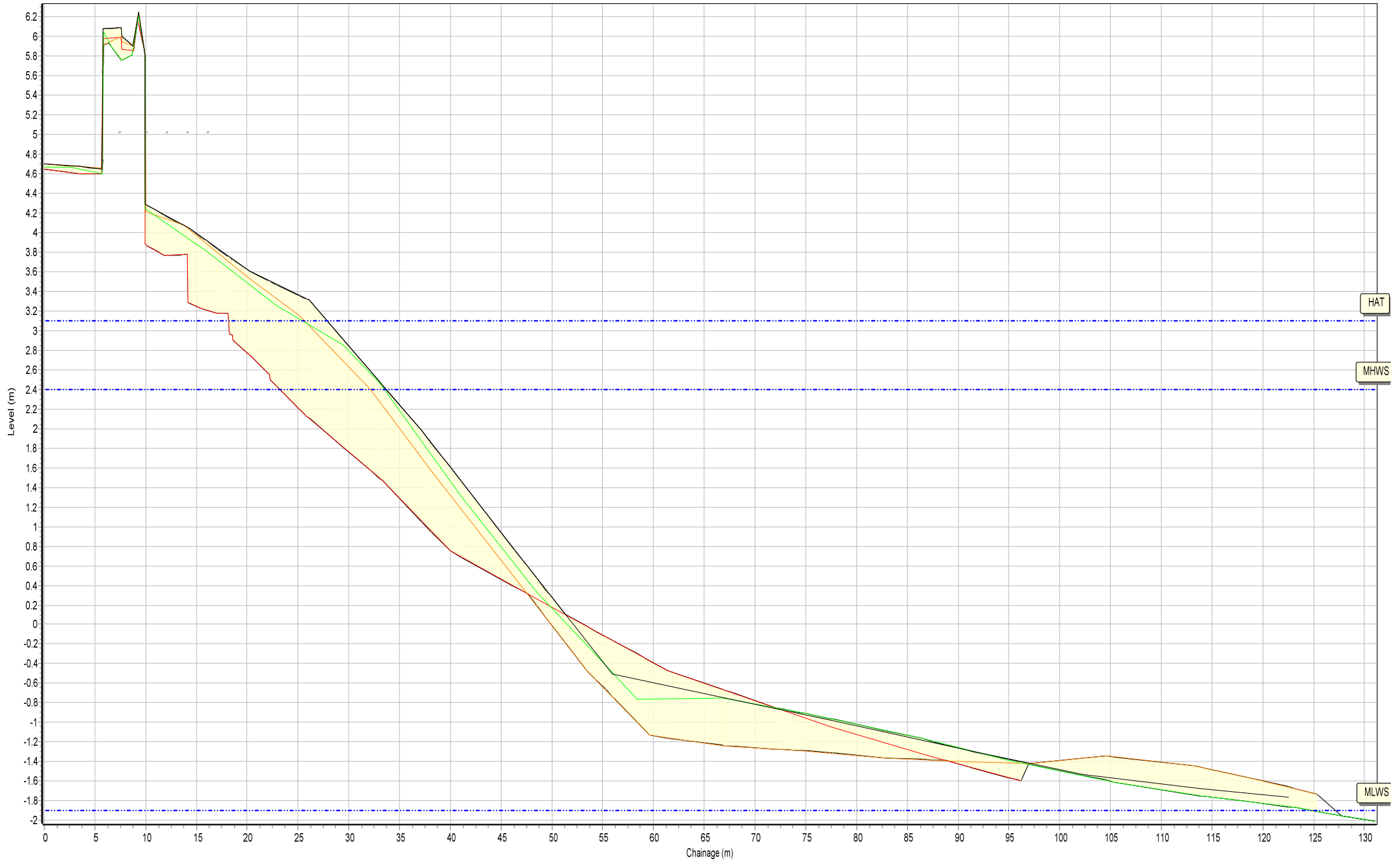
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MHWS

MLWS

SANDS

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HAT

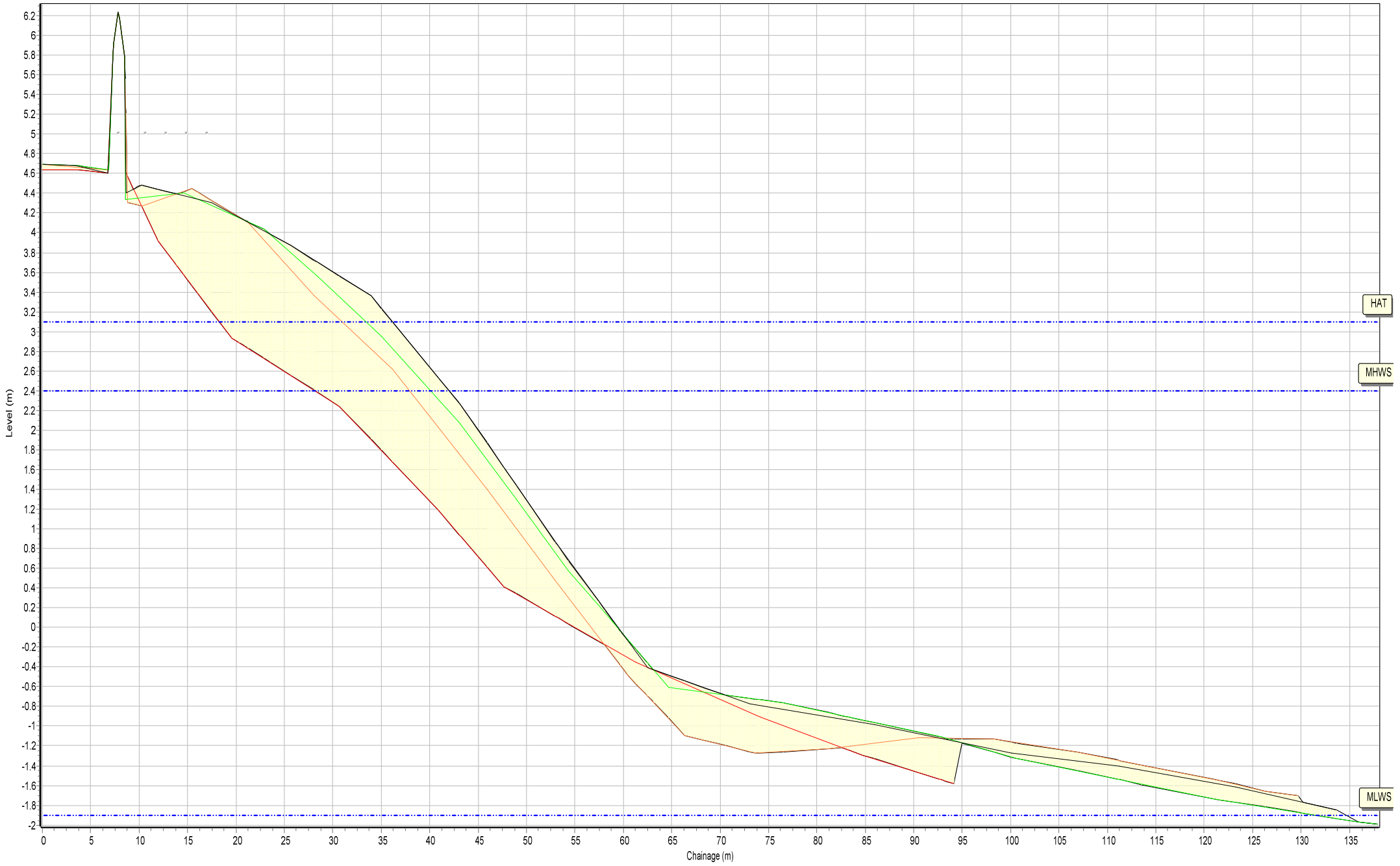
MHWs

MLWS

SANDS



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Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

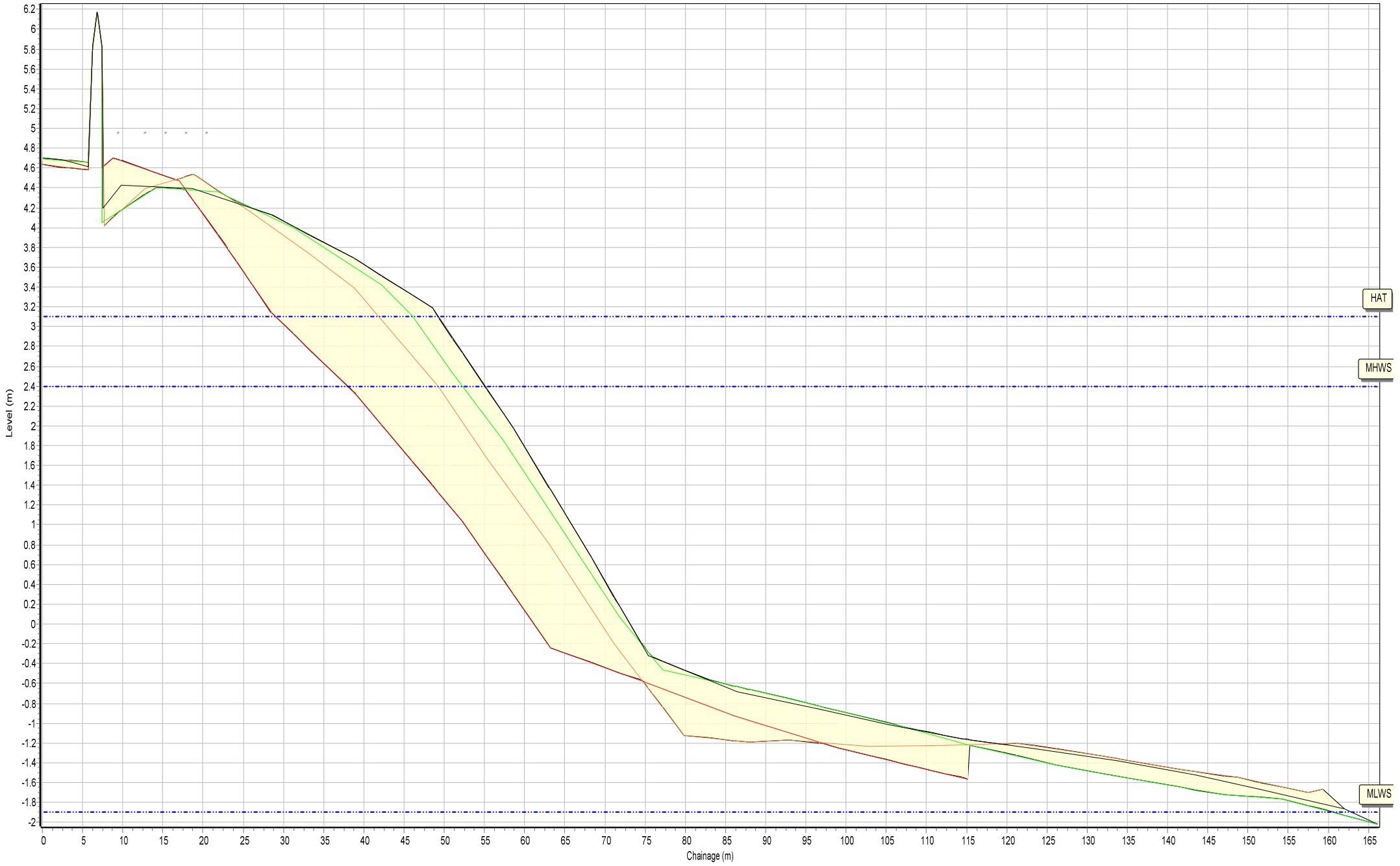
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MHWS

MLWS

SANDS

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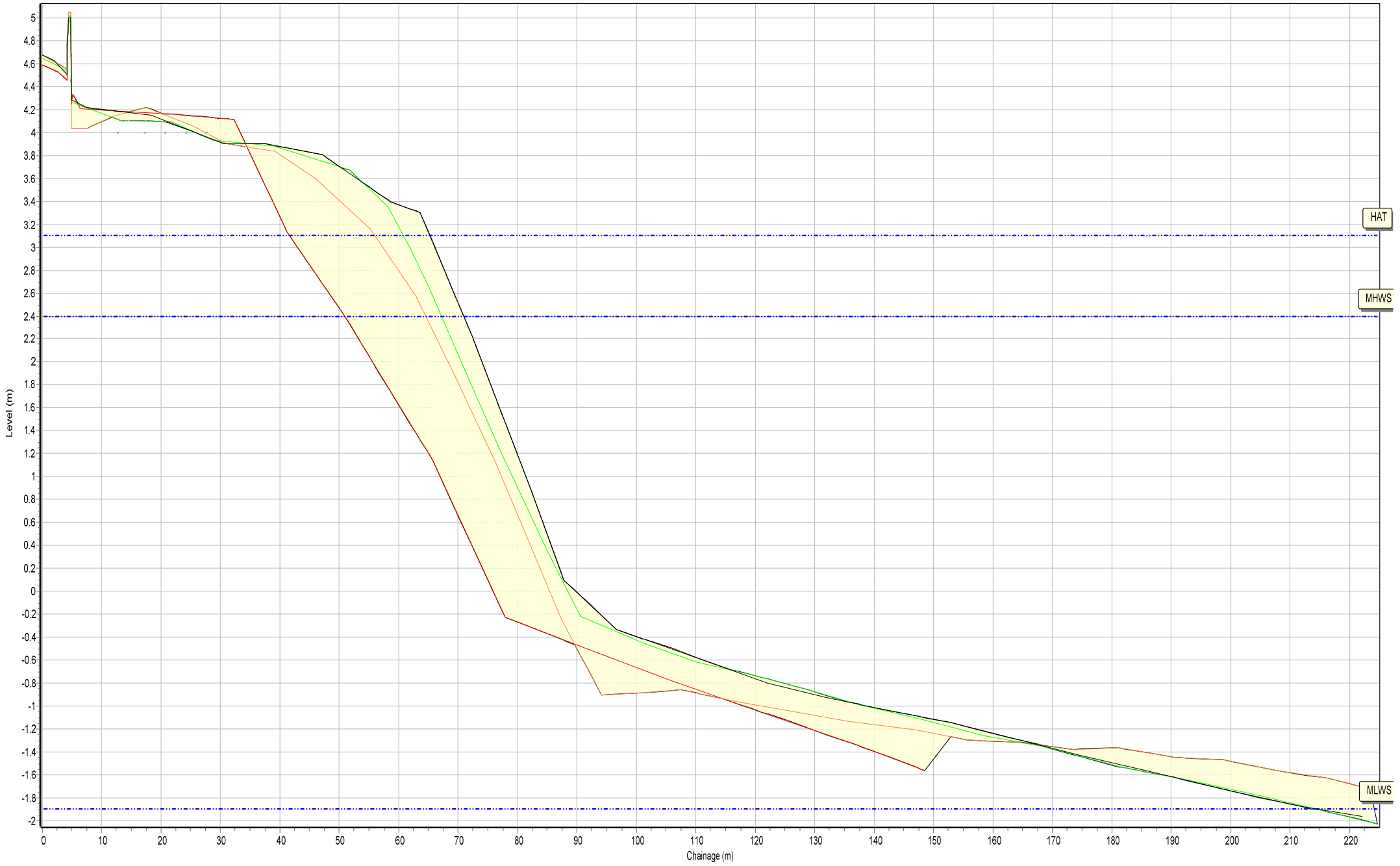
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MHWS

MLWS

SANDS

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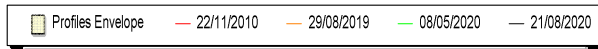
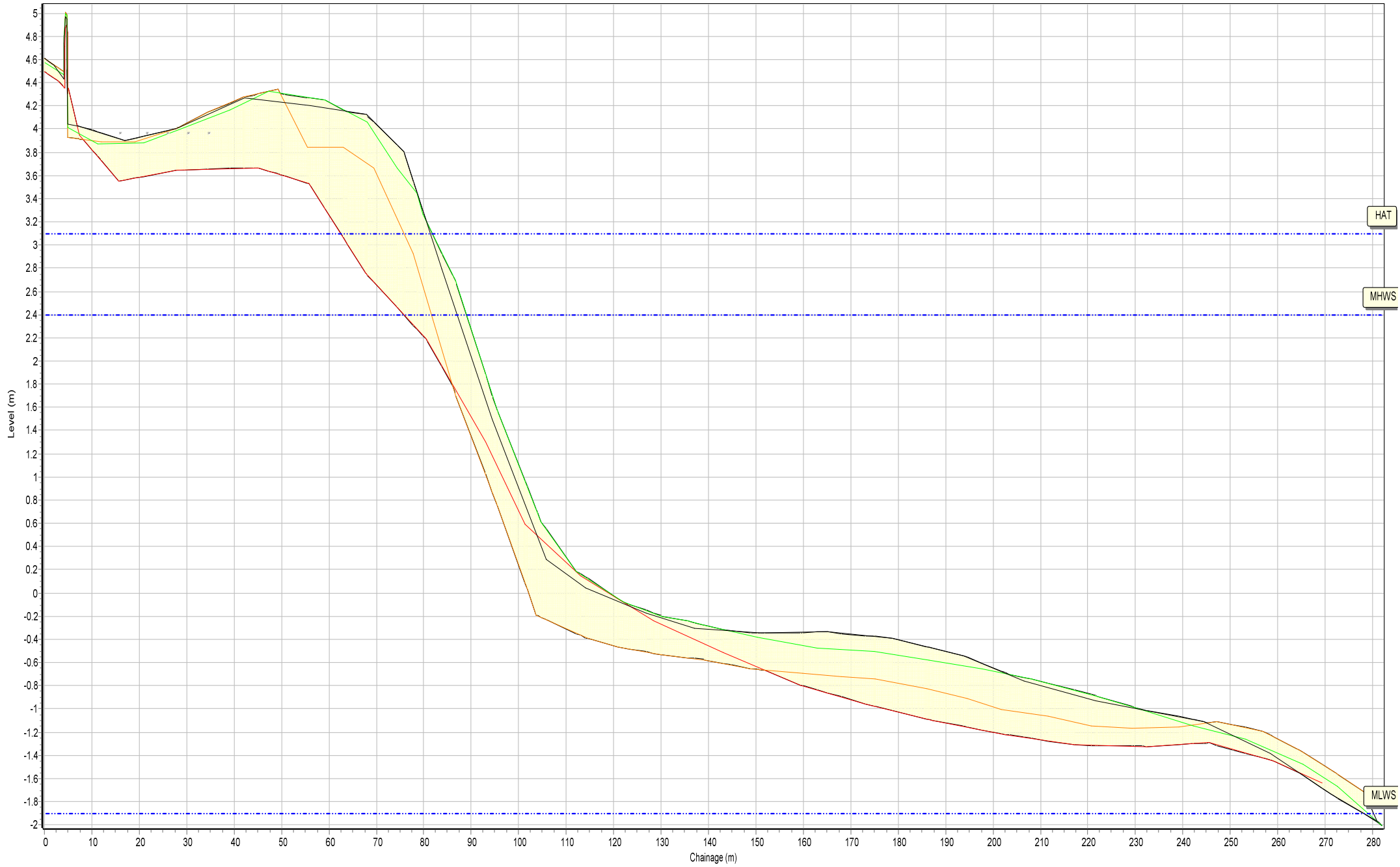


Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

Beach Profiles: 1aNWB16



# Beach Profiles: 1aNWB17



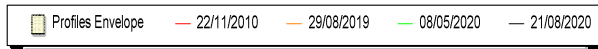
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MHWS

MLWS

SANDS

Beach Profiles: 1aNWB18



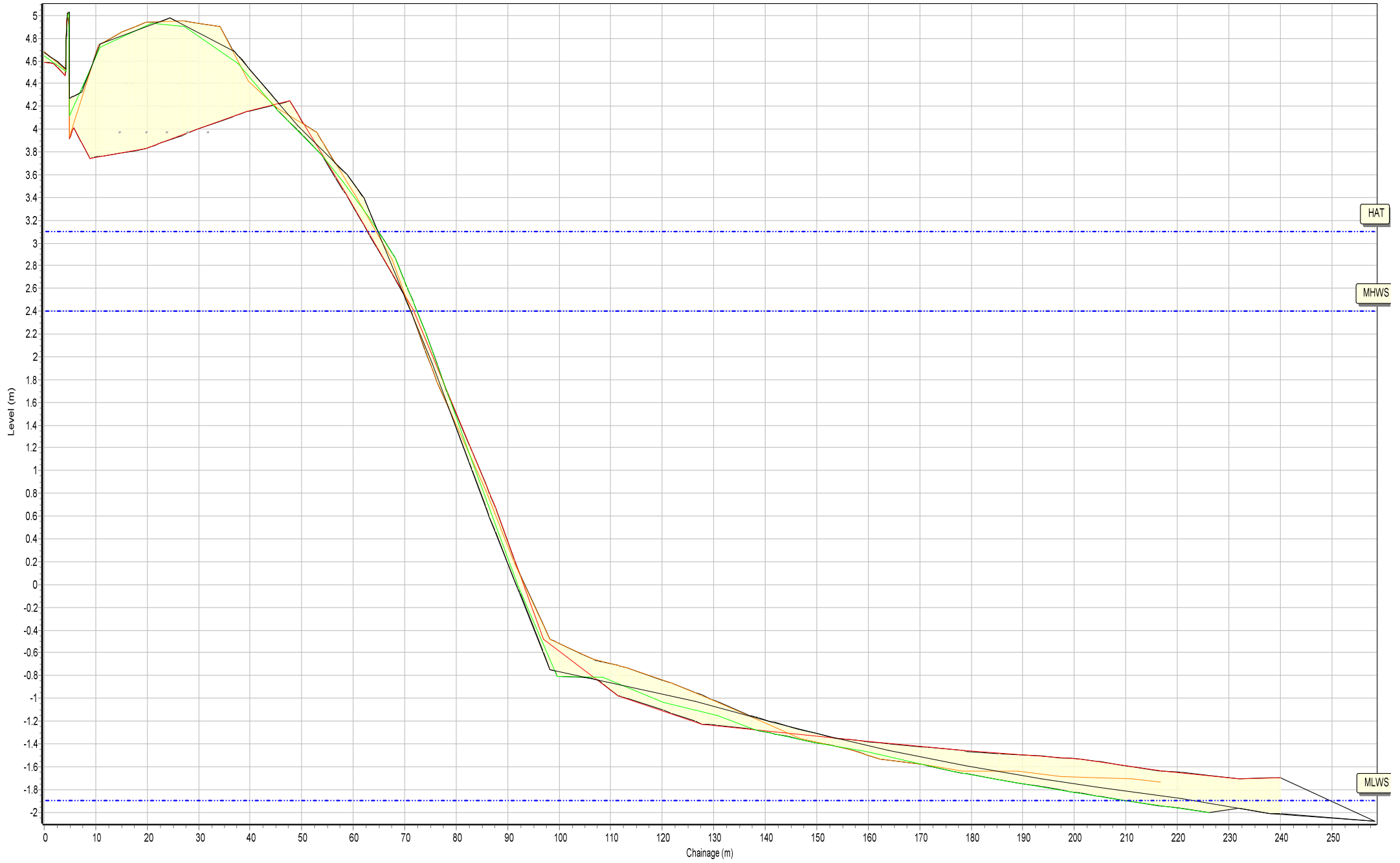
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MHWS

MLWS

SANDS

Beach Profiles: 1aNBW19



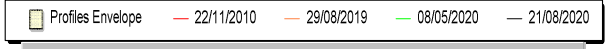
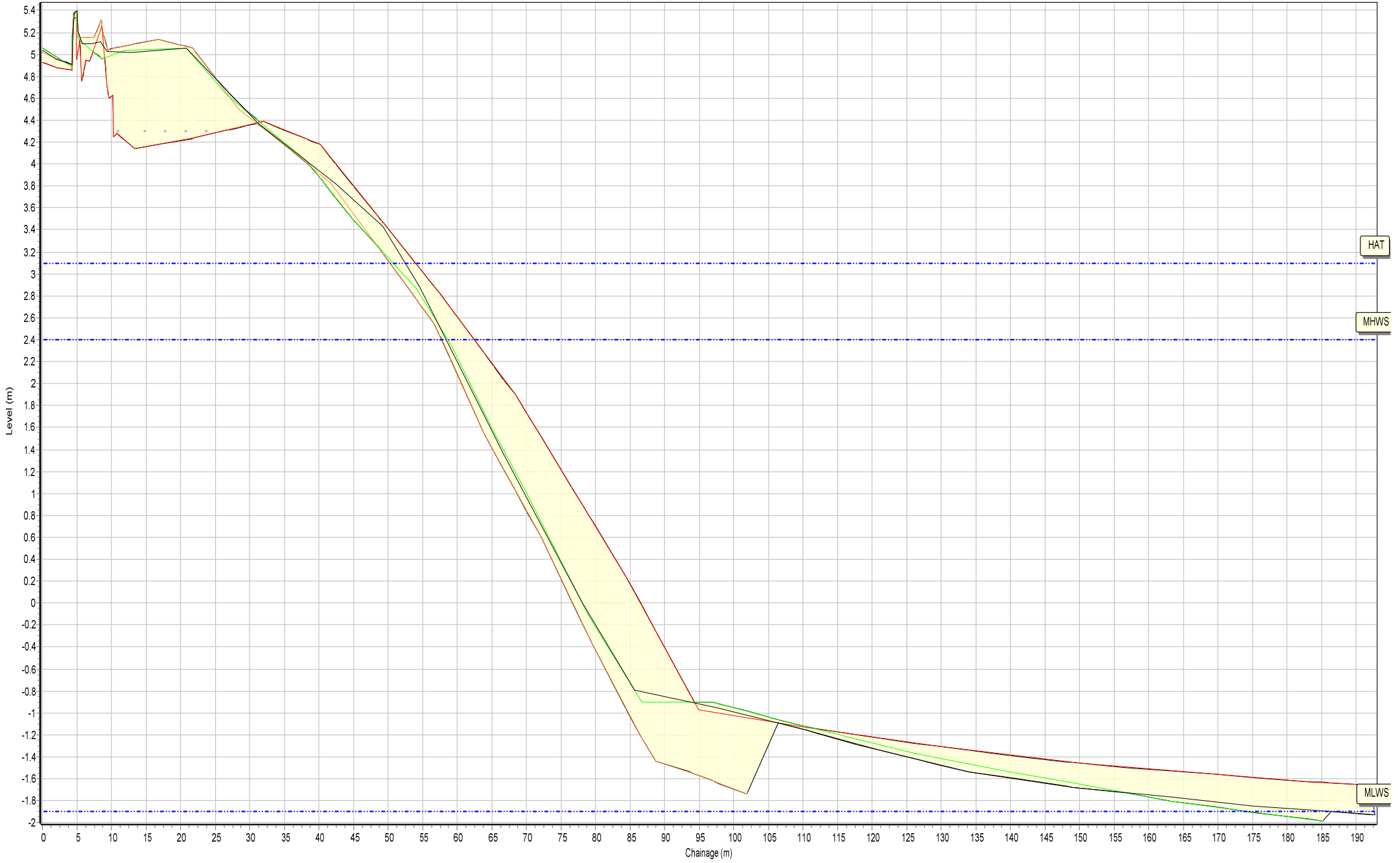
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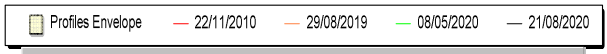
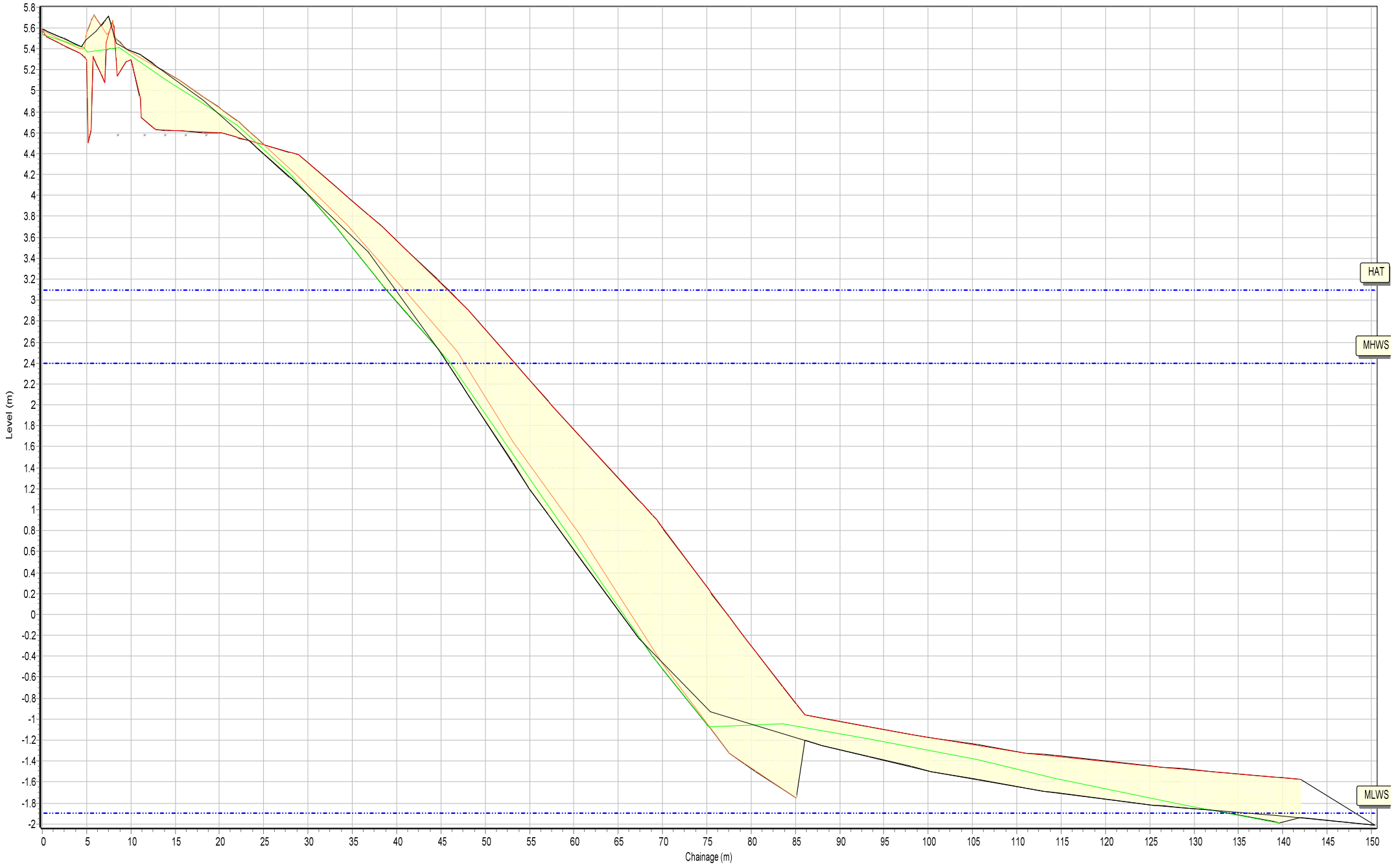
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Beach Profiles: 1aNBW20

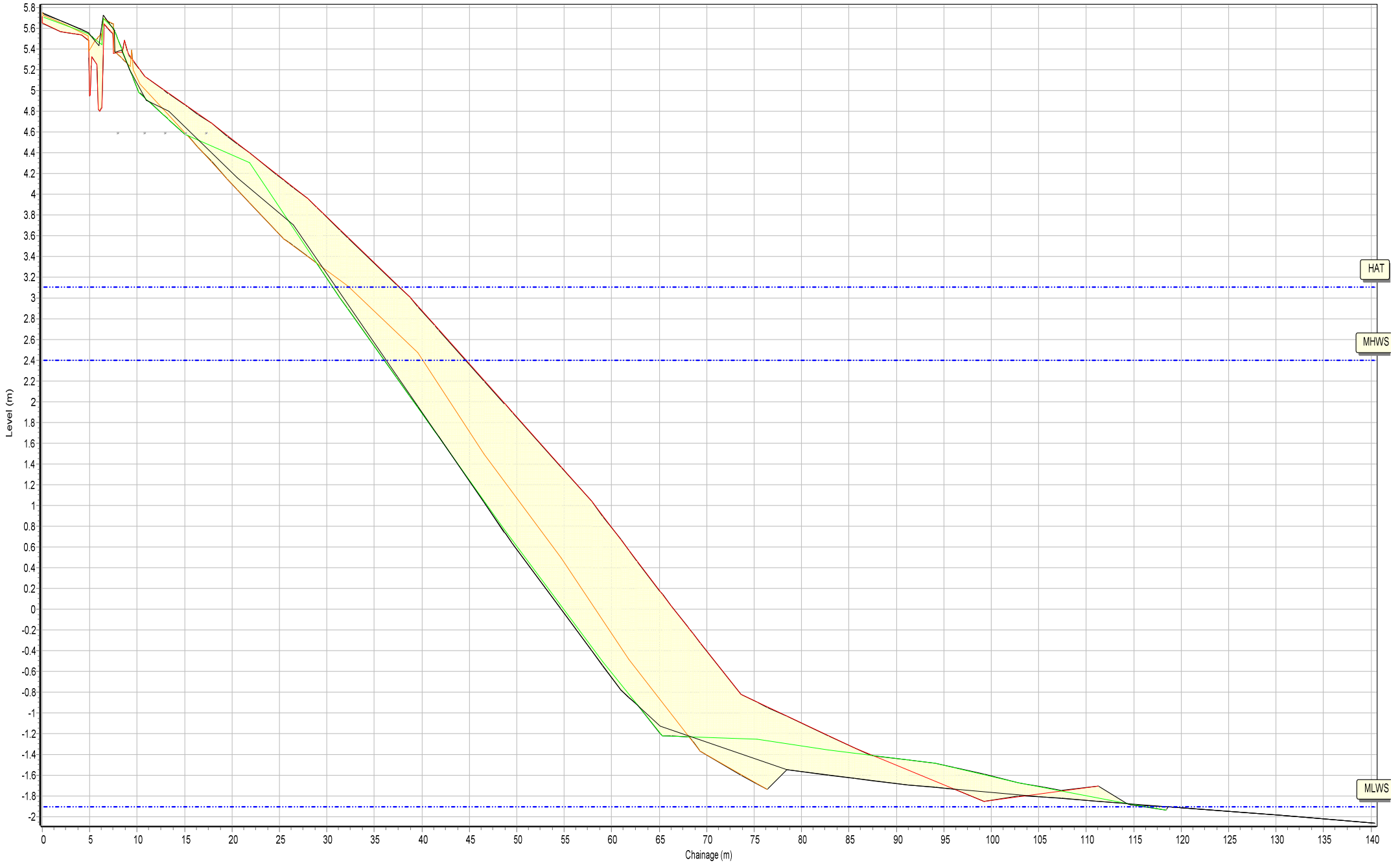




Beach Profiles: 1aNWB21



Beach Profiles: 1aNBW22



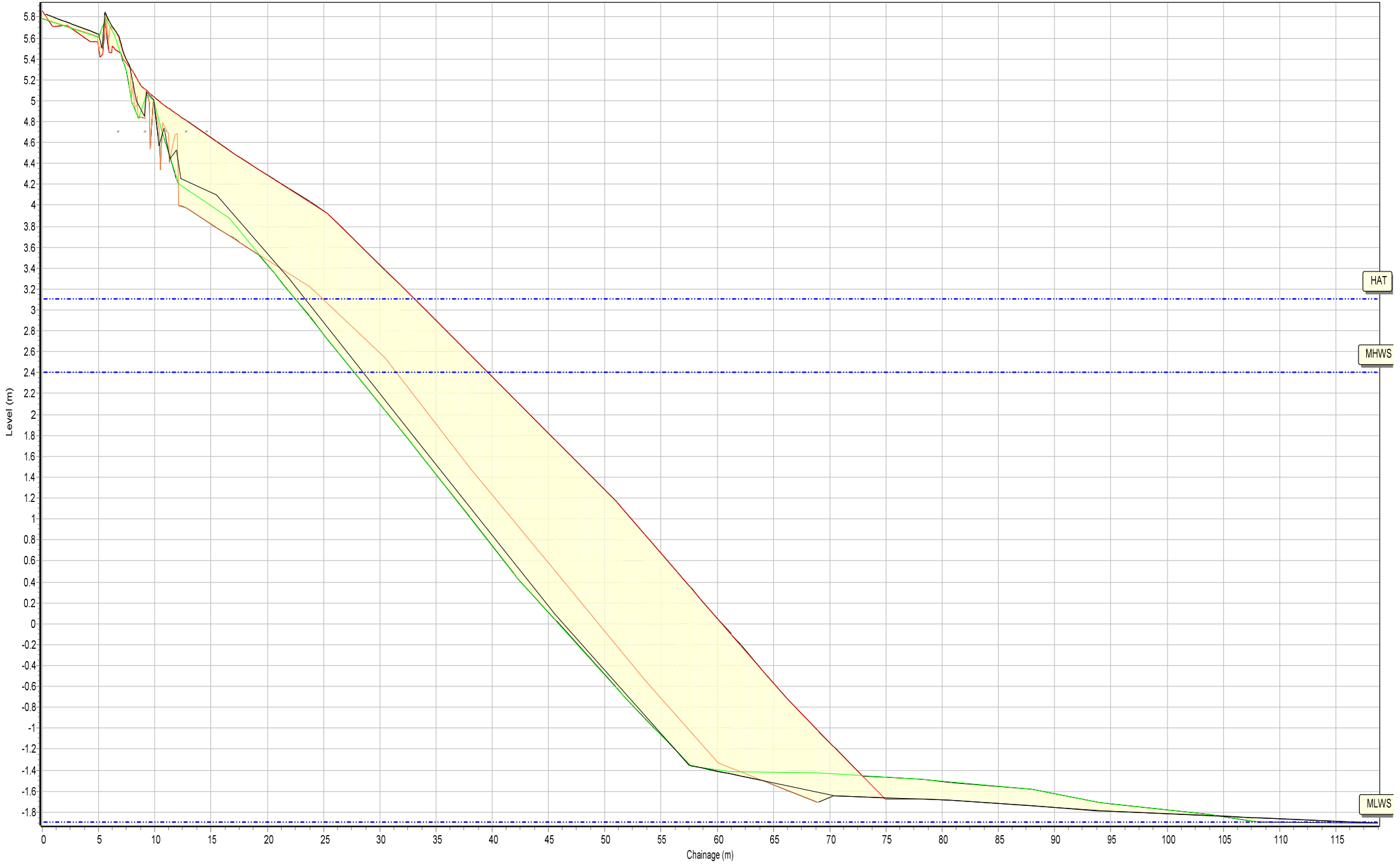
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MLWS

MLWS

SANDS

Beach Profiles: 1aNWB23



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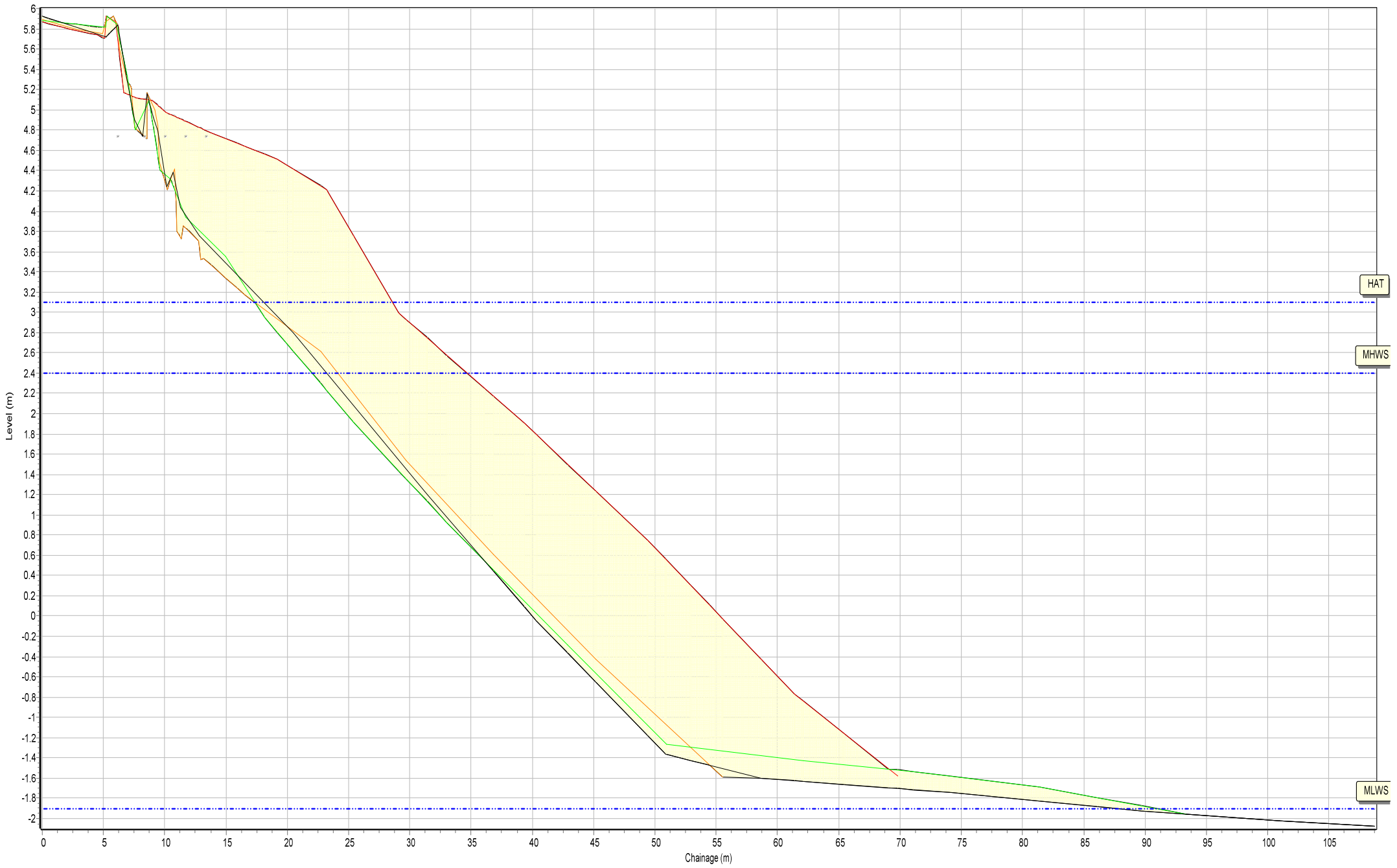
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MHWS

MLWS

SANDS

Beach Profiles: 1aNWB24



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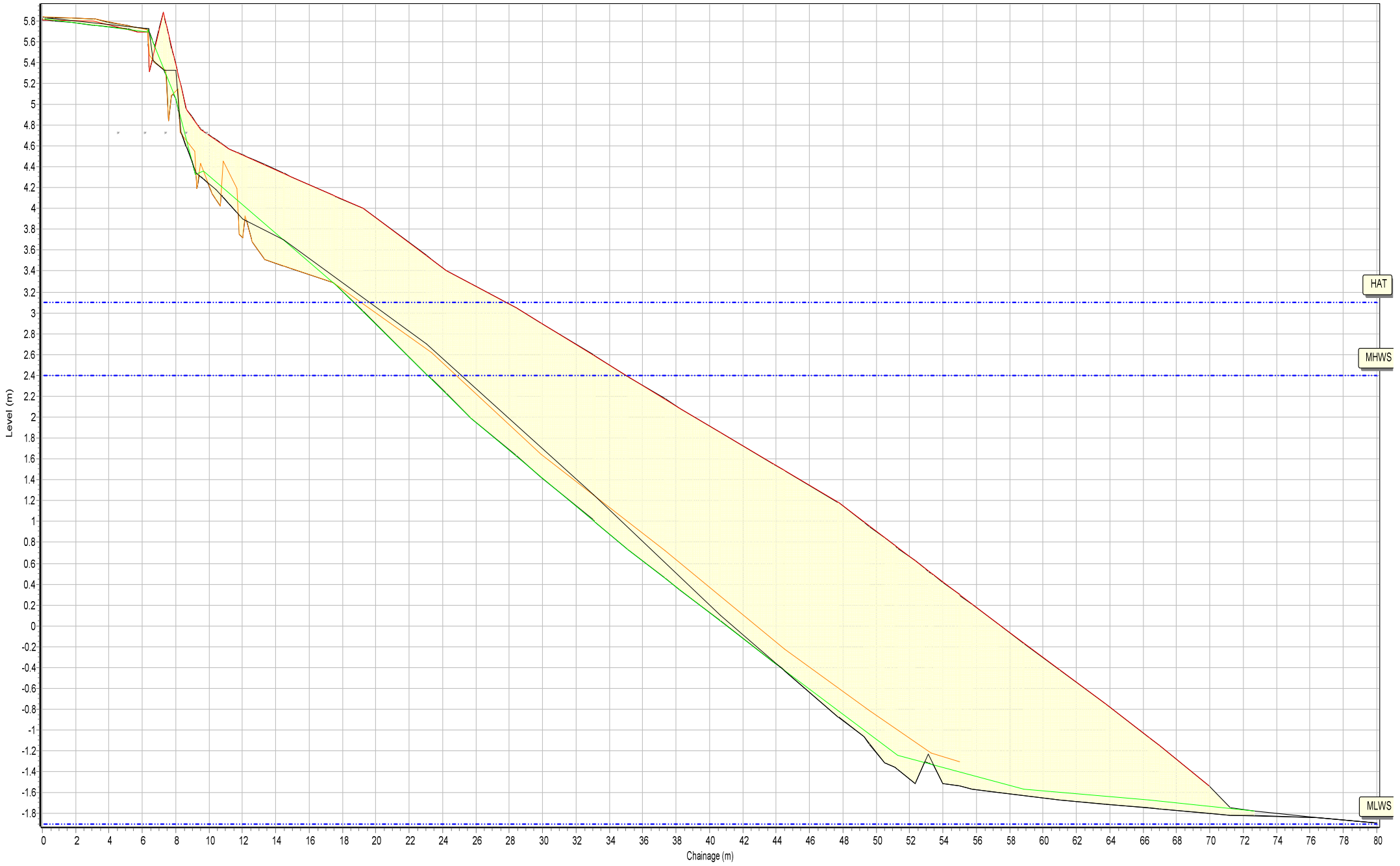
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aNWB25



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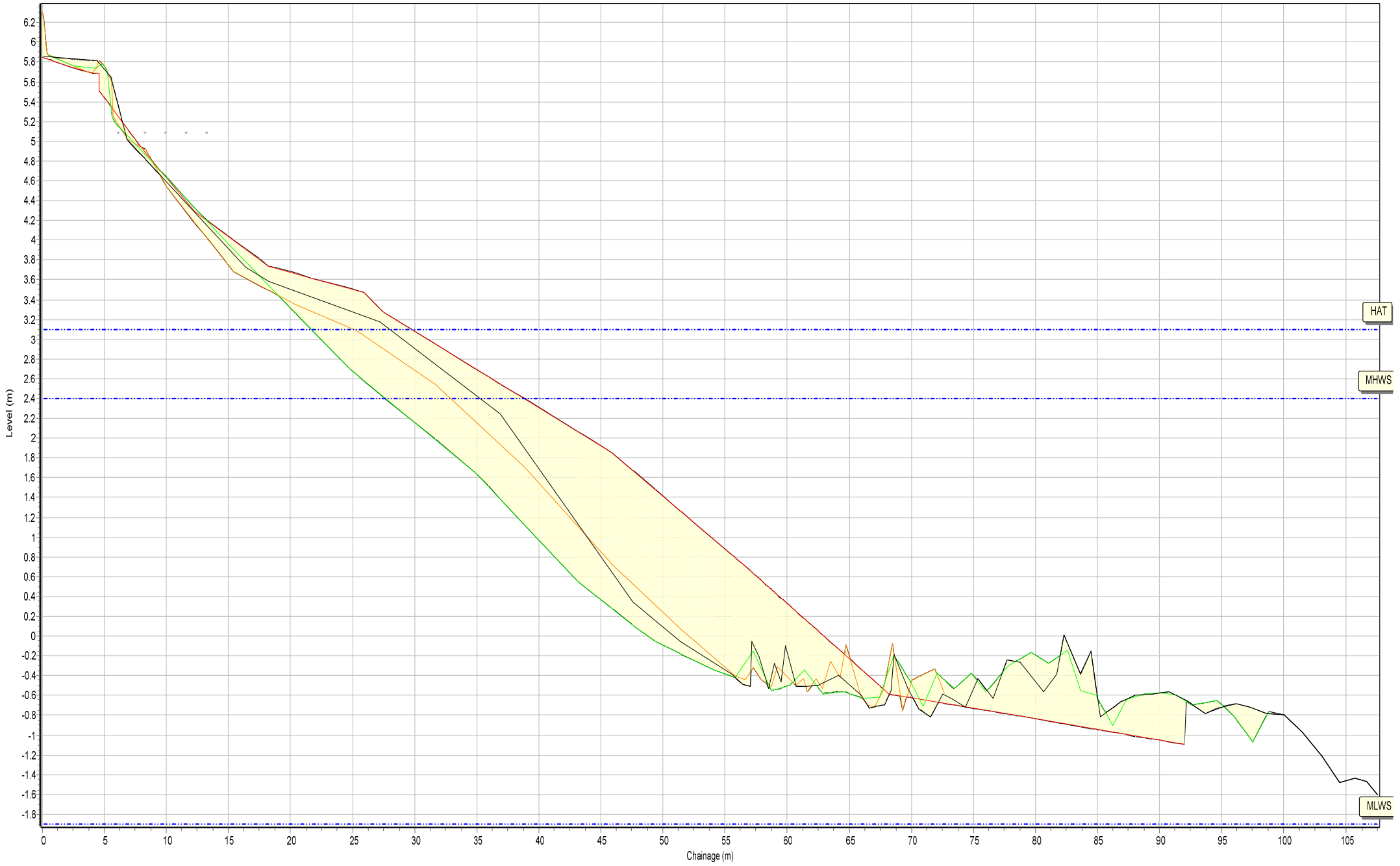
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MLWS

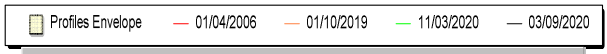
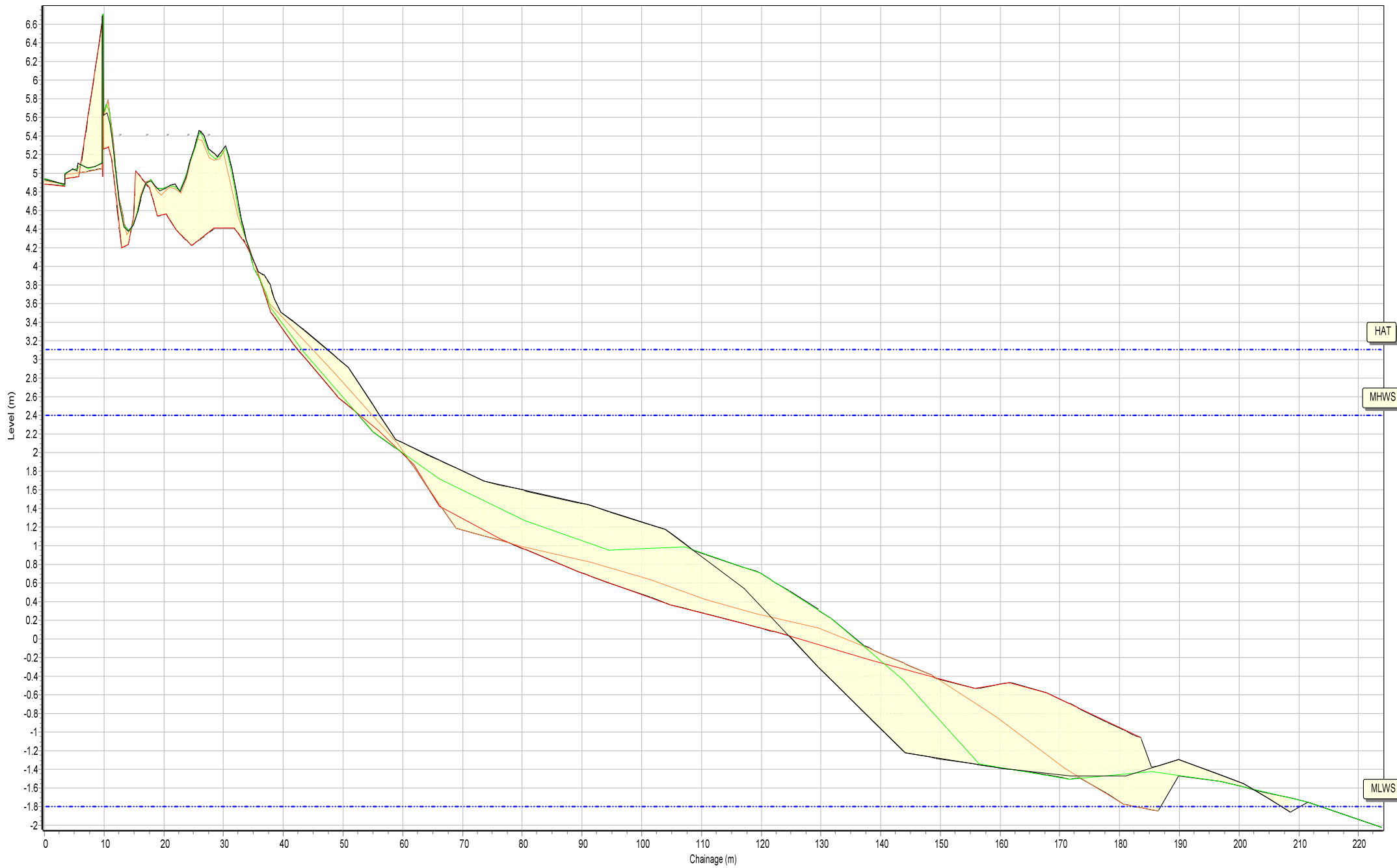
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Beach Profiles: 1aNWB26



Profiles Envelope 22/11/2010 29/08/2019 08/05/2020 21/08/2020

Beach Profiles: 1aBVC01



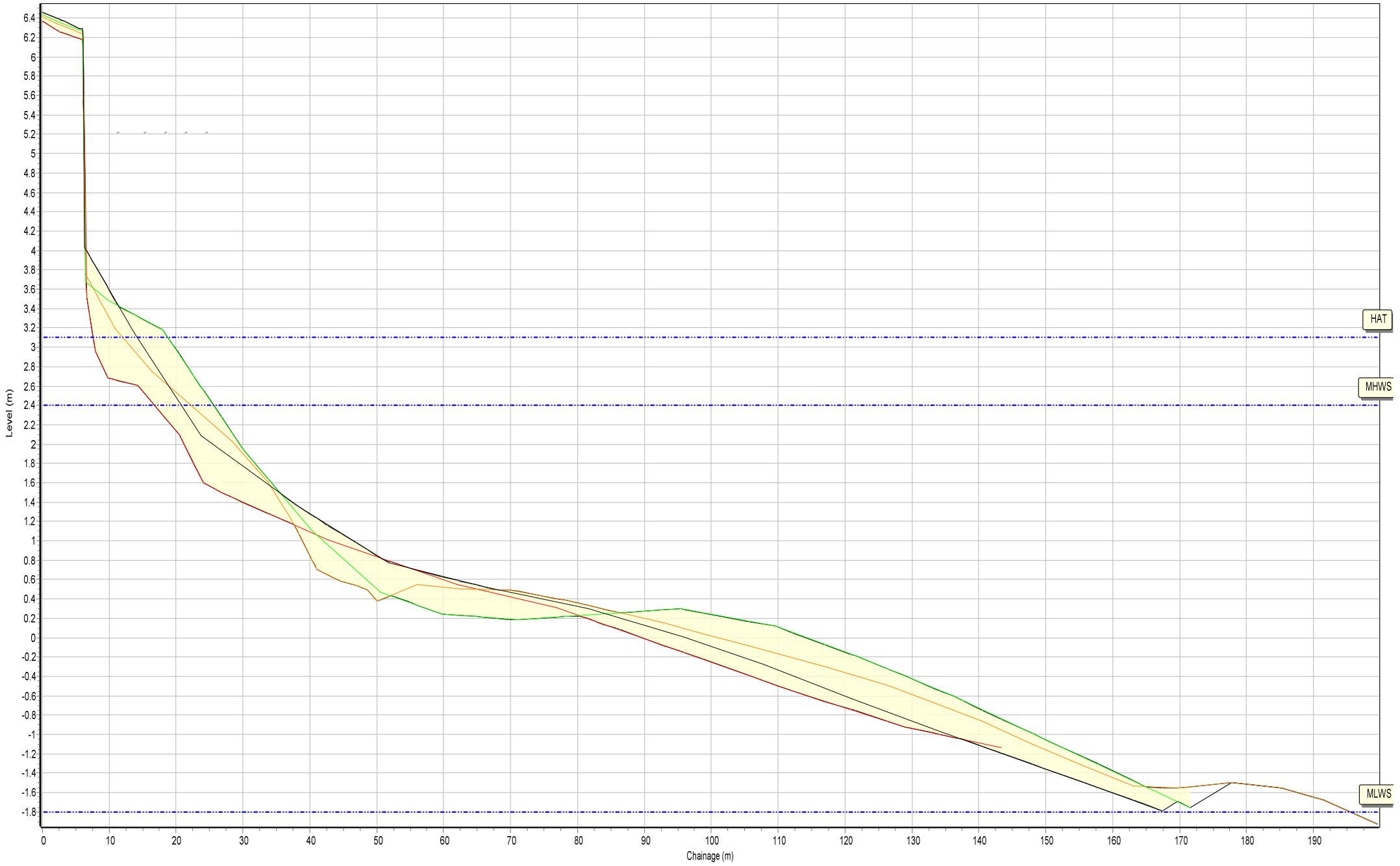
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MLWS

SANDS

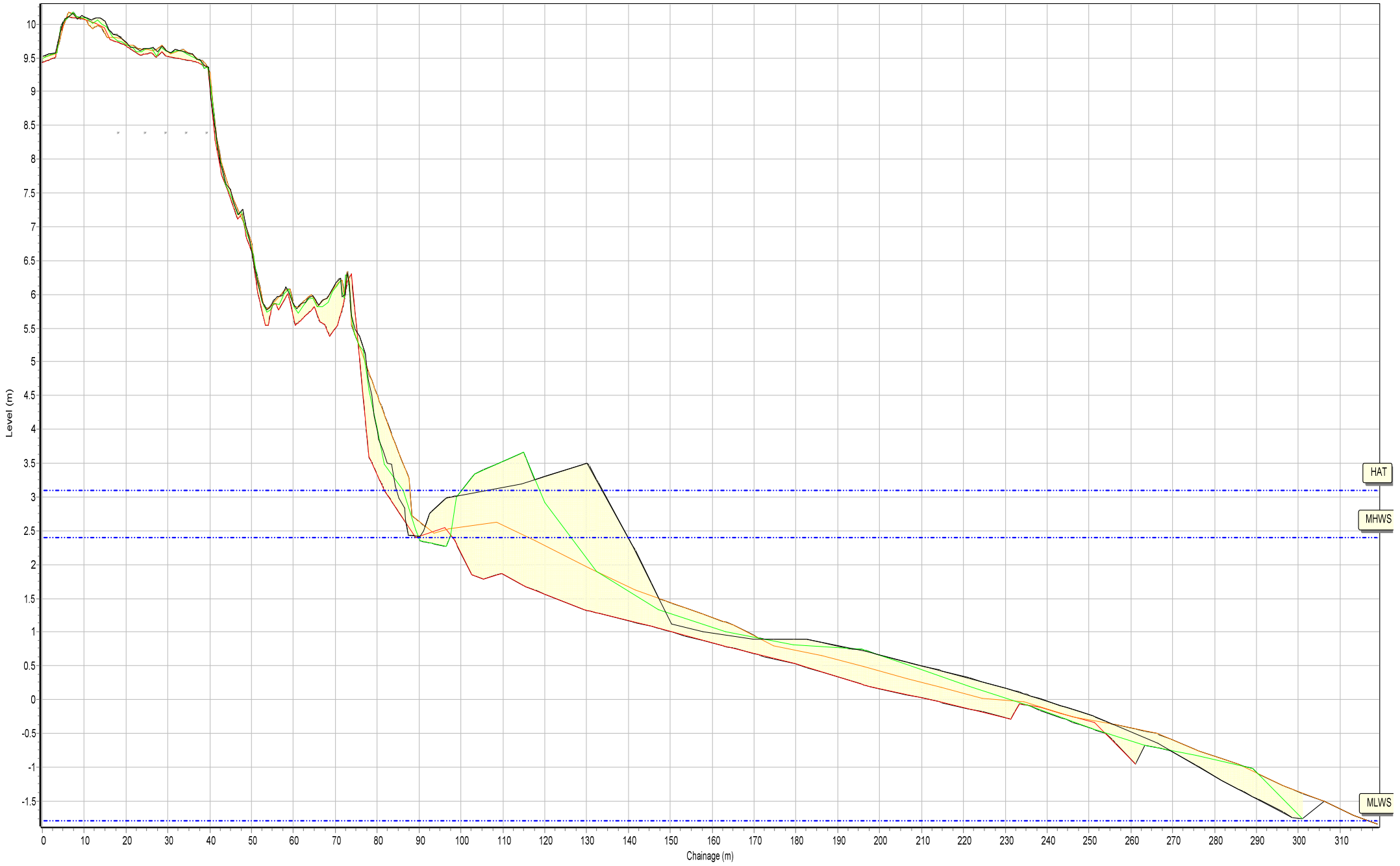
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Profiles Envelope 01/04/2006 01/10/2019 11/03/2020 03/09/2020



Beach Profiles: 1aBVCB03



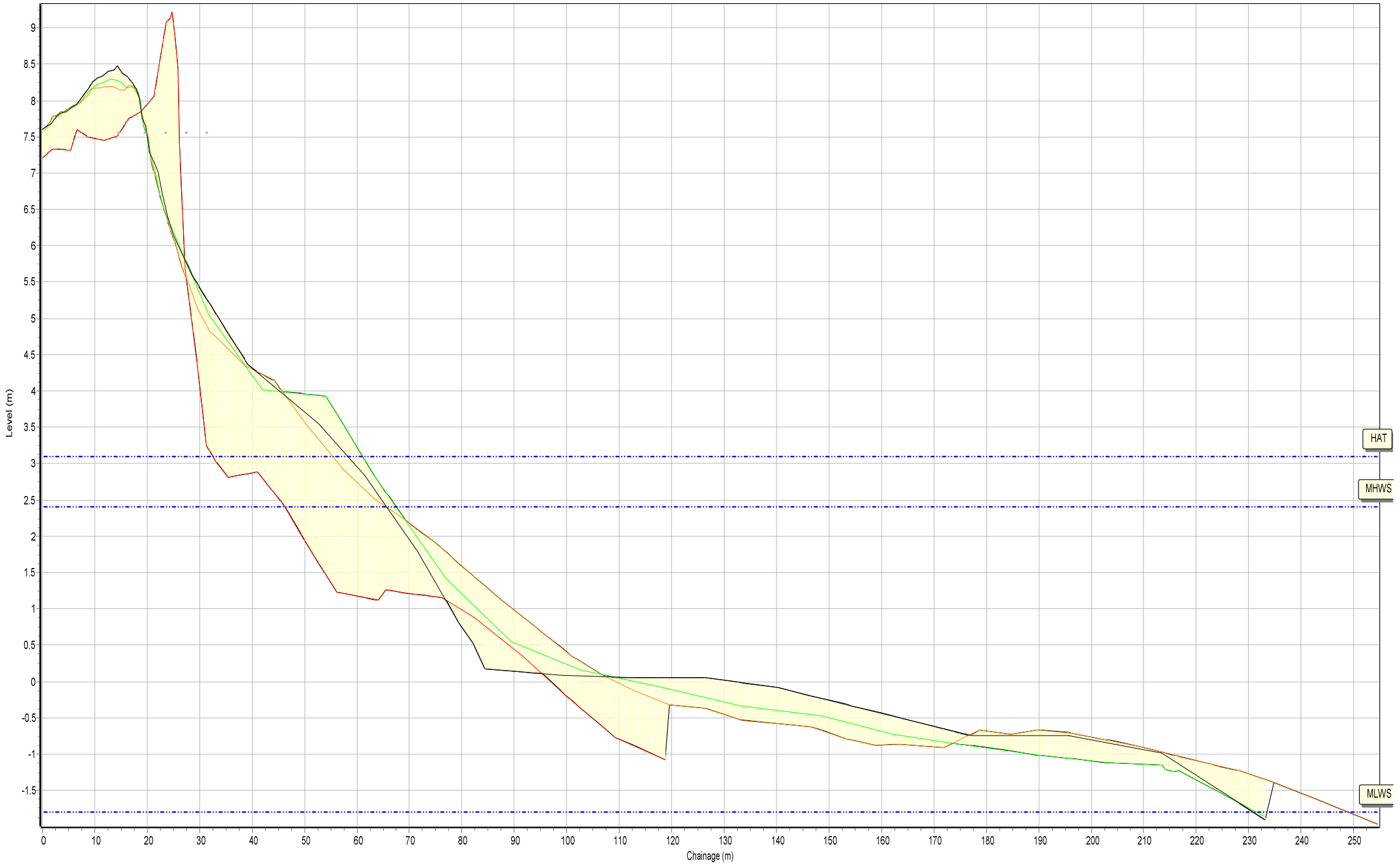
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MHWS

MLWS

SANDS

Beach Profiles: 1aBVC04



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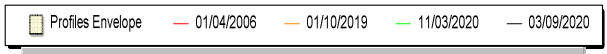
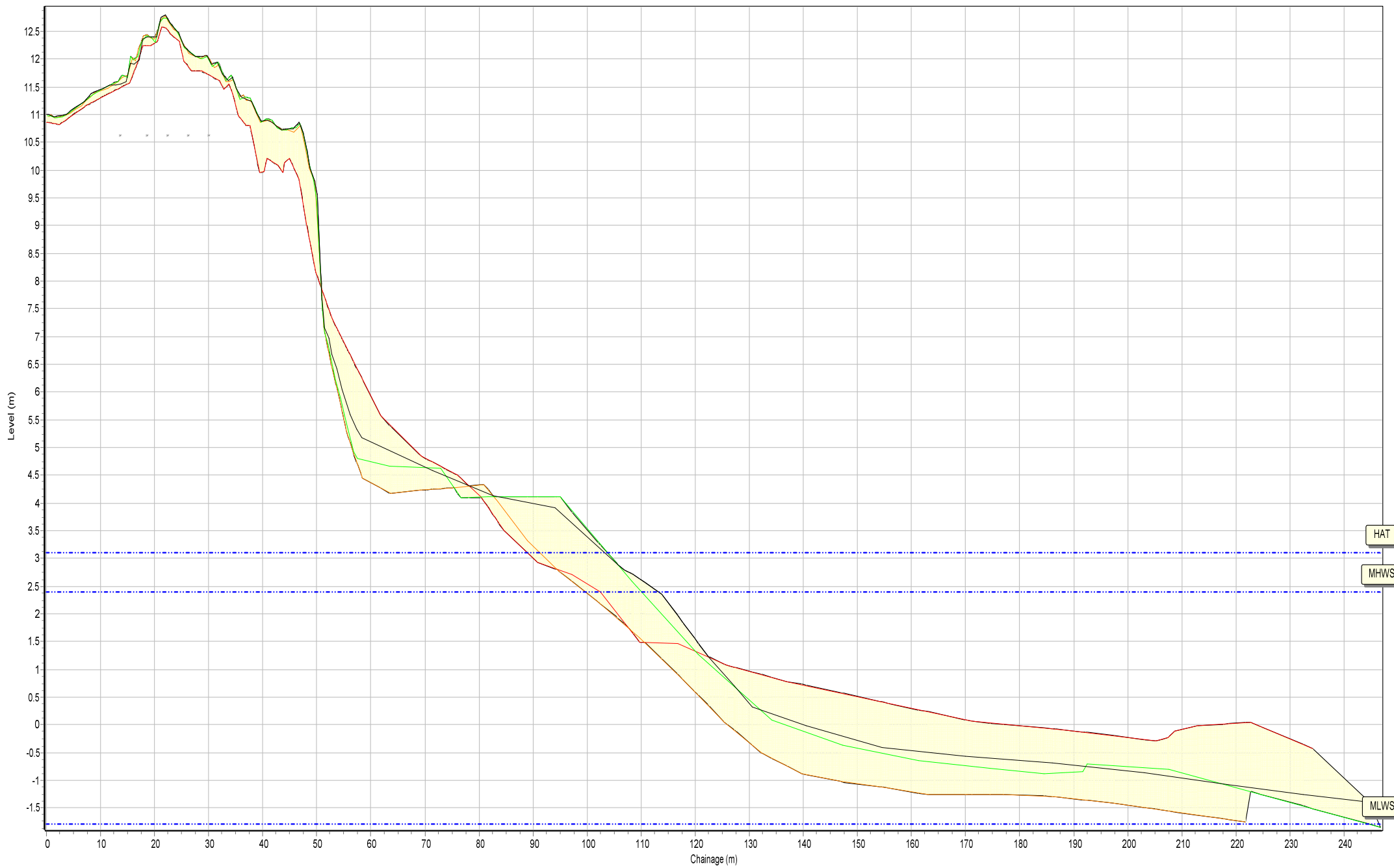
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SANDS

Beach Profiles: 1aBVBC05



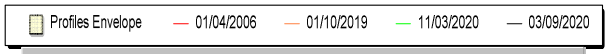
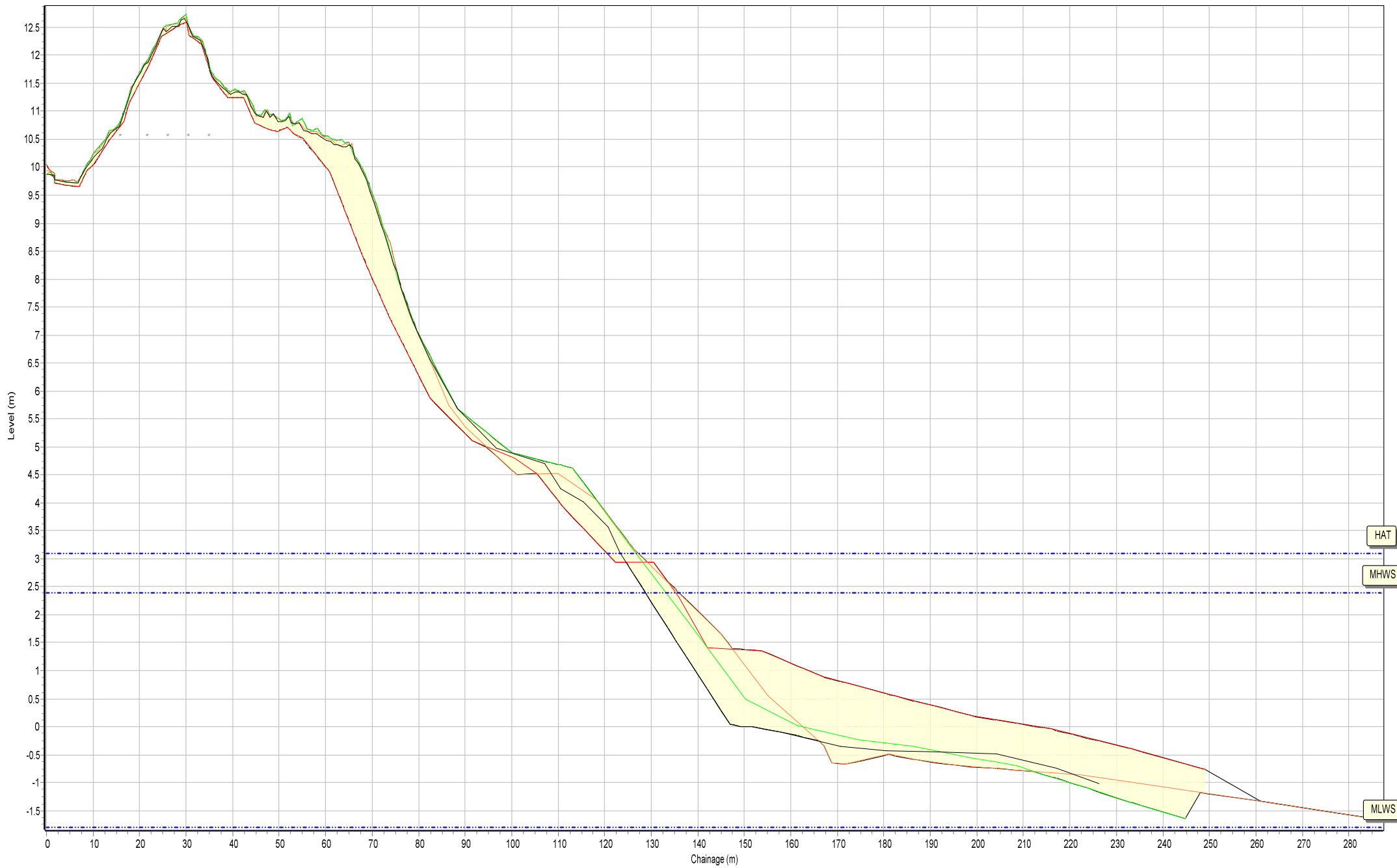
HAT

MHWS

MLWS

SANDS

Beach Profiles: 1aBVC06



HAT

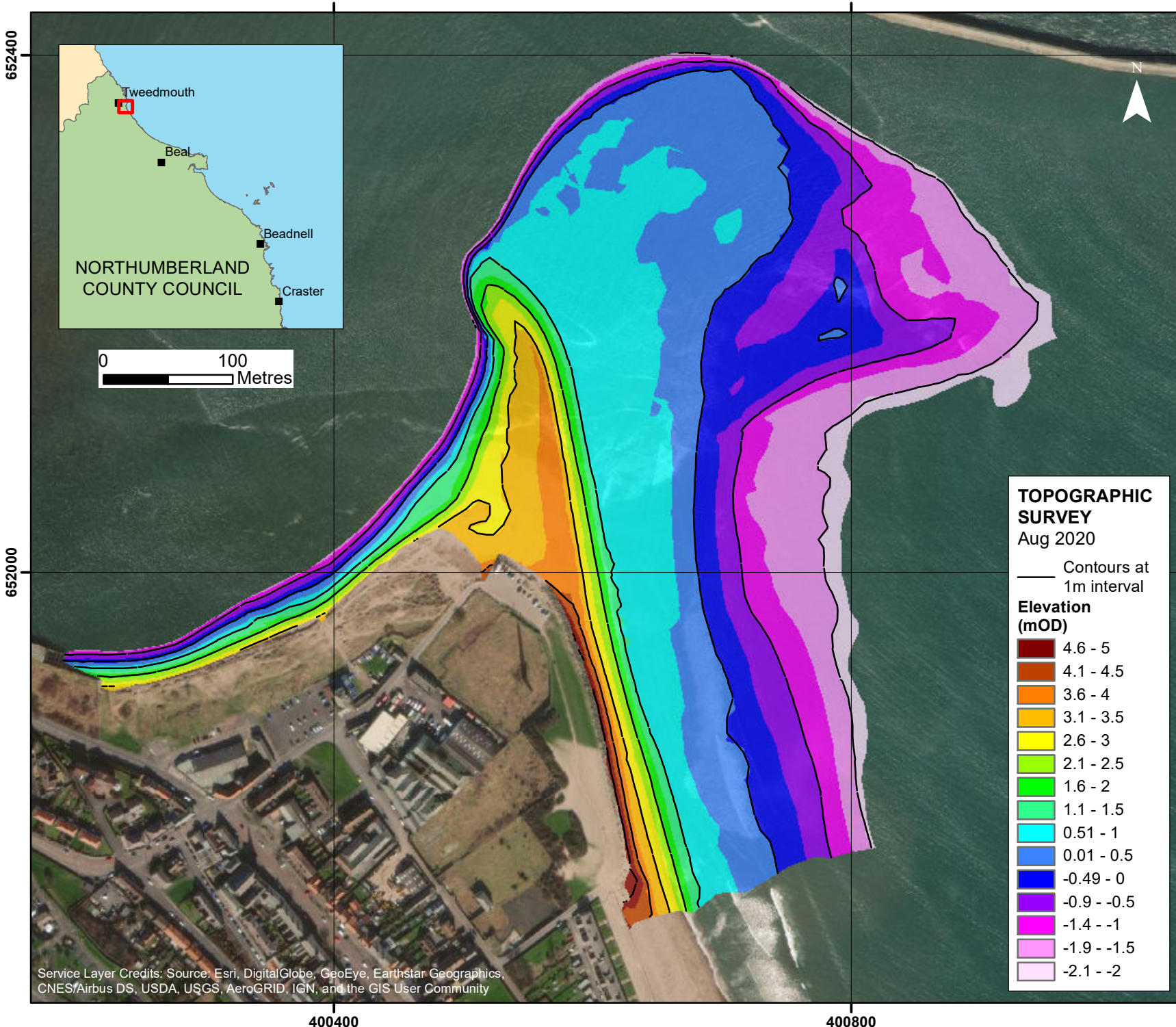
MHWS

MLWS

SANDS

## **Appendix B**

# **Topographic Survey**



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 1**  
**BERWICK**

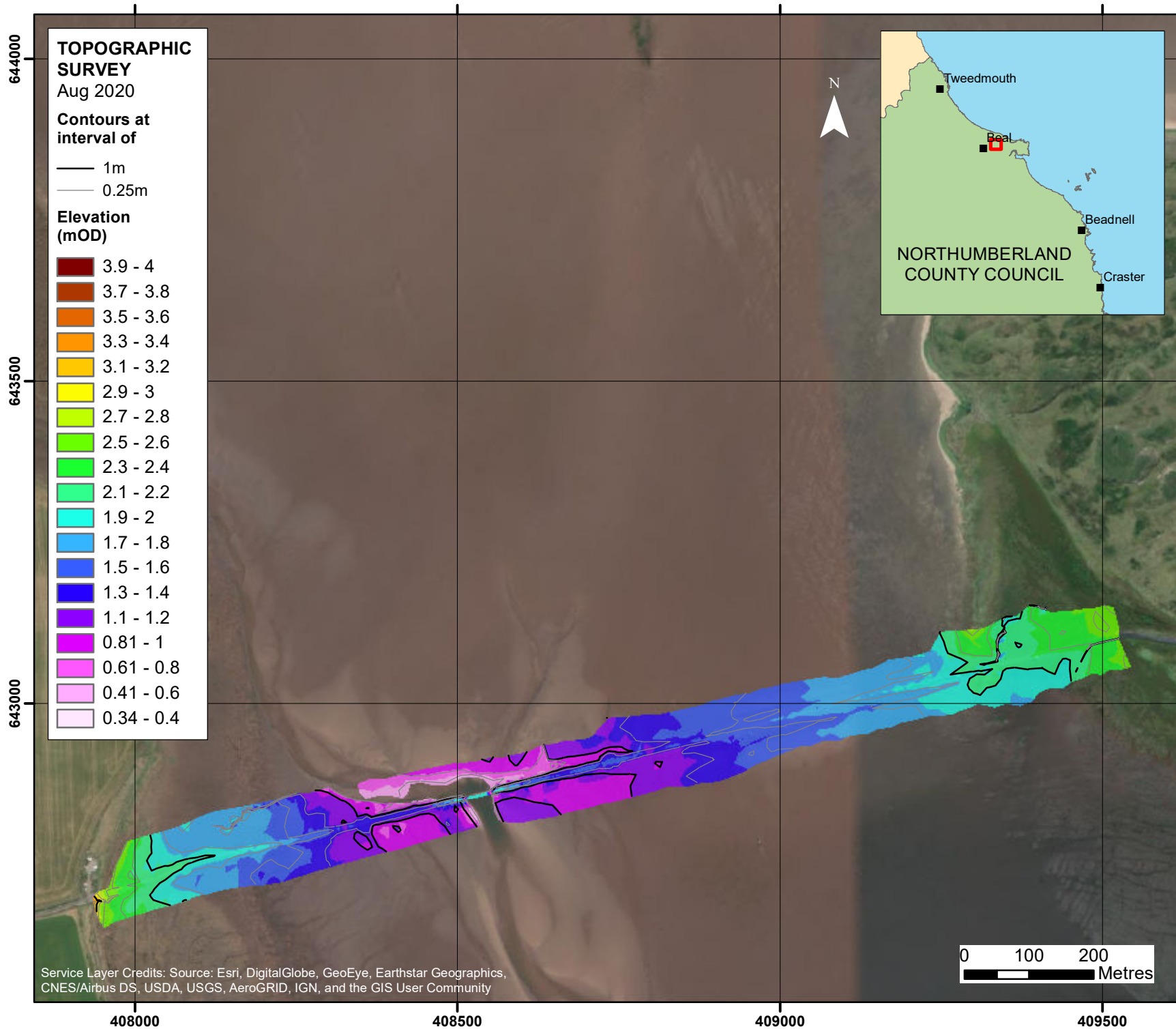
**Northumberland County Council Frontage**

Analytical Report  
'Full Measures' Survey 2020

Drawing Scale at A4 1:4,000

**WATER**  
Royal HaskoningDHV  
Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE

Tel: +44 (0)191 211 1300  
Fax: +44 (0)191 211 1313  
www.royalhaskoningdhv.com



Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 2**

**HOLY ISLAND CAUSEWAY**

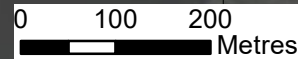
**Northumberland County Council Frontage**

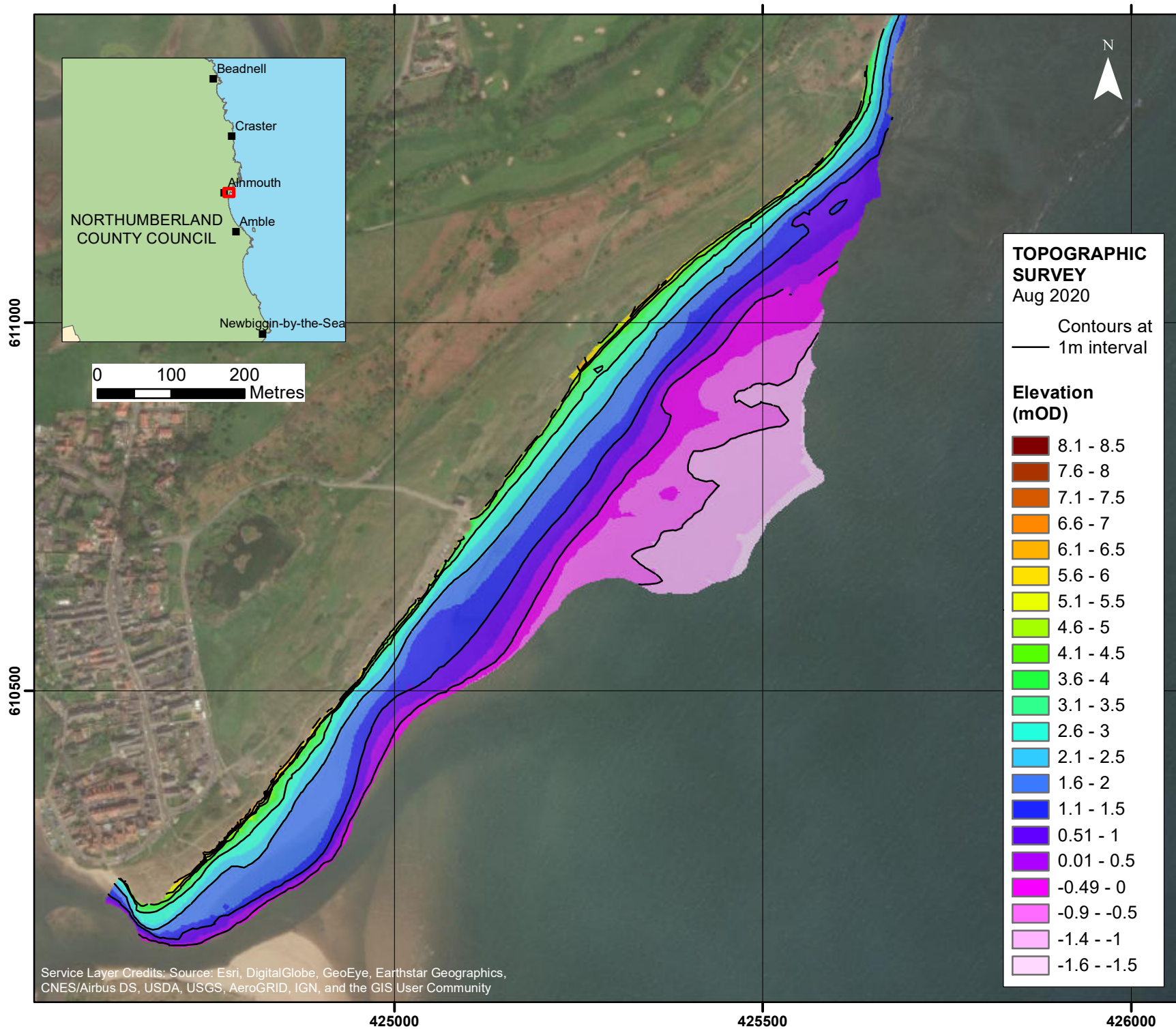
**Analytical Report 'Full Measures' Survey 2020**

Drawing Scale at A4 1:8,000

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Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 3**

**ALNMOUTH**

**Northumberland County Council Frontage**

Analytical Report  
'Full Measures' Survey 2020

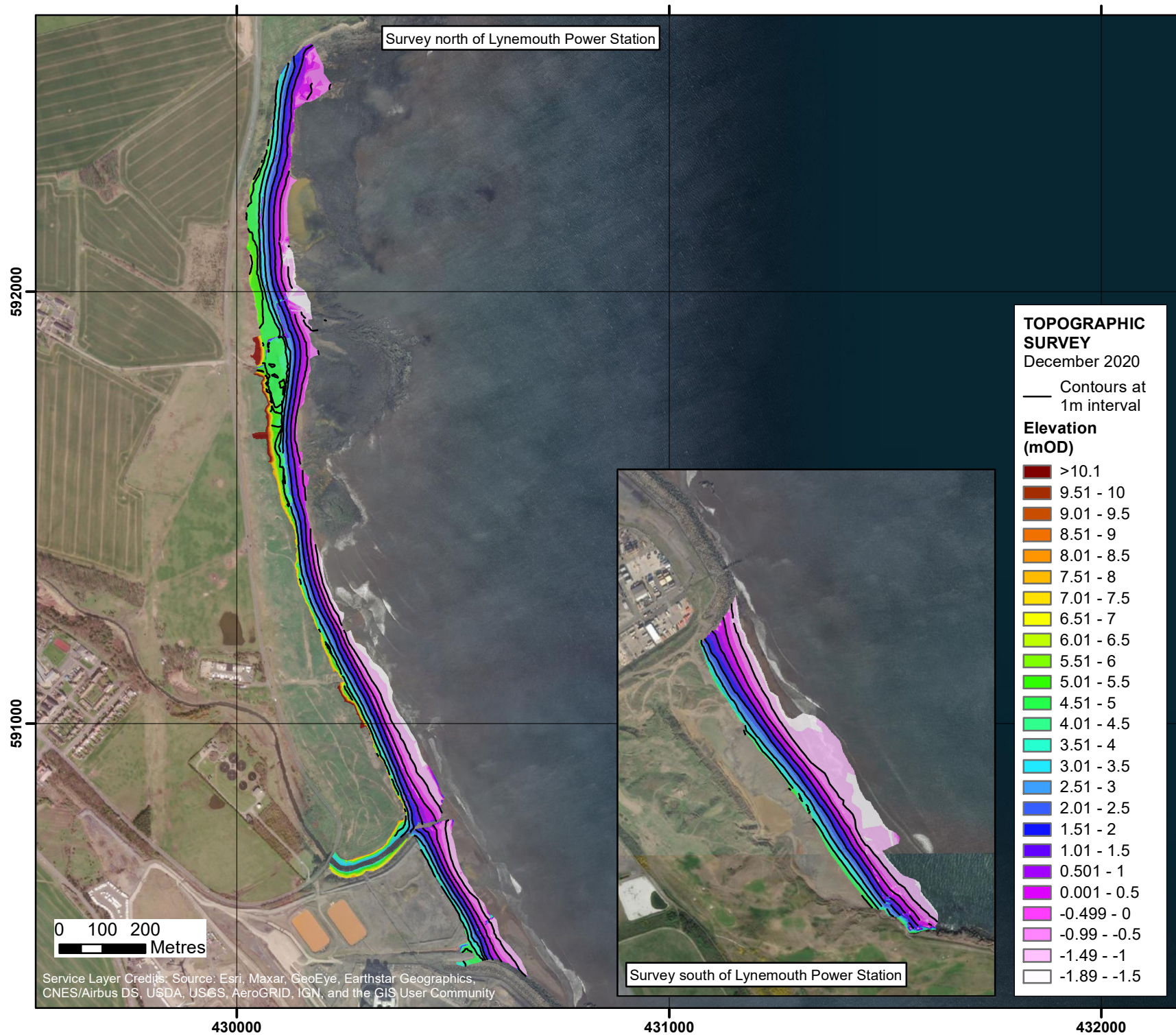
Drawing Scale at A4 1:7,000

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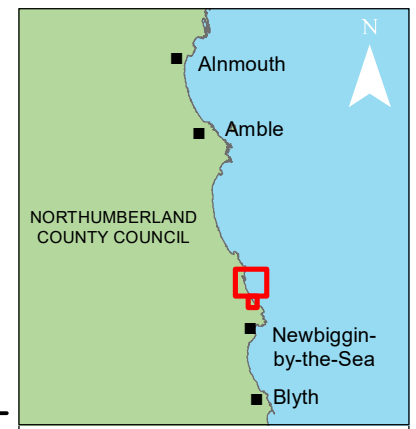


**TOPOGRAPHIC SURVEY**  
December 2020

— Contours at 1m interval

**Elevation (mOD)**

>10.1
9.51 - 10
9.01 - 9.5
8.51 - 9
8.01 - 8.5
7.51 - 8
7.01 - 7.5
6.51 - 7
6.01 - 6.5
5.51 - 6
5.01 - 5.5
4.51 - 5
4.01 - 4.5
3.51 - 4
3.01 - 3.5
2.51 - 3
2.01 - 2.5
1.51 - 2
1.01 - 1.5
0.501 - 1
0.001 - 0.5
-0.499 - 0
-0.99 - -0.5
-1.49 - -1
-1.89 - -1.5



Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 4**

**LYNEMOUTH**

**Northumberland County Council Frontage**

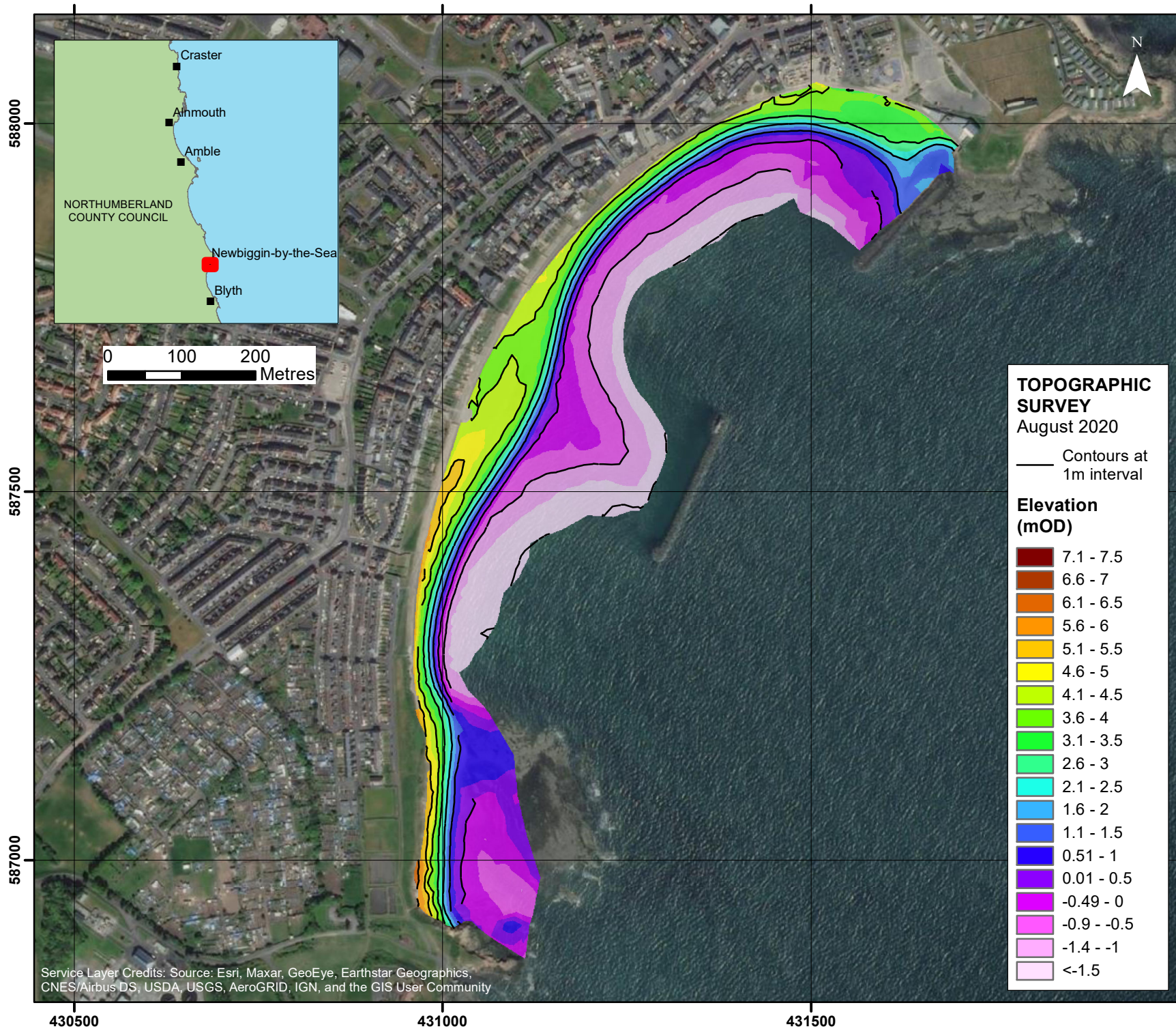
Analytical Report  
'Full Measures' Survey 2020

Drawing Scale at A4 1:12,000

**WATER**  
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Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Client: North East Coastal Group  
Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 5**  
**NEWBIGGIN-BY-THE-SEA**

**Northumberland County Council Frontage**

Analytical Report  
'Full Measures' Survey 2020

Drawing Scale at A4 1:7,000

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Marlborough Crescent  
Newcastle upon Tyne  
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Fax: +44 (0)191 211 1313  
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430500

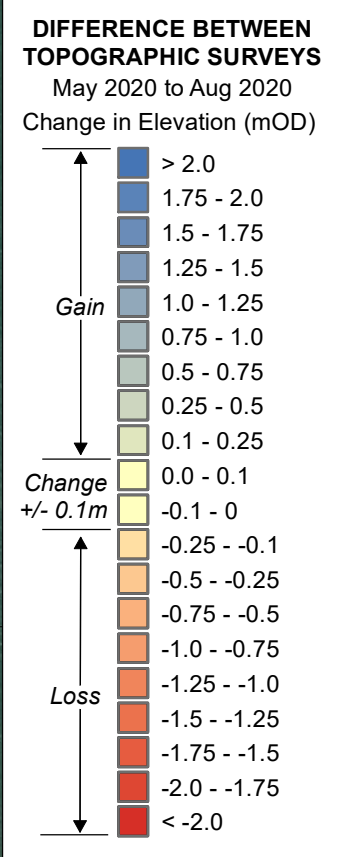
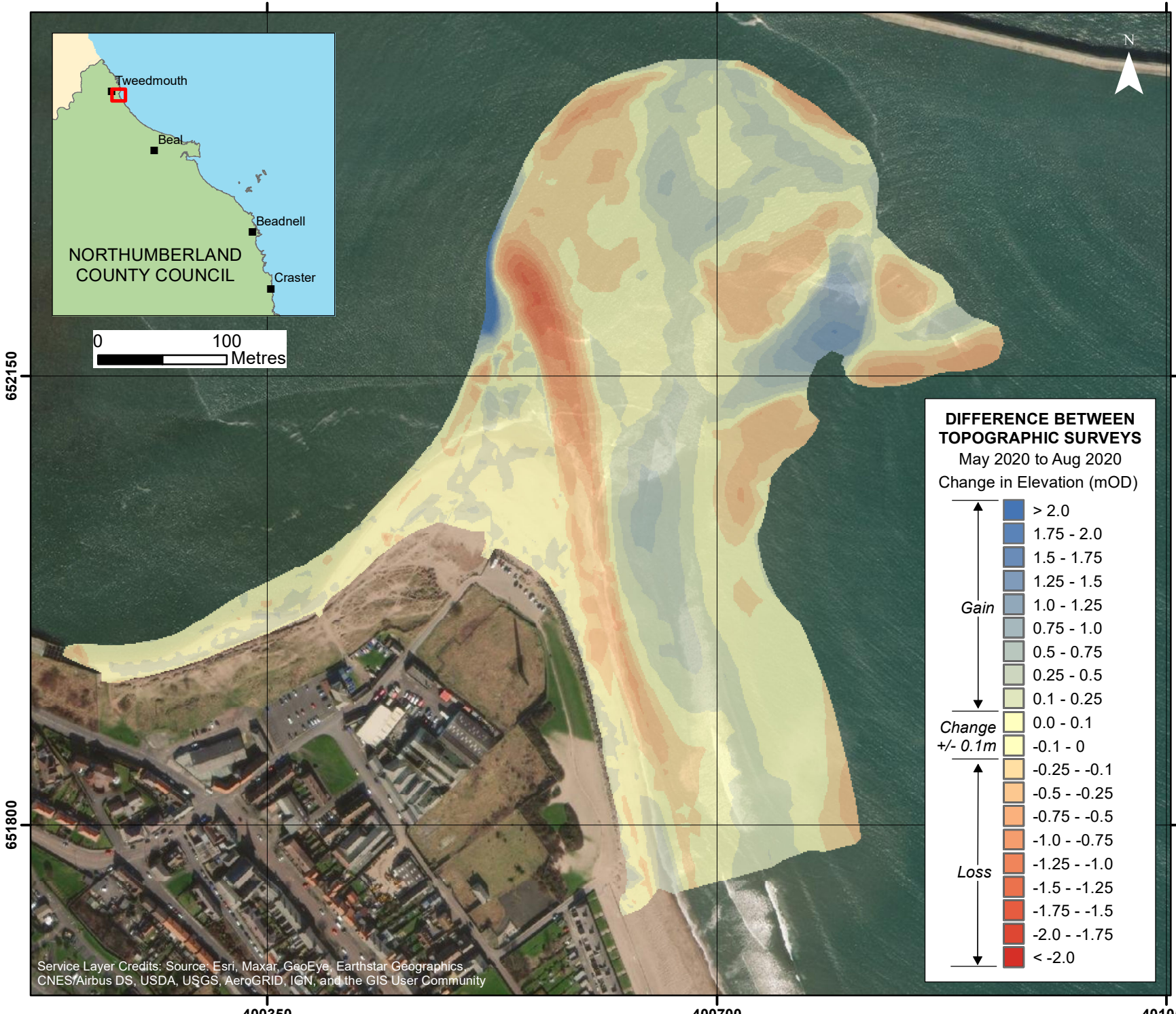
431000

431500

588000

587500

587000



Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 6**

**BERWICK**

**Northumberland County Council Frontage**

Analytical Report  
 'Full Measures' Survey 2020

Drawing Scale at A4 1:4,000

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 Marlborough House  
 Marlborough Crescent  
 Newcastle upon Tyne  
 NE1 4EE

Tel: +44 (0)191 211 1300  
 Fax: +44 (0)191 211 1313  
 www.royalhaskoningdhv.com



Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

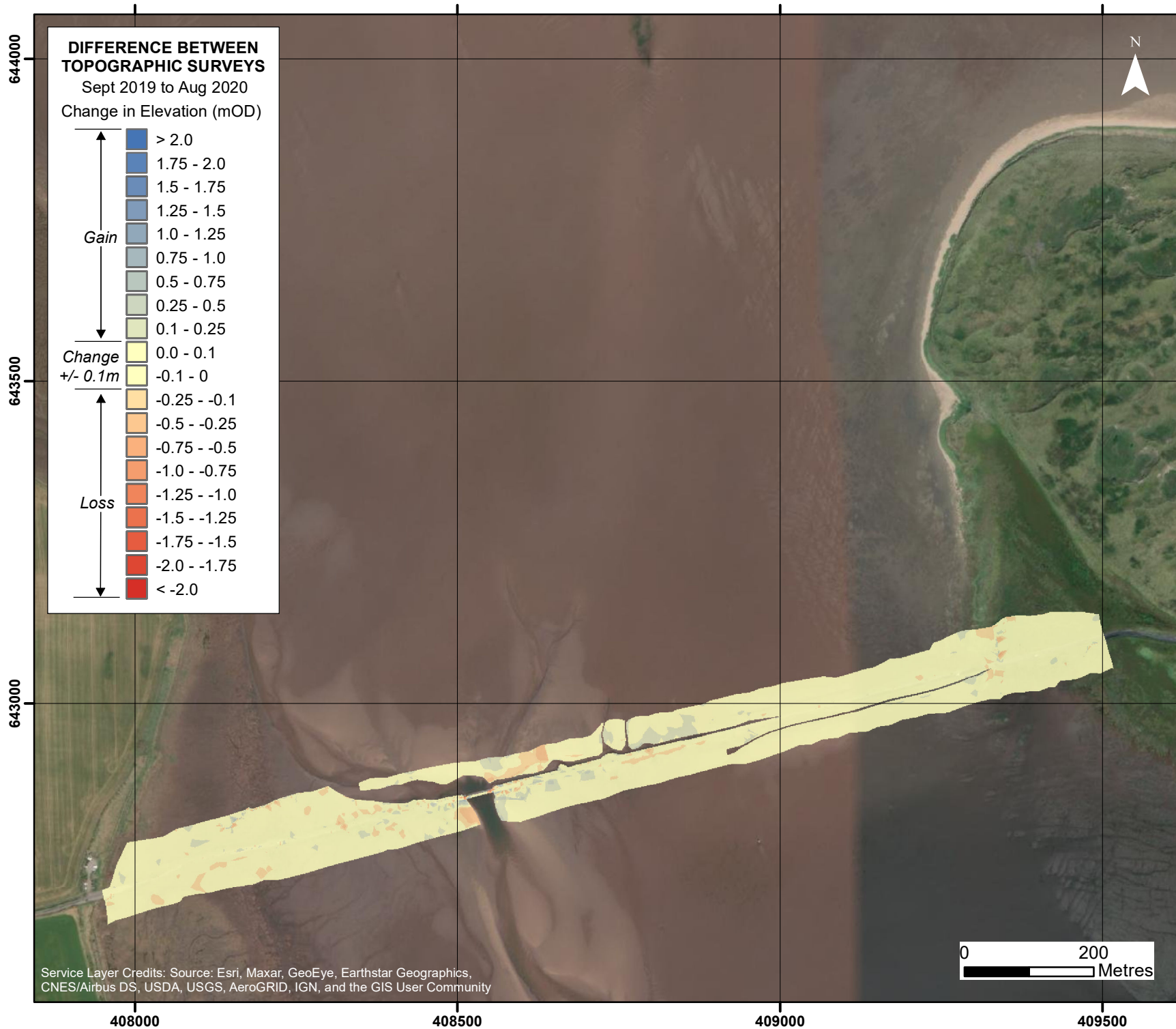
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651800

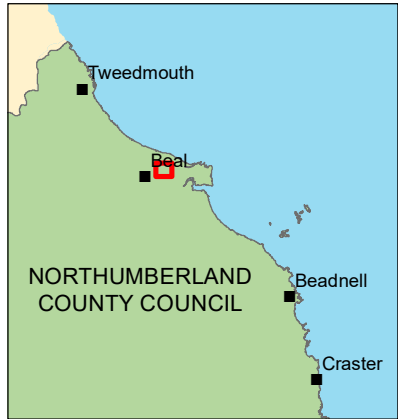
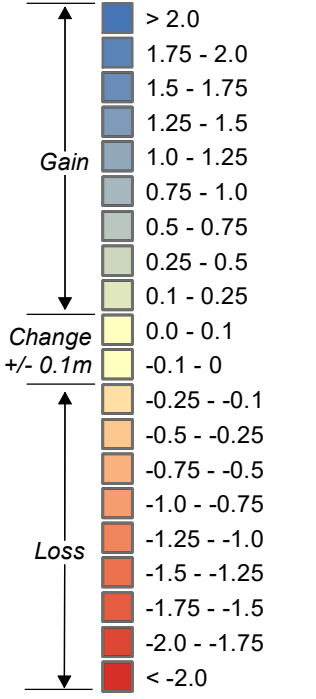
400350

400700

401050



**DIFFERENCE BETWEEN TOPOGRAPHIC SURVEYS**  
 Sept 2019 to Aug 2020  
 Change in Elevation (mOD)



Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 7**

**HOLY ISLAND CAUSEWAY**

**Northumberland County Council Frontage**  
 Analytical Report  
 'Full Measures' Survey 2020

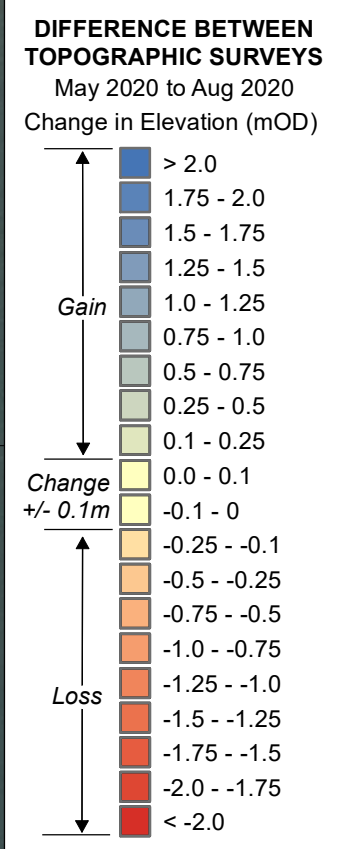
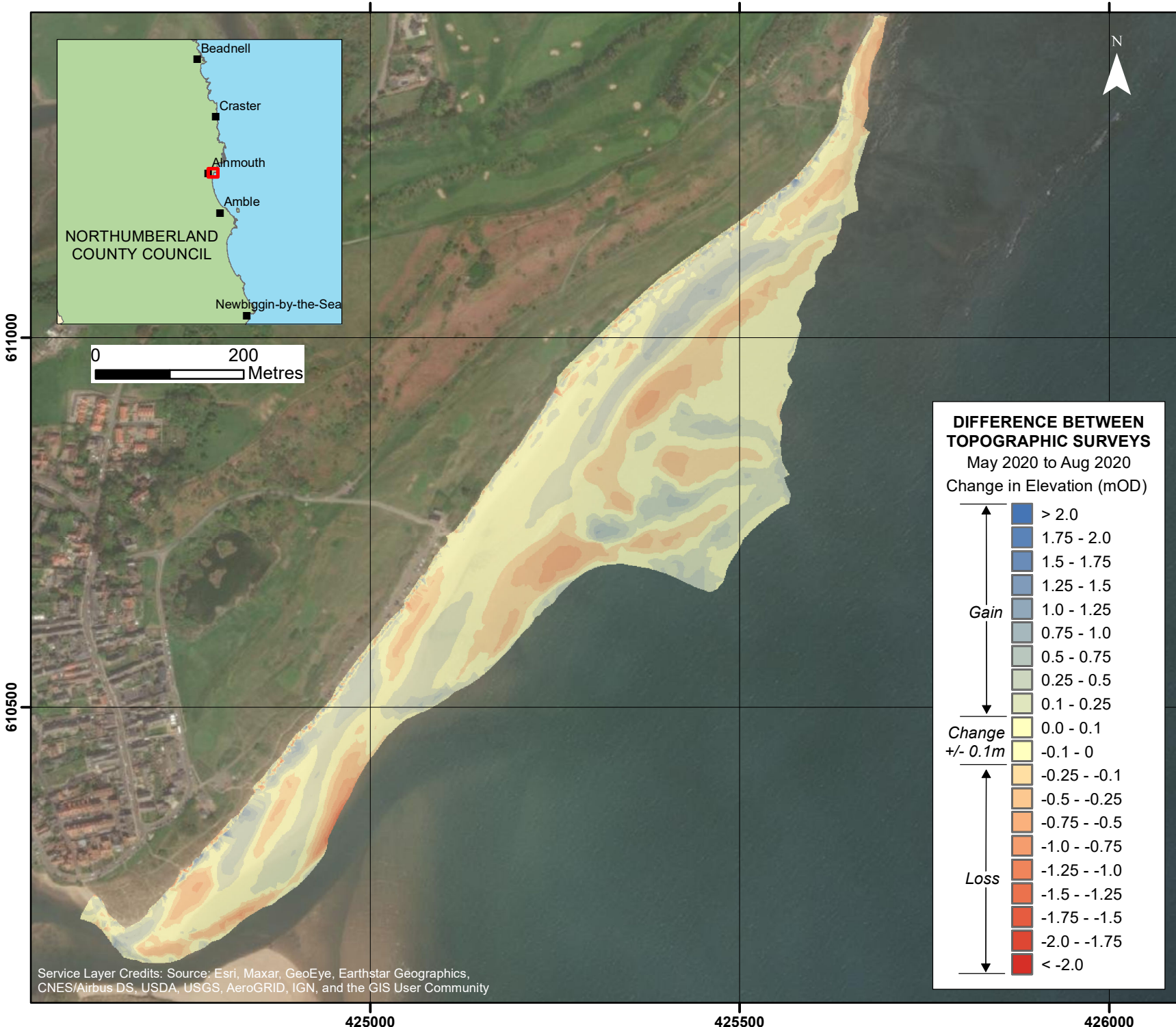
Drawing Scale at A4 1:8,000

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Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 8**

**ALNMOUTH**

**Northumberland County Council Frontage**

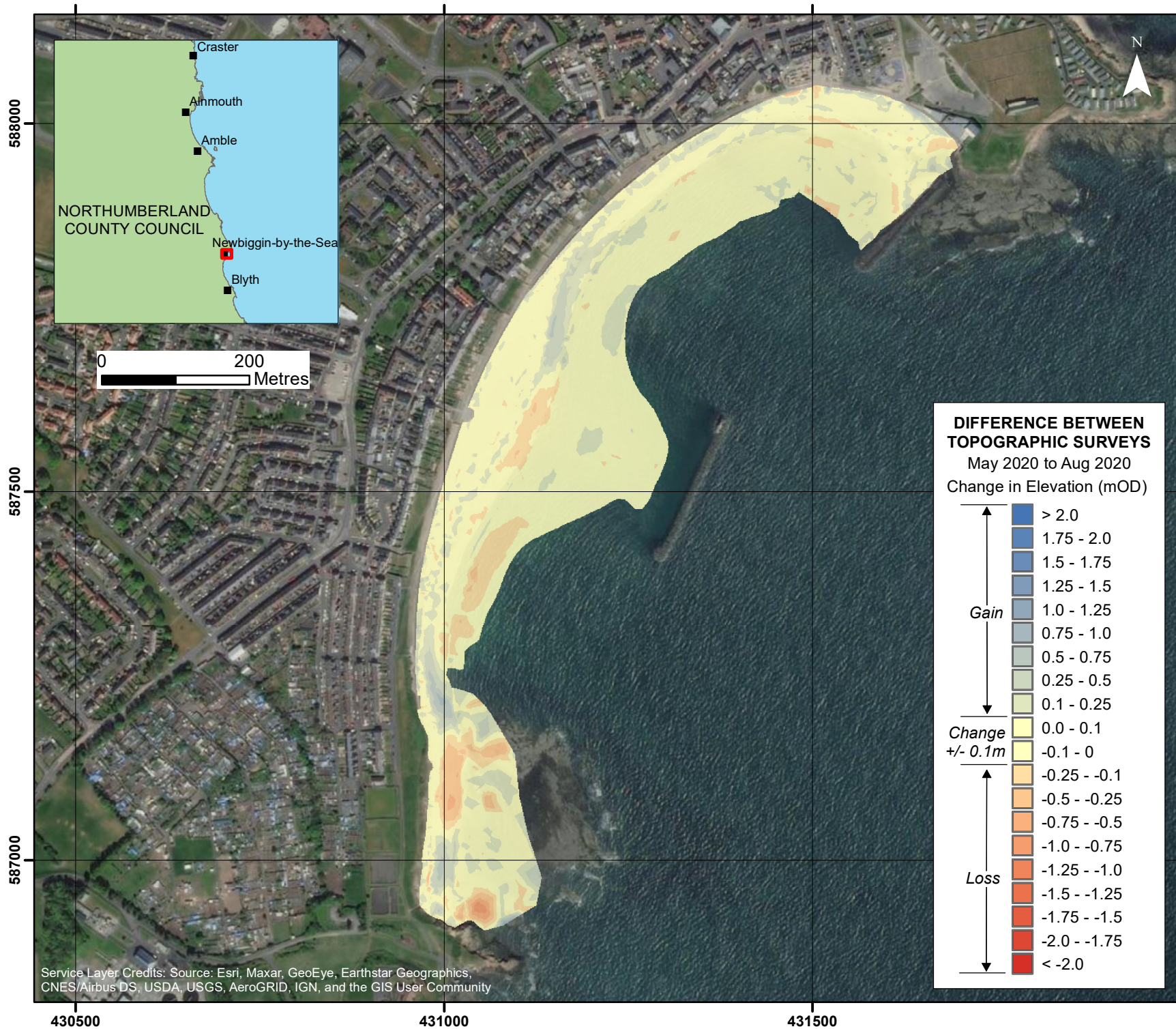
Analytical Report  
 'Full Measures' Survey 2020

Drawing Scale at A4 1:7,000

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Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**Appendix B - Map 9**  
**NEWBIGGIN-BY-THE-SEA**  
**Northumberland County Council Frontage**  
 Analytical Report  
 'Full Measures' Survey 2020

Drawing Scale at A4 1:7,000

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430500 431000 431500 587000 587500 588000

## **Appendix C**

# **Sand Extent Survey**

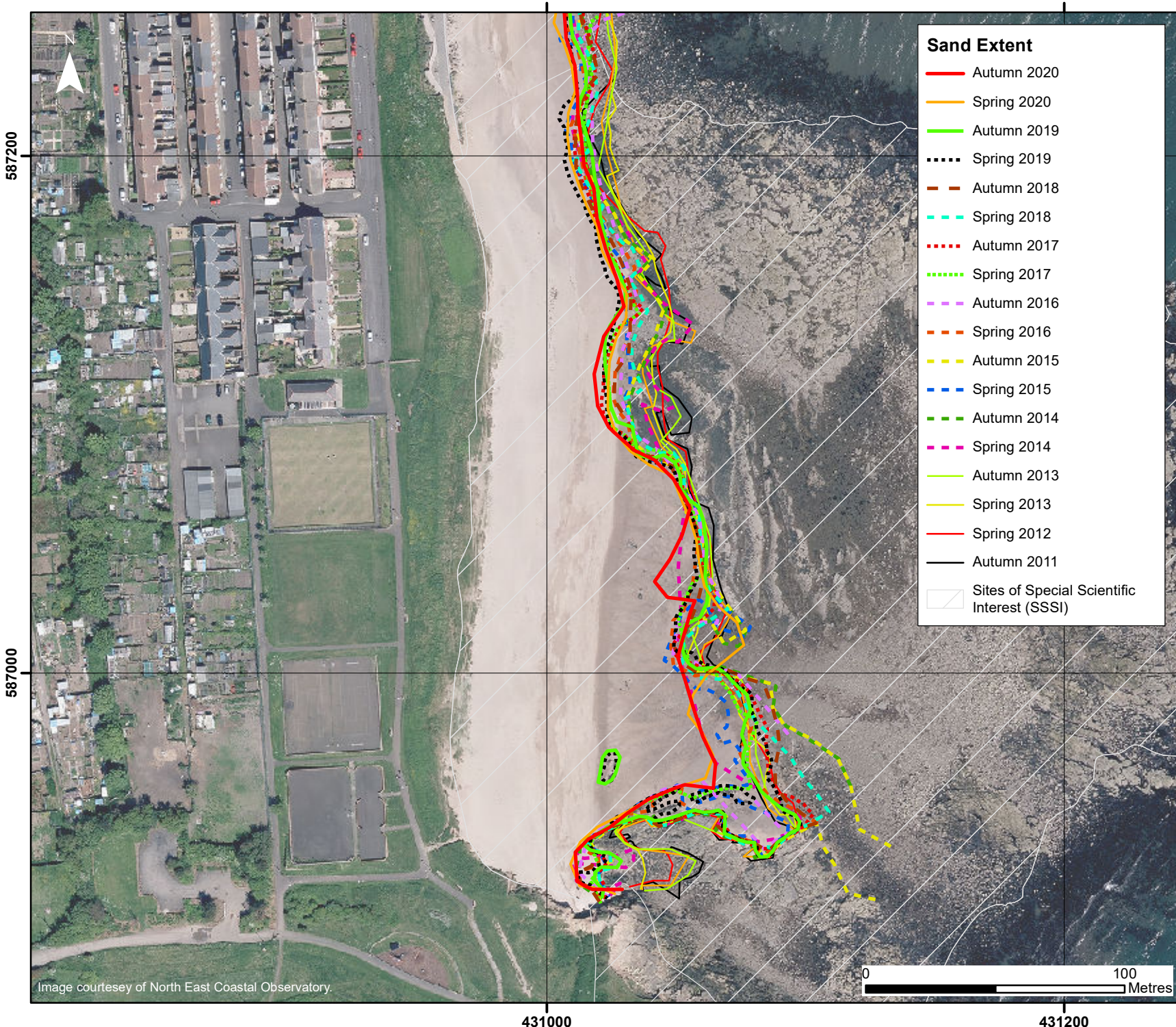


Image courtesy of North East Coastal Observatory.

**Sand Extent**

- Autumn 2020
- Spring 2020
- Autumn 2019
- Spring 2019
- Autumn 2018
- Spring 2018
- Autumn 2017
- Spring 2017
- Autumn 2016
- Spring 2016
- Autumn 2015
- Spring 2015
- Autumn 2014
- Spring 2014
- Autumn 2013
- Spring 2013
- Autumn 2012
- Spring 2012
- Autumn 2011
- Sites of Special Scientific Interest (SSSI)

Client: North East Coastal Group  
 Project: Cell 1 Regional Coastal Monitoring Programme

**NEWBIGGIN-BY-THE-SEA SAND EXTENT**

**Northumberland County Council Frontage**

Analytical Report  
 'Full Measures' Survey 2020  
 Drawing Scale at A4 1:2,000

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