North East Coastal Observatory

Royal HaskoningDHV
Enhancing Society Together

Cell 1 Regional Coastal Monitoring Programme Update Report 11: 'Partial Measures' Survey 2019

Northumberland County Council

Northumberland County Council

2019

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Authors	
Alix Scullion & Ewan Richardson	Royal HaskoningDHV
Dr Nick Cooper – Review & Approval	Royal HaskoningDHV

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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).

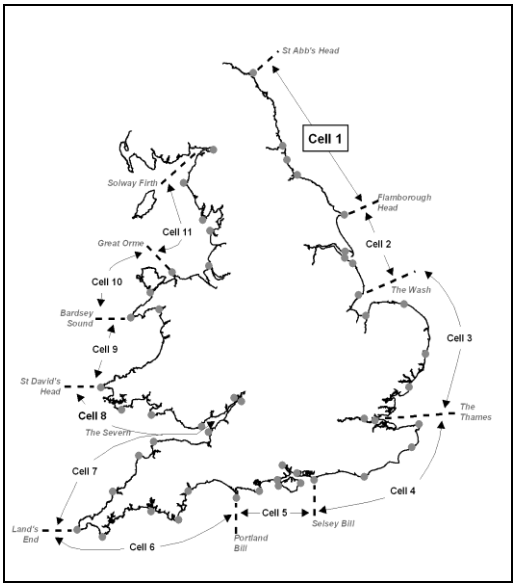


Figure 1 Sediment Cells in England and Wales

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 sea bed 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 every year. Some of these surveys are then repeated the following spring as part of a 'Partial Measures' survey.

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	Sept-Dec 08	May 09	Mar-May 09		-
2	2009/10	Sept-Dec 09	Mar 10	Feb-Mar 10	Jul 10	-
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sept 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb13	-
5	2012/13	Sept-Nov 12	Mar 13	Mar-Apr 13	Jun 13	-
6	2013/14	Sept-Oct 13	Feb 14	Mar-Apr 14	Jul 14	-
7	2014/15	Sept-Nov 14	Feb 15	Mar-Apr 15	Jul 15	-
8	2015/16	Sept-Dec 15	Feb 16	Mar-May 16	Jul 16	Jun 16
9	2016/17	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*	

(*) The present report is **Update Report 11** and provides an analysis of the 2019 Partial Measures survey for Northumberland County Council's frontage.

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 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 Newbiggin Bay (commenced 2010)

Cliff top survey (bi-annually) at:

- Cliff top survey at Lynemouth Bay (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)

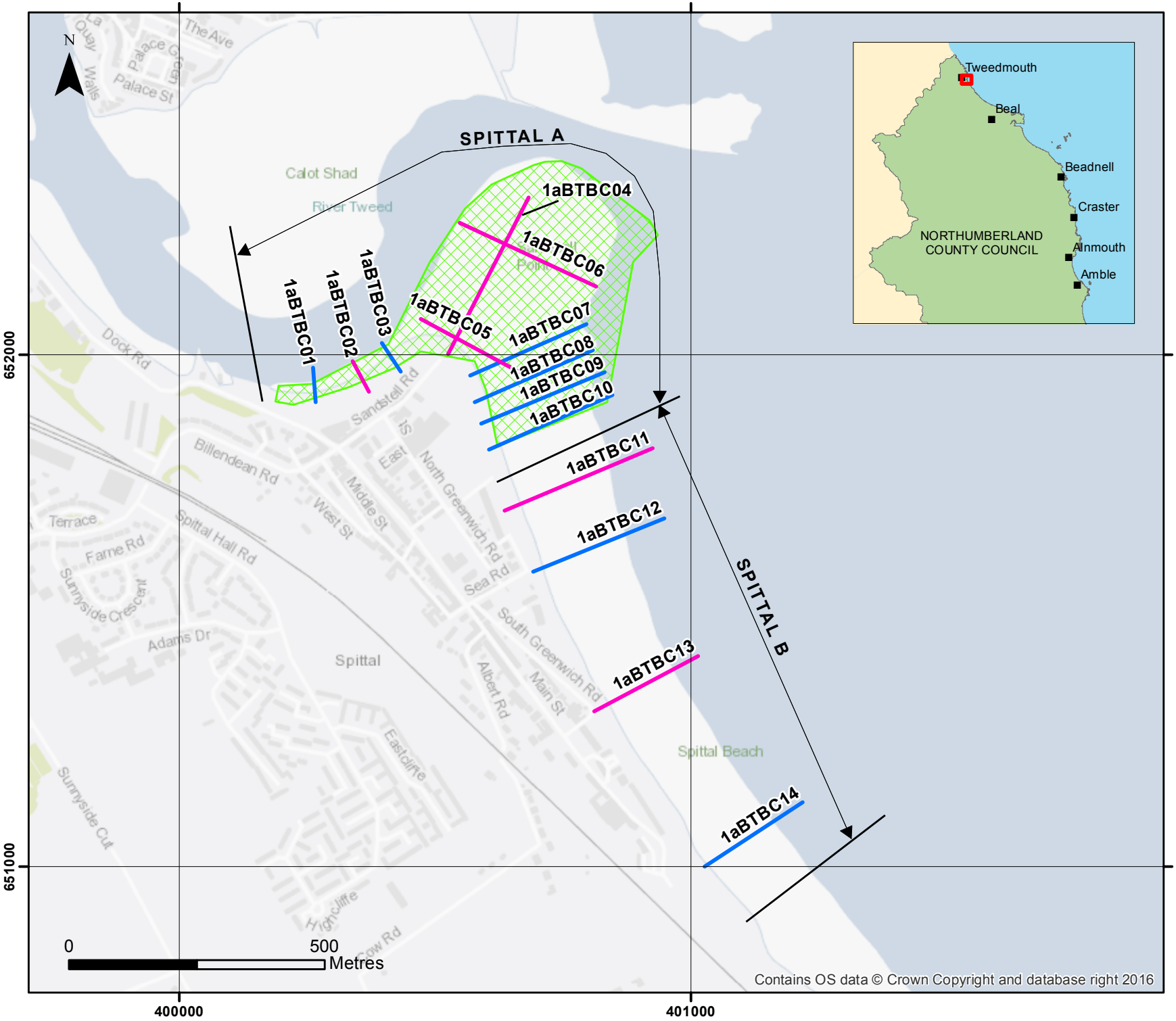
For all cliff-top surveys prior to Full Measures 2011, the data was previously saved in '.kmz' format for plotting and visual comparison in GoogleEarth. This data has been visualised in GIS, which revealed the quality was variable and reliable interpretations of short-term cliff change could not be made. For the present and future surveys, the data will be plotted in GIS and change will 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 Partial Measures survey was undertaken along this frontage between 20th February to 9th April 2019. During this time weather conditions varied considerably; refer to the survey reports for details of the weather conditions over this survey period.

The Update Report presents the following:

- 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
- key conclusions and highlighting of 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

Drawing Scale at A4 1:10,000

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

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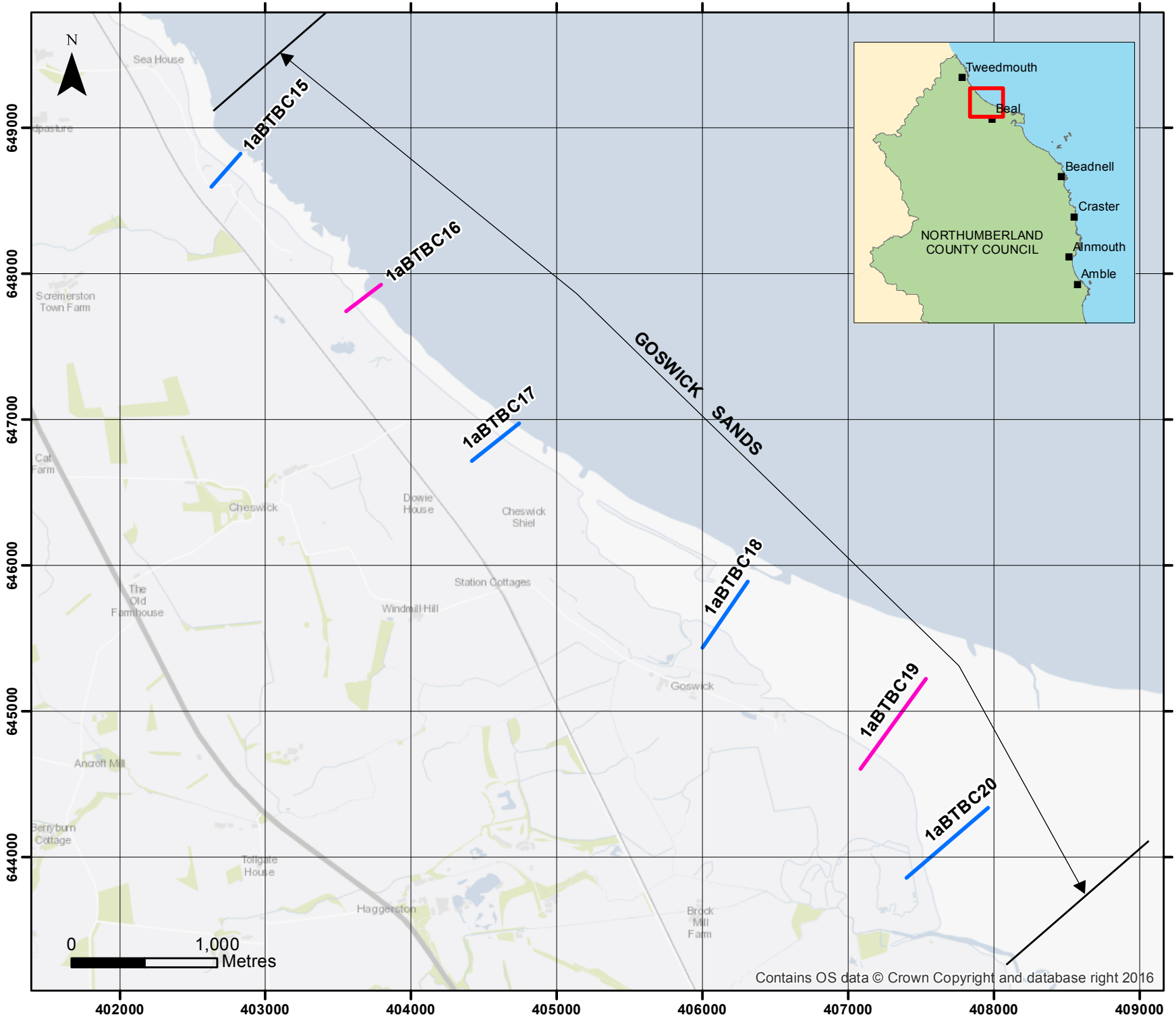

Key

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 2

Northumberland County Council Frontage

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Topo Surveys

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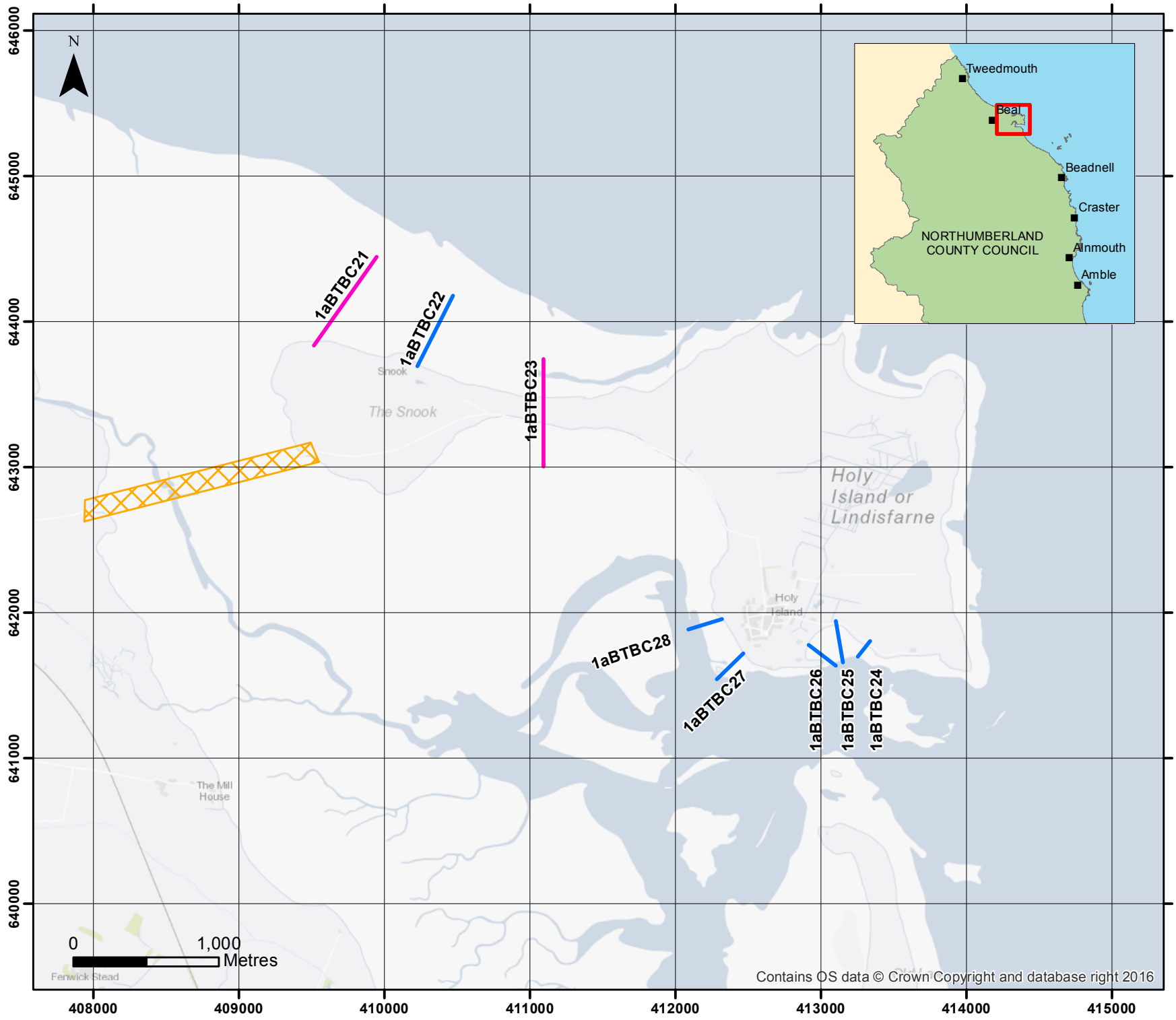

Key

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 3

Northumberland County Council Frontage

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Marlborough House
Marlborough Crescent
Newcastle upon Tyne
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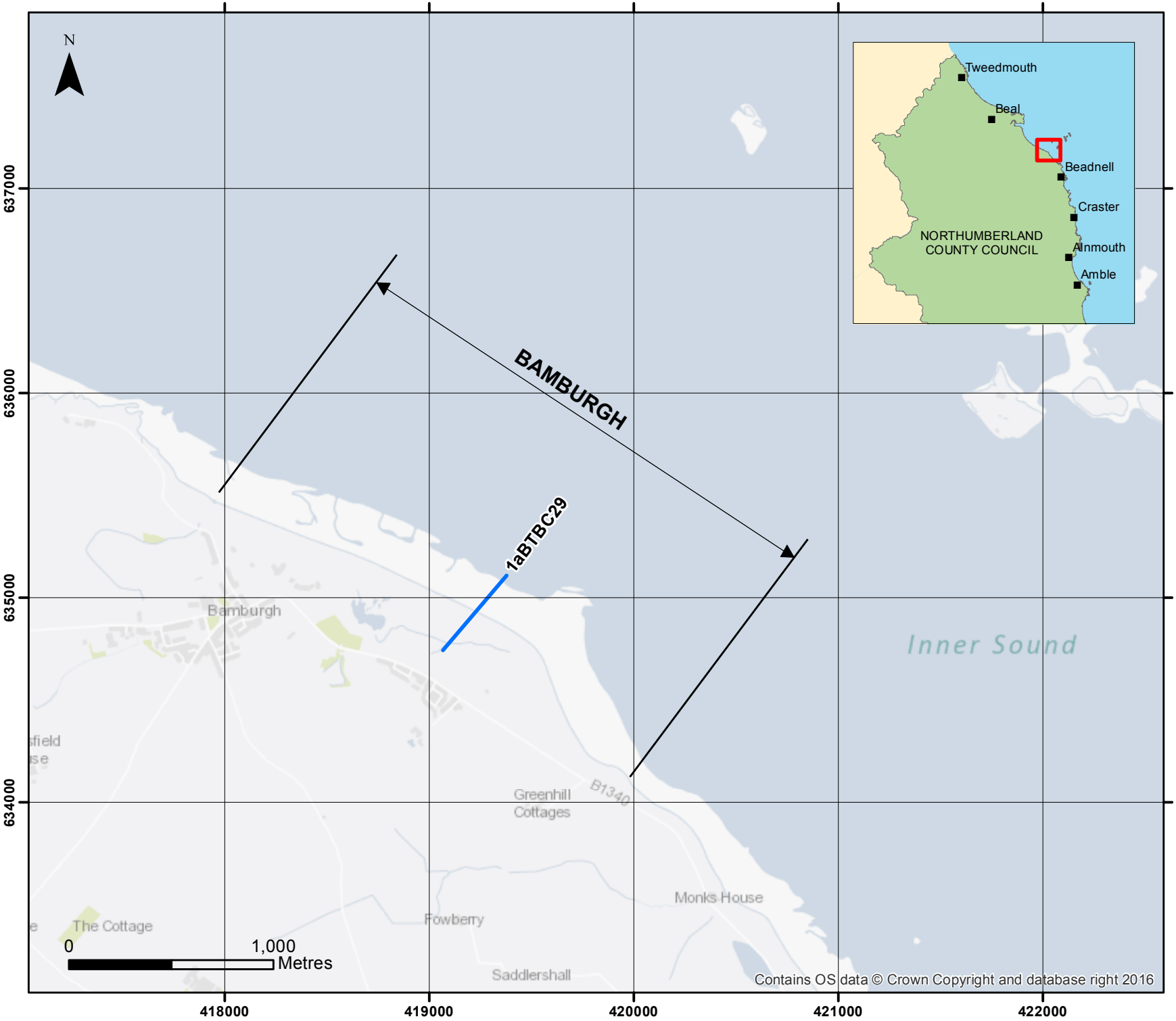

Key

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 4

Northumberland County Council Frontage

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Topo Surveys

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Marlborough House
Marlborough Crescent
Newcastle upon Tyne
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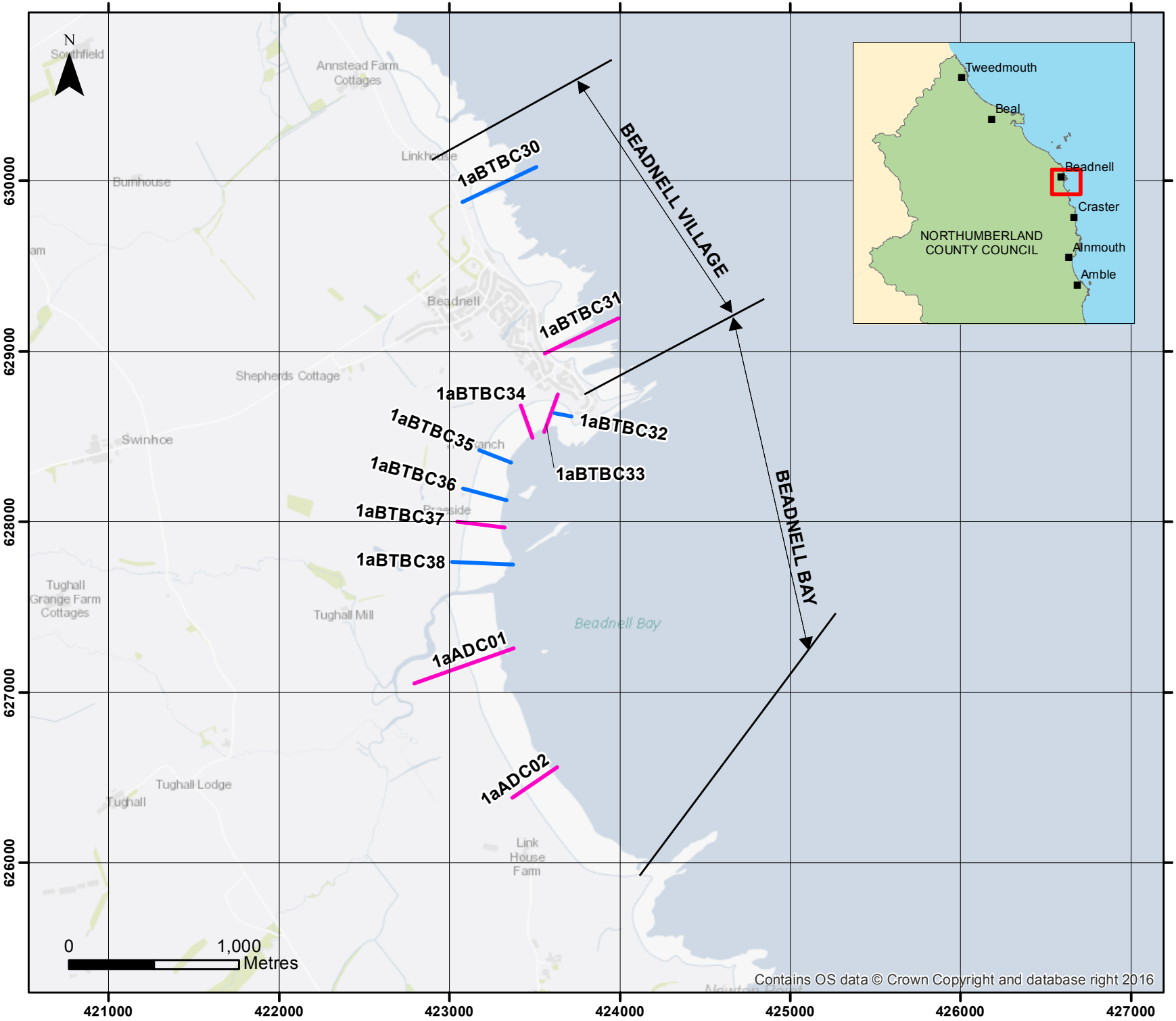

Key

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 5

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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Marlborough House
Marlborough Crescent
Newcastle upon Tyne
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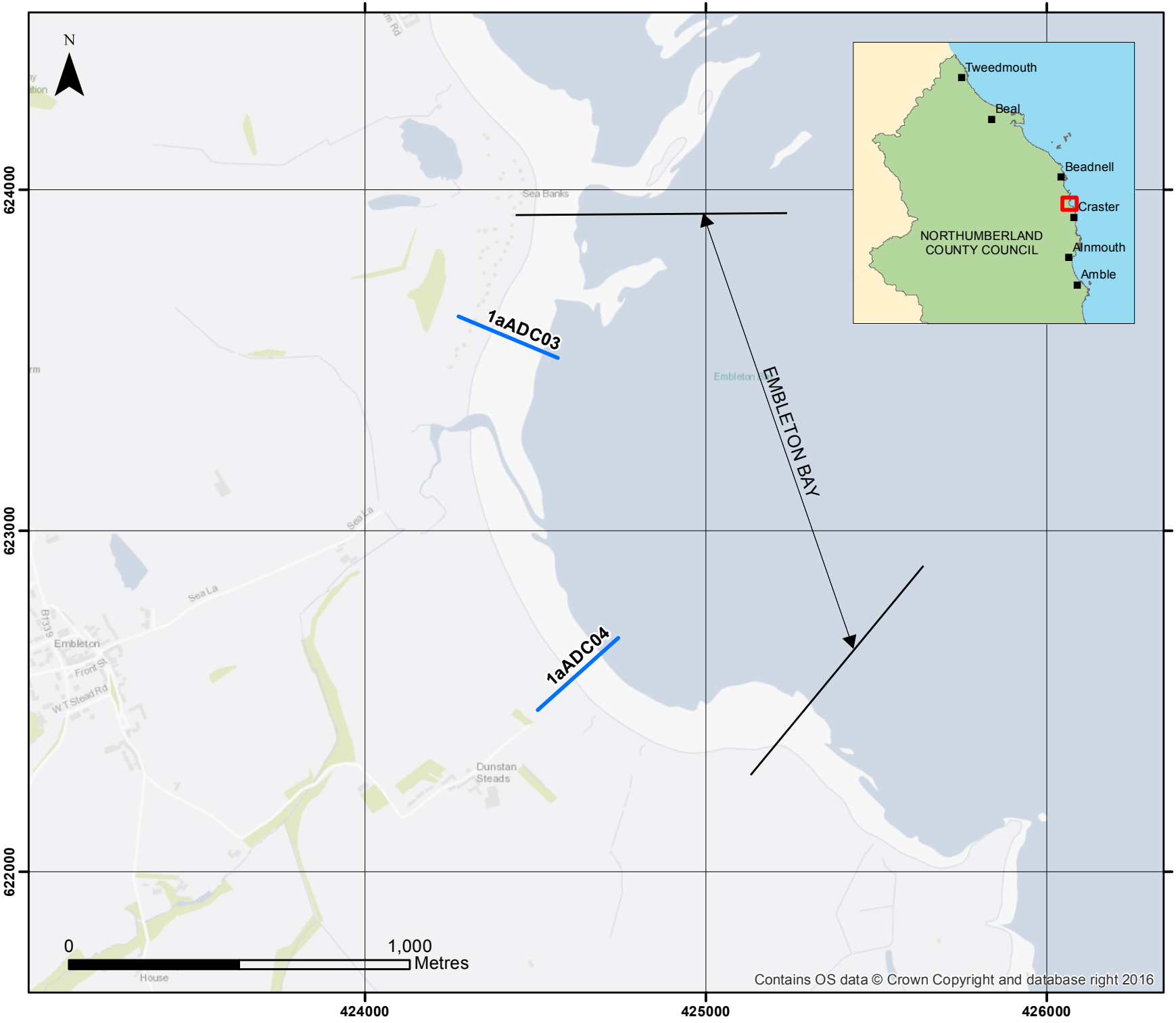

Key

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
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Marlborough House
Marlborough Crescent
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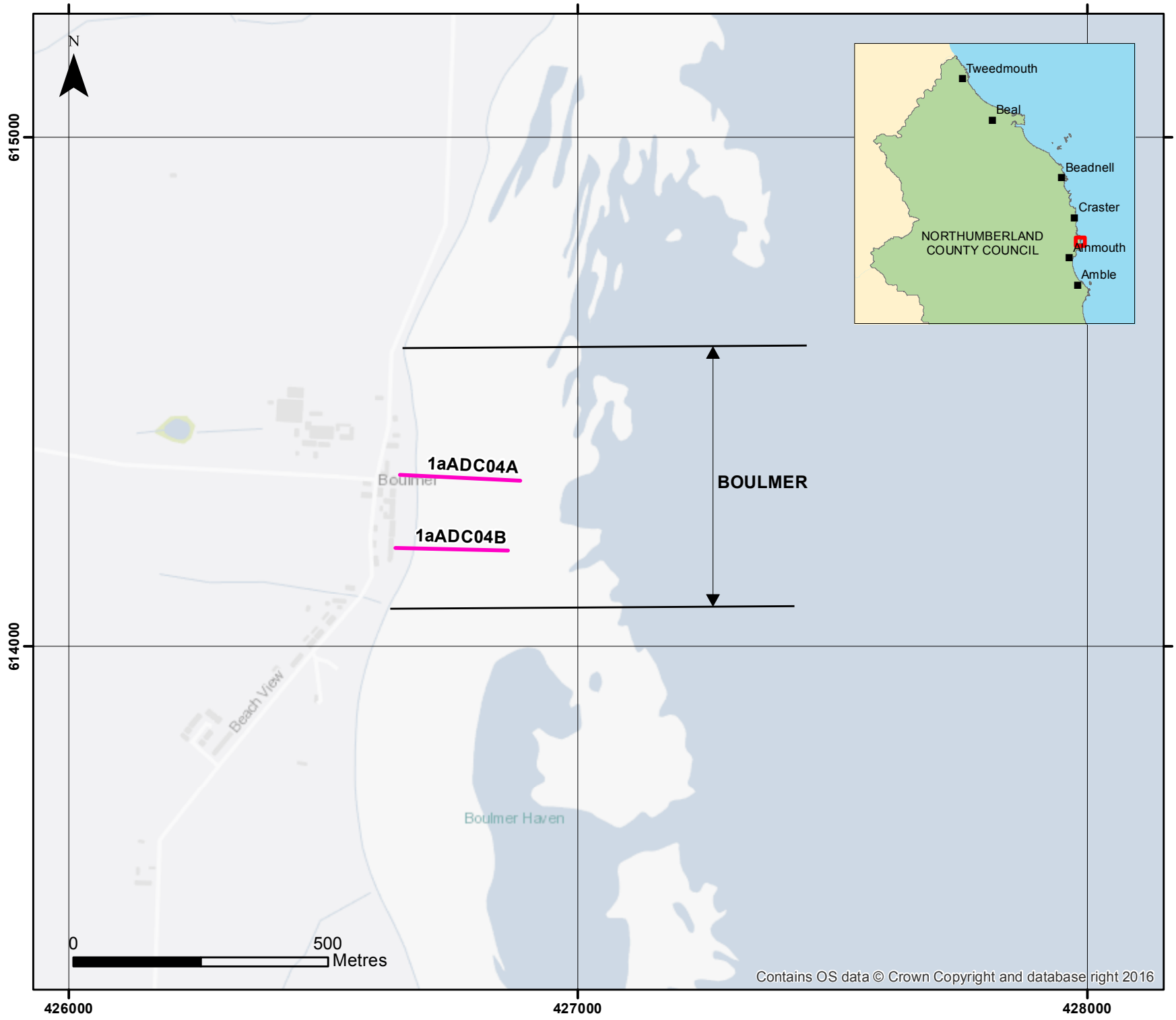

Key

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 7

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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Marlborough House
Marlborough Crescent
Newcastle upon Tyne
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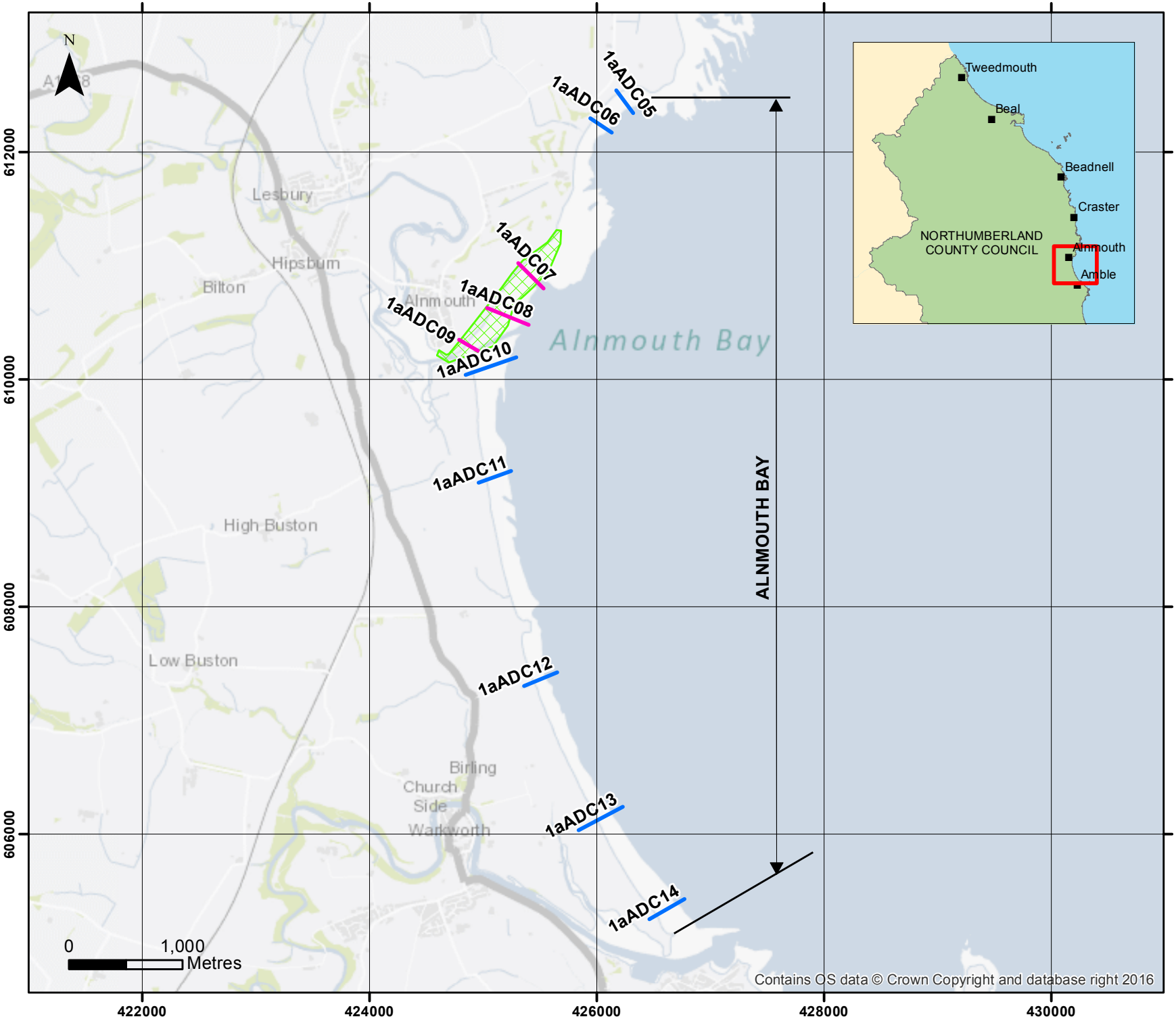

Key

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 8

Northumberland County Council Frontage

Analytical Report
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Marlborough Crescent
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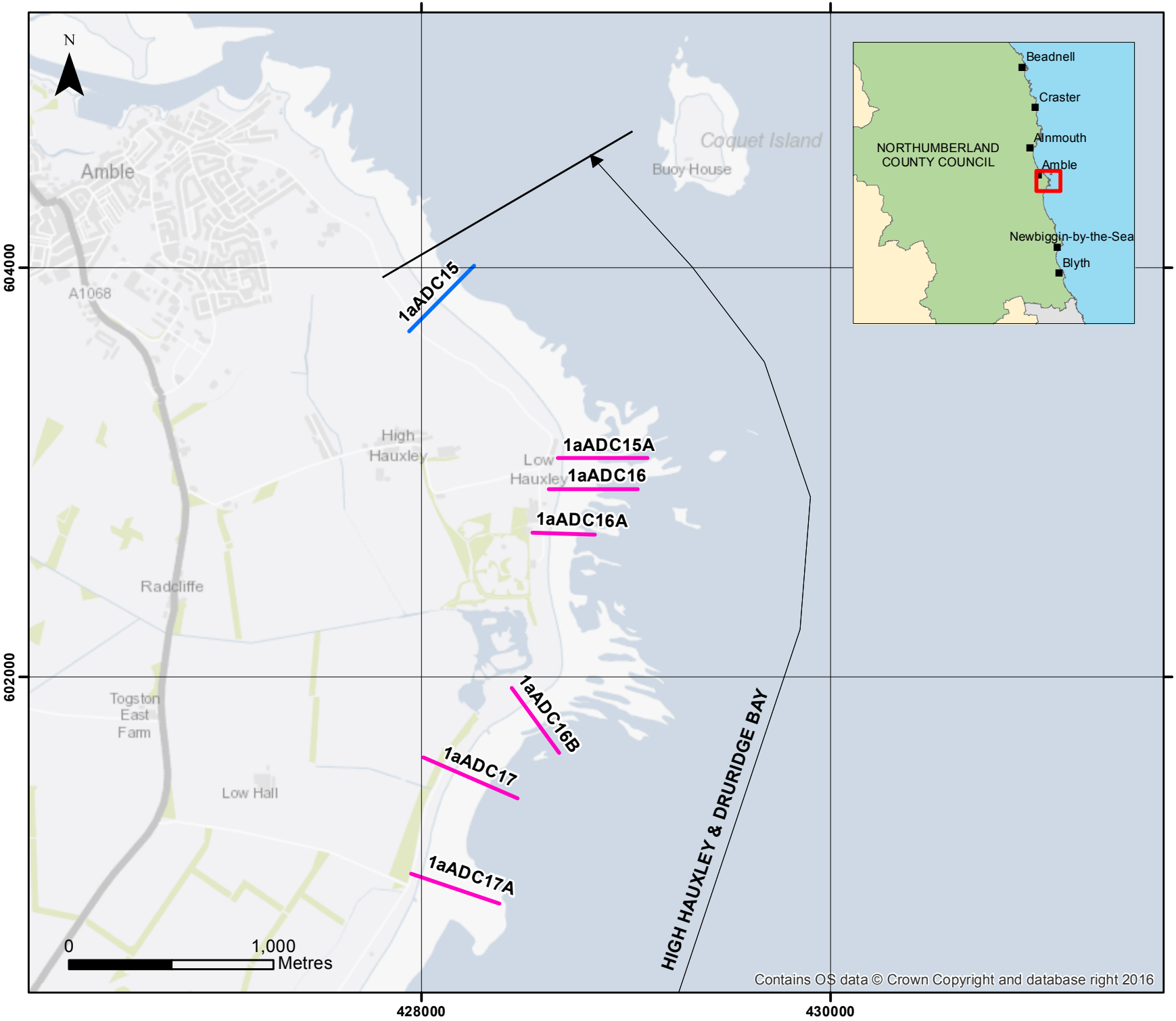

Key

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
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Marlborough Crescent
Newcastle upon Tyne
NE1 4EE

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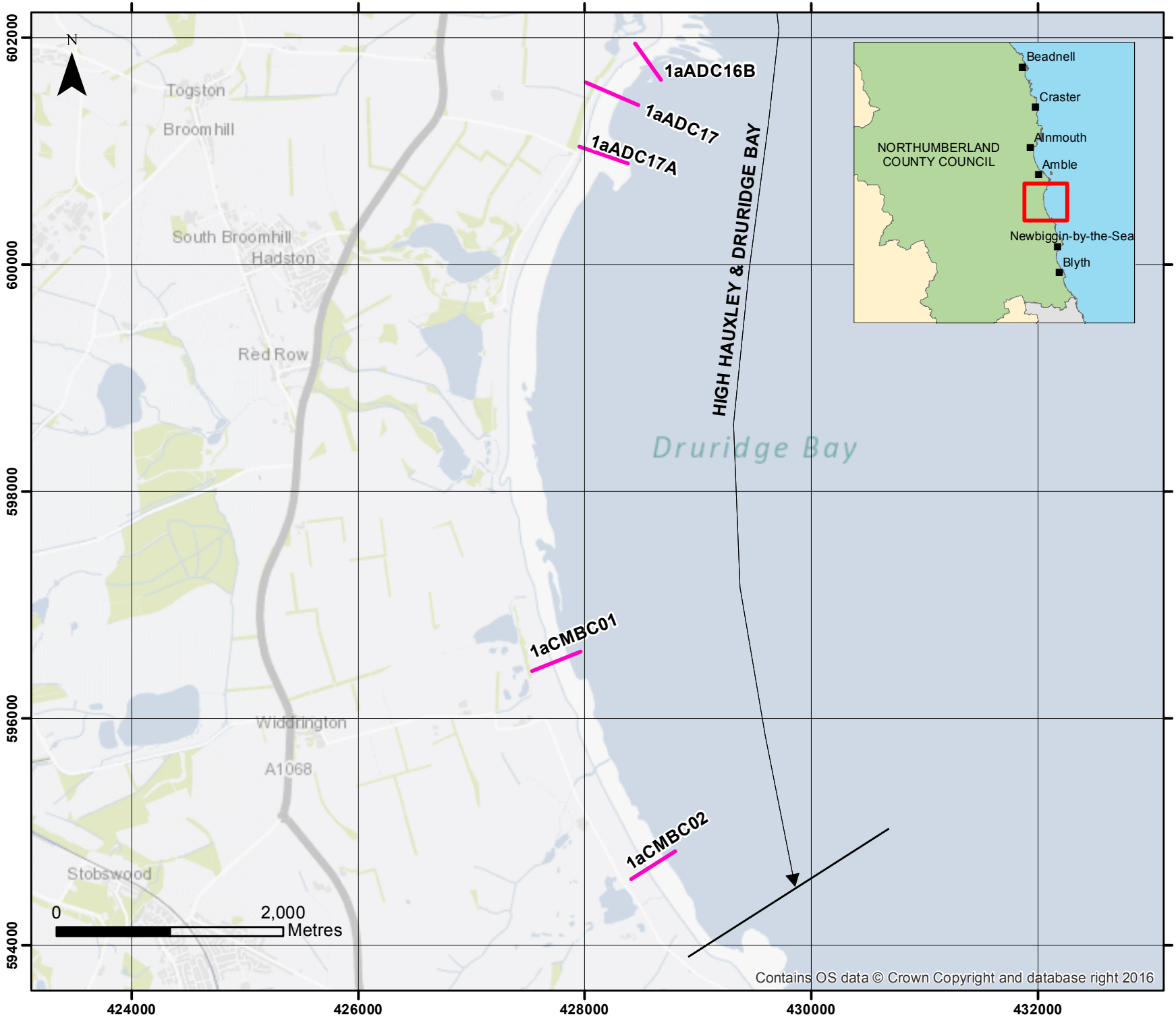

Key

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 10

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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Marlborough House
Marlborough Crescent
Newcastle upon Tyne
NE1 4EE

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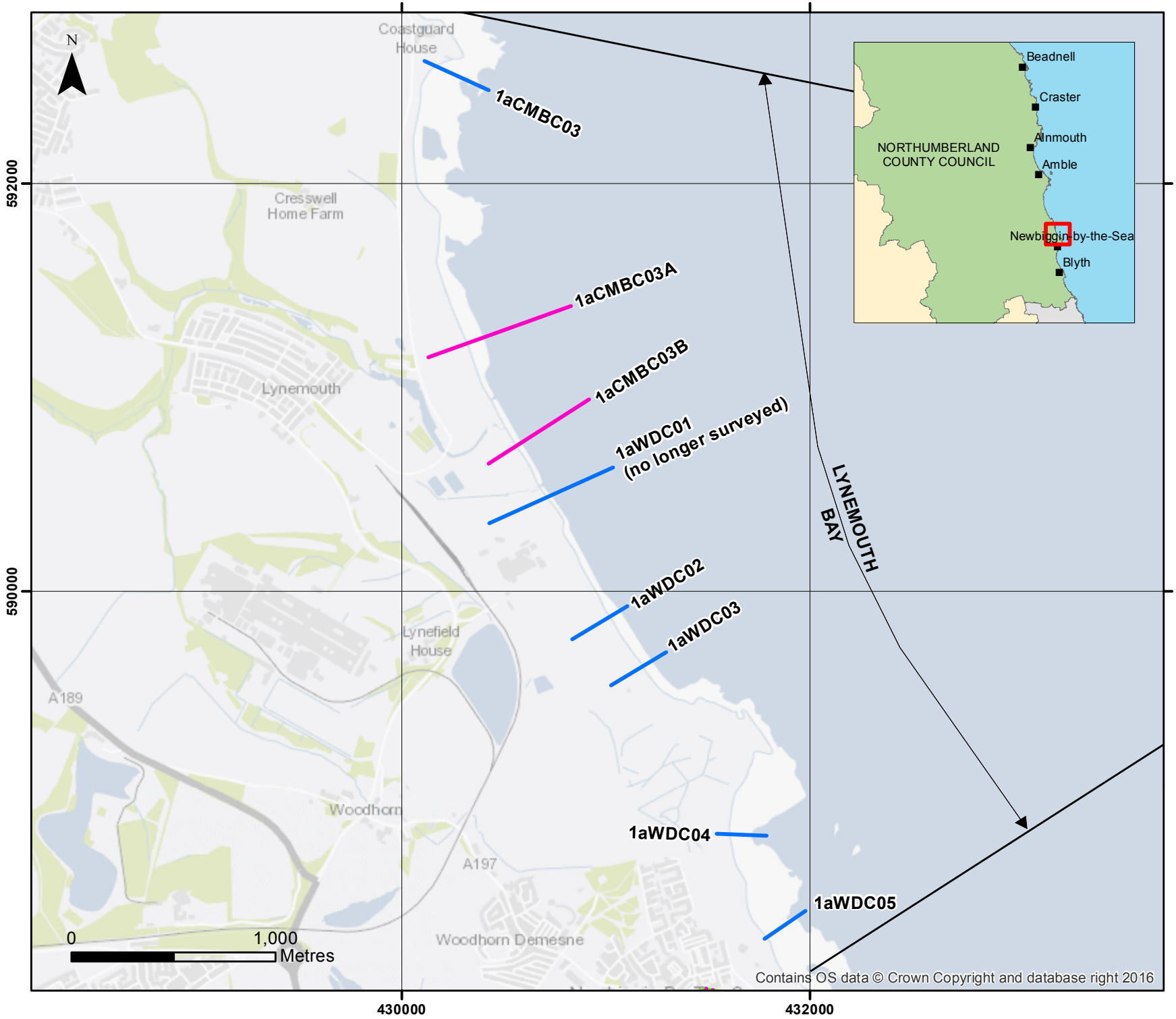

Key

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 11

Northumberland County Council Frontage

Analytical Report
Topo Surveys

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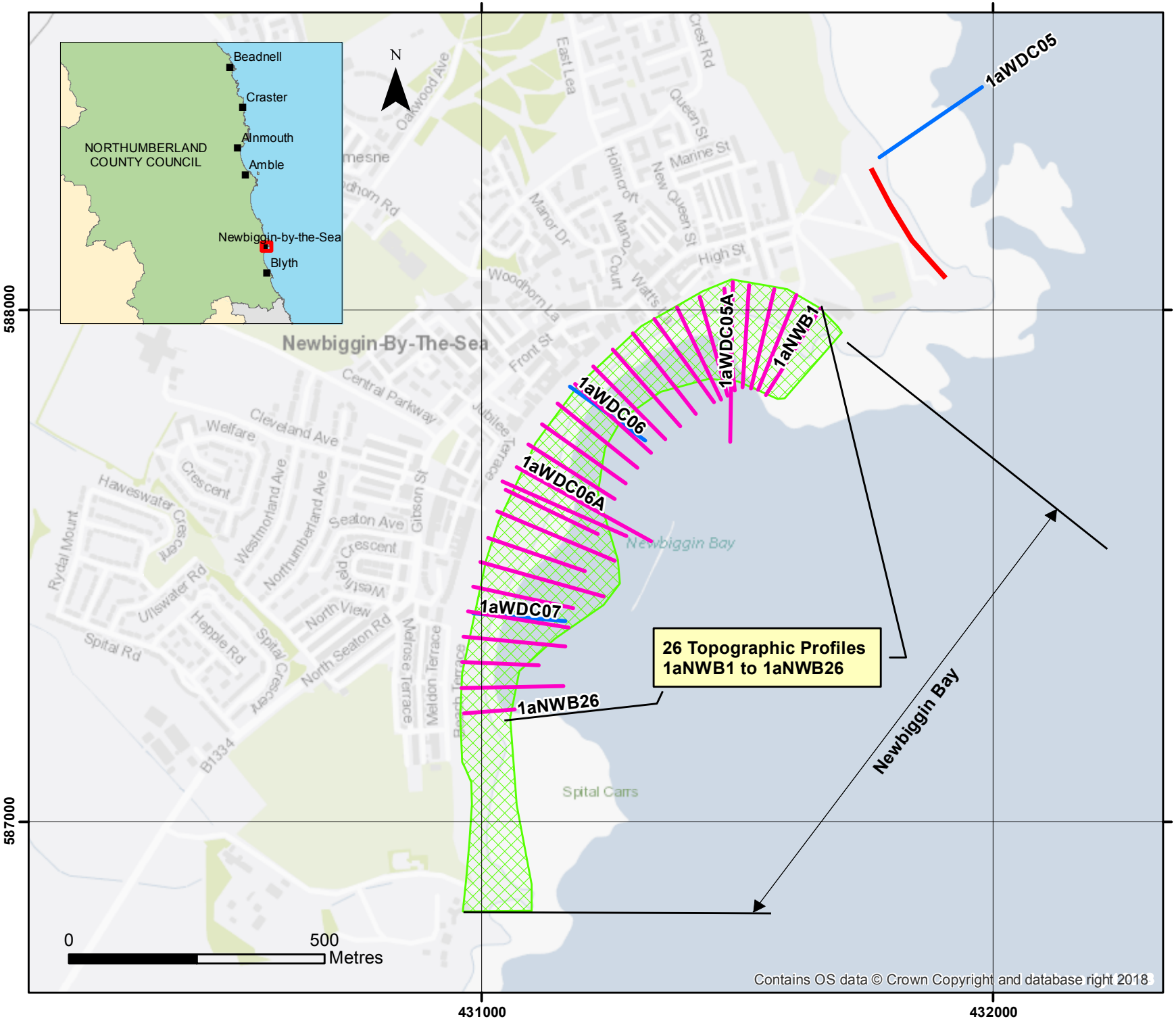

Key

SURVEY LOCATIONS

Topographic Profiles

- Annual
- Bi-Annual

Topographic Surveys

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

(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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Royal HaskoningDHV
Marlborough House
Marlborough Crescent
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NE1 4EE

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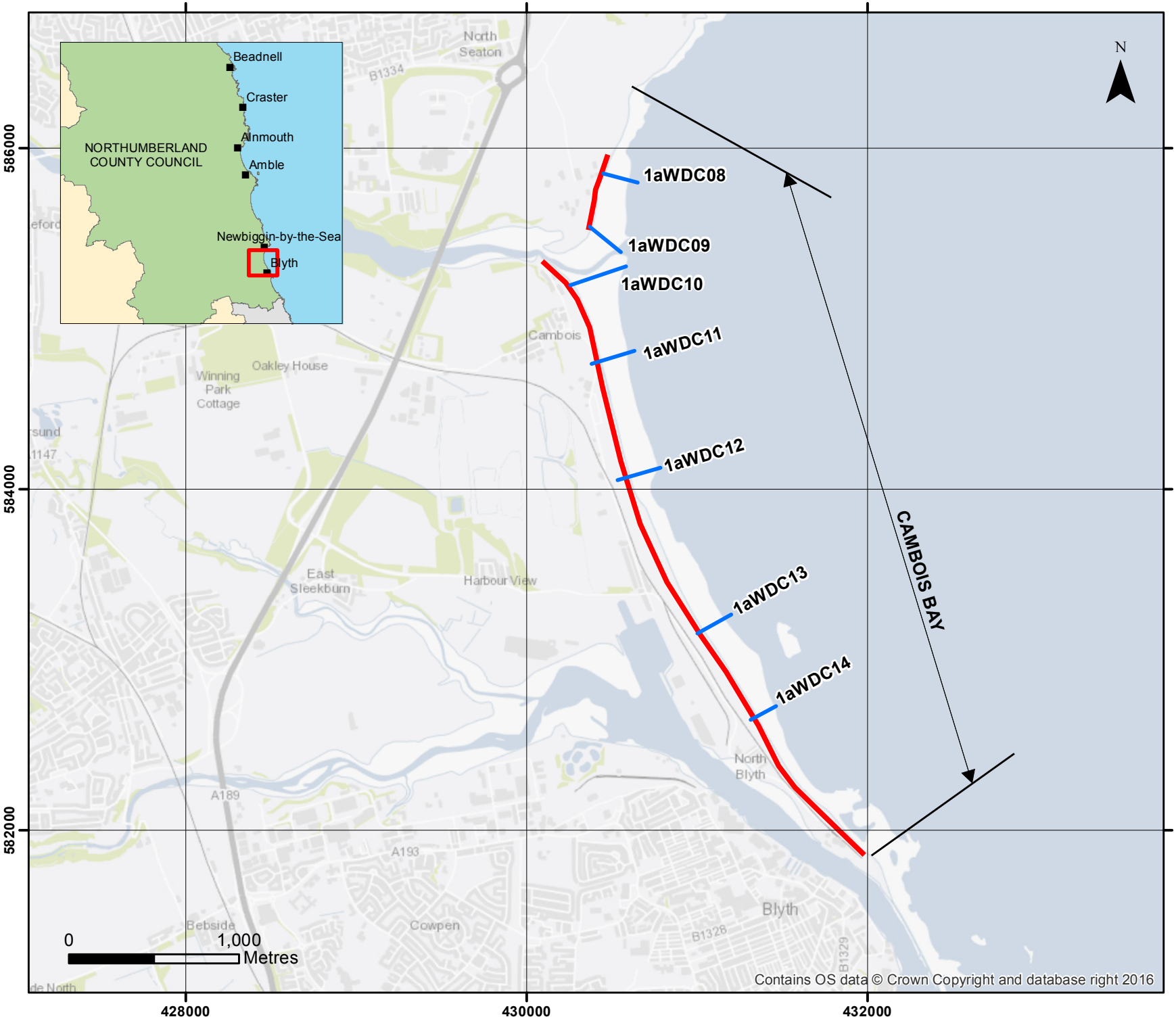

Key

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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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

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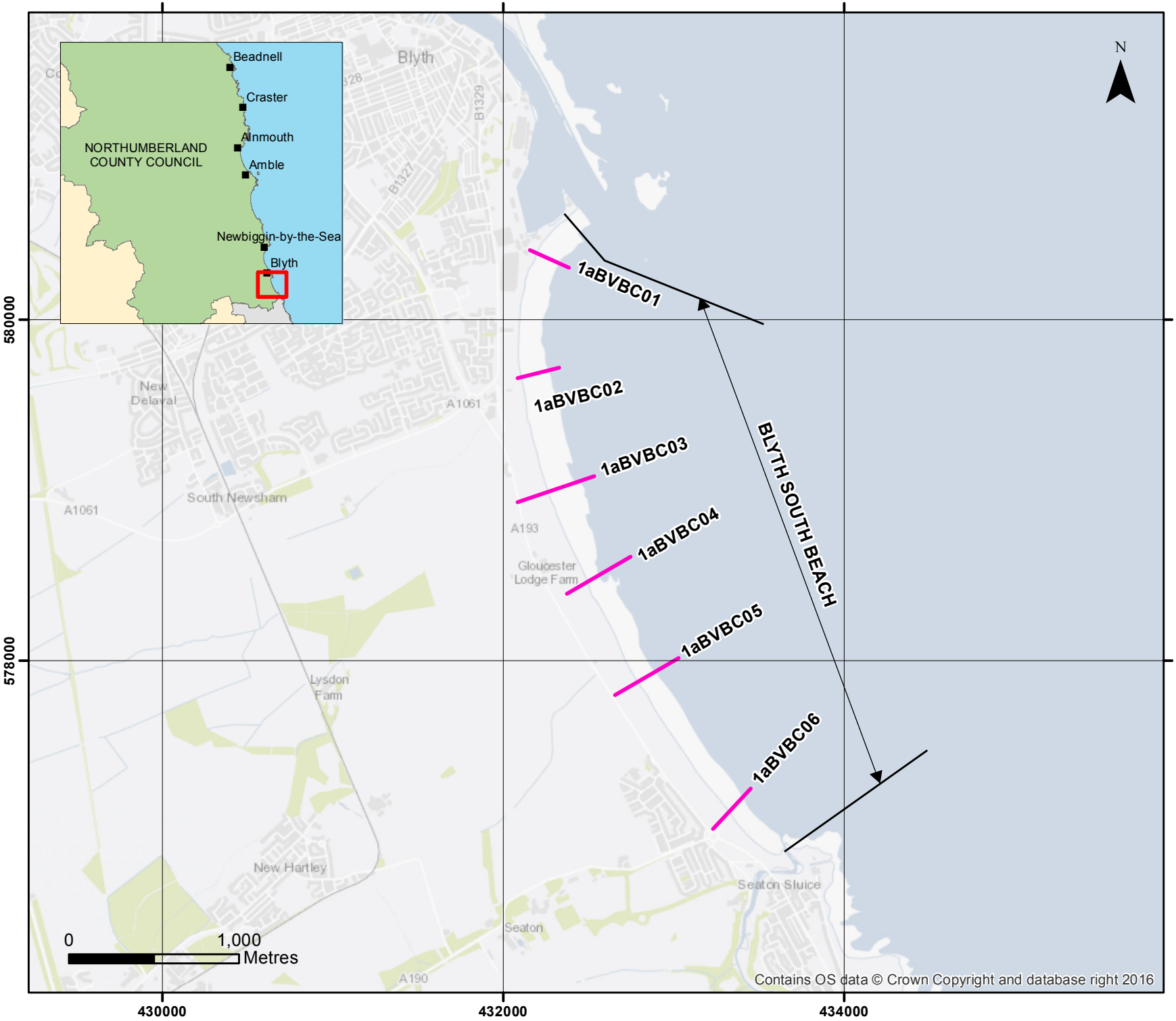

Key

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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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

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2. Analysis of Survey Data

2.1 Sandstell Point (Spittal A)

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 25th March 2019	**Beach Profiles:** Sandstell Point is covered by four beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. Profile **1aBTBC02** is located on the southern bank of the inner Tweed estuary. The dunes have remained stable with no changes in height or position. There has been very little change in the beach levels, ±0.1m from the dune front at chainage 41m to the end of the profile. Overall the profile is at a medium level compared to the range recorded from previous surveys. Profiles **1aBTBC04** (longitudinal section) and **1aBTBC05** and **1aBTBC06** (both cross-sections) cover the spit at Sandstell Point. Profile **1aBTBC04** shows that the berm previously recorded at chainage 220m has moved landwards by around 9m and increased in height by 0.3m. The landward side of the berm has eroded by 0.5m. Seaward of chainage 173m the spit has accreted by up to 0.4m. Overall the profile is at a relatively medium level compared to the range recorded from previous surveys, with the end of the spit being relatively high. Profiles **1aBTBC05** and **1aBTBC06** are transects across the spit, with the open sea on the right-hand side of the plot and the river channel to the left. At **1aBTBC05**, the seaward side of the spit has changed marginally, with change limited to ±0.1m. The river channel side of the side has increased in height by up to 0.2m and has moved seawards by c.30m. A hollow in the centre of the spit has been infilled with sediment by up to 0.6m. Overall the profile is within the middle of its range recorded from previous surveys, both in terms of height and position. At **1aBTBC06** the riverside of the spit profile shows movement towards the seaward side by up to 30m. The crest of the spit has increased in height by up to 0. 4m..Overall the profile is within the medium-low range recorded from previous surveys, both in terms of height and position.	Since the last survey, the dunes along the south bank of the River Tweed have remained stable. There has been movement of the river channel leading to the migration of the spit towards the open sea. **Longer term trends:** The small change in dune profile is within the bounds of previous surveys that indicate they have remained stable over the past 12 years. The beach profiles show that the form of the spit is generally within the range of past observations. The wide variation in profile forms over time is indicative of this being one of the most dynamic systems on the north east coast.

Survey Date	Description of Changes Since Last Survey	Interpretation
	The combination of movement observed at 1aBTBC05 and 1aBTBC06 suggests the river channel has migrated, pushing the base of the spit seawards slightly.	
March 2019	**Topographic Survey:** 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 2011. The previous survey was undertaken for the Full Measures survey in autumn 2018. Data from the most recent topographic survey (Partial Measures, spring 2019) 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 4) produced from the last produced topographic survey and the present survey. In particular, the difference plot shows: (i) little change in the dunes on the south bank of the River Tweed; (ii) decrease in the beach elevation caused by erosion along the northwest edge of the survey area just off the edge of the land; (iii) 3 narrow bands of alternating accretion and erosion across the spit running north-south parallel to the main coastline, with accretion closest to the coastline. (iv) a fourth wider north-south parallel band of erosion in the east of the survey extent; (v) The magnitude of accretion and erosion increases towards east; (vi) in the extreme north of the survey, a wide section of accretion is bordered by two parallel bands of erosion meaning that there is a band of accretion running north-south through the entire survey area.	The findings of the topographic survey show similar trends to the profile survey. This appears to show migration of both the river channel and the spit in an anti-clockwise direction around the headland.

2.2 Spittal (Spittal B)

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 25th March 2019	**Beach Profiles:** Spittal B is covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. Profile **1aBTBC11** is located to the north of Spittal Beach and shows alternating areas of accretion and erosion. From the edge of the dunes at chainage 20m to chainage 46m there has been accretion of up to 0.4m. Between chainage 46m and 77m there has been erosion of 0.25m. Between chainage 77m and 109m there has been accretion of up to 0.3m. Seawards of chainage 109m there has been erosion on the lower beach of up to 0.35m. Overall the profile is at a relatively high level on the upper beach, and a relatively medium level on the middle-lower beach compared to the range recorded from previous surveys. Profile **1aBTBC13** is located towards the centre of Spittal Beach. The upper beach to chainage 27m shows accretion of up to 0.8m switching to a small section of erosion before another section of accretion by up to 0.6m to chainage 90m. Seawards of chainage 98m there has been accretion of up to 0.8m, moving the toe of the beach seawards by around 5m. Overall the profile is at a medium level compared to the range recorded from previous surveys.	Since the last survey, the changes in beach level have been variable indicating a redistribution of sediment throughout the profiles. **Longer term trends:** At both profile locations along Spittal Beach, the changes observed from the present survey are generally within the bounds of previous surveys.

2.3 Goswick Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
8th March 2019	**Beach Profiles:** Goswick Sands are covered by two beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. Profile **1aBTBC16** is located to the north of Goswick Sands, between Far Skerr and Cheswick Black Rocks. The dune has remained stable since the last survey and there has been very little change in the upper and middle beach levels with change limited to ±0.1m. The present survey is around c.79m shorter than the previous survey, indicating that sediment has been removed from the lower beach. Overall the profile is at a high level on the upper and middle beach, whilst the lower beach is at a medium level compared to the range recorded from previous surveys. Profile **1aBTBC19** is located to the south of Goswick Sands. The dunes have remained largely stable since the last survey, with changes restricted to ±0.1m. Beach levels show very little change to the end of the survey at chainage 271m.The present survey is c.218m shorter than the previous survey and ends at a drain. Beach levels are at a relatively medium level compared to the range recorded from previous surveys.	Upper and middle beach levels have undergone very little change since the previous survey, however profile 1aBTBC16 is 79m shorter than the previous survey, suggesting a removal of sediment from the lower beach. **Longer term trends:** Both profiles are within the range recorded from previous surveys. However, the range of variation on record is limited compared to beaches elsewhere along the north east coast.

2.4 Holy Island

Survey Date	Description of Changes Since Last Survey	Interpretation
8th March 2019	**Beach Profiles:** Holy Island is covered by two beach profile lines for the Partial Measures surveys (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. **1aBTBC21** and **1aBTBC23** are located on the north-west side of the island, along The Snook. At profile **1aBTBC21** the dunes have remained stable since the last survey, with accretion of up to 0.1m on the dune face between chainage 38m and 55m. Beach levels have experienced accretion of up to 0.05m as far as the end of the survey at chainage 374m.The beach is at a relatively medium level compared to the range recorded from previous surveys. Profile **1aBTBC23** shows that the dunes and beach have remained stable since the last survey. The seawards Overall the beach levels are at a high level compared to the range recorded from earlier surveys.	The dunes, sandy foreshore and sand flats around The Snook have remained stable in both form and position since the last survey. **Longer term trends:** The minor changes observed since the last survey are within the bounds of previous surveys.

2.5 Beadnell Village

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 25th March 2019	**Beach Profiles:** Beadnell Village is covered by one beach profile line for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. **1aBTBC31** is in Nacker Hole and extends across the promenade and seawall. Since the last survey, the beach profile has remained relatively stable. There has been accretion of up to 0.1m of shingle across the upper beach from the seawall to chainage 19m. From chainage 19m to 29m there has been an erosion of up to 0.2m. Seawards of 29m, levels have generally lowered by up to 0.2m. Overall the profile is at a medium-high level on the upper beach and a low level on the middle beach, with the section between chainages 23m and 29m the lowest on record.	The beach to the south of Beadnell Village has generally remained stable. **Longer term trends:** The changes observed since the last survey are within the bounds of previous surveys.

2.6 Beadnell Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 25th March 2019	**Beach Profiles:** Beadnell Bay is covered by five beach profile lines for the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. Profiles **1aBTBC33** and **1aBTBC34** are located in Beadnell Harbour to the north of Beadnell Bay. Profile **1aBTBC37** is located further south towards the outfall of Brunton Burn/Long Nanny. At **1aBTBC33**, the beach profile shows erosion of 0.6m on the front face of the dunes. However, the survey report notes that the middle of the dunes were not surveyed due to access difficulties created by vegetation. The beach shows erosion of up to 0.2m across its profile. The profile is at a relatively medium level compared to the range recorded from previous surveys. At profile **1aBTBC34**, the dunes show erosion of up to 0.1m. Between the dune toe and chainage 113m, there has been accretion of up to 0.3m covering up previously exposed rocks between chainage 40m and 110m. Seaward of chainage 110m there has been erosion of up to 0.4m. The upper beach is at a medium level compared to the range recorded from previous surveys, whilst the lower beach is at a low level compared to the range recorded from previous surveys. At **1aBTBC37**, the dunes have remained mostly stable since the last survey. From the toe of the dunes to chainage 54m there has been an accretion of up to 0.5m Between chainage 54m and 164m there has been very little change. Between 164m and 226m there has been an accretion of up to 0.3m. Seawards of chainage 226m the beach toe has moved landwards by 12m. Overall the profile is at a medium level compared to the range recorded from previous surveys. Profiles **1aADC01** and **1aADC02** are located along the frontage to the south of the outfall of Brunton Burn/Long Nanny. The dunes at 1aADC01 and 1aADC02 have not changed form or position. At **1aADC01** the dune has remained stable with some erosion of 0.1m on the landward side. There has been accretion on the seaward facing dunes of up to 0.3m to chainage 286m. From chainage 286m to 469m there has been erosion of up to 0.3m. Seawards of chainage 469m there has been an accretion of the beach toe by up to 0.5m and a seaward extension of 45m. Overall the profile is at a medium-low level compared to the range recorded from previous surveys, particularly at the toe of the dunes where	Along the length of Beadnell Bay, the dunes have remained largely stable since the last survey, with some signs of growth. In general, the profiles show accretion on the upper beach and erosion on the lower beach, with the exception of profile 1aBTBC33 which shows accretion across the whole beach. **Longer term trends:** Along the length of Beadnell Bay, the dunes are of a similar form to those observed in the past. The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys, with the toe of the beach being the highest on record on several of the profiles.

Survey Date	Description of Changes Since Last Survey	Interpretation
	the dune toe is at its lowest level recorded. At profile **1aADC02** the dunes have not changed since the previous survey, with a minor amount of erosion on the landward side of up to 0.1m. There has been accretion of up to 0.4m from the dune toe to chainage 90m. The hollow at chainage 120m has been infilled with 0.5m of sediment. Seawards of chainage 132m there has been erosion of up to 0.2m. Overall the profile is at a relatively medium-low level compared to the range recorded from previous surveys.	

2.7 Boulmer

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 22nd February 2019	**Beach Profiles:** Boulmer is covered by two beach profile lines for the Partial Measures survey (Appendix A). These were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2018. At profile **1aADC04A** there has been a small accumulation of up to 0.2m at the toe of the dune cliff to chainage 18m. From chainage 18m to 31m there has been an erosion of up to 0.2m. Between 31m and the rock chainage at 72m there has been an accretion of up to 0.2m on the middle beach. Overall the profile is at a medium level compared to the range recorded from previous surveys. At profile **1aADC04B** the backshore (now rock armour) has remained stable since the last survey. There has been erosion of up to 0.3m on the upper beach to chainage 22m. Seaward of chainage 22m to 93m there has been an accretion of up to 0.4m across the middle and lower beach, covering up a previously exposed rock platform at chainage 70m. Seawards of chainage 93m the rock platform is exposed over the rest of the profile, as it was in the previous survey. The profile is at a relatively high level at the toe of the rock armour, and at a more medium level over the rest of the profile compared to the range recorded from previous surveys.	The dune cliff backshore at Boulmer is now fixed in position by the rock armour at both profiles. Beach levels at both locations in Boulmer have experienced quite limited change since the last survey, with very little change at the toe of the rock armour. Across the mid-profile a trend of accretion has dominated, partially covering the exposed rock platform. **Longer term trends:** The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys. The sandy part of the upper beach remains near its highest level on record, and the rocky shore platform continues to be mainly exposed in the lower foreshore.

2.8 Alnmouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
20th – 22nd February 2019	**Beach Profiles:** Alnmouth Bay is covered by three beach profile lines during the Partial Measures survey (Appendix A). The previous survey was undertaken for the Full Measures survey in autumn 2018. The three profiles are located to the north of Alnmouth Bay between Marden Rocks and the mouth of the River Aln Estuary. At profile **1aADC07** the overall position of the dunes has remained stable since the last survey. The beach level at the toe of the dunes has increased by 0.4m. The upper beach has been smoothed with the infilling of hollows by up to 0.4m to chainage 106m. The lower beach berm has migrated landward by 80m, moving the beach toe landward by 35m.The upper and middle beach is at a relatively medium level compared to the range recorded from previous surveys, whilst the lower beach is at a high level. At profile **1aADC08** the dunes have remained largely stable since the last survey, and the dune toe has accreted by around 0.2m. Between chainages 30m and 252m there has been an accretion of up to 1.0m, with the formation of a berm at chainage 180m and shallow depression at chainage 160m. Between chainage 290m and 326m there has been erosion of up to 0.1m. There has been an extension of the beach toe by up to 37m. Overall the profile is generally at a low level on the upper beach and at a medium-high level on the middle and lower beach compared to the range recorded from previous surveys. At profile **1aADC09** the dunes have remained stable since the last survey, however the toe of the dune has moved landward by around 4m. From chainage 22m to 105m there has been an accretion of up to 0.7m. The toe of the beach seawards of chainage 105m shows limited change up to ±0.1m. Overall, the beach toe has steepened and is c.41m shorter than the previous survey. Overall the profile is at a relatively low-medium level compared to the range recorded from previous surveys.	The dunes have remained largely stable since the last survey. There has been minimal beach level change, with erosion being the marginally dominant process. The continued migration of the river channel is the most notable change. **Longer term trends:** The dunes shows long-term stability. The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys, although change in the position of the river channel has substantially curtailed profile 1aADC09 and therefore no information is available about beach elevations on the opposite bank of this channel along this profile alignment (this been the case since 2015).

Survey Date	Description of Changes Since Last Survey	Interpretation
March 2019	**Topographic Survey:** The northern part of Alnmouth Bay (to the north of the River Aln estuary) is covered by bi-annual topographic survey, which commenced in April 2005. Data from the most recent topographic survey (Partial Measures, spring 2019) 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 5) produced from the last produced topographic survey (Full Measures, autumn 2018) and the present survey. The difference plot shows a mixed pattern of erosion and accretion. In the extreme south of the survey area erosion is dominant in the area fronting the village of Alnmouth itself. Moving northwards across the section of beach fronting the golf course accretion becomes the dominant process with some erosion noted directly adjacent the shore fronting the access road and car park. To the north of the car park area the pattern is more scattered and less consistent. In general, the upper beach is dominated by accretion, with erosion more dominant in the mid beach, and some accretion across the lower beach.	The findings of the topographic survey show a mixture of erosion and accretion, some resulting from winter erosion of the upper beach and consequent accretion in the lower beach (draw down), whereas other changes result from migration of the mouth of the River Aln across the beach.

2.9 High Hauxley & Druridge Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
22nd March 2019	**Beach Profiles:** High Hauxley to Druridge Bay is covered by eight beach profile lines during the Partial Measures survey (Appendix A). Four of these (with A or B suffixes) were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2018. **1aADC15A**, **1aADC16** and **1aADC16A** are located around Hauxley Haven. Dunes at these three profiles have remained stable since the last survey. At profile **1aADC15A**, the seaward face and toe of the dunes has advanced by around 1m. There have been marginal levels of accretion between the toe and chainage 28m. Seaward of this point erosion has been the dominant process. There has been moderate loss of approximately 0.3m from the mid beach between chainage 28 m and chainage 90m. Seaward of this point the beach level has dropped significantly with up to 1m of loss between chainage 90m and chainage 190m. The rock shore platform which extends seaward of chainage 190m is exposed as in previous surveys. The profile is overall at a low level relative to the range of previously recorded surveys, particularly between chainage 35m – 45m and chainage 62m – 158m where the profile is at its lowest recorded level. At profile **1aADC16** there has been a similar pattern to 1aADC15A. There has been minor movement of the toe of the dunes with a relaxation on the gradient between chainage 63m and chainage 90. Seaward of this point erosion has dominated. Between chainage 90m – 140m erosion has been limited to less than 0.1m, however this increases to losses of up to 0.8m between chainage 135m and 235m. Seawards of chainage 235m the rocky platform is fully exposed, as it was in the previous (Autumn 2018) survey. Overall the beach is at a low level relative to the range recorded from previous surveys. The beach profile is at its lowest level between chainage 135m - 210m and chainage 220m and the end of the survey at 235m. The survey report notes '*gaps in section due to bushes and no access to resident's garden'* which appear to be in the dune part of the section. Profile **1aADC16A** shows accretion of up to 0.4m against the toe of the sea defences at chainage 80m. Between chainage 90m and 137m the profile has remained relatively stable with erosion and accretion within the order of +/- 0.1m. Seaward of this point there has been erosion of up to 0.5m, and the mid beach berm recorded in 2018 has been lost. The rock platform is exposed from chainage 215m as in	At Hauxley Haven, the dunes have remained stable since the last survey. Beach levels have varied and are generally at low levels but largely remain within the bounds of previous surveys. In most of Druridge Bay the dunes and low cliff at their toe, where present, have experienced little change. However, the beaches have varied with erosion tending to dominate, however all profiles are largely at a medium-low level compared to the range recorded from previous surveys. **Longer term trends:** At Hauxley Haven and Druridge Bay, the dunes have demonstrated a long-term trend of stability. The changes in beach profile form and position observed since the last survey are generally within the bounds of previous surveys.

Survey Date	Description of Changes Since Last Survey	Interpretation
	previous surveys. Overall the profile is at a low level relative to the range recorded from previous surveys, with the exception of the upper beach where beach levels remain in the mid-range. **1aADC16B**, **1aADC17** and **1aADC17A** are located to the north of Druridge Bay, between Bondi Carrs and Hadston Carrs and extend seawards from Togston Links. At profile **1aADC16B** there has been erosion of up to 0.4m between chainage 80m and 150m, exposing more areas of rock. The Spring 2019 survey shows the rock to be wholly exposed across the upper and mid beach. Between chainage 155m and 185m the rock platform remains exposed. Seaward of chainage 185m there has been accretion of up to 0.2m. Despite some accretion across the lower beach overall the beach remains at a low level relative to the range recorded from previous surveys. At profile **1aADC17** there has been some accretion at the toe of the dunes of 0.2m. From chainage 45m to 95m there has been minor losses of up to 0.1m. Seawards of this point until chainage 170m there has been little change (less than +/- 0.05m). Between chainage 170m and the end of the survey at chainage 303m there has been erosion of up to 0.4m. Seawards The profile is generally at a low level compared to the range recorded from previous surveys, with the mid beach being at a medium level. At profile **1aADC17A** the dunes have remained stable. The upper beach shows accretion of up to 0.5m from the dunes to chainage 110m. Between chainage 110m and 162m a berm which was noted in the Autumn 2018 survey has been eroded meaning the profile now lies at its lowest recorded level between chainage 120m – 1662m. Conversely, accretion of up to 0.5m between chainage 162m and 230m mean that the rock platform at the toe of the beach previously exposed from chainage 200m has been covered Seaward of chainage 230m the rocky foreshore is exposed. Overall the profile is at a low level compared to the range of previously recorded results. **1aCMBC01** and **1aCMBC02** are located in the southern section of Druridge Bay. At profile **1aCMBC01**, the dunes appear to have remained stable, with minor amounts of accretion of up to 0.1m. There has been accretion on the upper beach of up to 0.8m between chainage 190m and 225m. Between chainage 225m and 275m there has been erosion of up to 0.4m whereas, seawards of chainage 275m until 345m a berm has formed with up to 0.4m of accretion at its crest. Erosion seawards of chainage 345m has caused the toe of the beach to move landward by approximately 20m. The upper and lower beach is at a medium level compared with the range of previously recorded surveys, whilst the mid beach is particularly low.	

Survey Date	Description of Changes Since Last Survey	Interpretation
	At profile **1aCMBC02**, the dunes have remained stable. The surveyor's report notes that "*a section of field and dunes is missing from the profile due to pregnant livestock and livestock with young animals in the area*". The upper beach has experienced up to 1m of accretion between the toe of the dunes at chainage 195m and chainage 230m. There has been a small amount of erosion between chainage 230m and 320m of up to 0.4m. Seawards of chainage 320m beach levels have increased by up to 0.3m, with the toe of the beach moving seawards by around 50m. Compared to the range recorded from previous surveys the profile is a medium to low level.	

2.10 Lynemouth Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
20th March 2019	**Beach Profiles:** Lynemouth is covered by two beach profile lines during the Partial Measures survey (Appendix A). Profiles 1aCMBC03A and 1aCMBC03B were added to the programme in October 2007. The previous survey was undertaken for the Full Measures survey in autumn 2018. **1aCMBC03A** is located c.450m north of the mouth of the River Lyne and extends across the extensive slag banks before reaching the foreshore. The profile of the slag bank has not experienced any change since the last survey however, the small cliff which forms the interface between the beach and the slag bank has retreated by approximately 2m. The beach levels show erosion across the profile of up to 0.4m. The beach levels are at their lowest recorded level. **1aCMBC03B** is located to the north of Lynemouth Power Station and extends across the extensive slag banks before reaching the foreshore. The process of slag bank erosion has been progressing for some years. Since the last survey, the slag bank has not shown any movement however. The toe of the small seaward facing cliff has retreated by approximately 2m. The beach between chainage -26m and 23m shows a decrease in levels of up to 0.8m. Seawards of chainage 23m there has been a small section of accretion before the end of the survey at 31m. Overall the beach profile is low compared to earlier surveys, reflecting the ongoing landward recession of the artificial shoreline at this point in the bay.	North of the mouth of the River Lyne, the slag bank has remained stable. The beach has experienced erosion and is at its lowest recorded level. To the north of the power station, the slag bank has remained stable. The beach has continued to erode across the majority of its length. **Longer term trends:** North of the mouth of the River Lyne, the slag bank has demonstrated a long-term trend of stability. To the north of the power station, the slag bank has continued to retreat, demonstrating parallel retreat of the artificial shoreline.
March 2018	**Cliff-top Survey:** Cliff top survey data collected for baseline survey (autumn, 2008), the previous Full Measures survey (autumn 2018) and the present Partial Measures survey (spring 2019) is presented in this report. 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 ±0.2m 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. There have been numerous small areas of erosion of up to 0.3m along the survey length however, the	Since the last survey, there have been several small areas of erosion of up to 0.3m erosion. **Longer term trends:** Since surveys began in October 2008, cliff movement has been greatest in the north of the survey area with up to 3.4m of cliff top retreat, whilst the central and southern parts of the survey area have shown less movement with retreat of up to 1.4m.

Survey Date	Description of Changes Since Last Survey	Interpretation
	cliff has generally remained stable experiencing limited change since the previous survey.	

2.11 Newbiggin-by-the-Sea

Survey Date	Description of Changes Since Last Survey	Interpretation
21st February 2019	**Beach Profiles:** Newbiggin-by-the-Sea is covered by four beach profile lines during the Partial Measures survey (Appendix A). Two of these (with an 'A' suffix) 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. It should be noted that an extended series of profiles and a topographic survey are also recorded via the Cell 1 Regional Coastal Monitoring Programme for purposes of post-project evaluation of this capital scheme. These profiles are not analysed here, however, the findings of the topographic survey are presented below. The previous survey was the Full Measures assessment undertaken in autumn 2018. **1aWDC05A** is in the north of Newbiggin Bay. There has been accretion of up to 0.5m at the toe of the seawall, and up to 0.2m across the upper beach profile to chainage 60m. Seaward of chainage 60m, there has been minor erosion of up to 0.1m. The rock platform remains exposed at chainage 110m. The profile is at a high level relative to the range recorded from previous surveys, with the section at the toe of the seawall being one of the highest on record. **1aWDC06** is located in the centre of the northern part of Newbiggin Bay, between the two breakwaters. There has been negligible accretion up to 0.2m of material at the base of the seawall. From chainage 24m to approximately 47m the beach profile erodes by approximately 0.15m, however, seaward of chainage 47m erosion is much higher, reaching up to 0.5m toward the lower beach. The beach profile is at a relatively medium level compared to the range recorded from previous surveys. **1aWDC06A** is located in the centre of Newbiggin Bay, behind the offshore breakwater. The front face of the upper beach berm has accreted and moved seawards by around 5m. There has been erosion across the middle beach from the berm to chainage 190m of up to 0.2m. Seawards of chainage 190mthere has been minor accretion of up to up to 0.1m. Overall the profile is at a medium-high level relative to the range recorded from previous surveys. **1aWDC07** is located towards the south of Newbiggin Bay. There has been erosion of up to 0.2m across the beach profile to chainage 70m. Seawards of chainage 70m the beach levels have dropped by up to	Since the last survey, the beach at Newbiggin-by-the-Sea generally shows accretion on the upper beach and erosion on the middle and lower beach. The only exception is profile 1aWDC07 which shows accretion across the beach profile. All profiles are at a medium-high level compared to the range recorded from previous surveys. **Longer term trends:** Data collected since the start of monitoring 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. The changes in beach profile form and position observed since the last survey are within the bounds of previous surveys.

Survey Date	Description of Changes Since Last Survey	Interpretation
	0.5m. Overall the profile is at a medium level compared to the range recorded from previous surveys, however the toe of the beach is at its lowest level recorded.	
April 2019	**Topographic Survey:** Newbiggin-by-the-Sea is covered by bi-annual topographic survey, which commenced in September 2010 to assess the performance of the capital scheme constructed in 2007. Prior to incorporation in the programme, these surveys were undertaken on occasions between 2007 and 2010 as part of the scheme development. The previous survey was the Full Measures assessment undertaken in autumn 2018. Data from the most recent topographic survey (Partial Measures, spring 2018) have been used to create a digital ground model (DGM) (Appendix B – Map 3) using a Geographical Information System (GIS). A difference plot has also been produced using the DGM (Appendix B – Map 6) produced from the previous and present surveys. The topographic survey shows patchy accretion and erosion. The tombolo behind the central breakwater shows accretion on both of its sides with some minor erosion at its seaward tip. A wide shore parallel band of accretion in the mid beach which continues northwards on to the upper beach to the north of the breakwater. The mid-lower beach to the north of the breakwater shows the largest and most continuous area of erosion. South of the breakwater the pattern is patchy with generally low magnitude changes, particularly on the lower beach. The survey report notes that; sand was covering most of the revetment rocks at the back of the beach; concrete steps were exposed for stretches at the back of the beach; and there was evidence of beach grooming and digging out of the sea walls at the back of the beach.	The topographic survey shows variable change across the bay, with most change occurring north of the tombolo behind the central breakwater. The southern end of the bay shows a much patchier distribution of change. This suggests there may have been movement away from the north of the bay towards the tombola.
April 2019	**Sand Extent Survey**: Spital Carrs is located to the south of Newbiggin Bay and is covered by a bi-annual sand extent survey, which commenced in 2011. The survey was designed to address concerns that the beach recharge scheme undertaken in Newbiggin Bay may impact on the Spital Carrs SSSI and SPA. The sand extent survey therefore identifies the boundary of the sand beach on the rock platform. Data from the most recent sand extent survey (Partial Measures, spring 2019) has been plotted onto	Since the last survey, there has been retreat of the edge of the sand across the survey area. **Longer term trends:** sand extent surveys for the past 11 surveys shows oscillation of the edge of the beach with no net trend. Recent changes are within the range of changes seen previously.

Survey Date	Description of Changes Since Last Survey	Interpretation
	aerial imagery (refer to Appendix C – Map 1). The plot shows some variation of the extent of sand between the autumn 2018 and the spring 2019 survey. There has been up to 10m of landward retreat of sand in the north of the survey extent. Generally, across the shore platform there has been little change. The spring 2019 sand extent is generally within the range of changes seen in previous surveys, with the exception of the reach north of the sports pitches where the sand extent is now in its most landward position.	

2.12 Cambois Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
February 2019	**Cliff-top Survey:** Cliff top survey data collected for baseline survey (spring, 2009), the previous Full Measures survey (autumn 2018) and the present Partial Measures survey (spring 2019) is presented in this report. 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 from the cliff top monitoring are anticipated to have an accuracy of ±0.2m 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. There has been very little change in the position of the cliff top at Sandy Bay Caravan Park since the previous survey in autumn 2018 along the majority of the survey length. In particular, there has been little change across the north of the survey area. The only notable area of erosion is a 7m section located in the southern end of the survey limit which shows erosion of 1.6m when compared to the autumn 2018 survey. The dunes on the southern bank of the River Wansbeck show very little change, except for a 6m section at directly to the rear of the northernmost area of rock armour at the beach access point which has experienced 1.3m of retreat. There have been variable amounts of erosion along the survey length in Cambois Bay, typically less than 0.3m, but with numerous short sections (<10m length) of erosion up to 1.0m, and a few areas of more severe erosion; the most notable area is in the south of the survey area: • Consistent erosion of 0.2m to 0.6m over a 450m length opposite the main quay of the tidal basin (between profiles 1aWDC13 and 1aWDC14). • A 36m long section of up to 1.7m erosion approximately 120m south of profile 1aWDC13. • A 40m long section of up to 1.8m erosion approximately 260m south of profile 1aWDC13	Since the last survey in Autumn 2018, there has been erosion of up to 1.6m over short sections in the south of the Sandy Bay Caravan Park survey area. In Cambois Bay the erosion is generally localised small sections, with the most consistent areas of erosion being in the south of the bay adjacent the tidal basin. **Longer term trends:** 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 2007, whilst the northern part has eroded by c.1-3m. In Cambois Bay, the area of greatest cliff top retreat since the surveys began in 2009 is in the centre of the bay opposite Ridley Terrace, Cambois, where up to 12m of erosion has occurred. The north and south of the bay have more typical retreats of c.3-7m. .

2.13 Blyth South Beach

Survey Date	Description of Changes Since Last Survey	Interpretation
20th February 2019	**Beach Profiles:** Blyth South Beach is covered by six beach profile lines for the Partial Measures survey (Appendix A). The previous survey was the Full Measures assessment undertaken in autumn 2018. **1aBVBC01** is located towards the north of South Beach, in front of the land owned by the Port of Blyth. The dunes have remained stable with some accretion of up to 0.1m on the most seaward dune. There has been up to 0.3m of accretion against the toe of the dunes from chainage 35m to 45m. In the upper-mid beach, between chainage 47m and 70m there has been a section of erosion of up to 0.2m, whilst the lower-mid beach has experienced a small amount of accretion of up to 0.1m between chainage 70m and 90m. Seawards of this point until the end of the profile erosion has dominated, three berms recorded in the September 2019 surveys have been eroded and the profile has a steady shallow gradient until the end of the survey at chainage 193m. The overall effect has been to smooth out the profile, whilst the beach toe has moved landward by approximately 50m since the previous survey. Overall the profile is at a medium level compared to the range recorded from previous surveys. At profile **1aBVBC02**, erosion has dominated. On the upper beach from the base of the seawall at chainage 7m there has been erosion of up to 0.4m until chainage 35m. Between chainage 35m and 39m there is a short section of no change. Seawards of this point across the mid beach (chainage 39m to 108m) erosion of up to 0.5m has occurred. A short length of accretion has occurred between chainage 122m and the end of the survey at chainage 145m. Overall the profile is at a low level compared to the range recorded from previous surveys with the section of beach between chainage 40m and 75m being at its lowest recorded level. At profile **1aBVBC03**, there have been no significant changes to the position and form of the dune crests or the upper part of the dune front since the last survey. On the upper beach there has been accretion of up to 0.2m between the dune toe and chainage 85m. Between chainage 85m and 150m there has been accretion of up to 1.5m, in-filling a formally recorded depression in this location. Seawards of chainage 150m until 240m there has been limited amount of accretion of between 0m and 0.2m. Across the lower beach seawards of chainage 240m a shallow berm (crest c.257m) has formed up to 0.5m in height. Overall the profile is at a medium-high level compared to the range recorded from	Since the last survey, the dune crests at Blyth South Beach have remained stable, generally retaining the same form and position with some minor advances. There have been variable amounts of erosion and accretion across the profiles, with a general trend of flattening and smoothing out of the profiles. All the profiles with the exception of BVBC02 and BVBC05 are at a medium level compared to the range recorded from previous surveys. The upper-mid beach at these two profiles are however at their lowest recorded levels. **Longer term trends:** At Blyth South Beach, the dunes have generally demonstrated a long-term trend of stability. The profiles are mostly at a medium level.

Survey Date	Description of Changes Since Last Survey	Interpretation
	previous surveys, with the lower beach berm between chainage 255 and 310m being the highest recorded beach level in this location. At profile **1aBVBC04**, up to 0.1m of accretion has taken place on the dune crest and on the sloping dune face, with the dunes have remained stable over the winter of 2018/19. The upper beach shows erosion of up to 0.2m to chainage 65m. Between chainage 65m and 125m a previously recorded berm has eroded, leading to a drop-in beach levels of up to 2.5m. Between chainage 125m and 175m there has been up to 0.3m of accretion with the seaward berm recorded in Autumn 2018 moving landward by approximately 30m. The berm now rises from chainage 175m with crest at chainage 200m before dropping away to the end of the survey at chainage 255m. The toe of the beach (MLWS interception point) has moved landward by 45m. Overall the profile is at a medium level compared to the range recorded from previous surveys, though the toe of the beach is in a fairly landwards position. At profile **1aBVBC05**, the dunes have remained stable. There has been 0.4m up to 0.4m of accretion against the toe of the dunes at chainage 57m. Between chainage 68m and 77m the profile has remained relatively stable with some minor erosion of up to 0.1m. Between chainage 77m and 134m a berm has formed with up to 2.5m of accretion at the berm crest (chainage 97m). Seawards of chainage 134m there has been erosion of up to 0.4m. Overall the profile is at its lowest recorded level on the upper beach to chainage 56m however across the remained of the profile the beach is at a more medium level across the mid and lower beach compared to the range recorded from previous surveys. **1aBVBC06** is located at the southern end of the beach, towards Seaton Sluice. The dunes have remained stable, with minor accretion advancing the dune toe face by around 5m. The upper beach berm formally recorded around chainage 100m to 135m has moved seaward by approximately 10m. This has led to a loss of material, of up to 0.6m, from the upper mid beach and a gain of material, of up to 1.3m, on the lower mid beach. Seaward of chainage 155m there has been up to 0.4m of erosion. Whilst the dune face is at its most seaward position the remainder of the profile lies at a medium level compared to the range recorded from previous surveys.	

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles

- Profiles 1aBTBC19, 1aBTBC21, and 1aBTBC23 all end at drains.
- At profile 1aBTBC33, the middle of the dunes was not measured due to the presence of dense vegetation. Care is therefore needed when interpreting the interpolated data.
- At profiles 1aADC08 and 1aADC09, the profiles end at the River Aln channel due to quicksand.
- At Profile 1aADC16 there are gaps in the section due to bushes, and no access to resident's gardens.
- At profile ADC16B a 'new' fence has been installed at the start of the profile (around the time of the Partial Measures survey, spring 2014). This fence is now the new profile start point.
- At profile CMBC02 area of field and dunes missing due to pregnant livestock and livestock with young animals in the area.

Topographic Surveys

- At Newbiggin-by-the Sea, the topographic survey report notes that sand was covering most of the revetment rocks at the back of the beach, and that the concrete steps were exposed for long stretches at the back of the beach.
- There was evidence of beach grooming and digging out of the seawalls at the back of the beach at Newbiggin.
- At Berwick the surveyors noted that quicksand near the water's edge was noticeable

Cliff Top Surveys

Surveying any cliff top is difficult due to the need for a consistent interpretation of the cliff edge in successive surveys, which can be challenging, especially when vegetation is thick. For these reasons, it has been assumed that any changes of ±0.2m may be considered as being within the margins of error of the surveying technique, and that any indication of an advancing cliff line is error.

Surveying the cliff top along Cambois Bay is more difficult than the similar surveys at Newbiggin Caravan Park and Sandy Bay Caravan Park because the cliff edge is less distinct and hard to precisely define due to vegetation coverage and its smooth, degraded form.

The surveyors noted that there was very thick dense vegetation at the north end of Cambois cliff top which hindered the survey of the line.

4. Recommendations for 'Fine-tuning' the Monitoring Programme

No changes to the monitoring programme are recommended at this time.

5. Conclusions and Areas of Concern

- At Sandstell Point (Spittal A), the recorded profiles and topographic survey present no causes for concern, with the spit in the middle of its range.
- At Spittal (Spittal B), the recorded profiles present no causes for concern, with the beach being at a medium-high level.
- At Goswick Sands, the recorded profiles present no causes for concern, with the beach being at a medium level.
- At Holy Island, the recorded profiles present no causes for concern, with the beach being at a medium-high level.
- At Beadnell Village, the recorded profiles present no causes for concern, with the upper beach being at a medium-high level and the mid beach being at a low level.

- At Beadnell Bay, the recorded profiles present no causes for concern, a general trend of accretion on the upper beach and erosion on the lower beach was observed.
- At Boulmer the recorded profiles present no causes for concern, with the beach being at a medium level.
- At Alnmouth Bay, the recorded profiles and topographic surveys present no causes for concern, with the beach being at a medium level.
- At High Hauxley & Druridge Bay, the beach levels are at a low to medium level but generally remain within the range recorded from previous surveys.
- At Lynemouth Bay, to the north of the River Lyne (profile 1aCMBC03A) the beach levels are at their lowest recorded level and the shallow cliff face which forms the interface between the slag bank and the beach has retreated by 2m. To the north of the Power Station (profile 1aCMBC03B), the slag bank cliff face has retreated by 2m and the beach is generally at a low level.
- At Newbiggin Bay, there is no cause for concern with the upper beach experiencing accretion and the mid and lower beach experiencing more erosion. All the profiles are at a medium-high level and remain within the range previously recorded.
- At Cambois Bay, the cliff top survey shows short sections of 1-2m of erosion in the south of the survey area at Sandy Bay Caravan Park. Along the Cambois Bay survey length there has been little change in the north, but consistent erosion of 0.2-0.6m along 450m of the central section opposite the tidal basin with some more localised areas of up to 1.8m erosion.
- At Blyth South Beach, the profiles have generally flattened and been smoothed out, and beach levels are generally at medium levels compared to the range recorded from previous surveys, except fronting the seawall where the mid beach is the lowest on record.
- Across the Northumberland County Council frontage beaches appears to have recovered from the effects of the March 2018 storm, known as the ‘Beast from the East’.

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

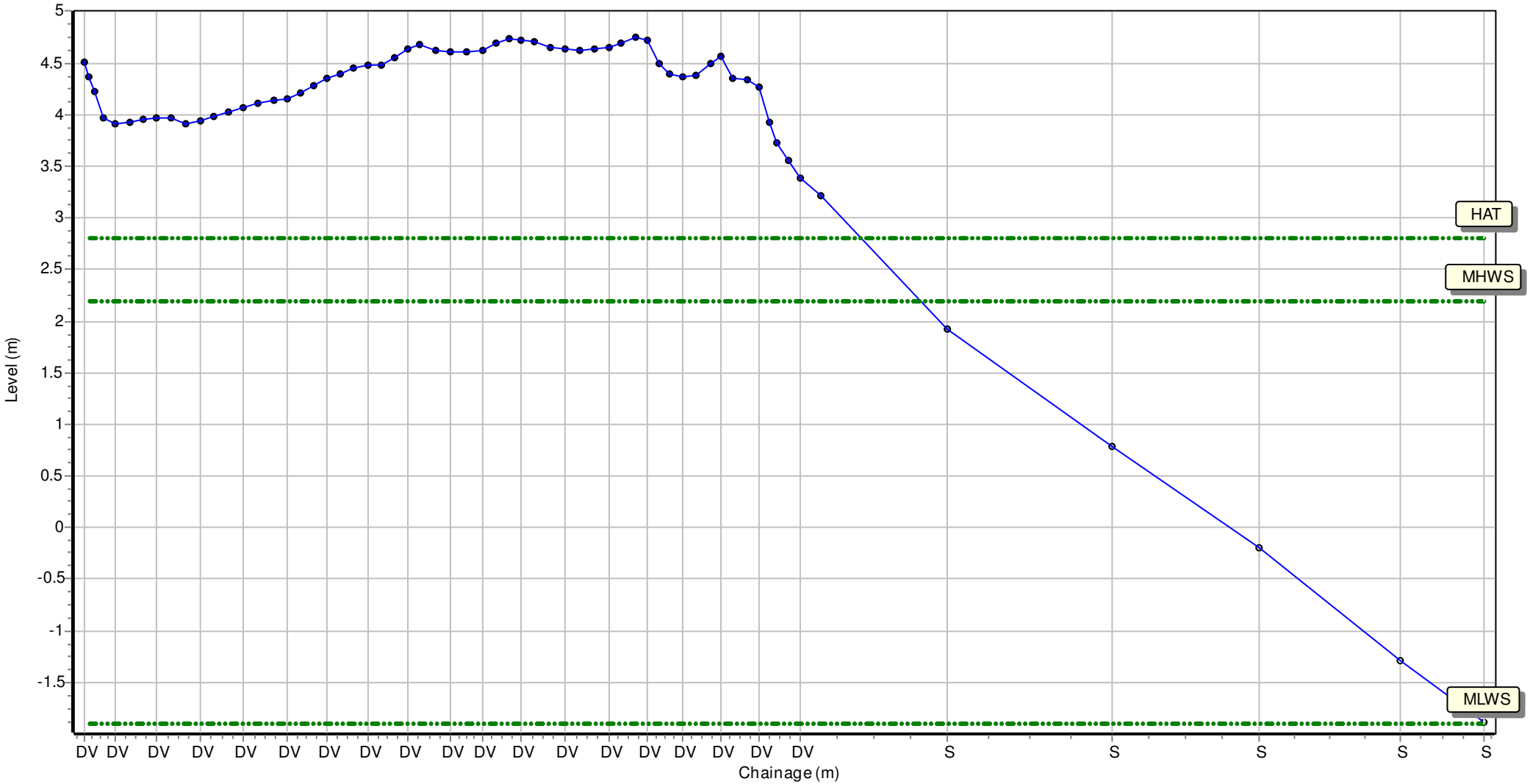
Location: **1aBTBC02**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

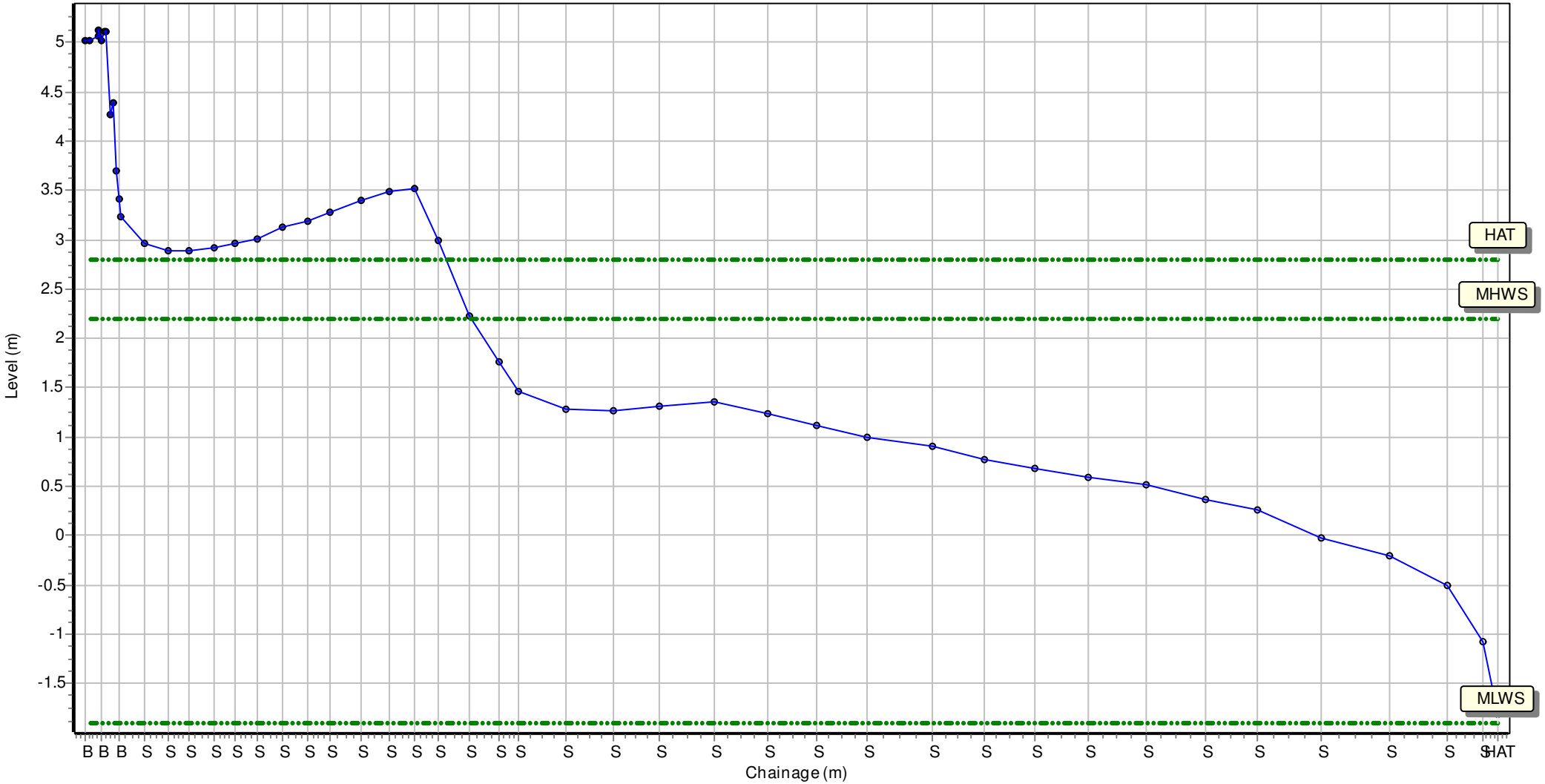
Location: **1aBTBC04**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

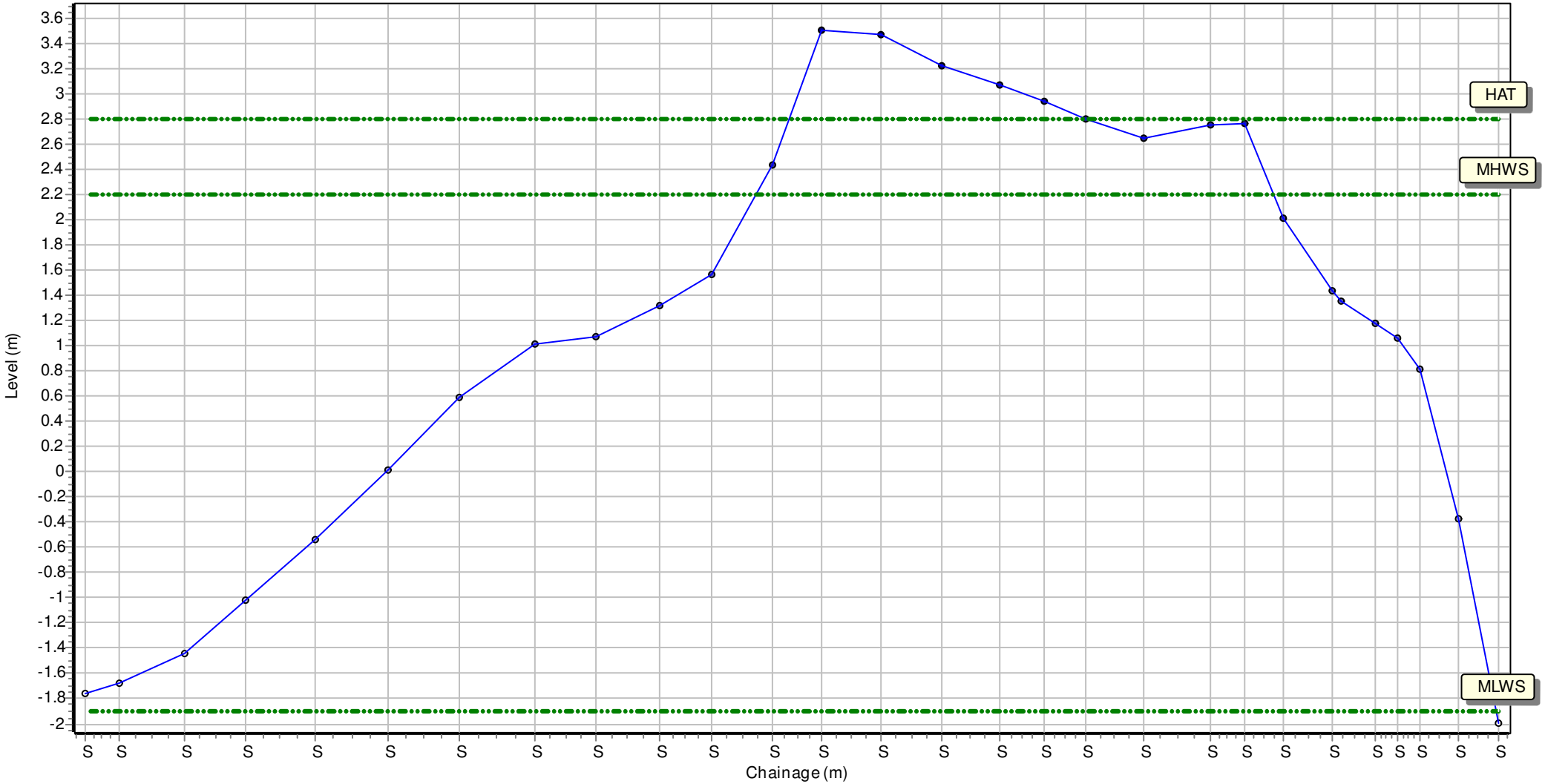
Location: **1aBTBC05**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

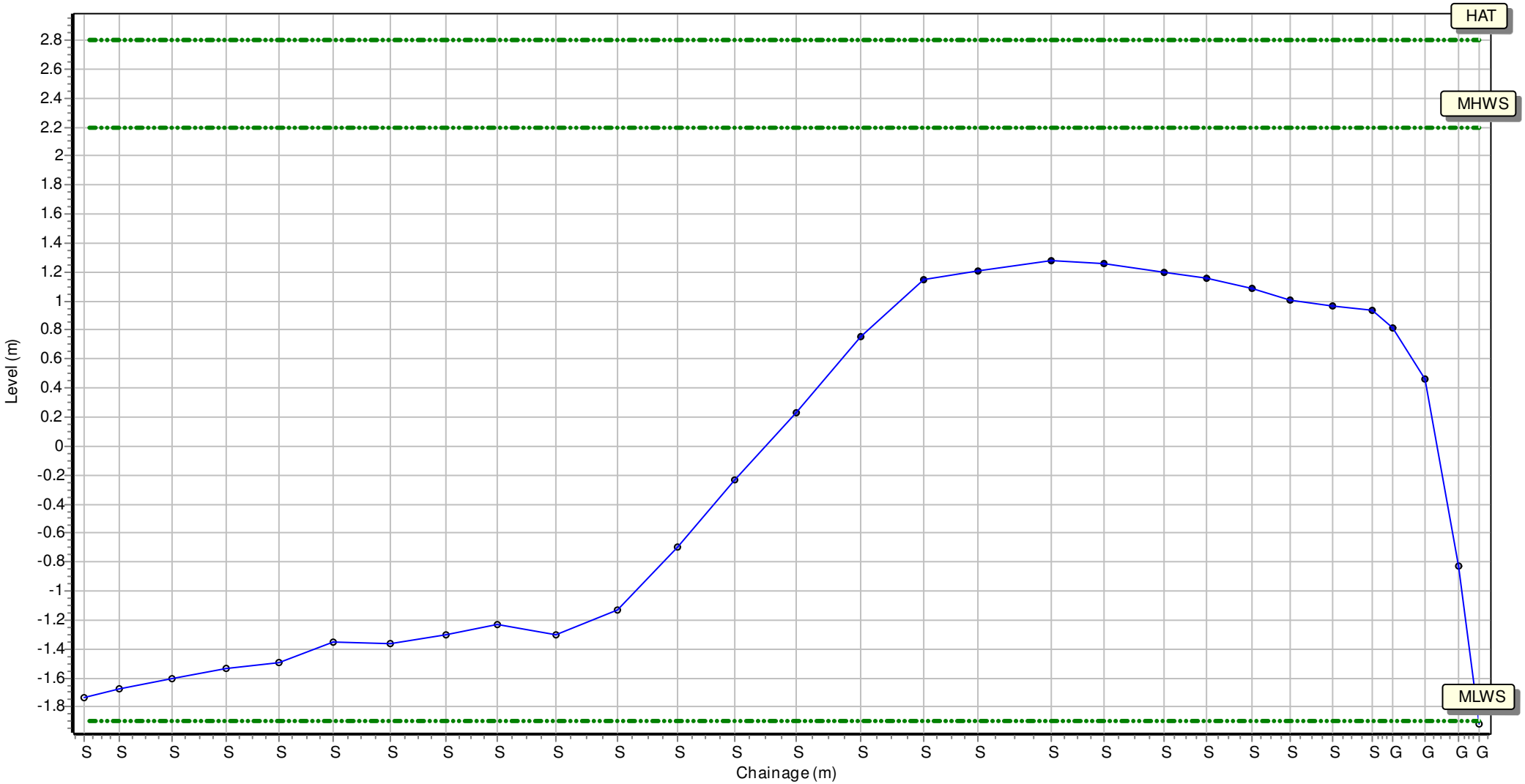
Location: **1aBTBC06**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

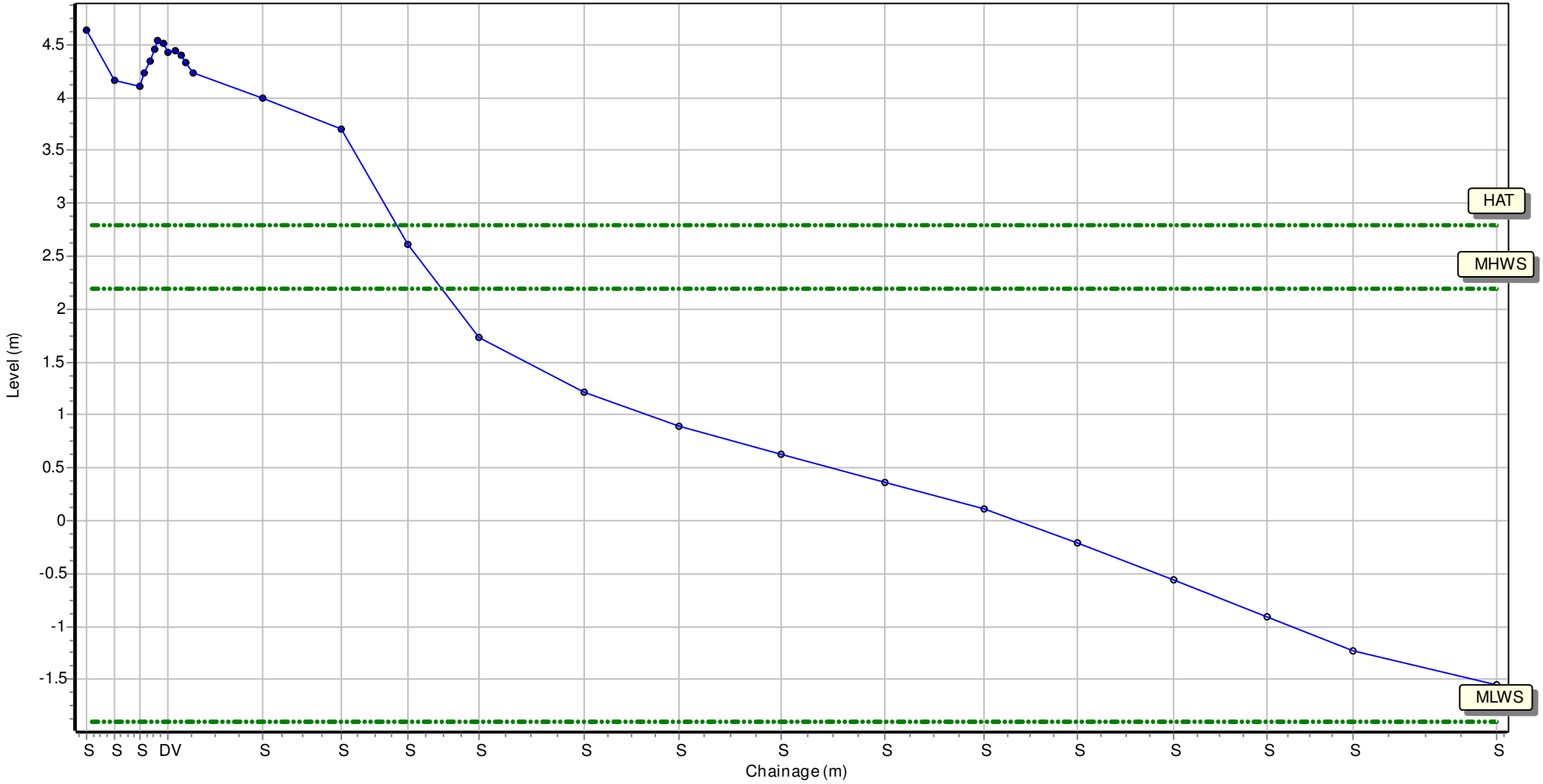
Location: **1aBTBC11**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

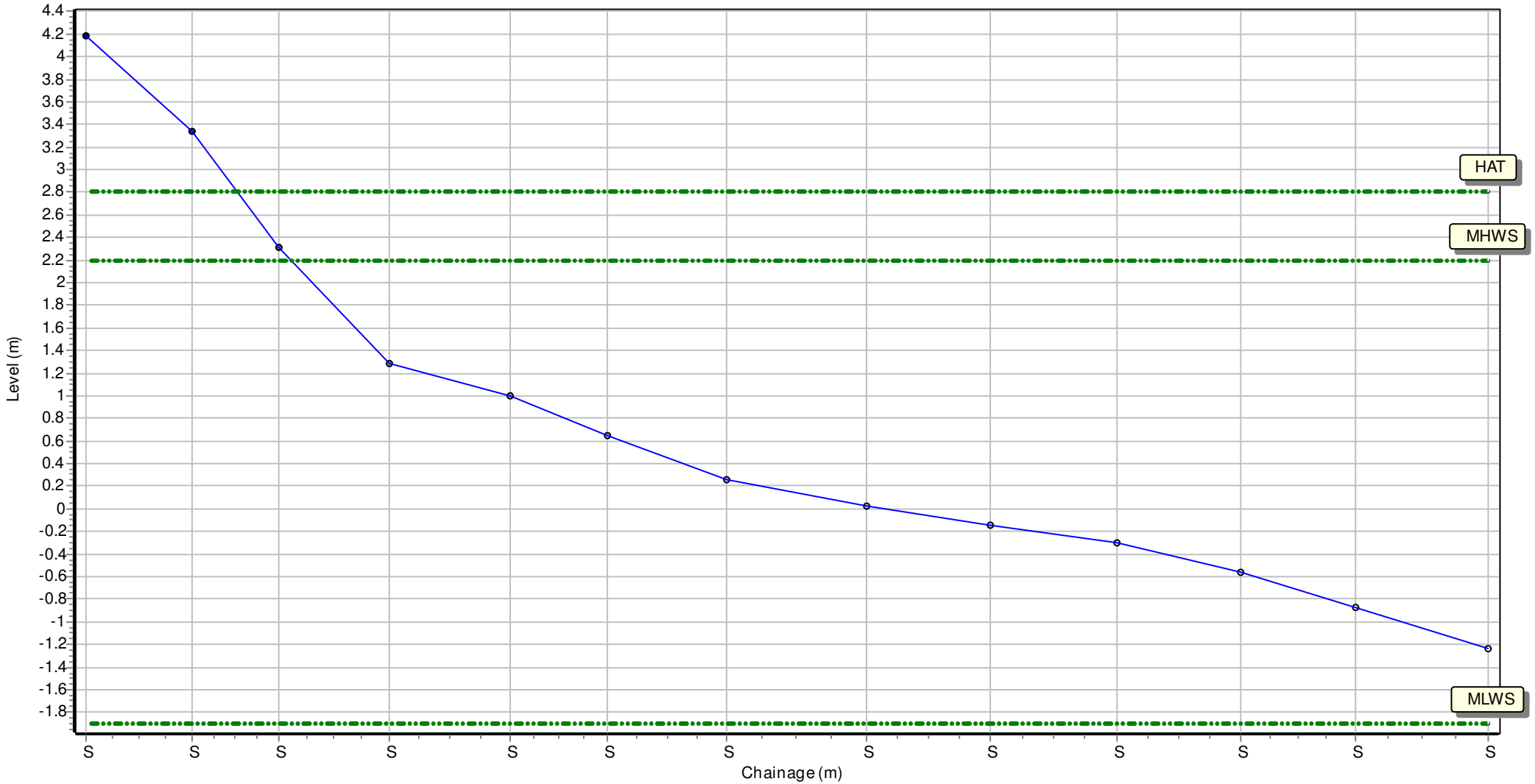
Location: **1aBTBC13**

Date: 25/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

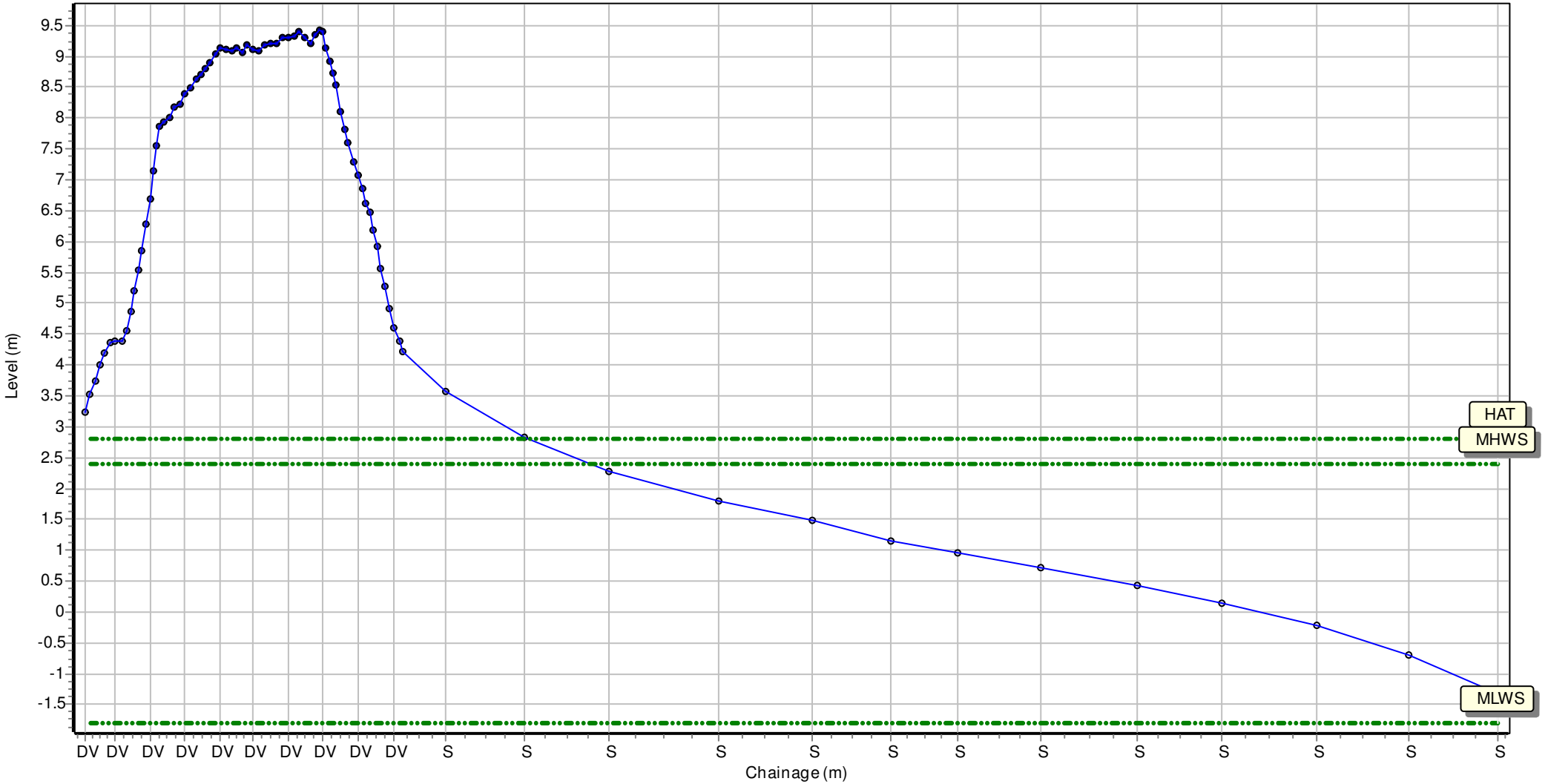
Location: **1aBTBC16**

Date: 08/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

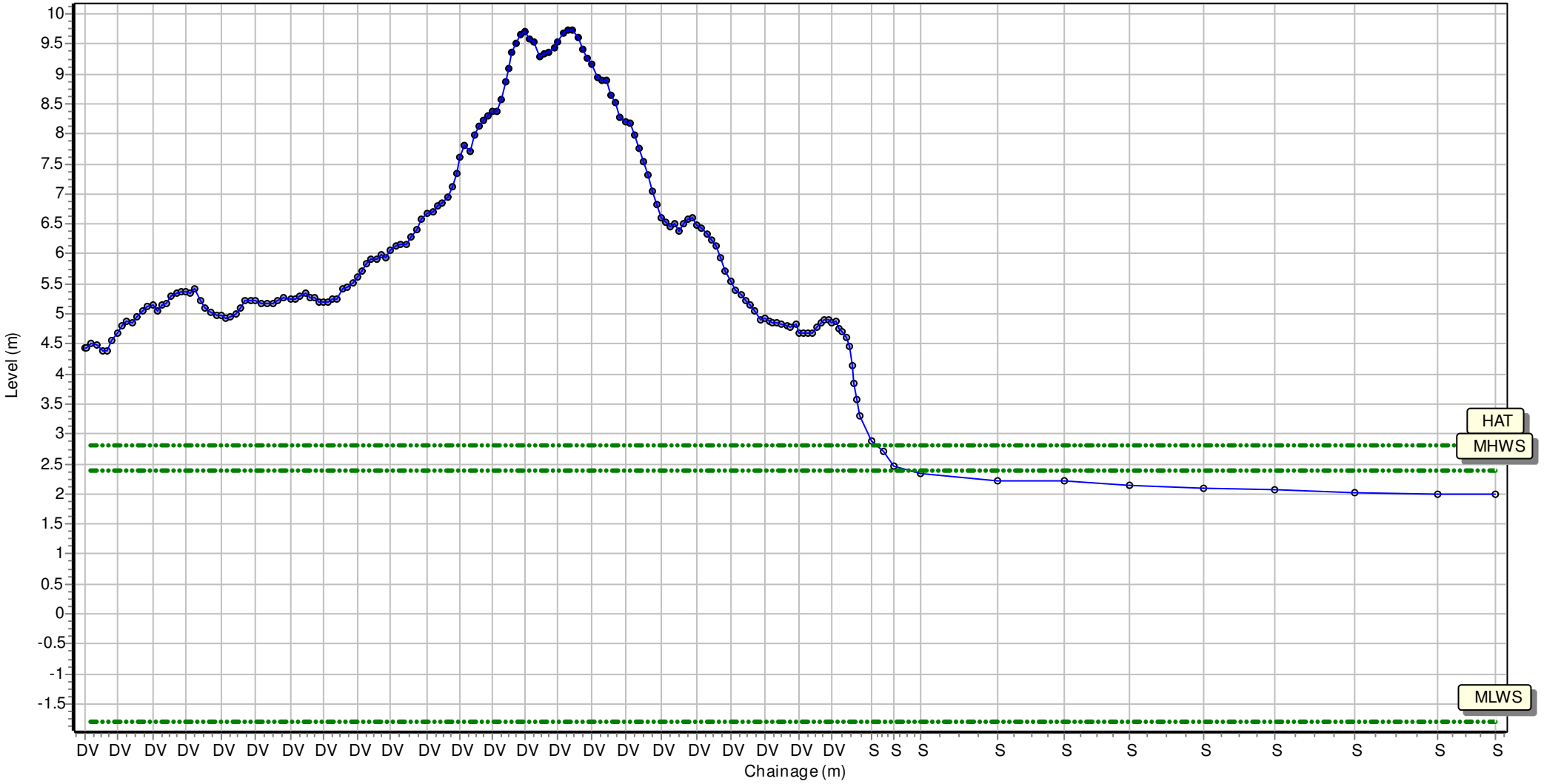
Location: **1aBTBC19**

Date: 08/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

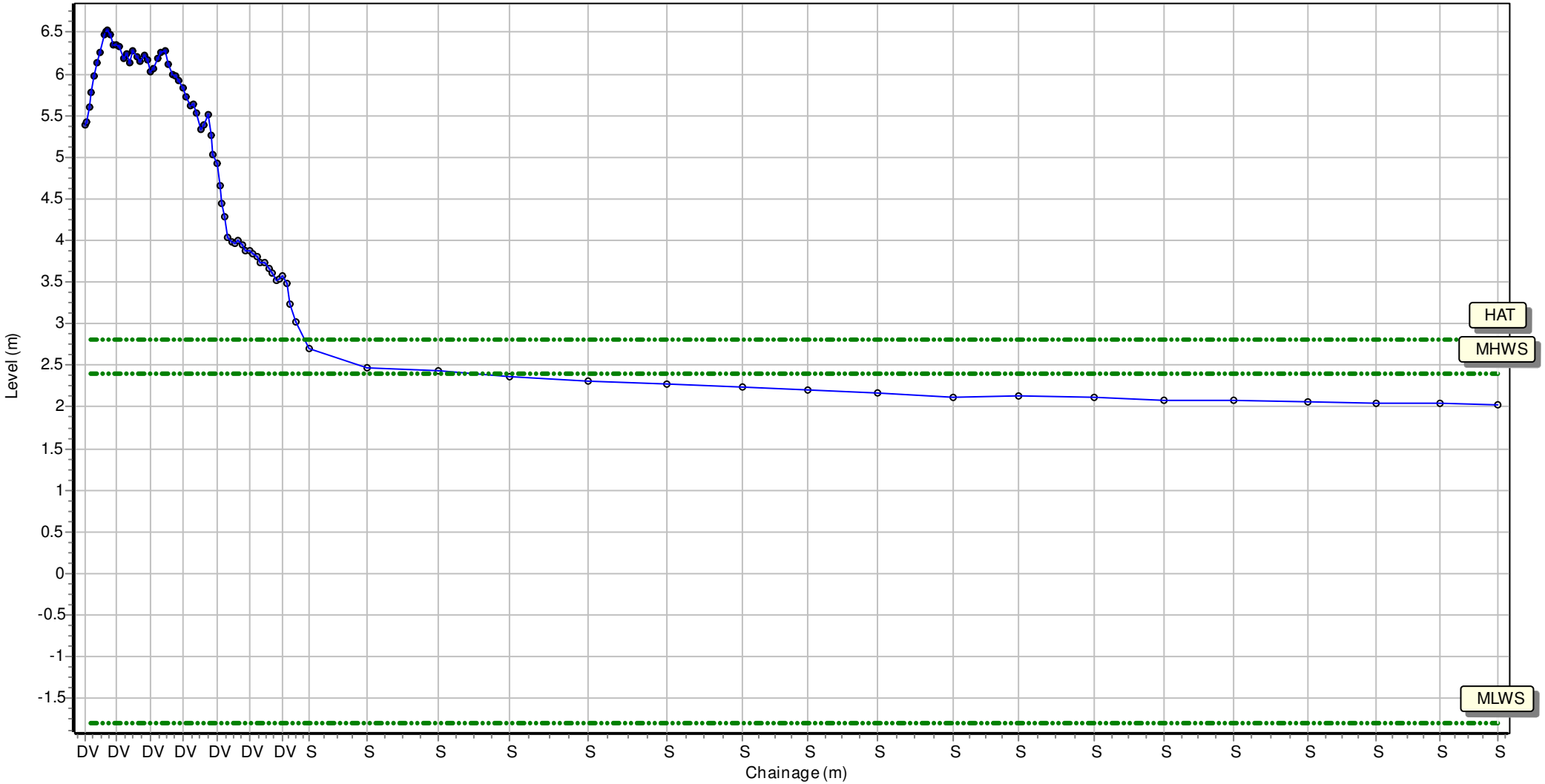
Location: **1aBTBC21**

Date: 08/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

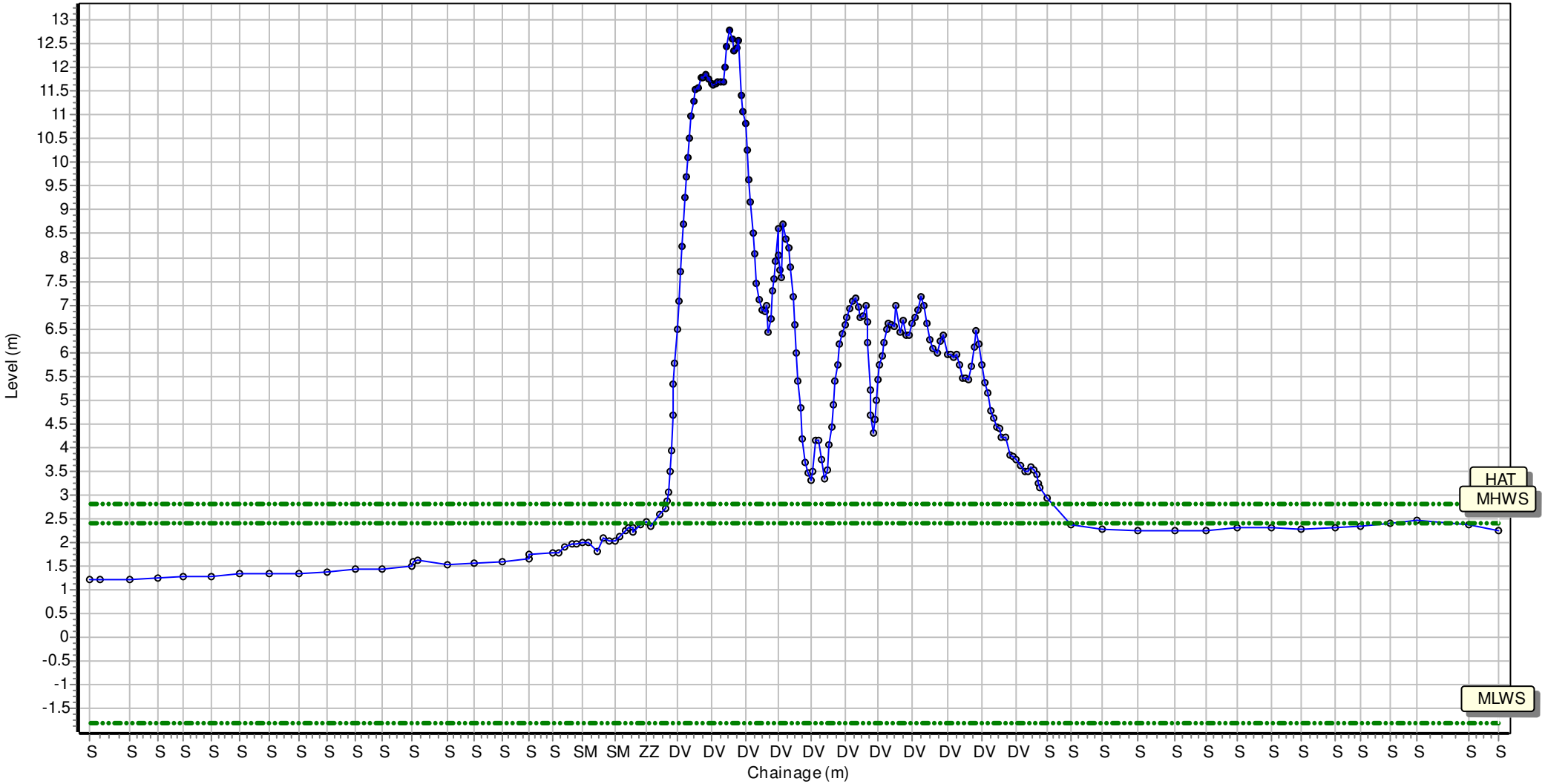
Location: **1aBTBC23**

Date: 08/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

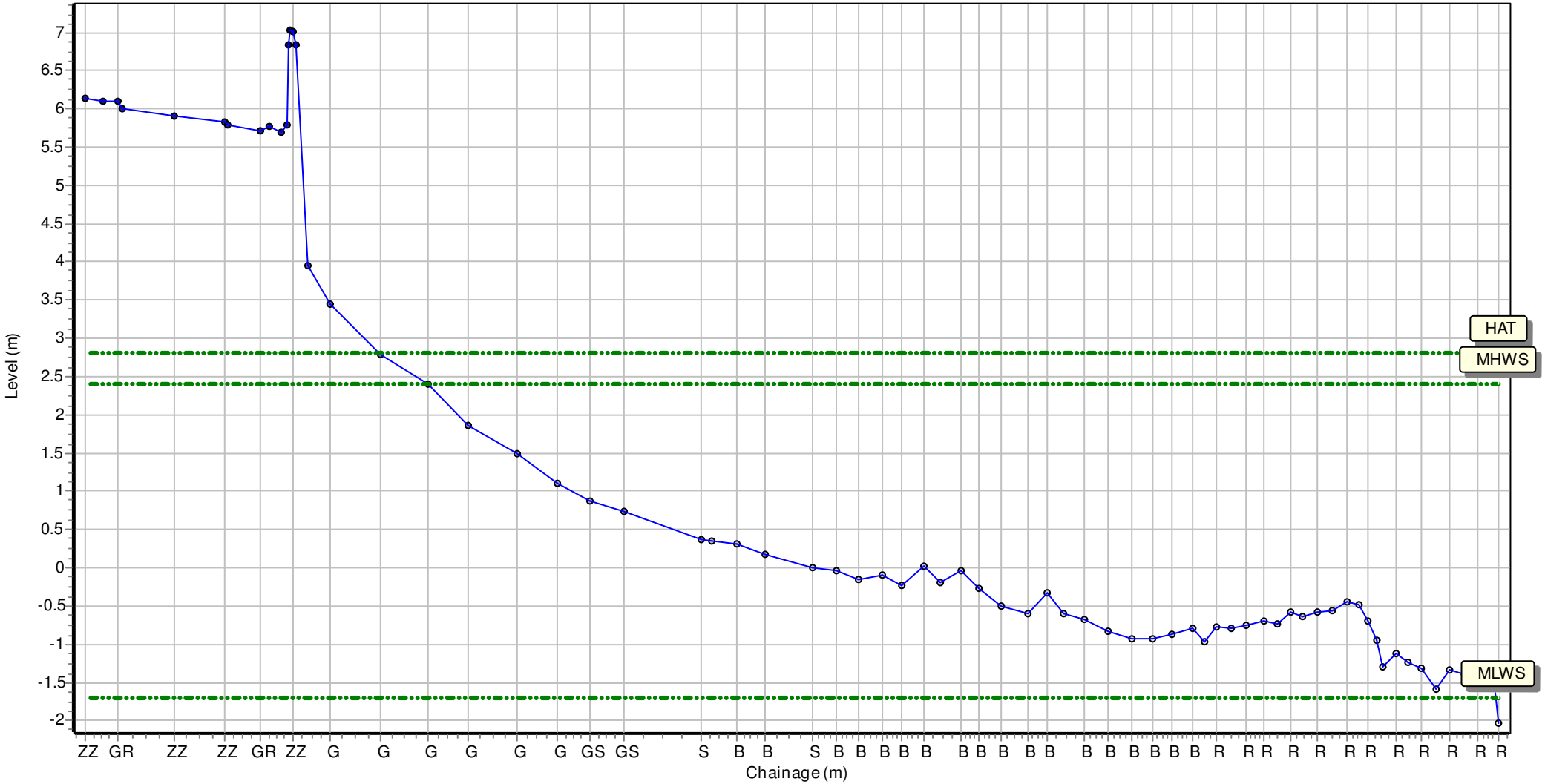
Location: **1aBTBC31**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

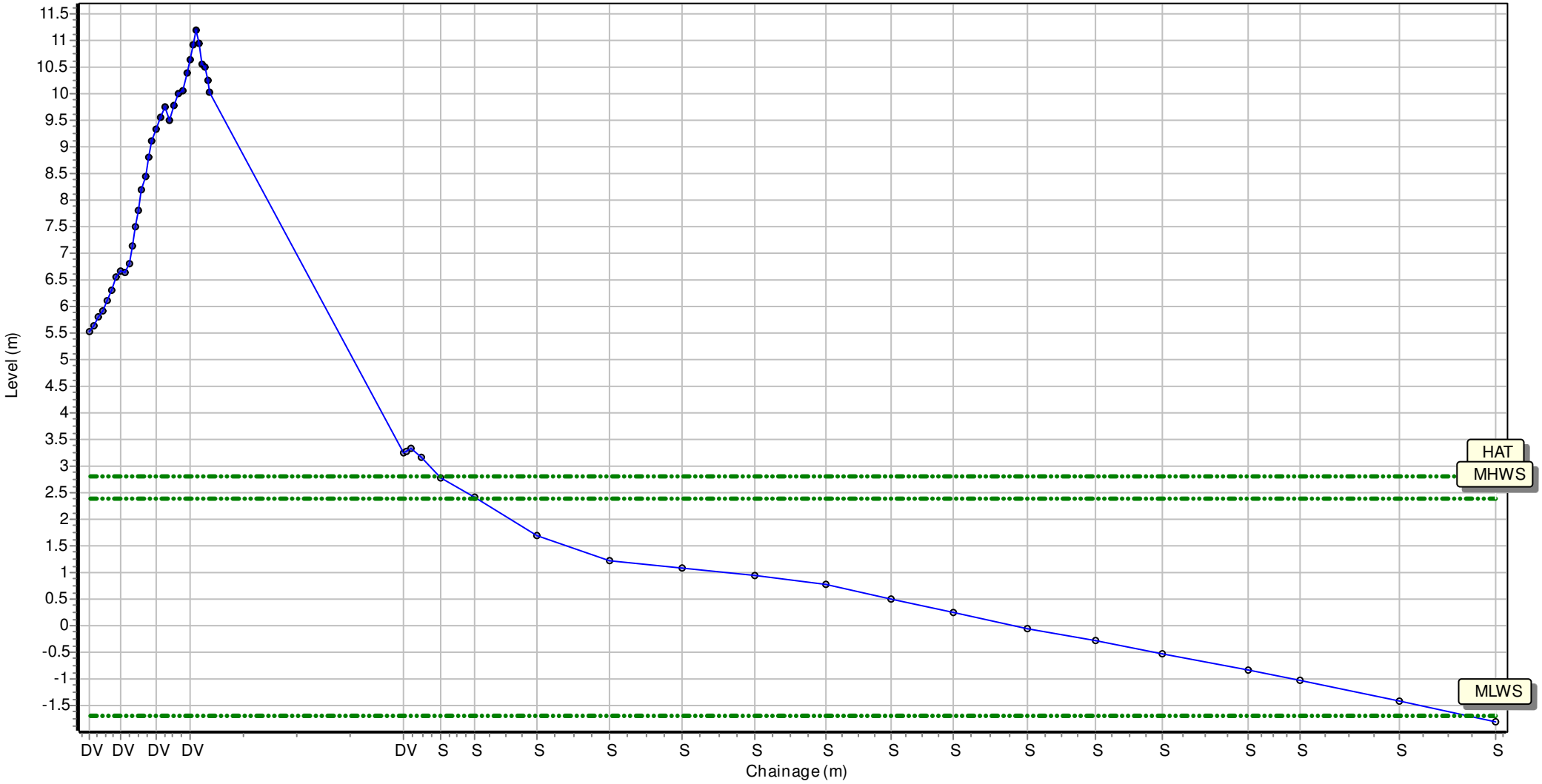
Location: **1aBTBC33**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

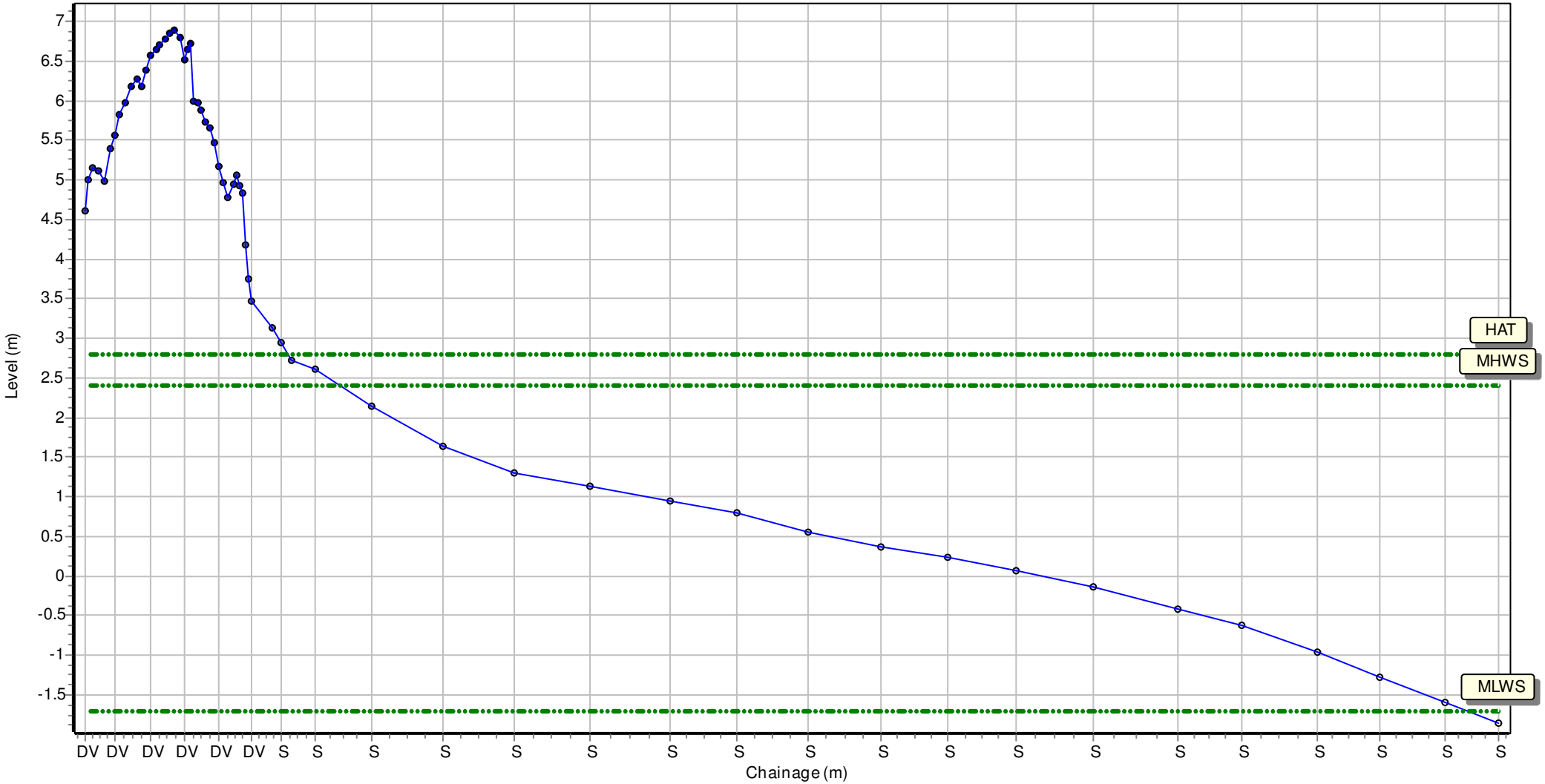
Location: **1aBTBC34**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

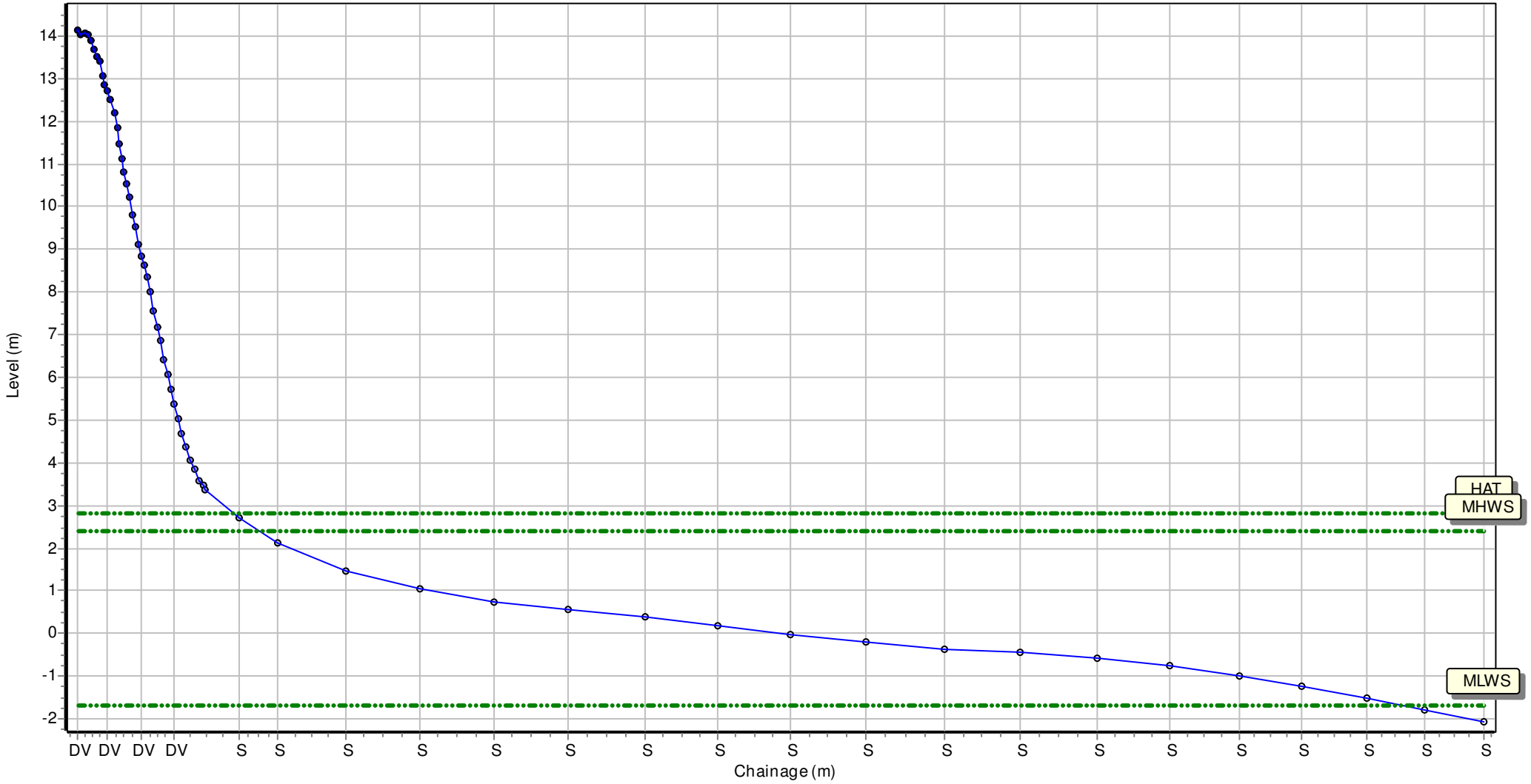
Location: **1aBTBC37**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

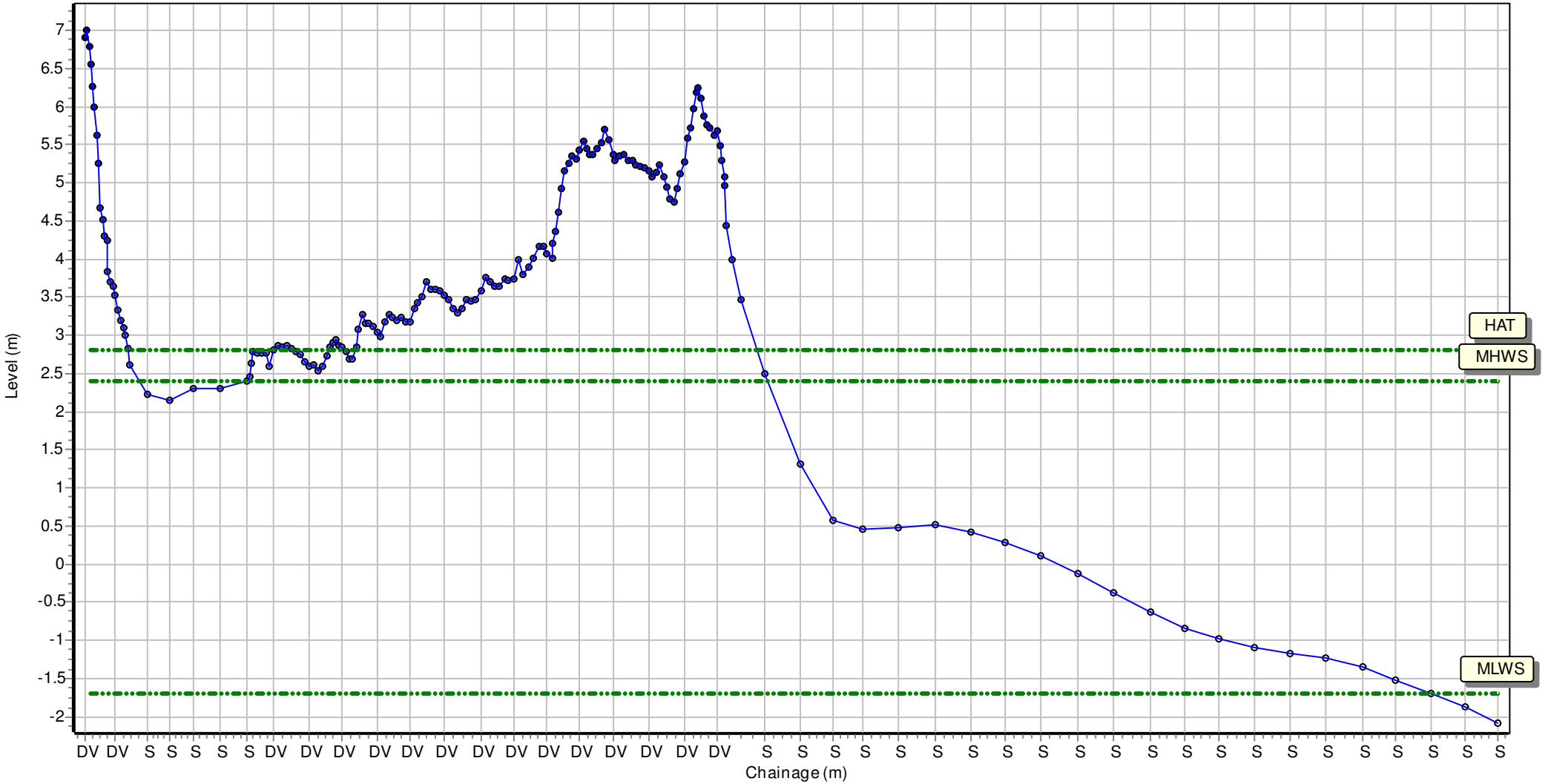
Location: **1aADC01**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

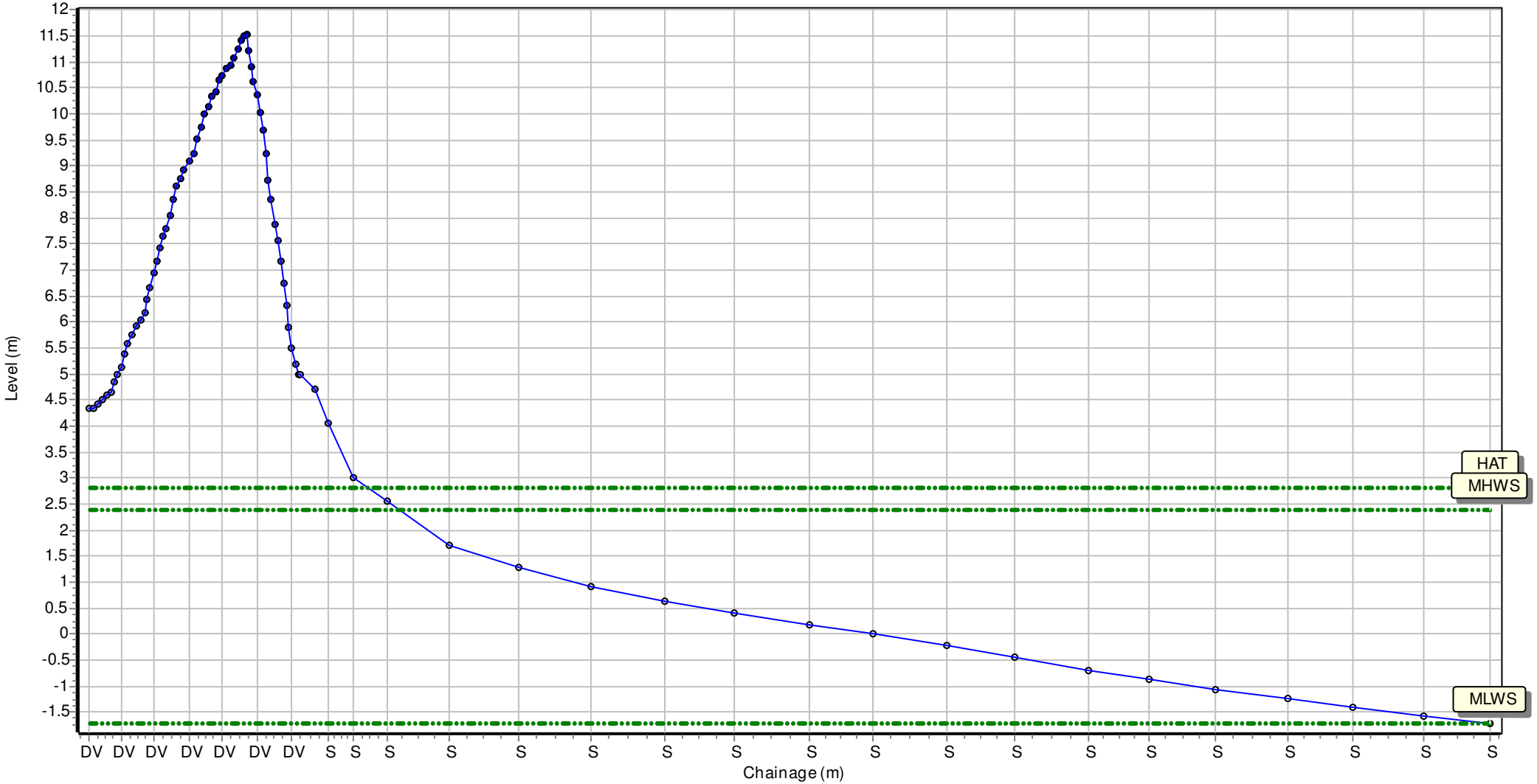
Location: **1aADC02**

Date: 21/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

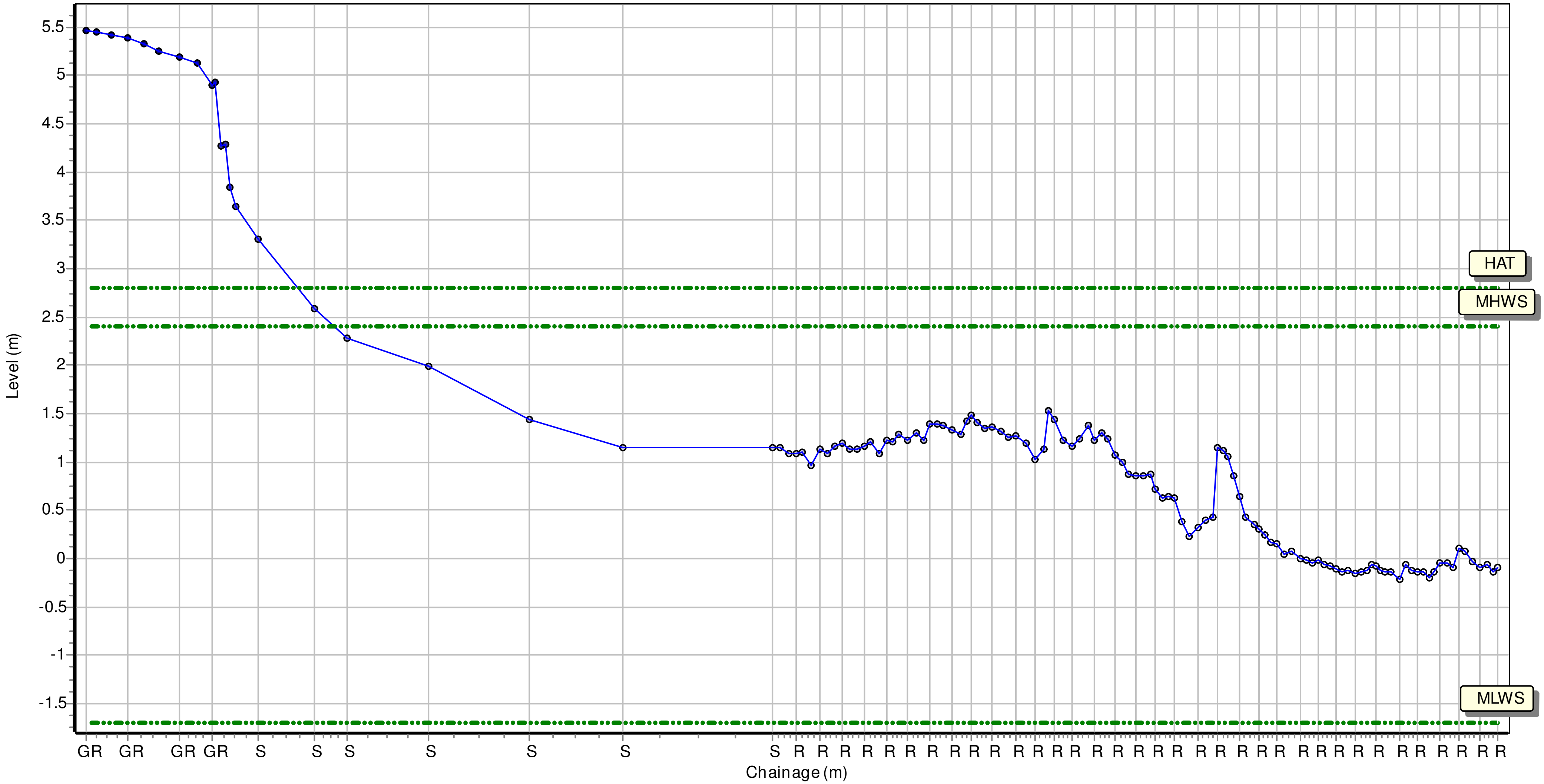
Location: **1aADC04A**

Date: 22/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



http://www.sandsuser.com

SANDS

Beach Profile

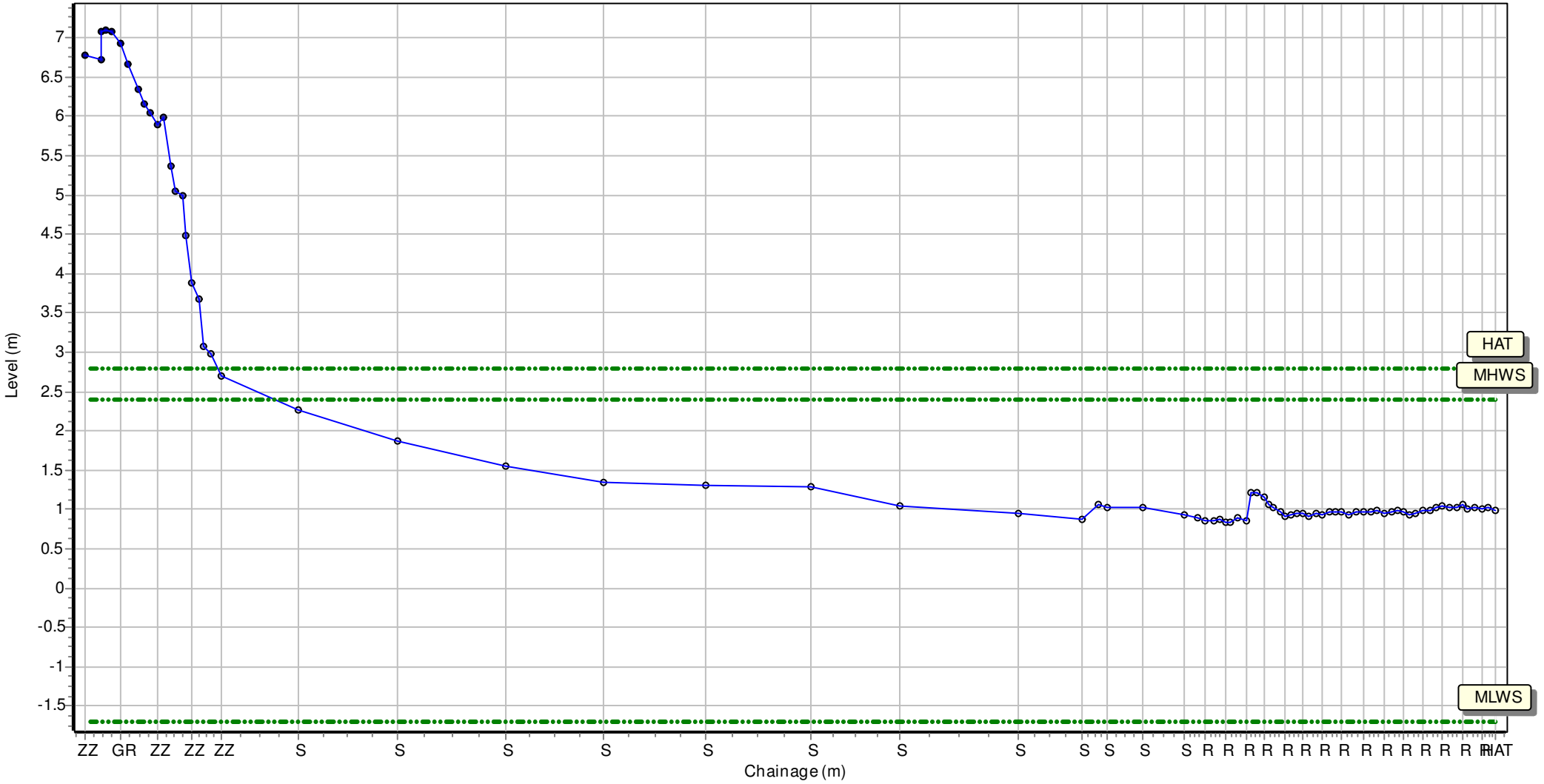
Location: **1aADC04B**

Date: 22/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

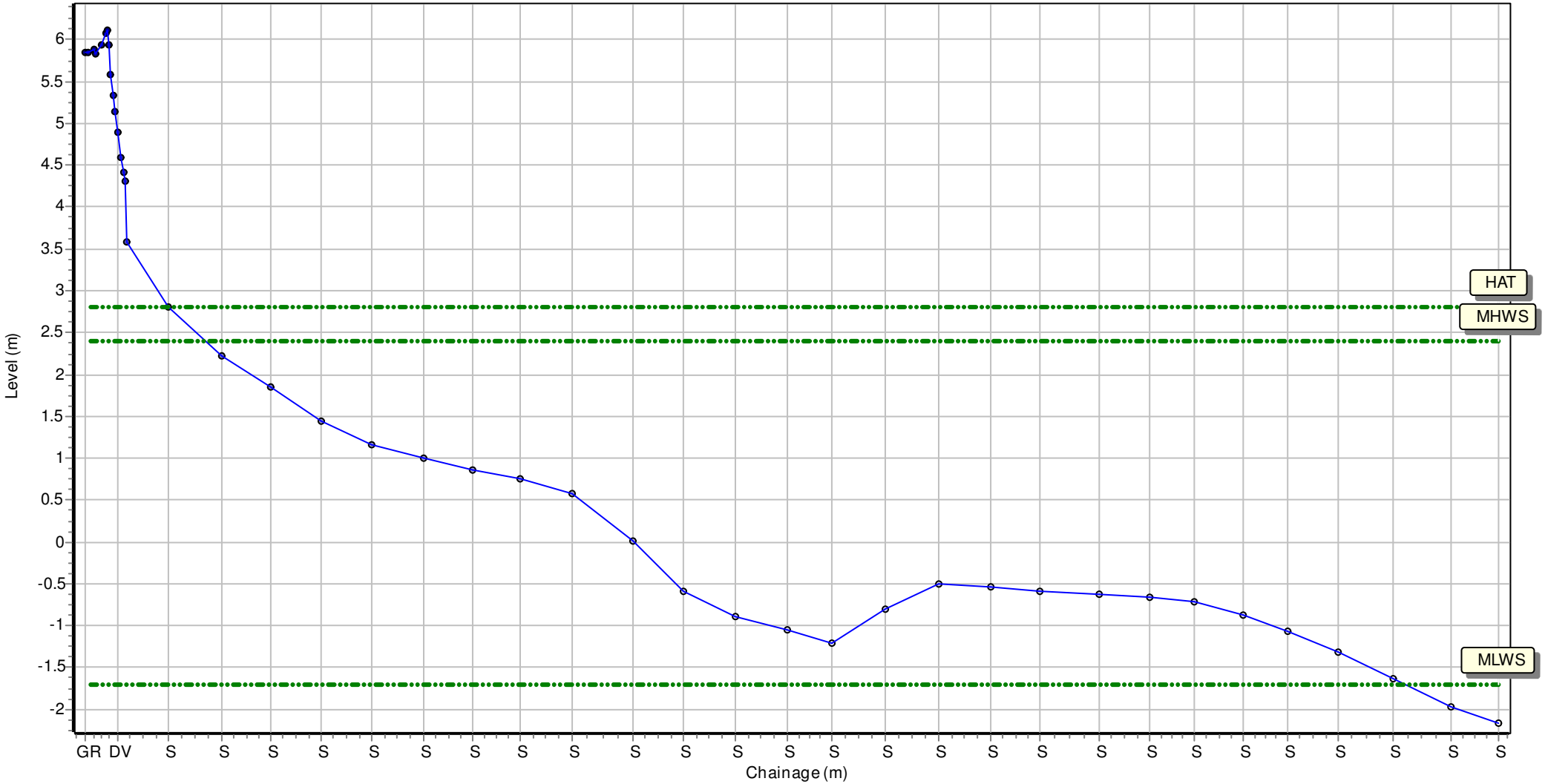
Location: **1aADC07**

Date: 22/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

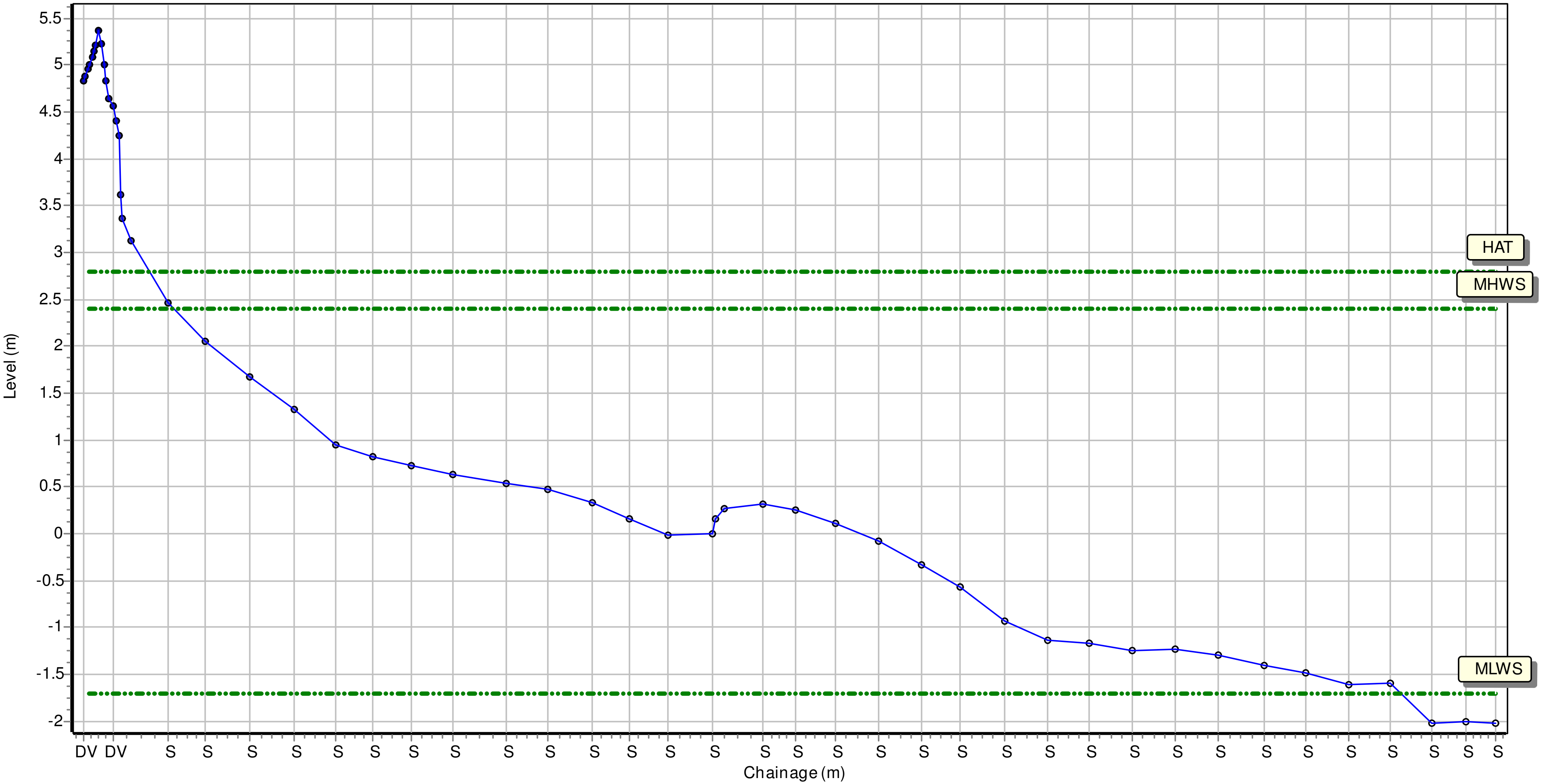
Location: **1aADC08**

Date: 22/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

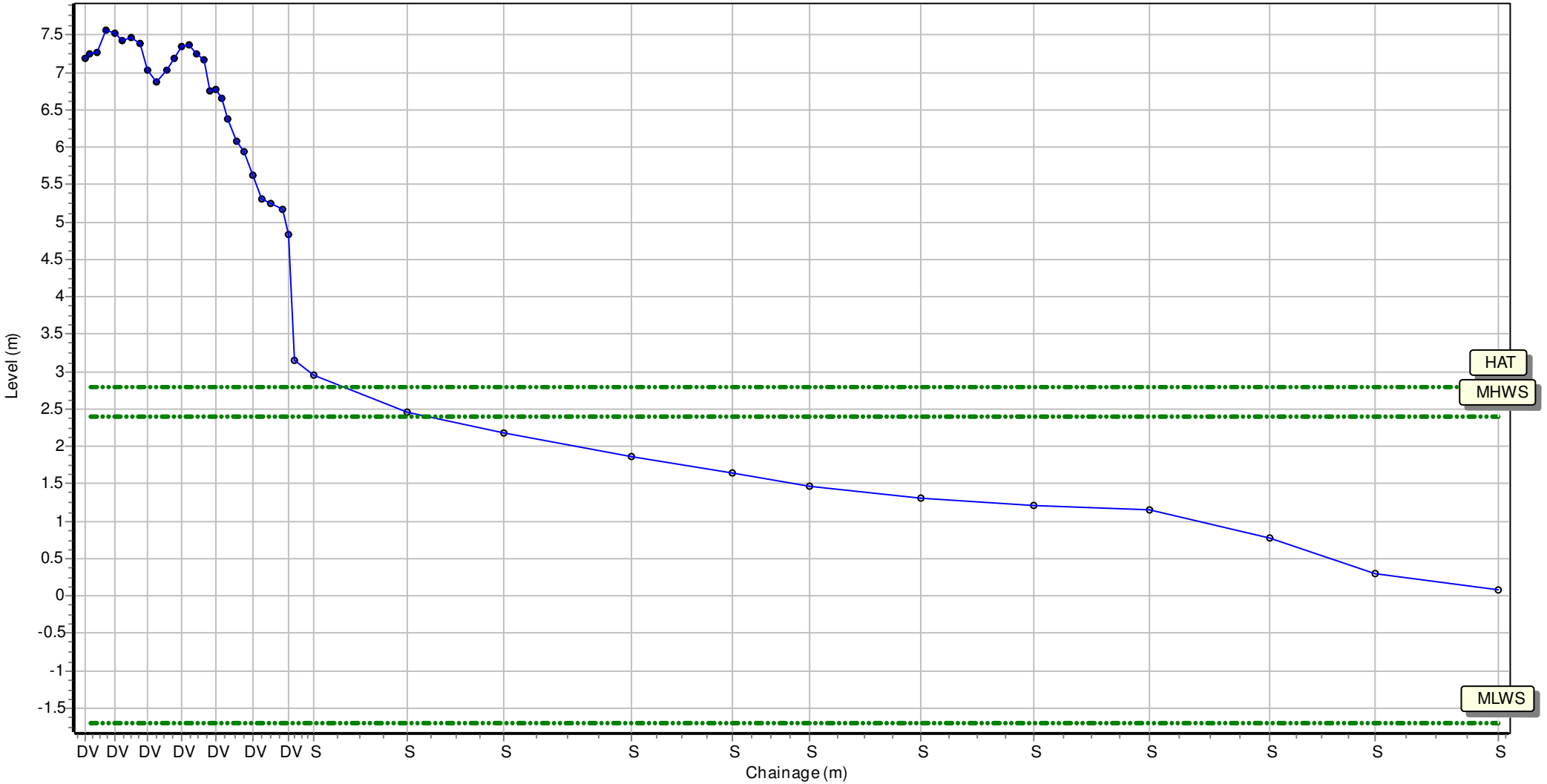
Location: **1aADC09**

Date: 22/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

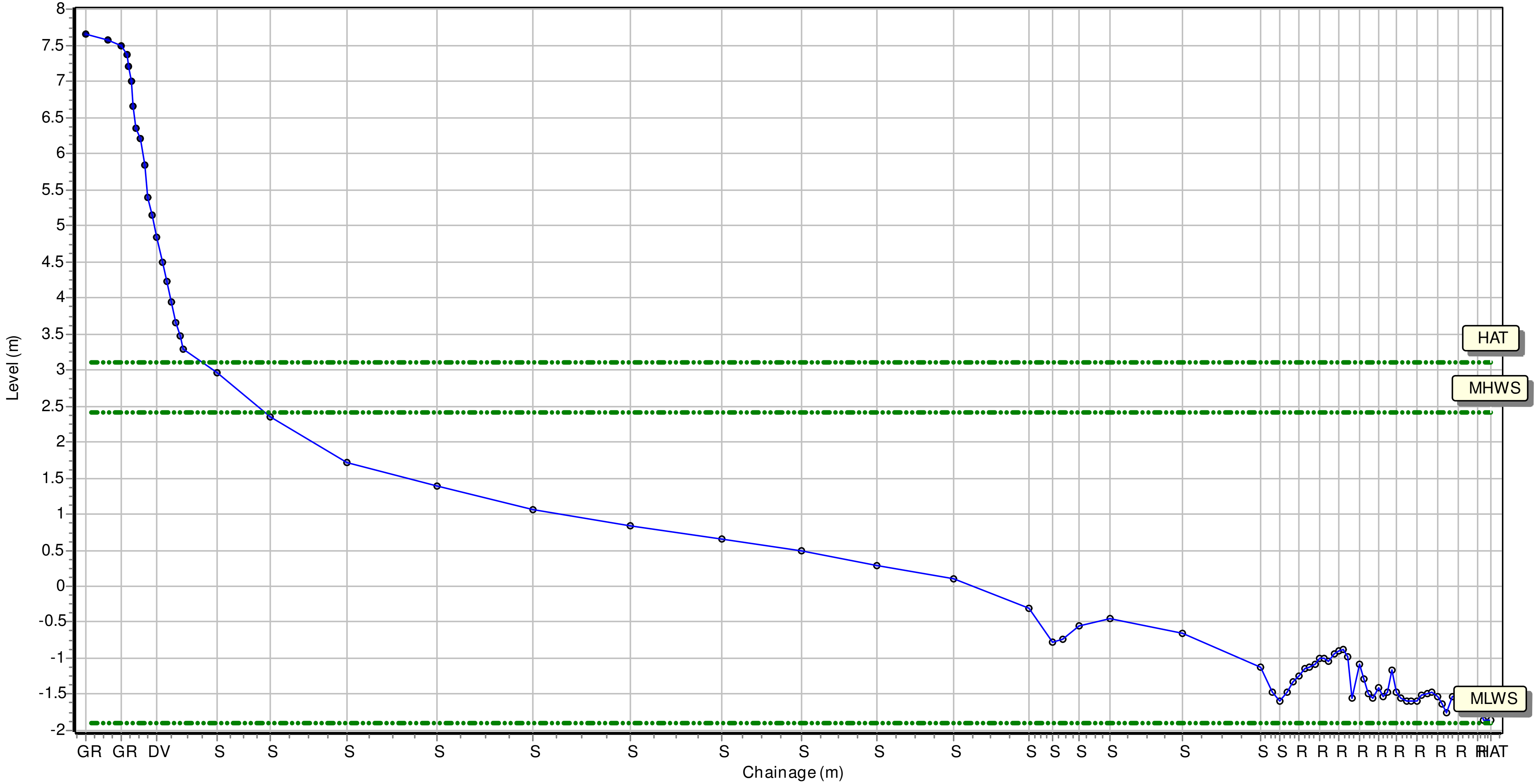
Location: 1aADC15A

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

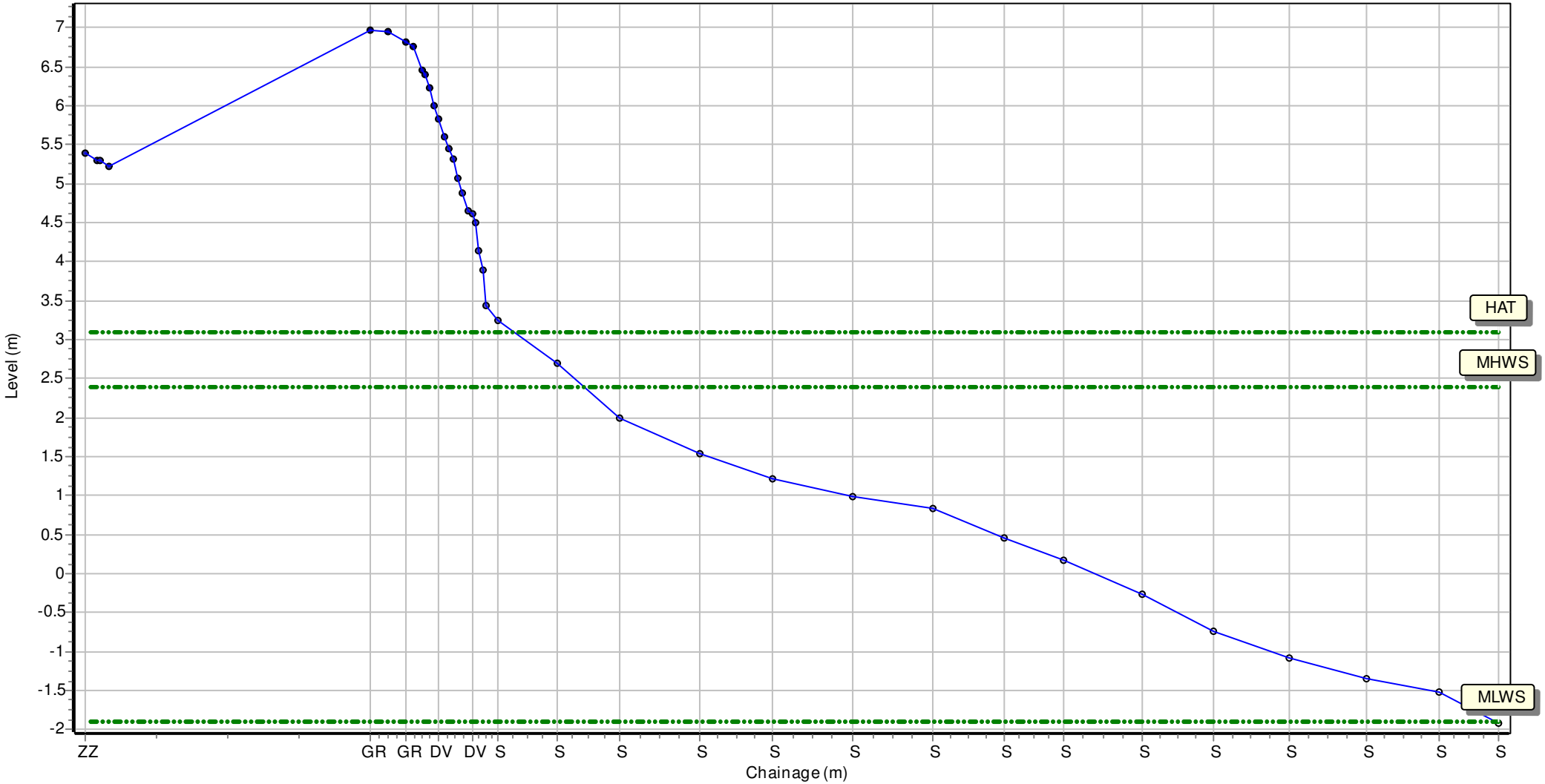
Location: **1aADC16**

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

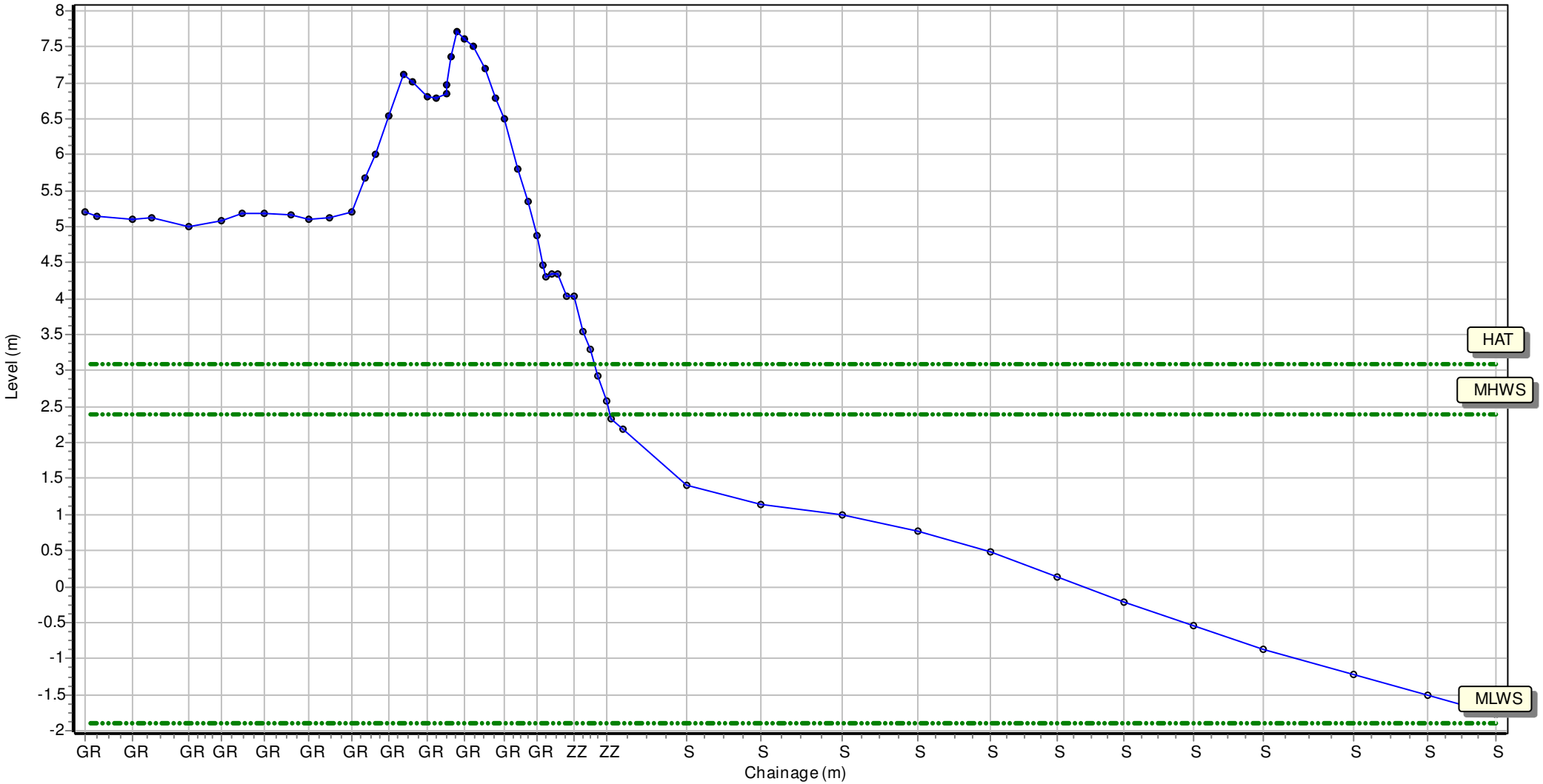
Location: **1aADC16A**

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

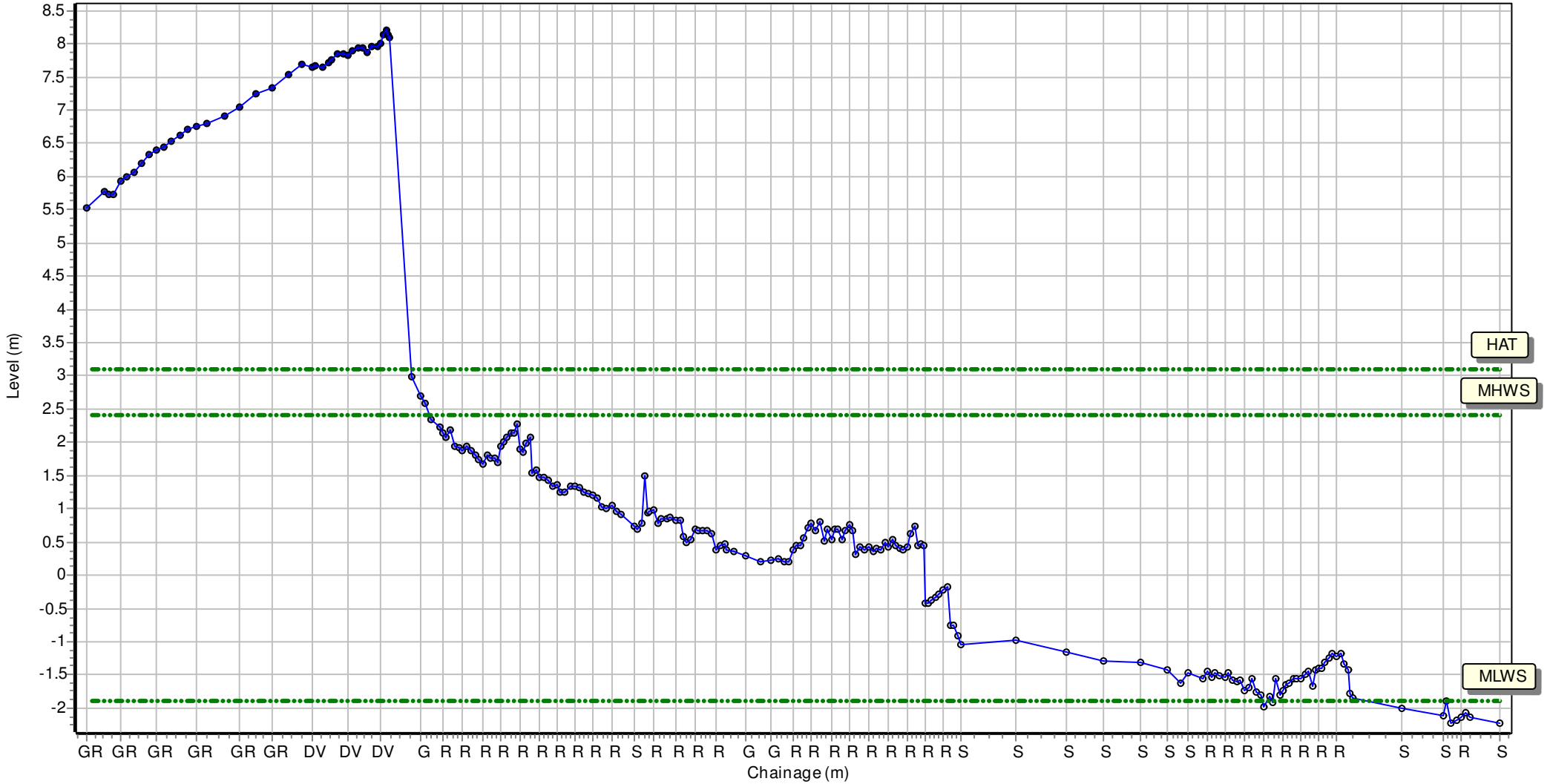
Location: **1aADC16B**

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

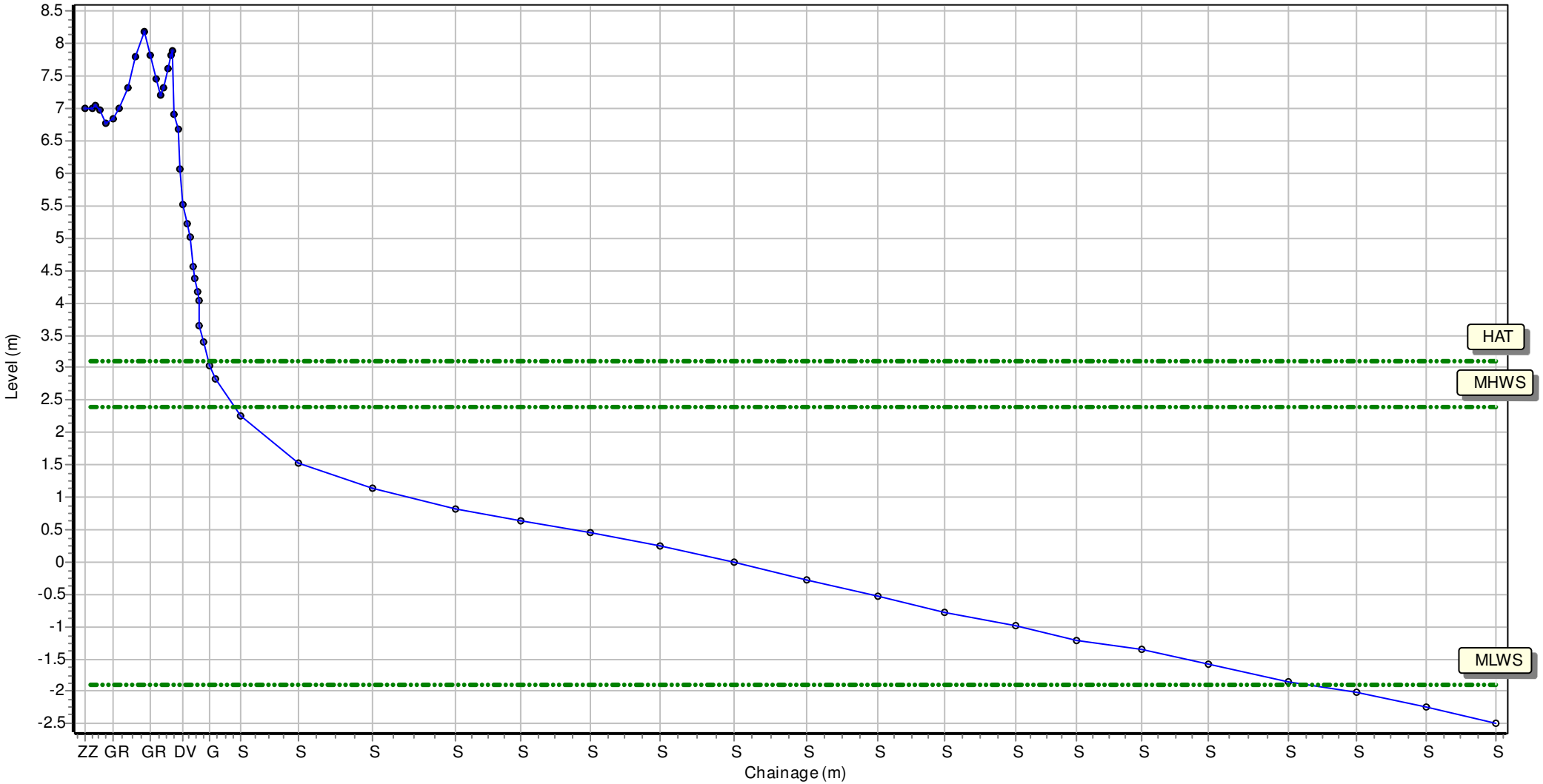
Location: **1aADC17**

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

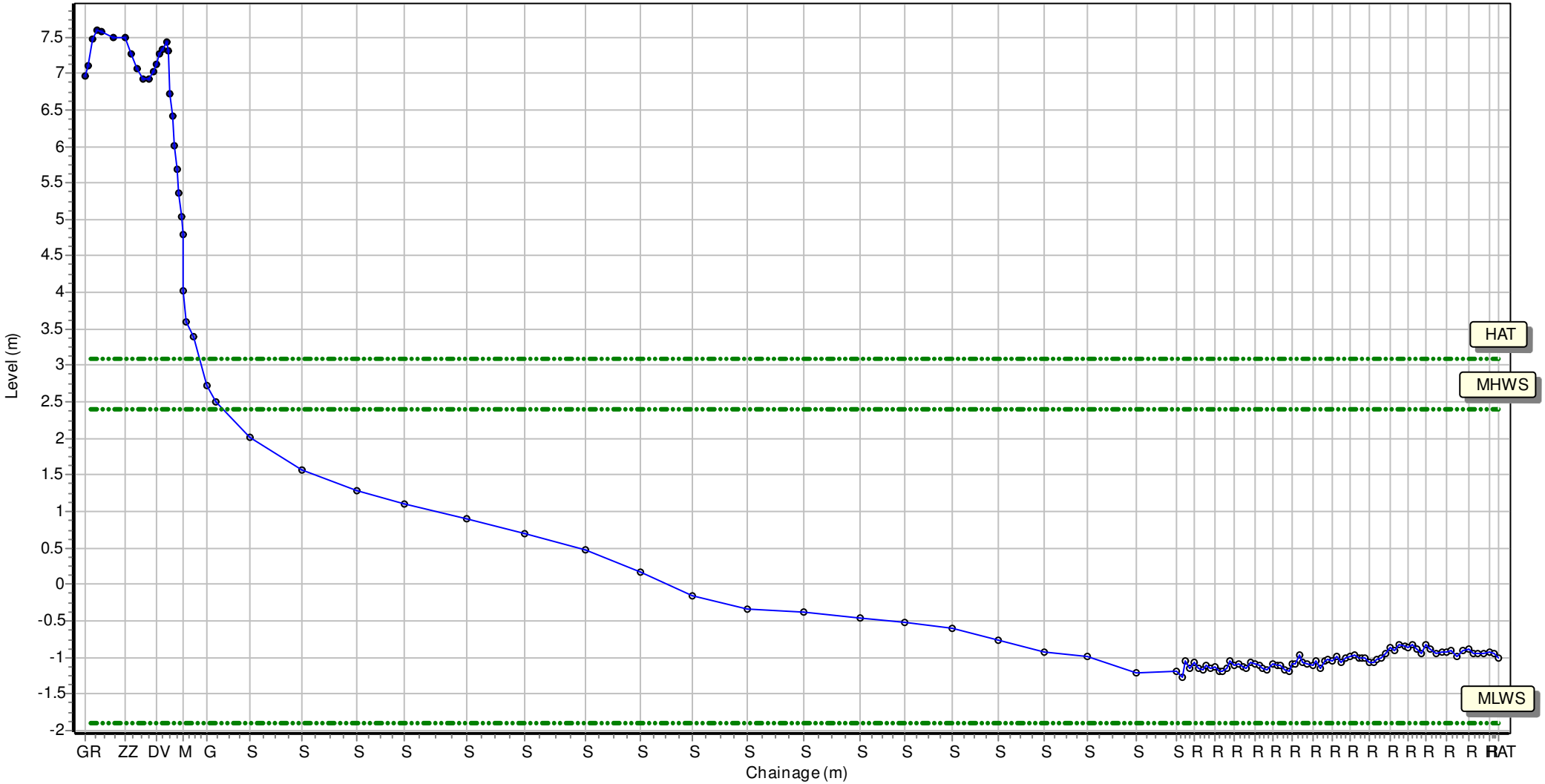
Location: **1aADC17A**

Date: 22/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

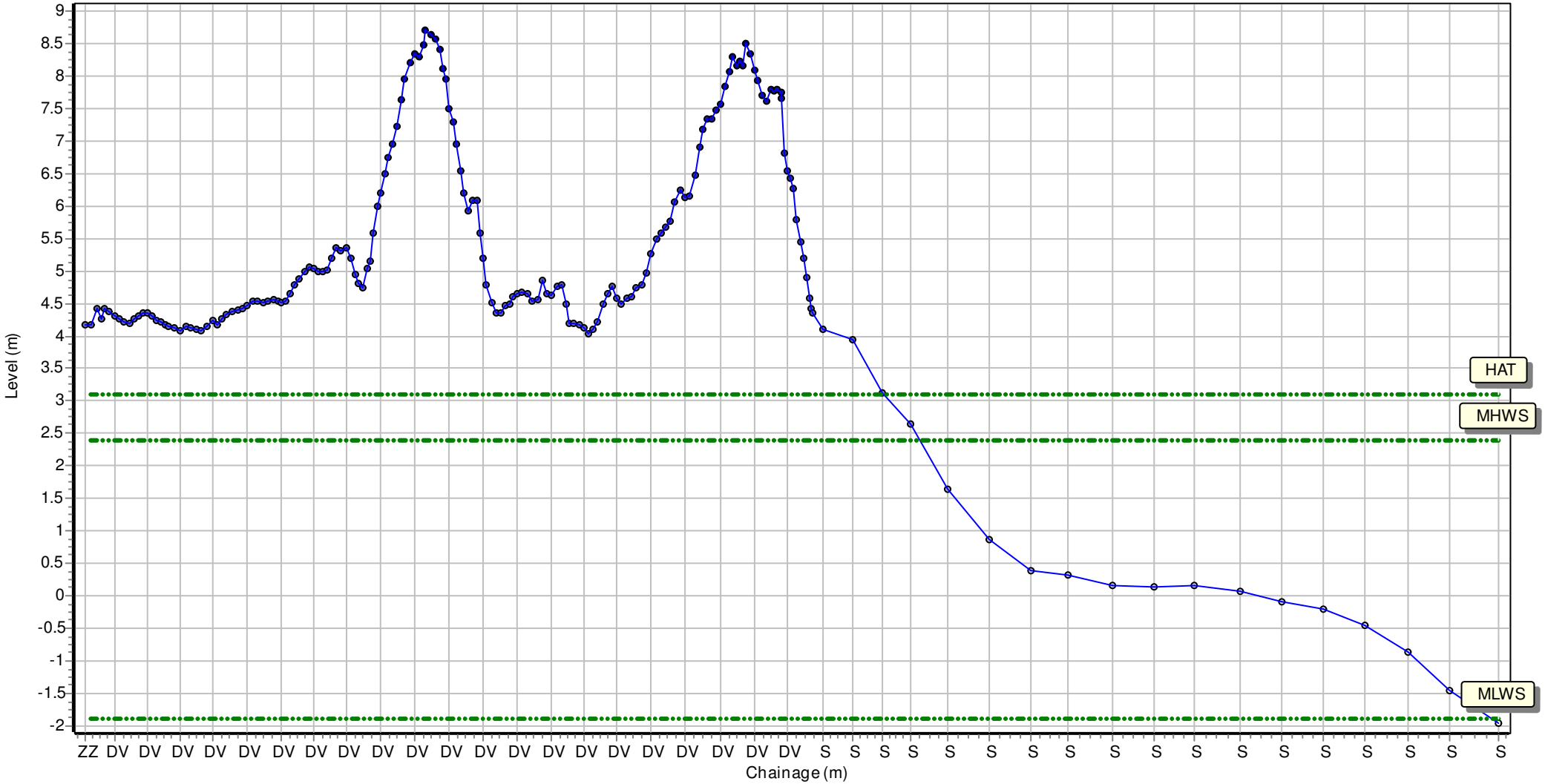
Location: **1aCMBC01**

Date: 20/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

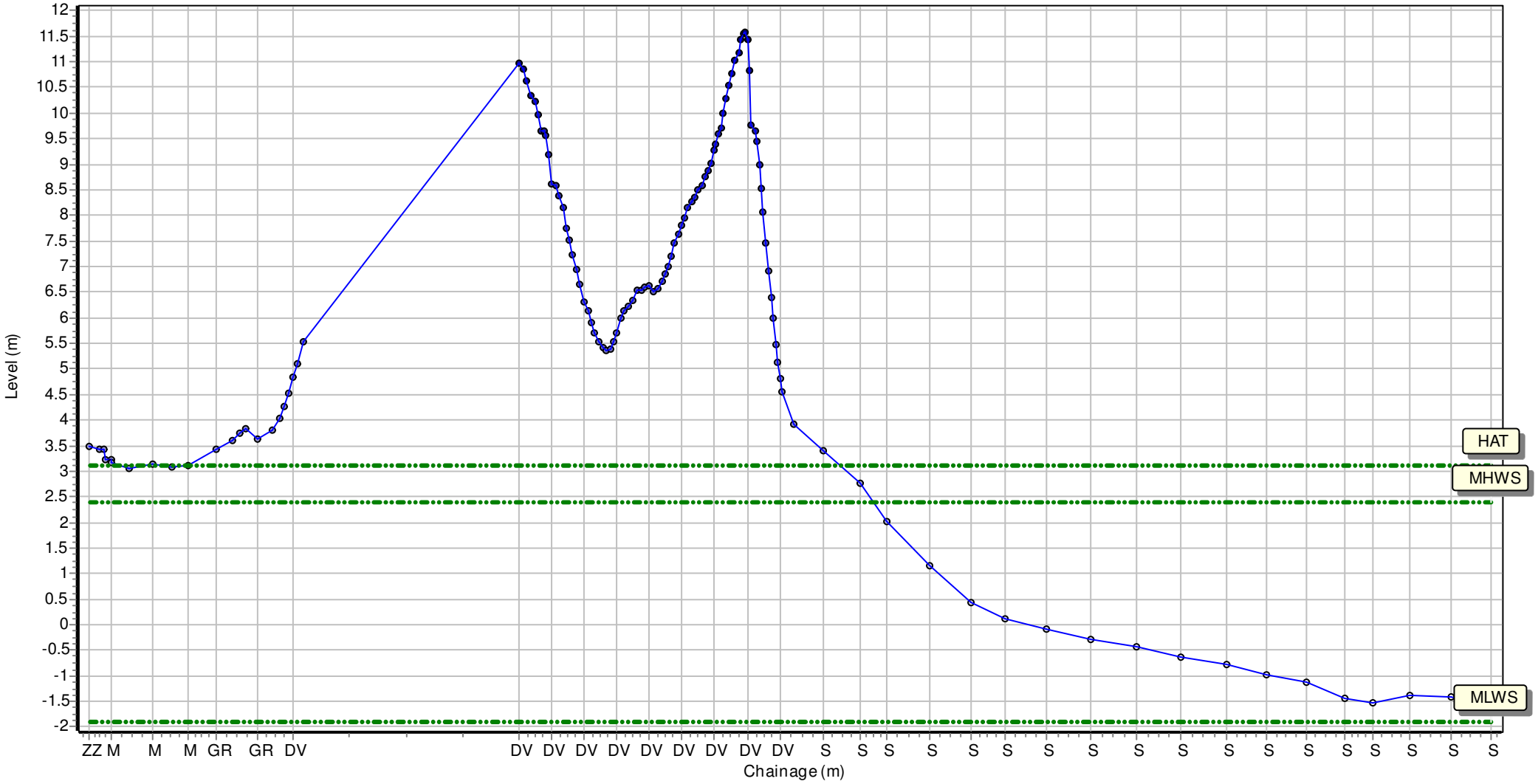
Location: **1aCMBC02**

Date: 20/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

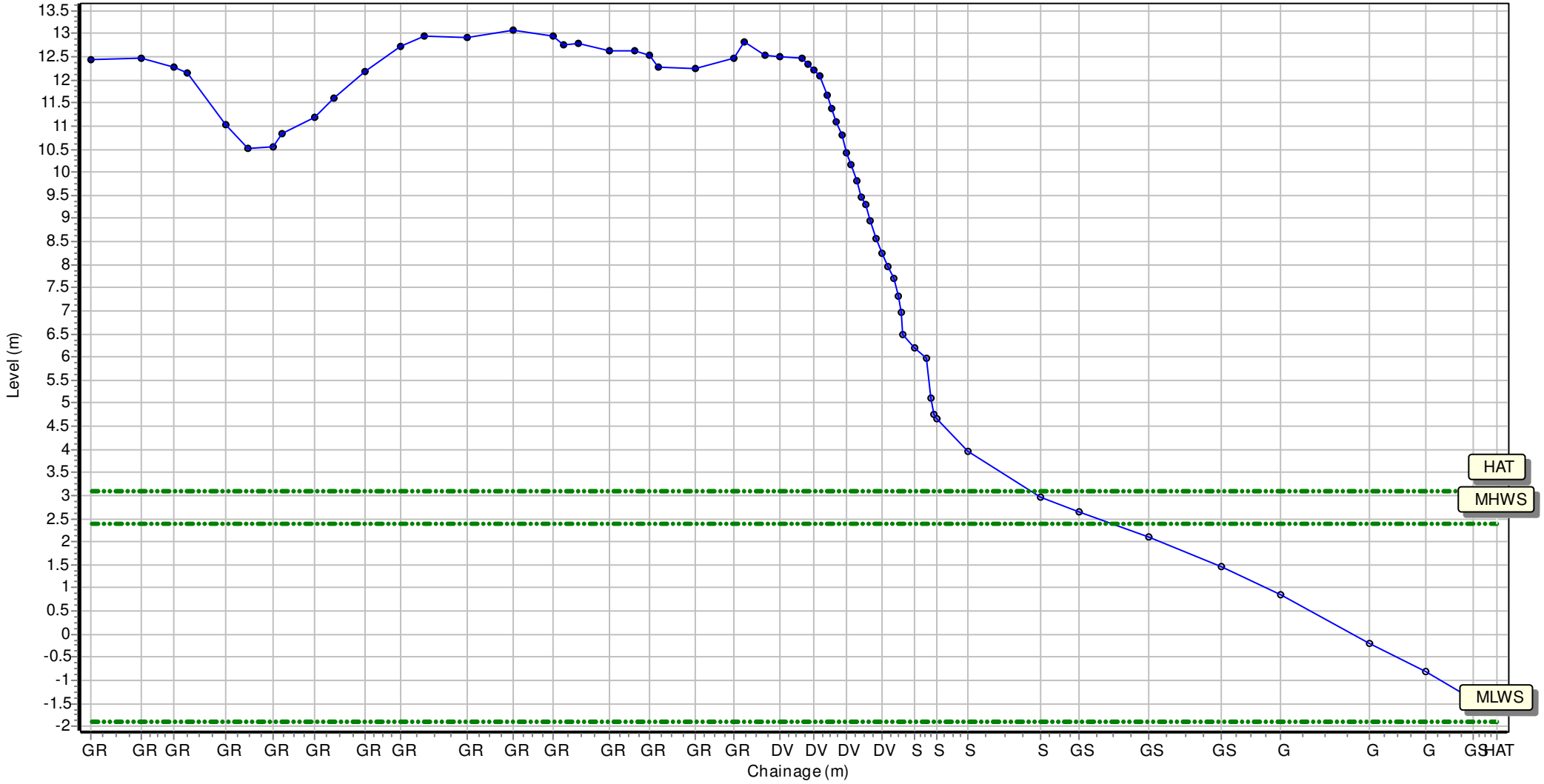
Location: **1aCMBC03A**

Date: 20/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

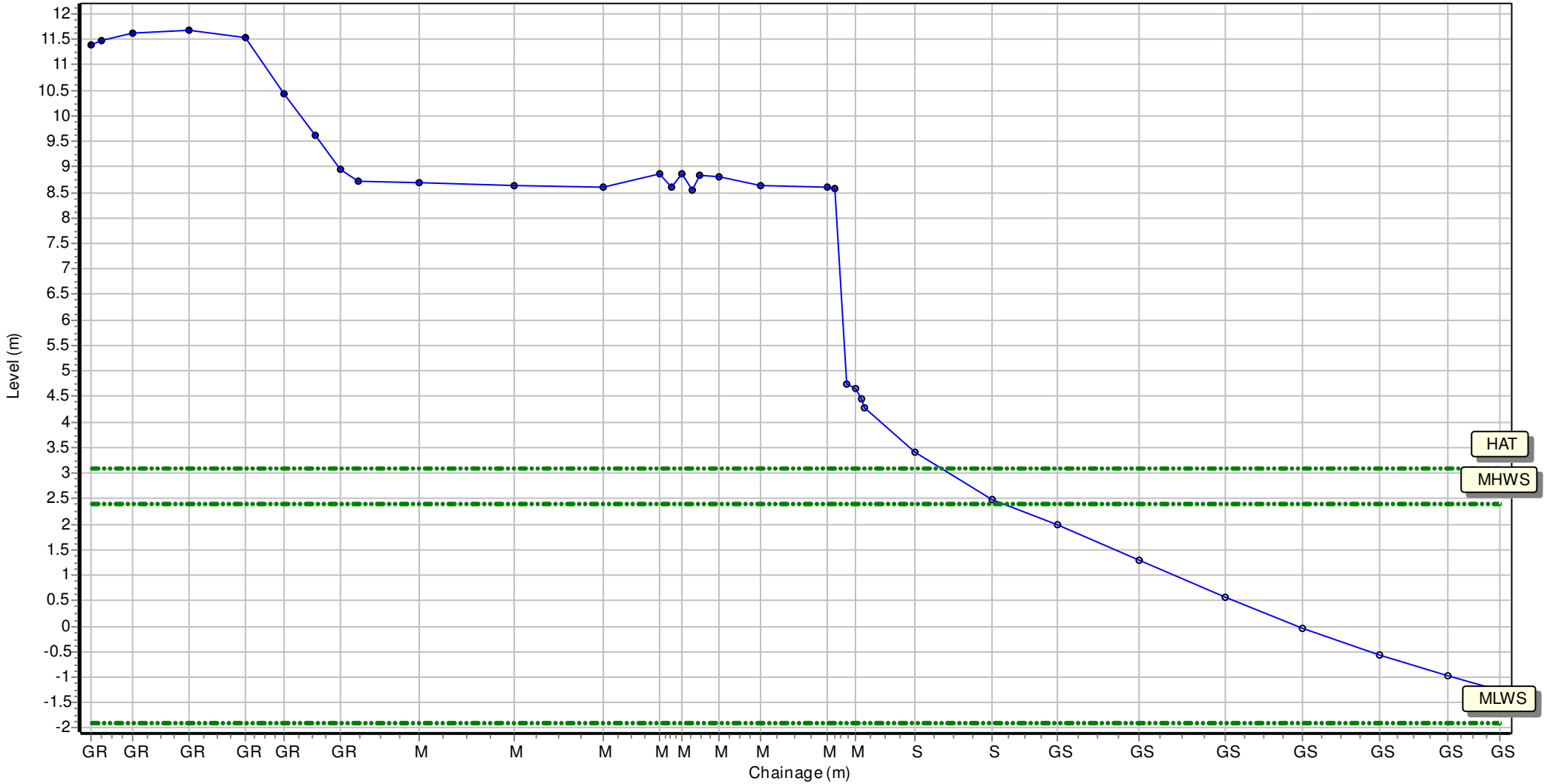
Location: **1aCMBC03B**

Date: 20/03/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

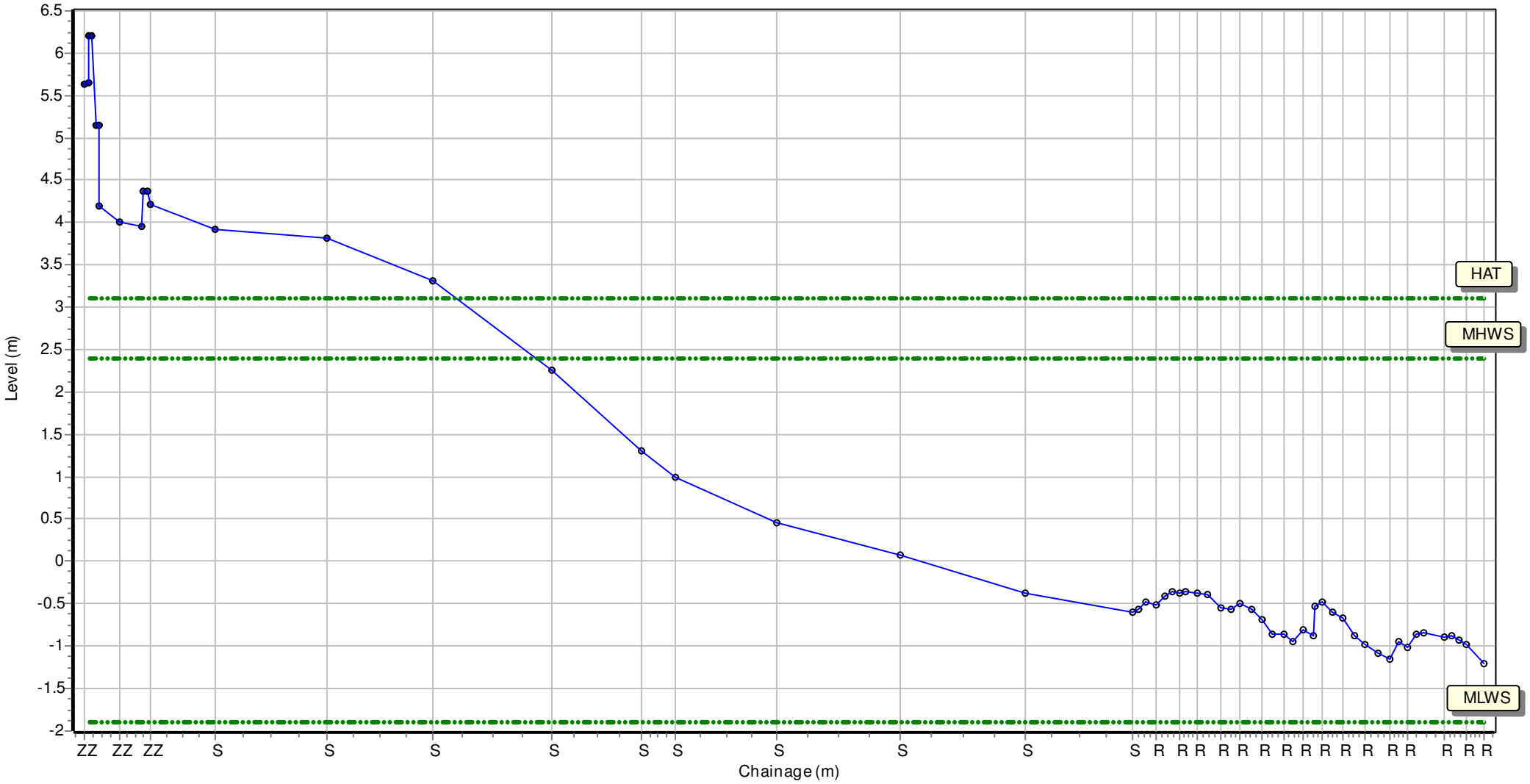
Location: **1aWDC05A**

Date: 21/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

Easting: 431490.829 **Northing:** 588054.668 **Profile Bearing:** 181 ° from North



Beach Profile

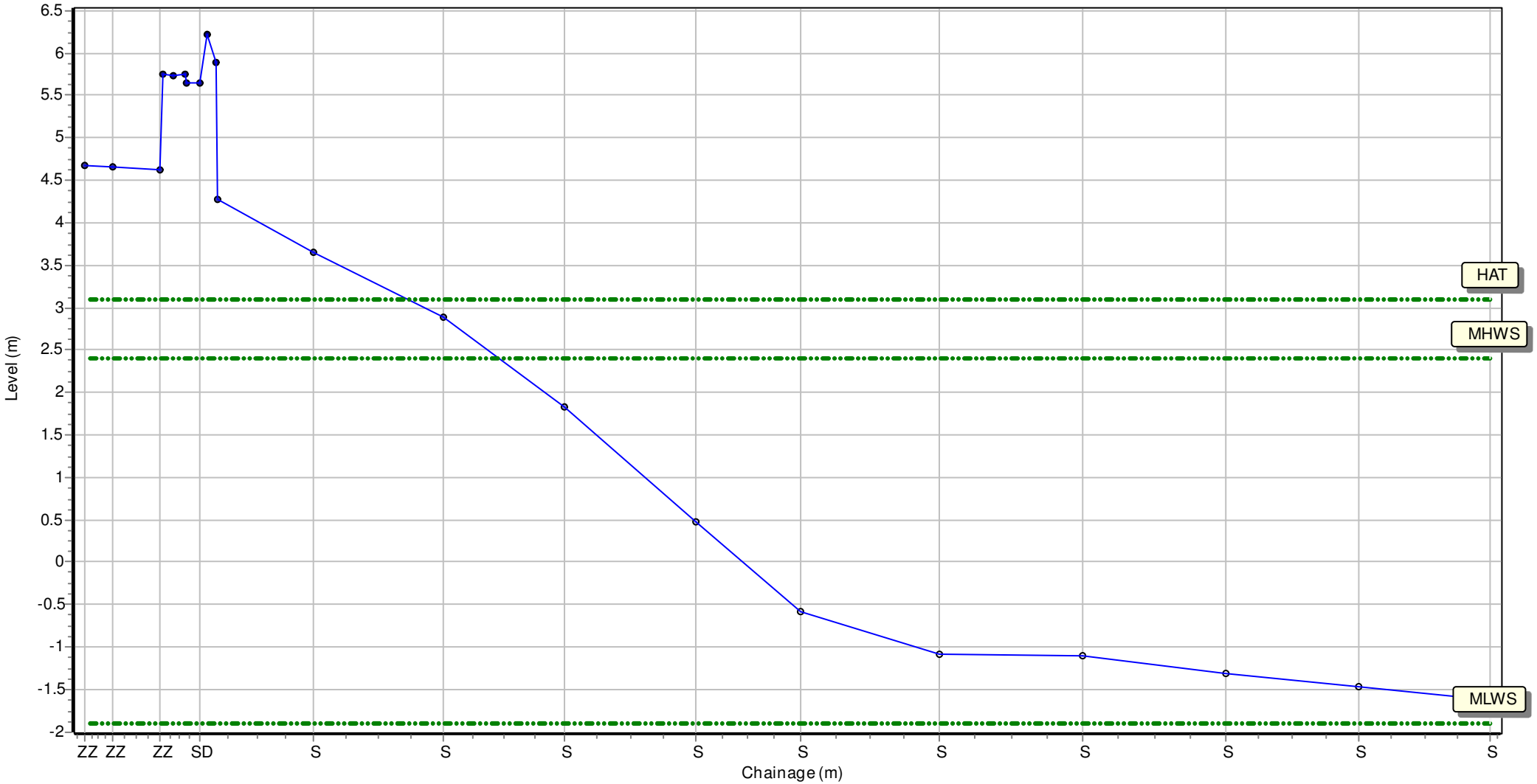
Location: **1aWDC06**

Date: 21/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

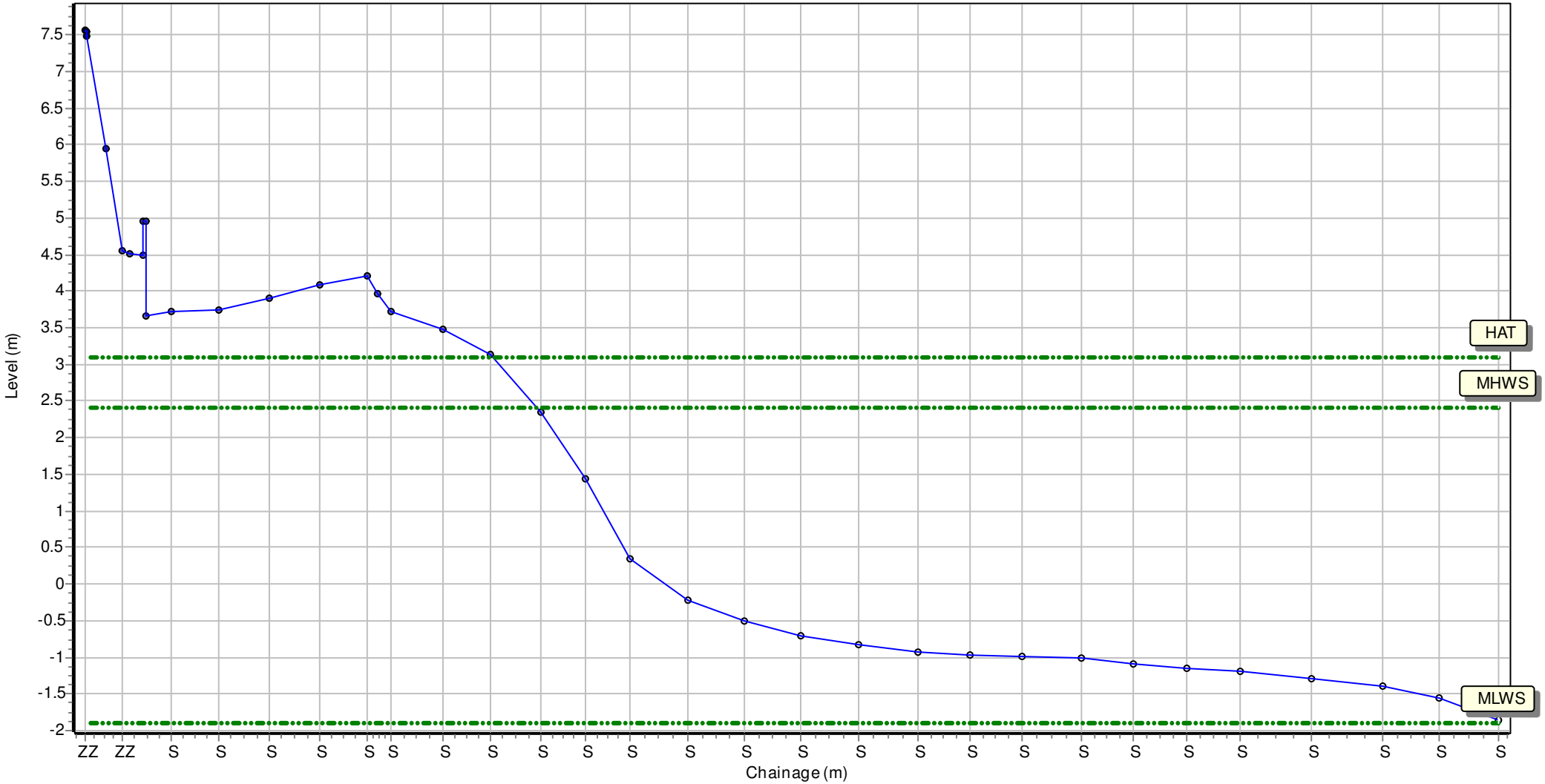
Location: **1aWDC06A**

Date: 21/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

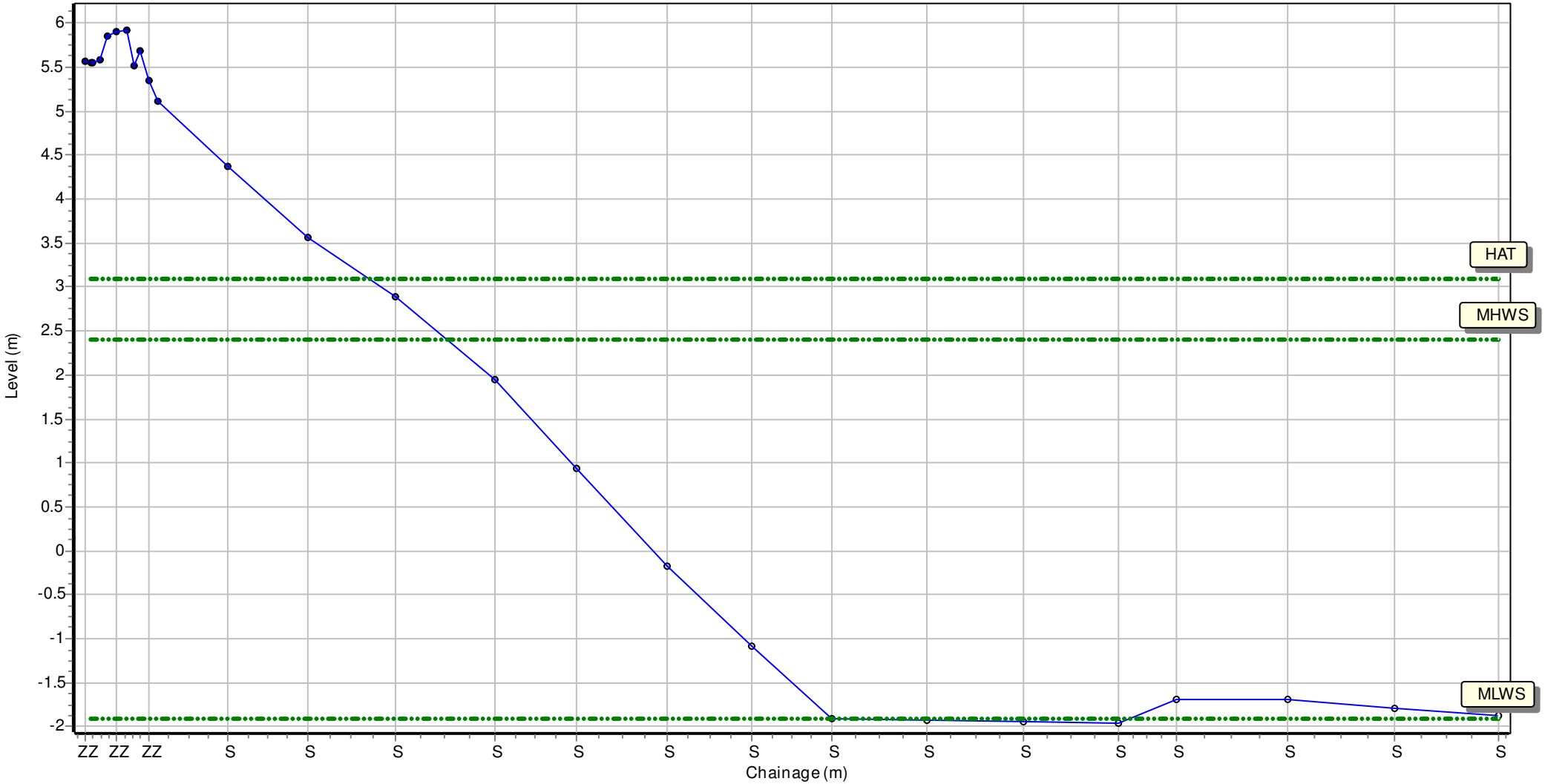
Location: **1aWDC07**

Date: 21/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

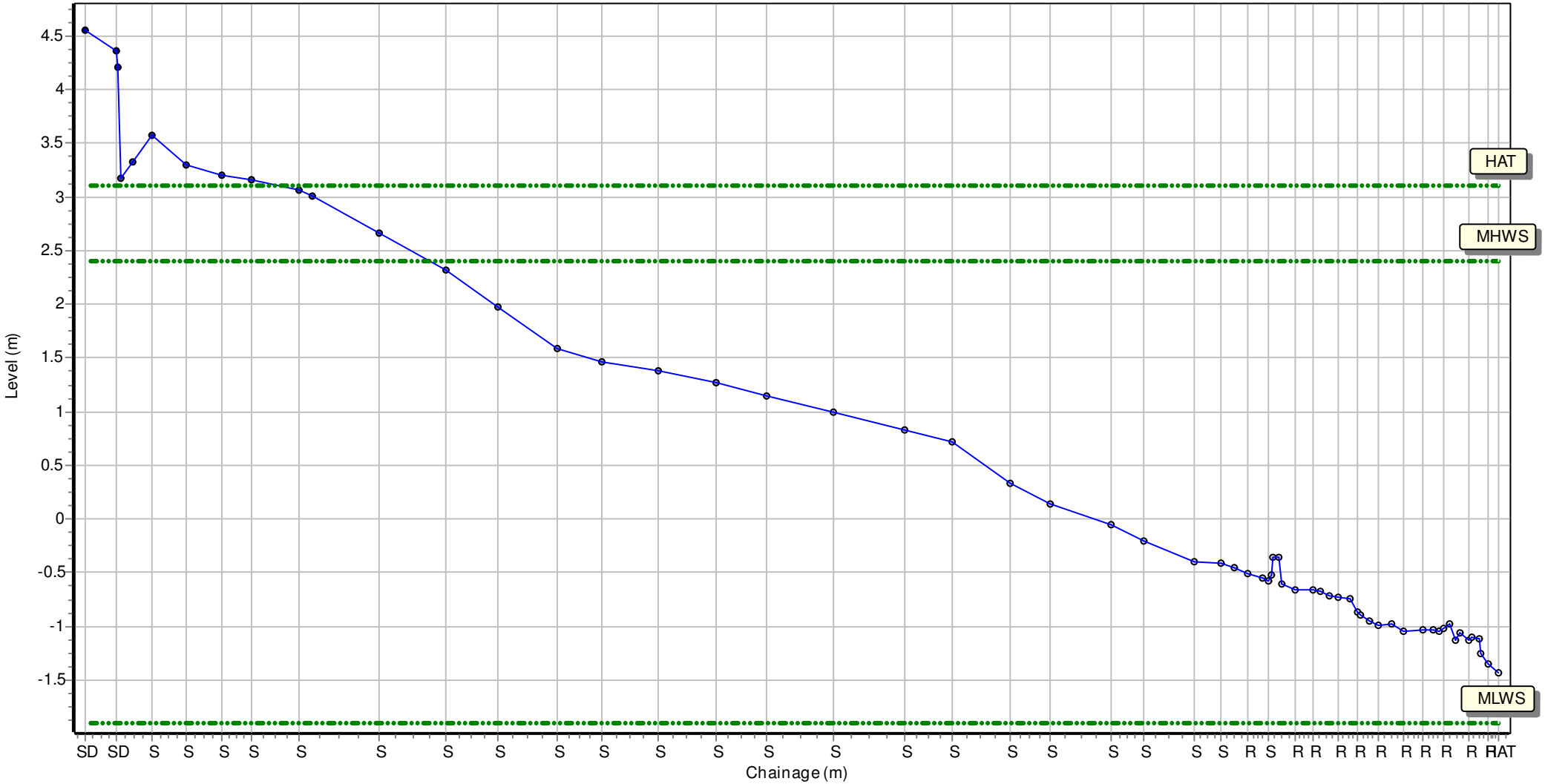
Location: **1aNWB1**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

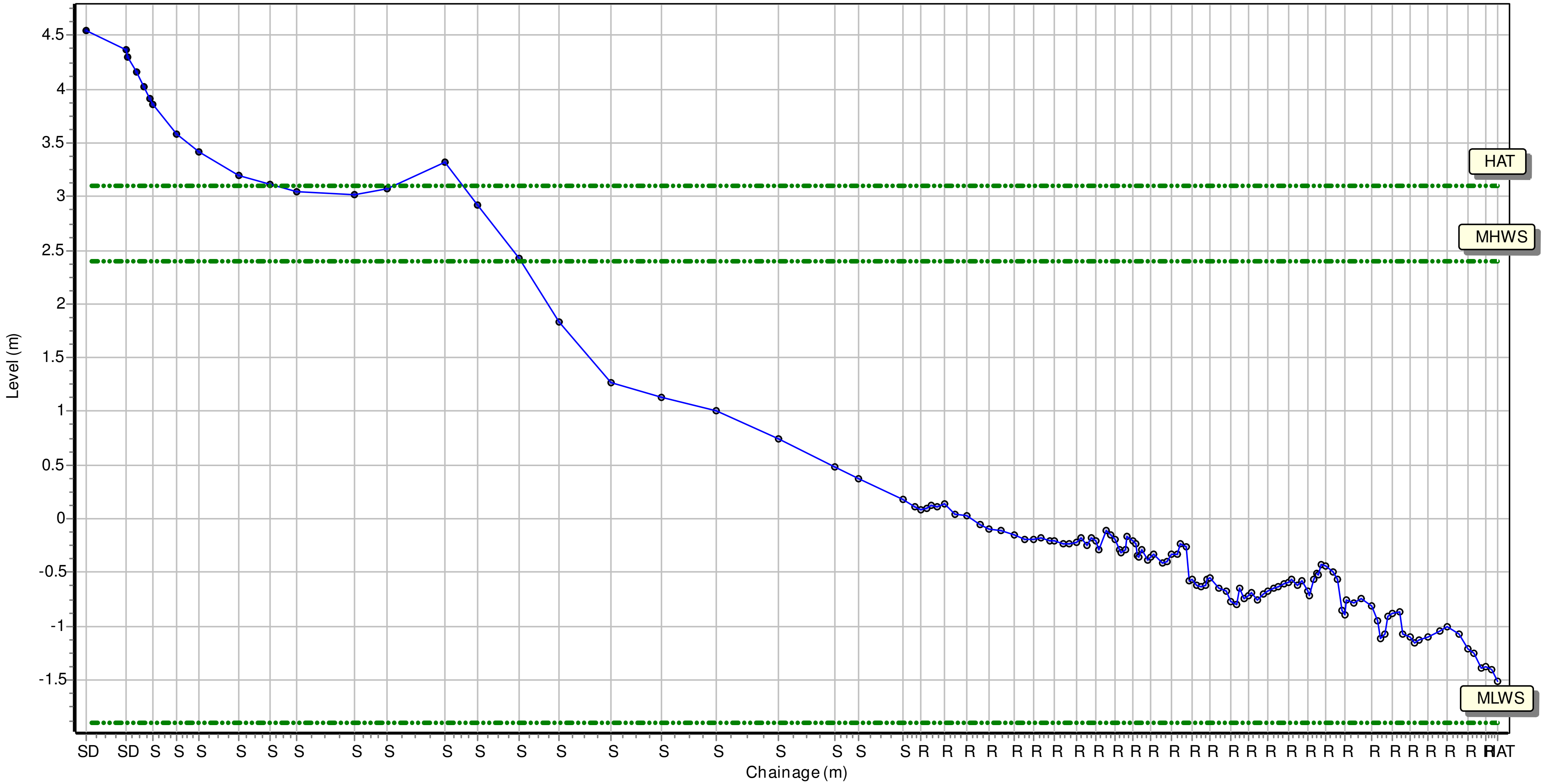
Location: 1aNWB2

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

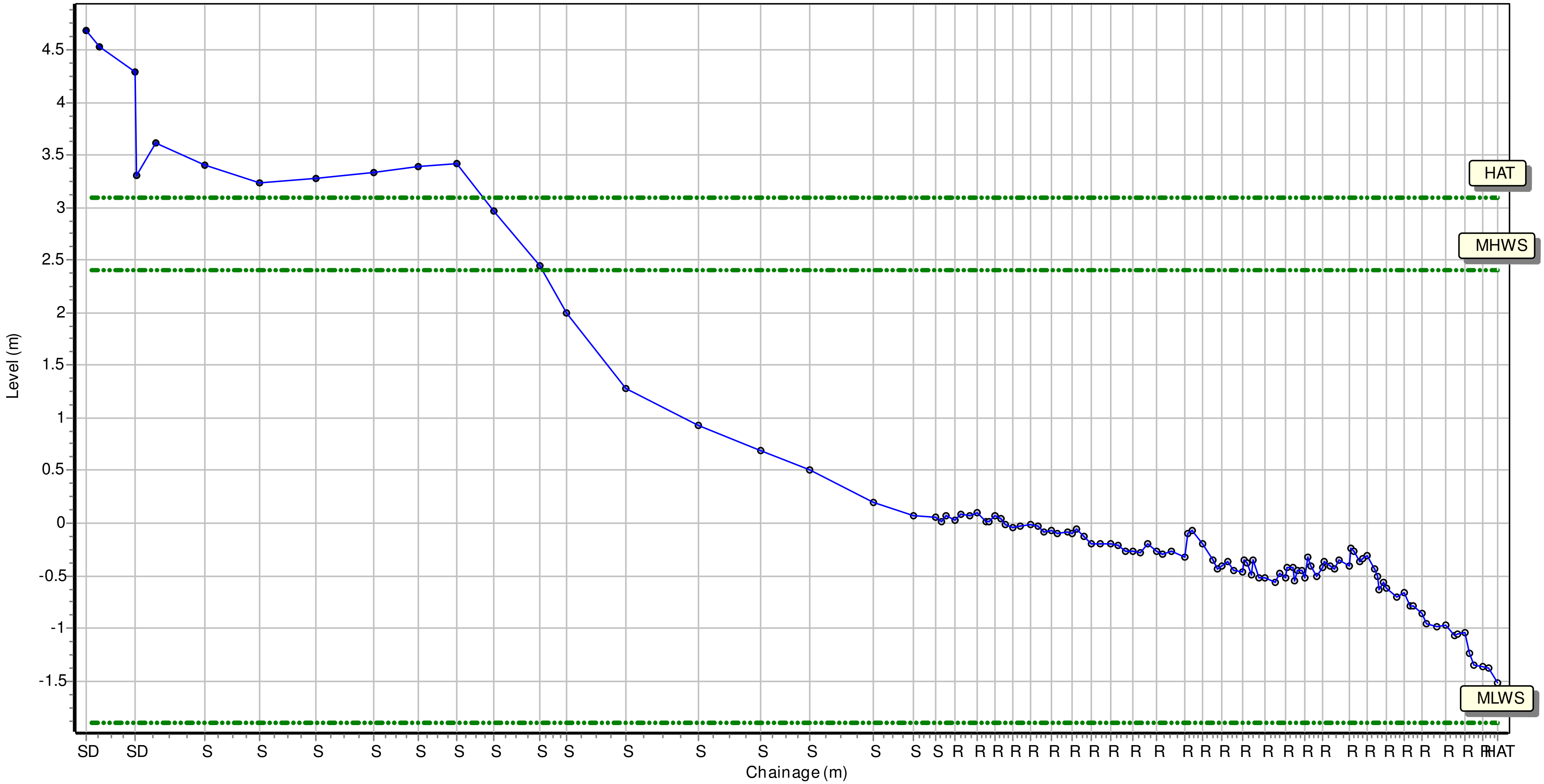
Location: 1aNWB3

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



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Beach Profile

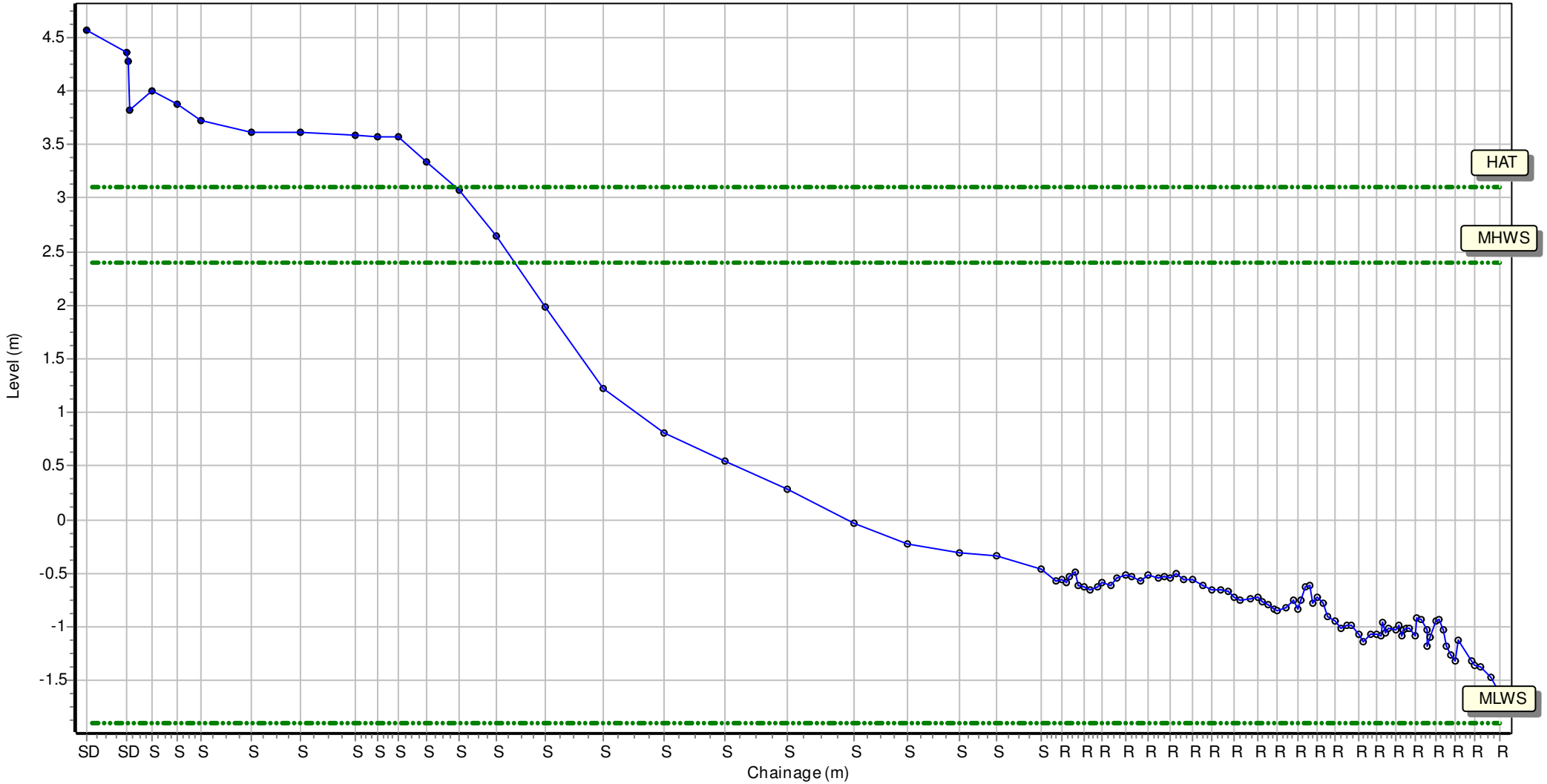
Location: **1aNWB4**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

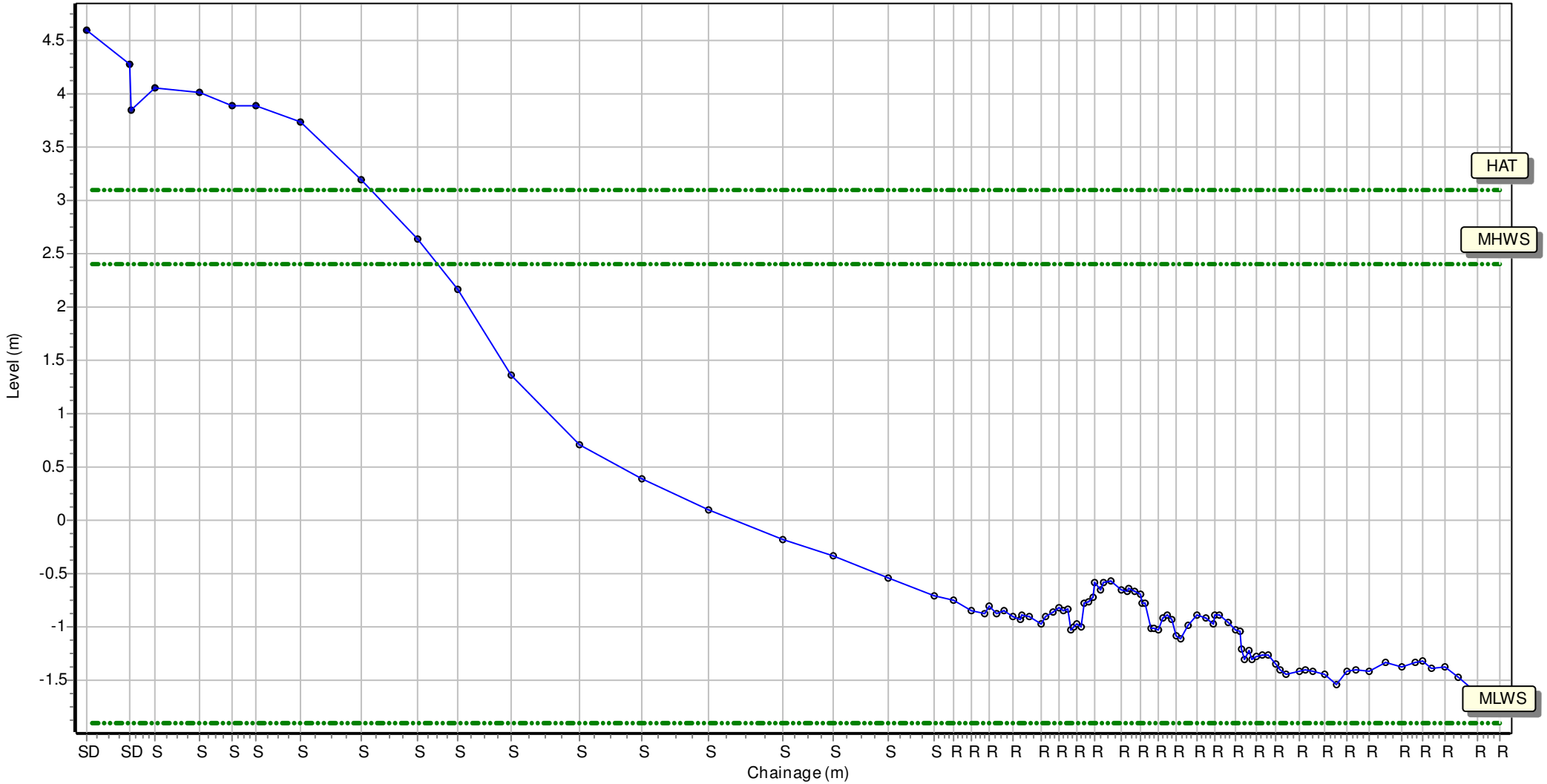
Location: **1aNWB5**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

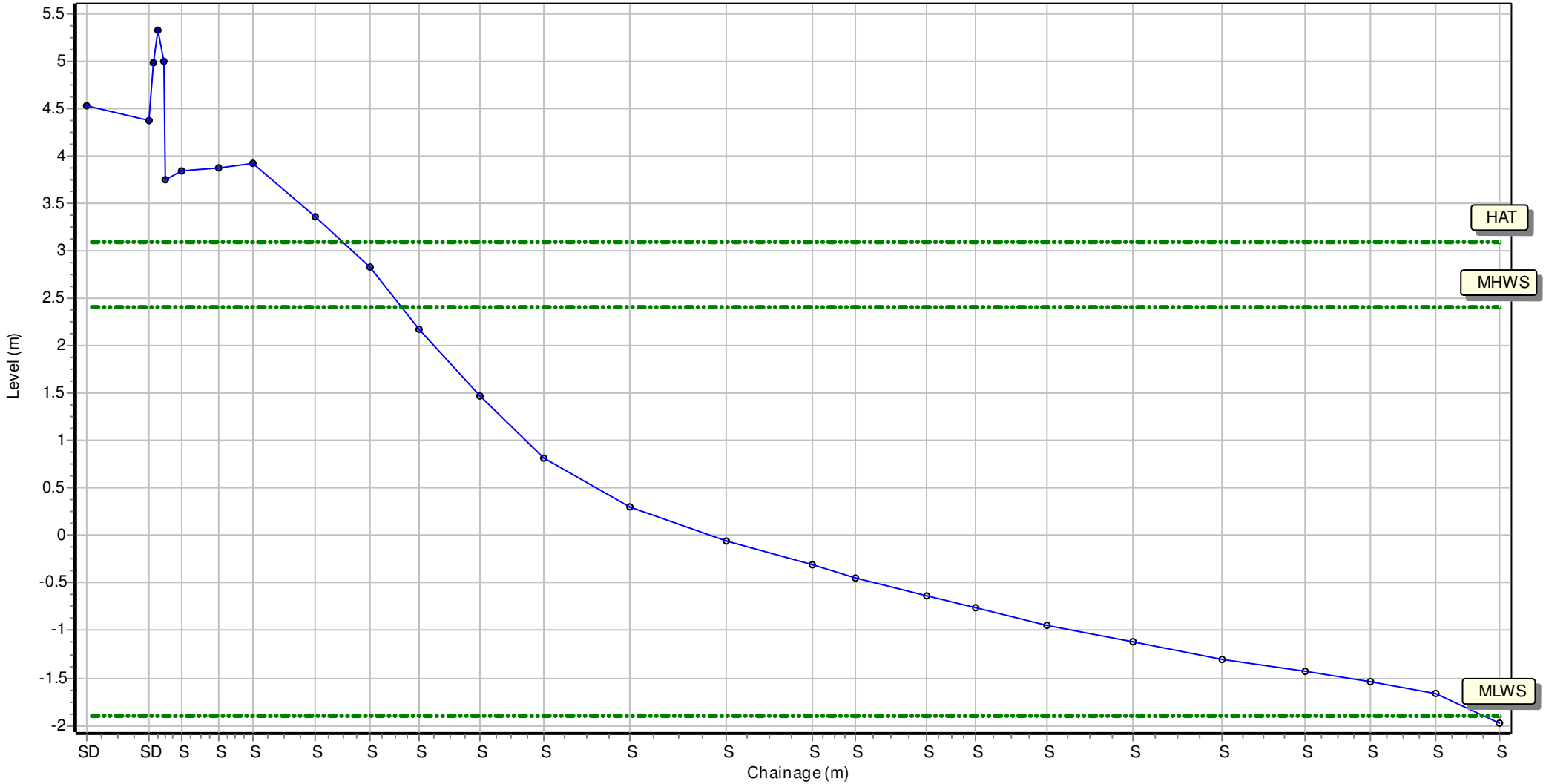
Location: **1aNWB6**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

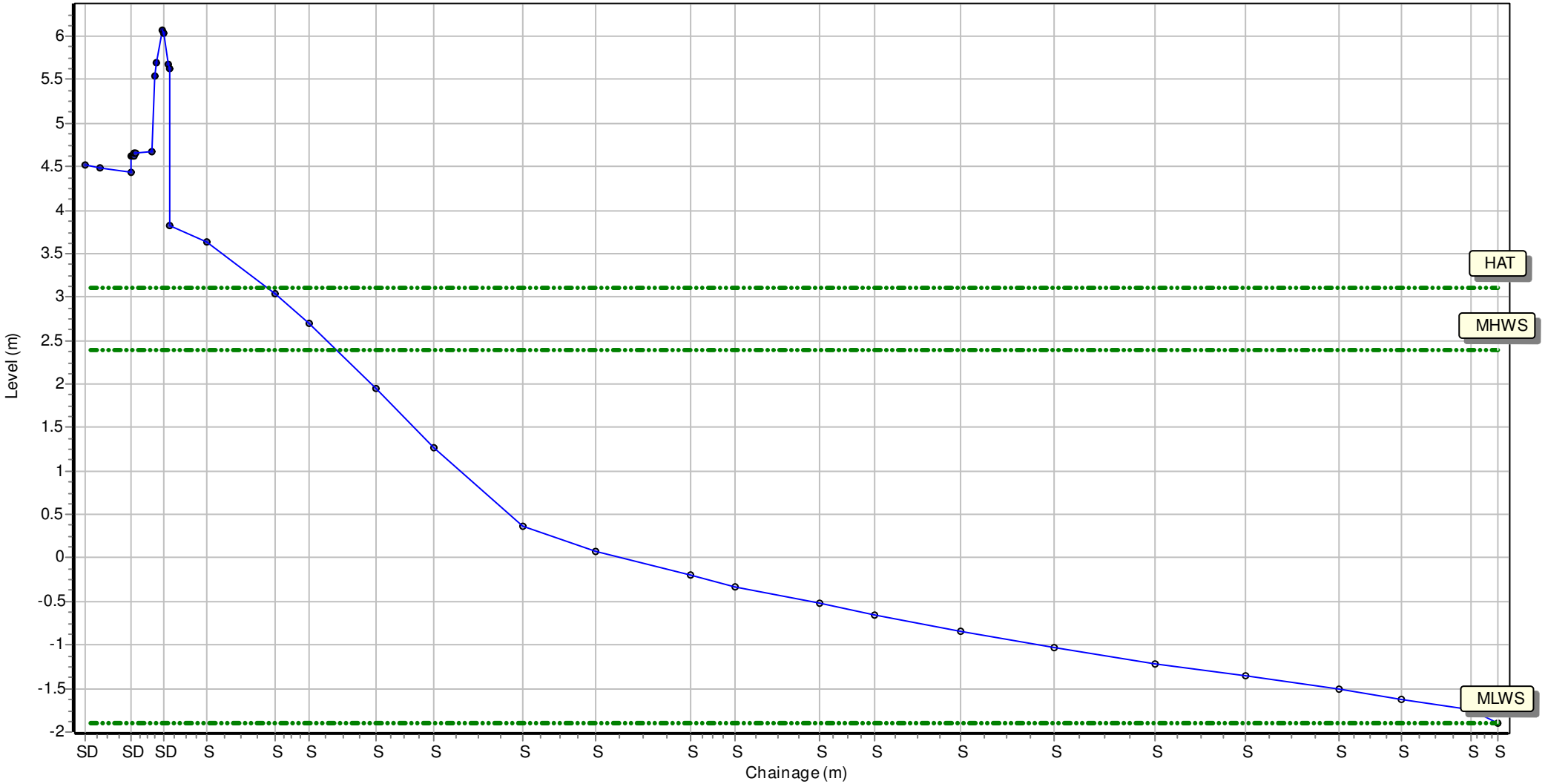
Location: **1aNWB7**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

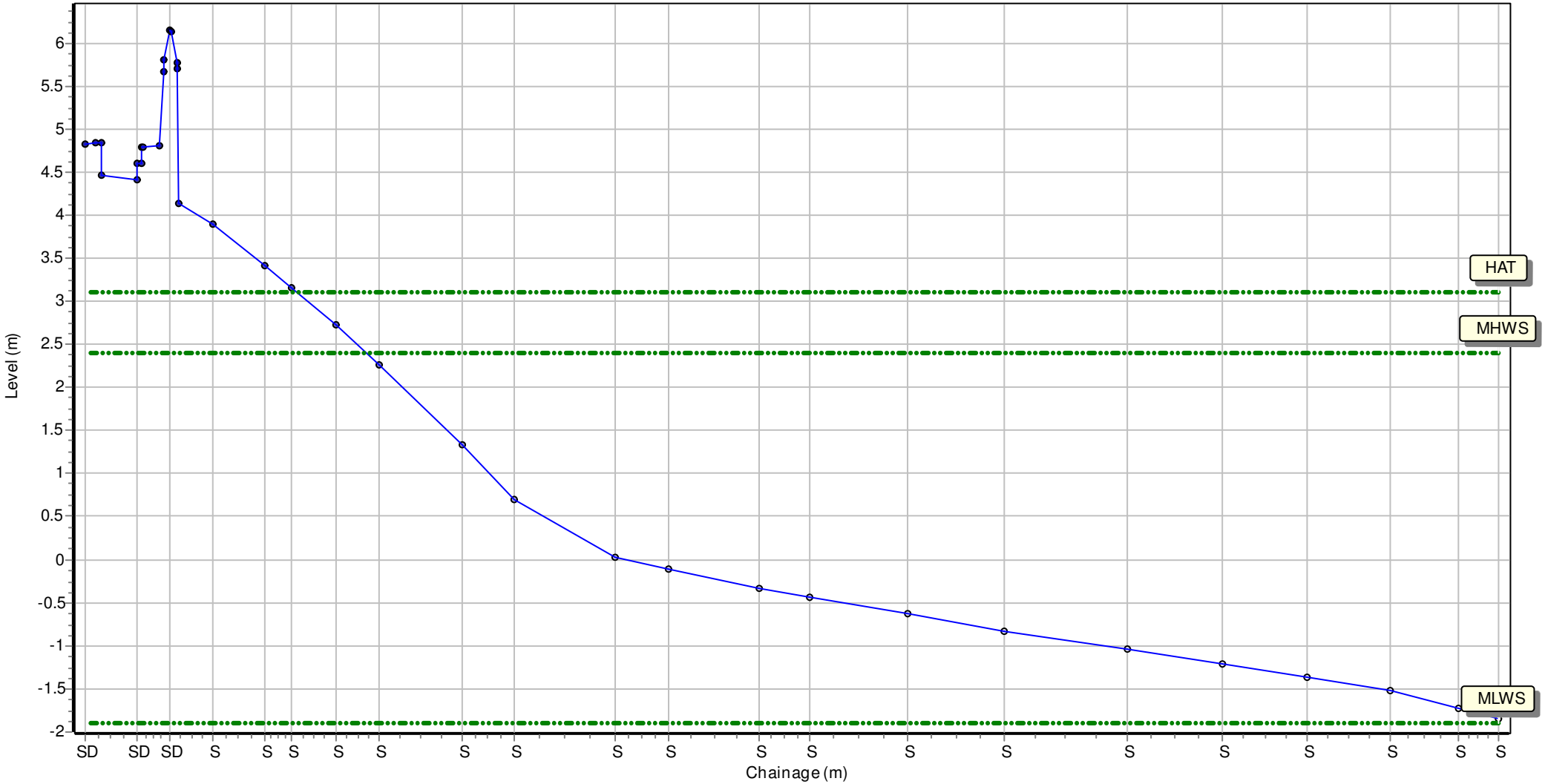
Location: **1aNWB8**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

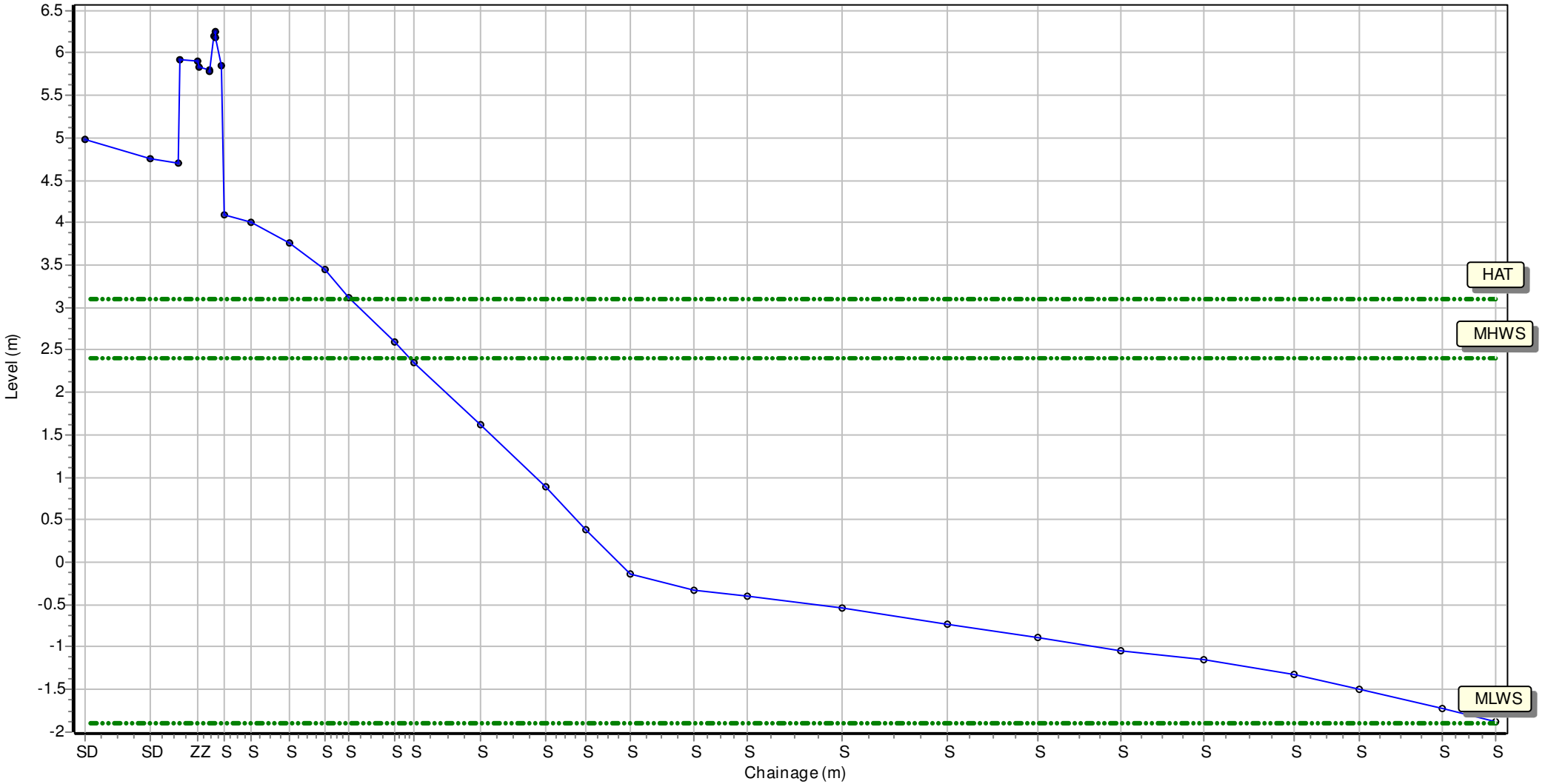
Location: **1aNWB9**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

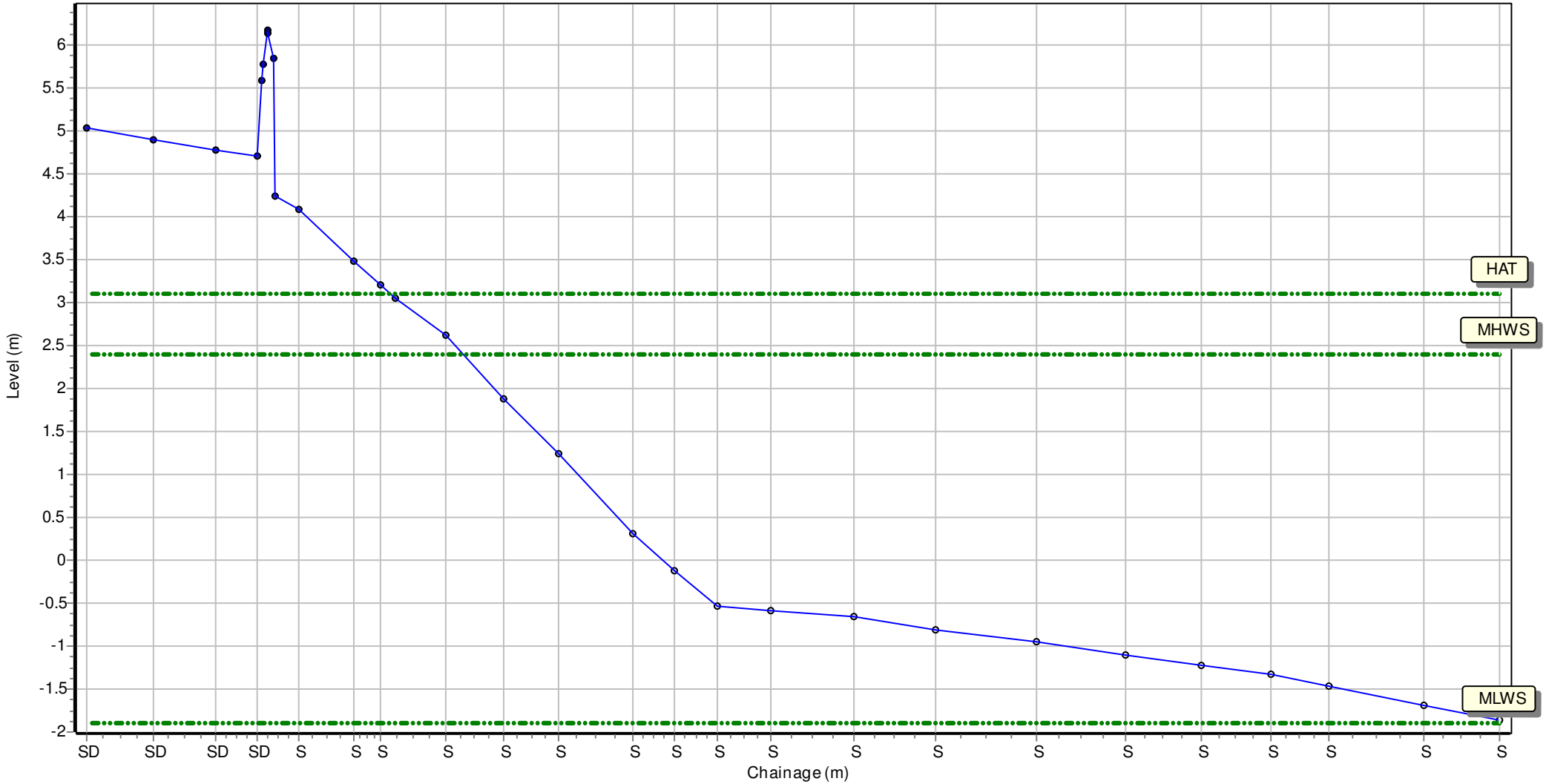
Location: **1aNWB10**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

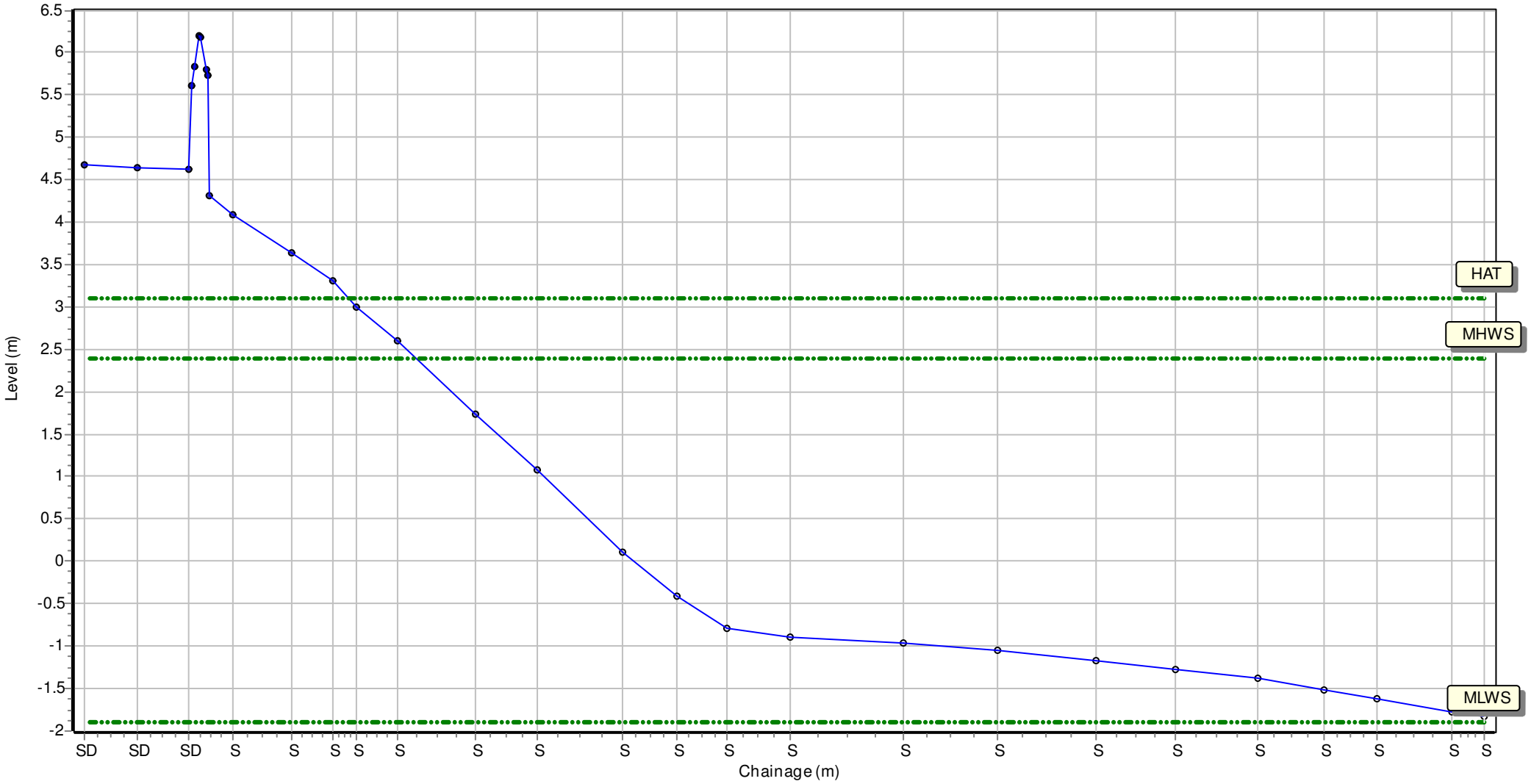
Location: **1aNWB11**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

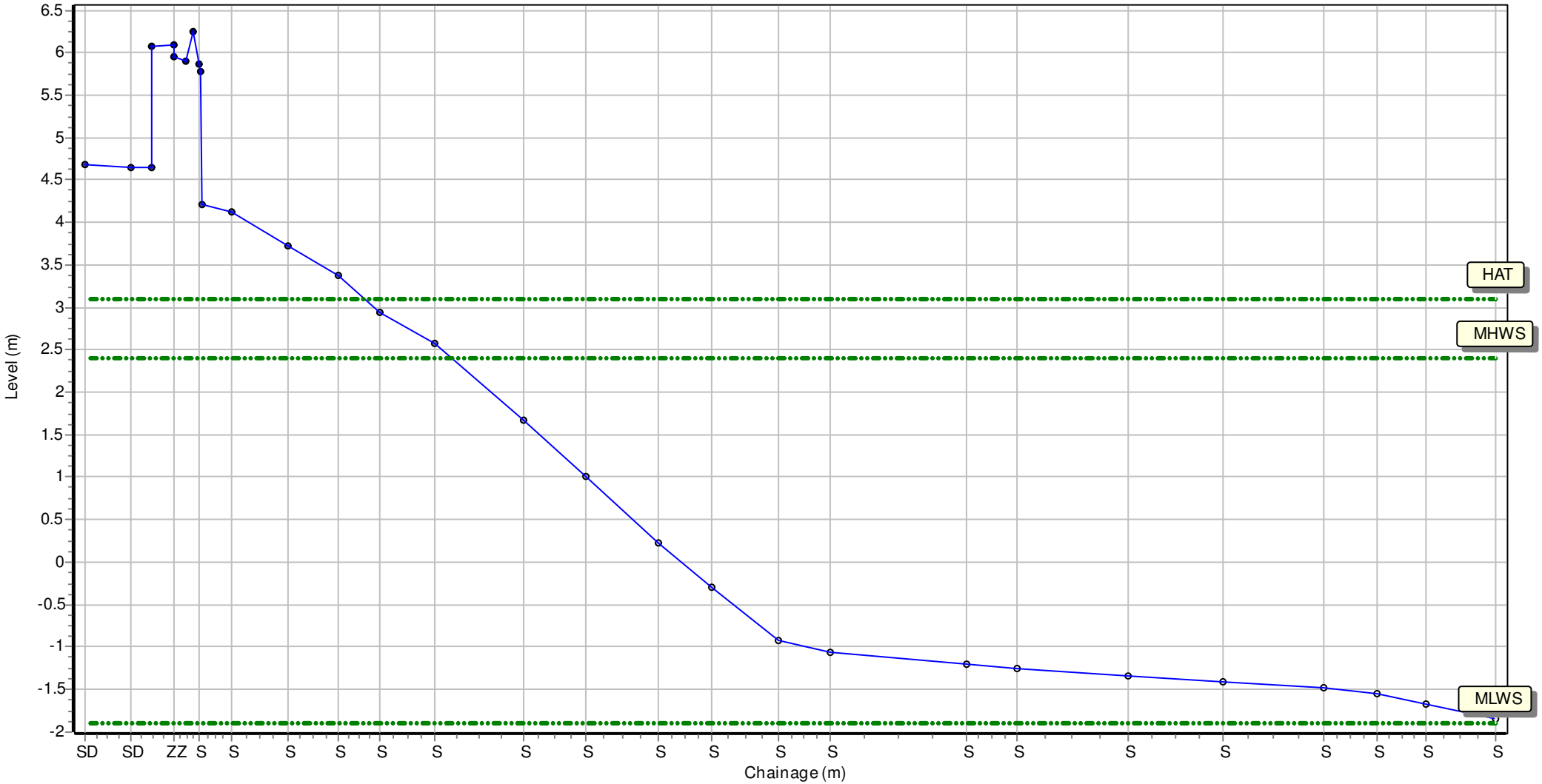
Location: **1aNWB12**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

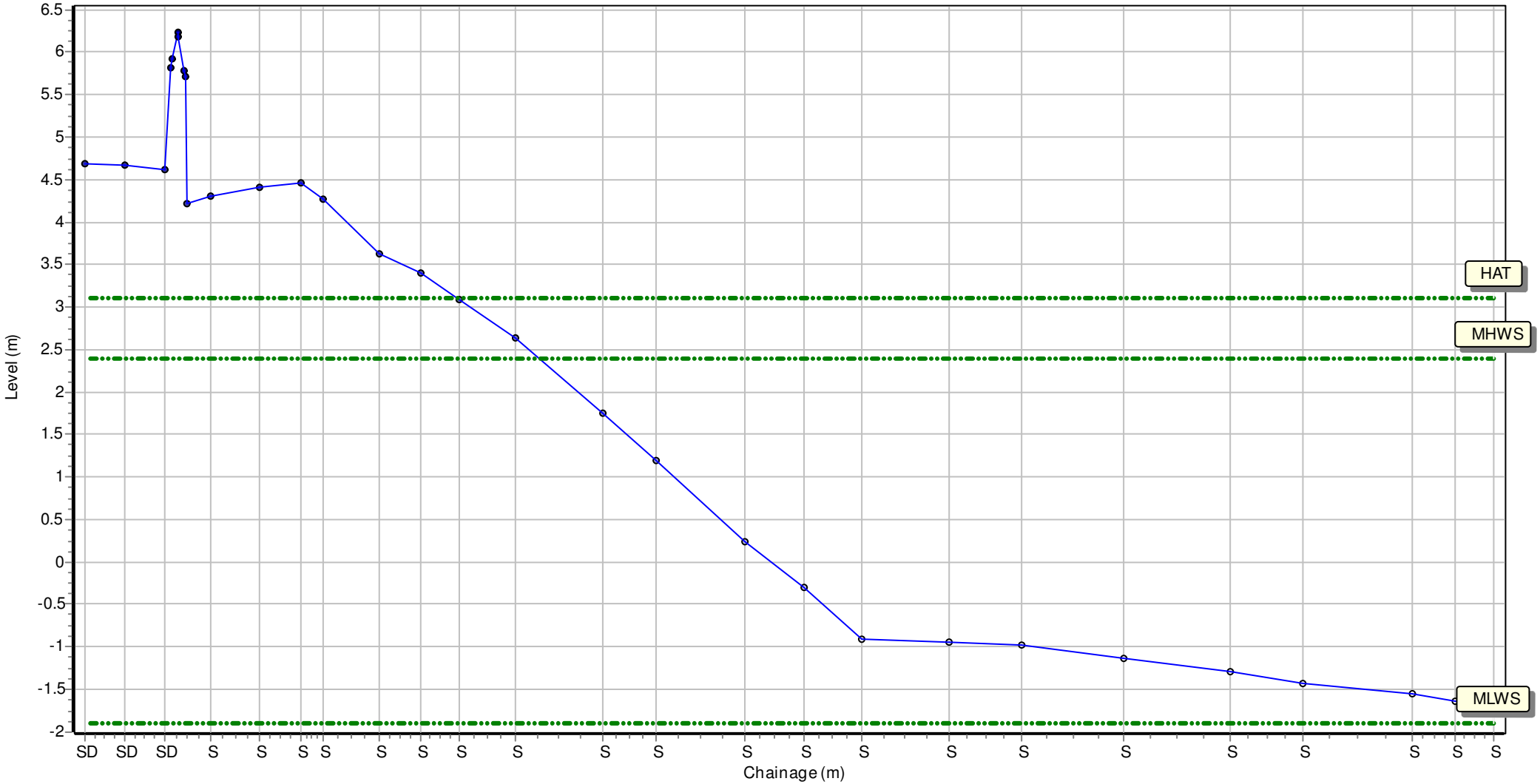
Location: **1aNWB13**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

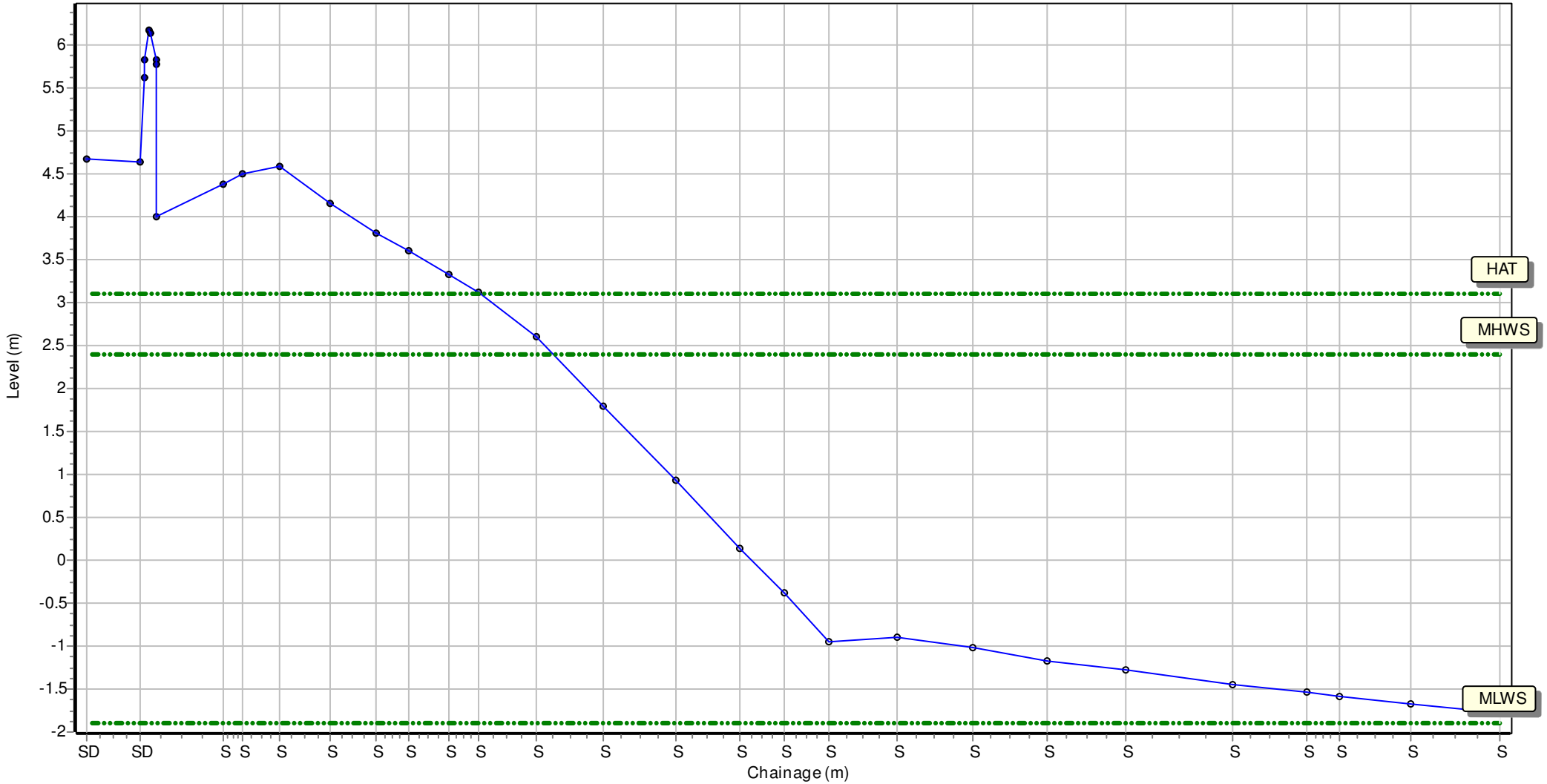
Location: **1aNWB14**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

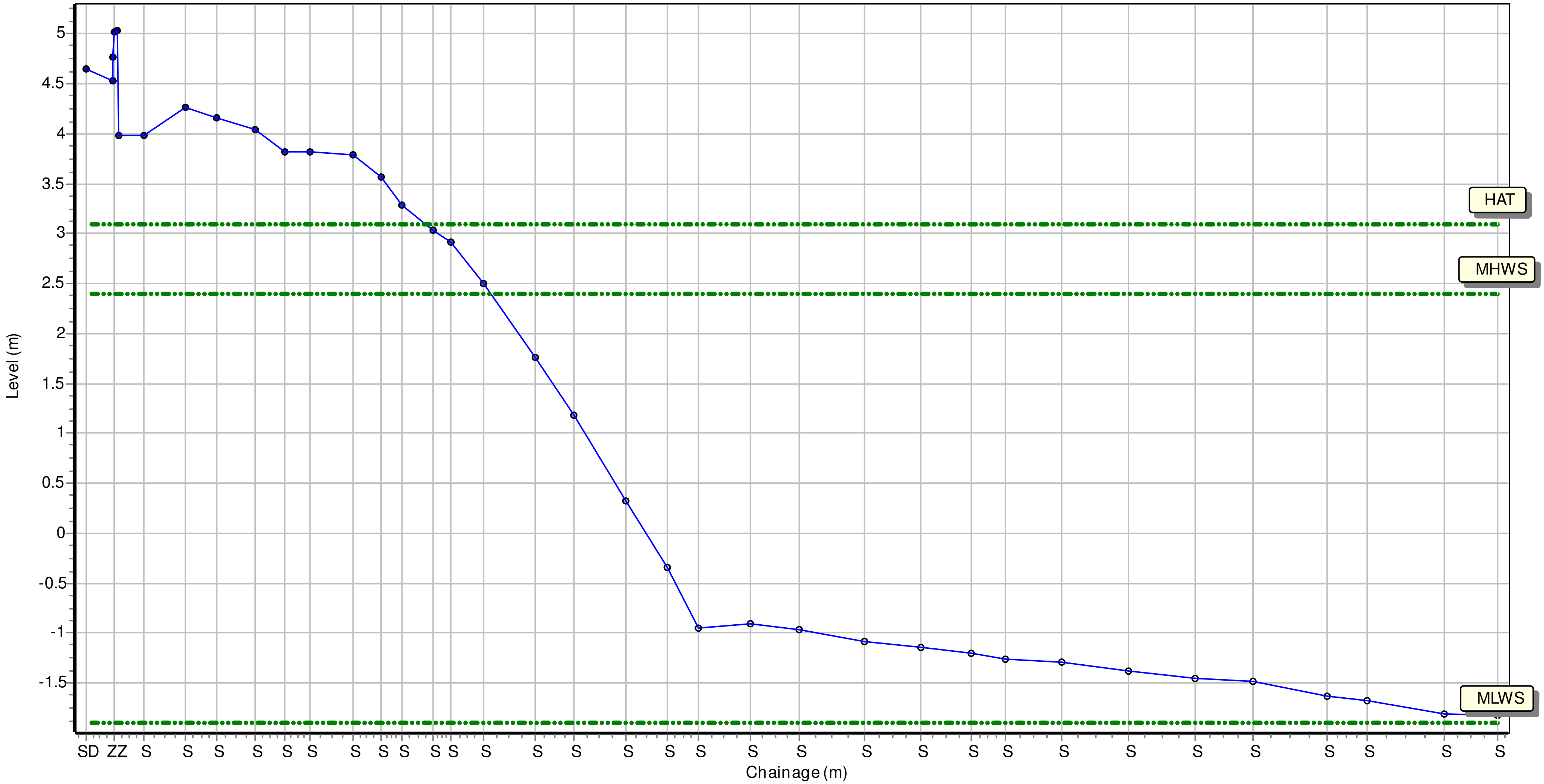
Location: **1aNWB15**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



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Beach Profile

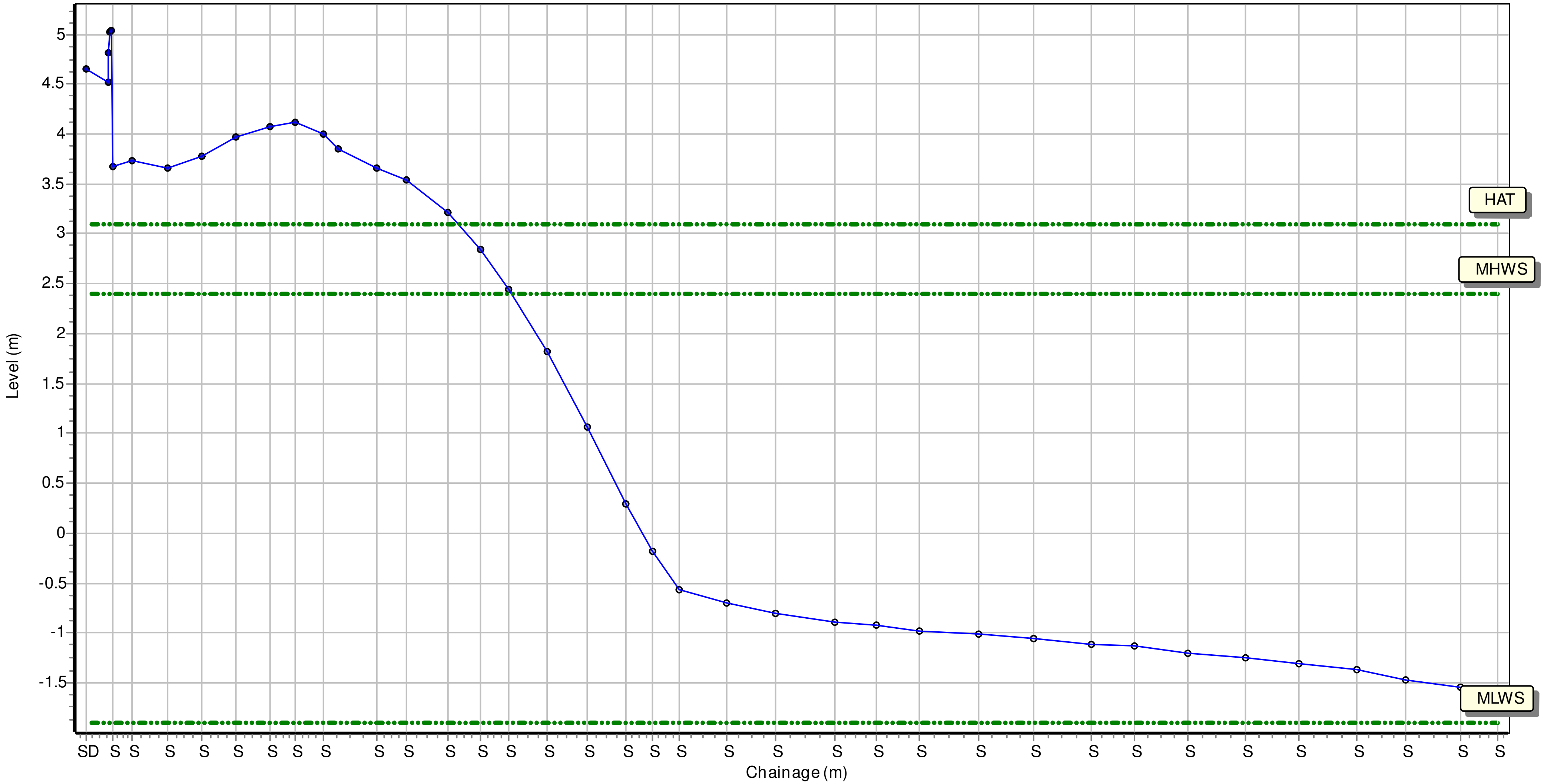
Location: **1aNWB16**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



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Beach Profile

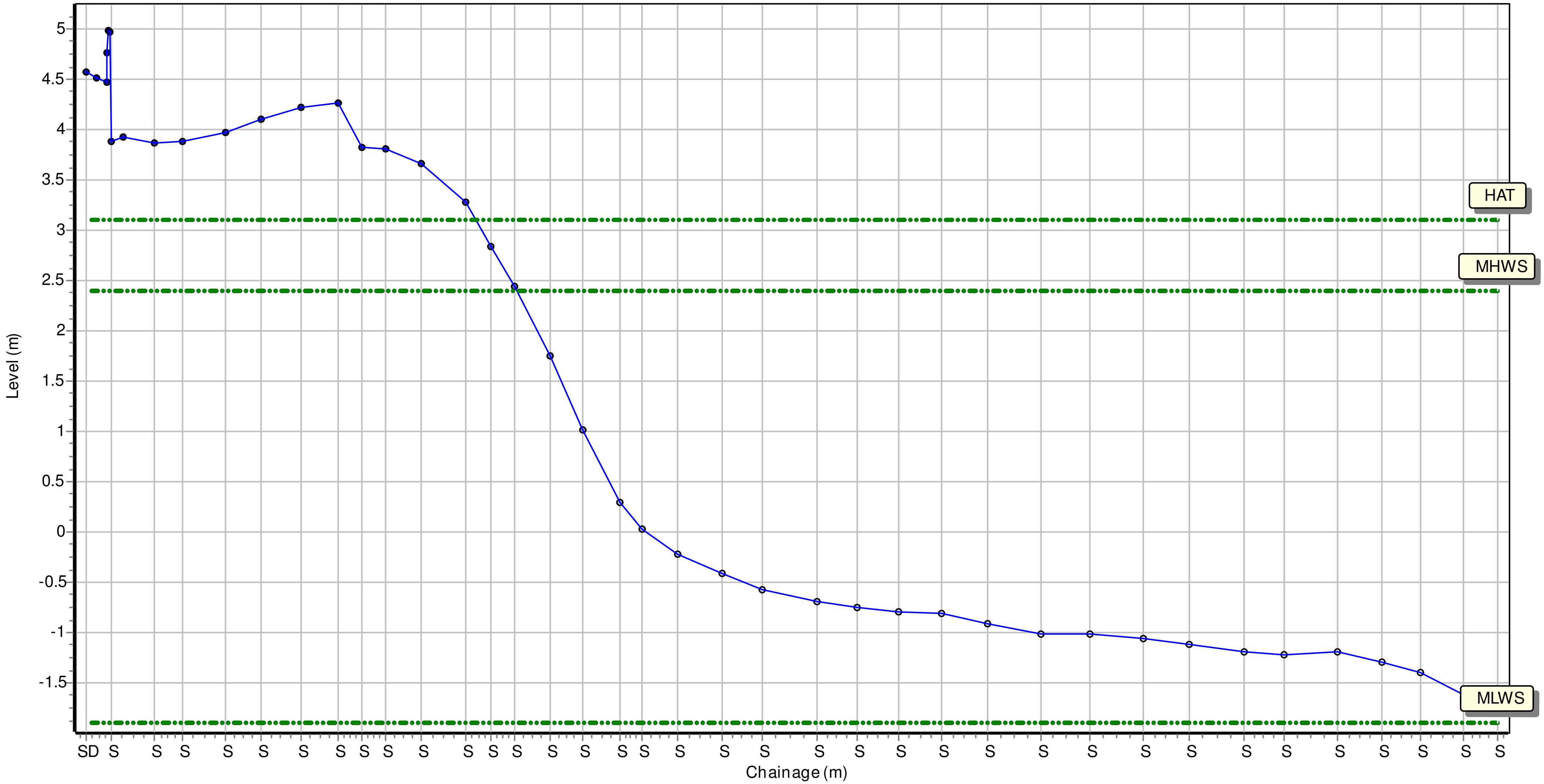
Location: **1aNWB17**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

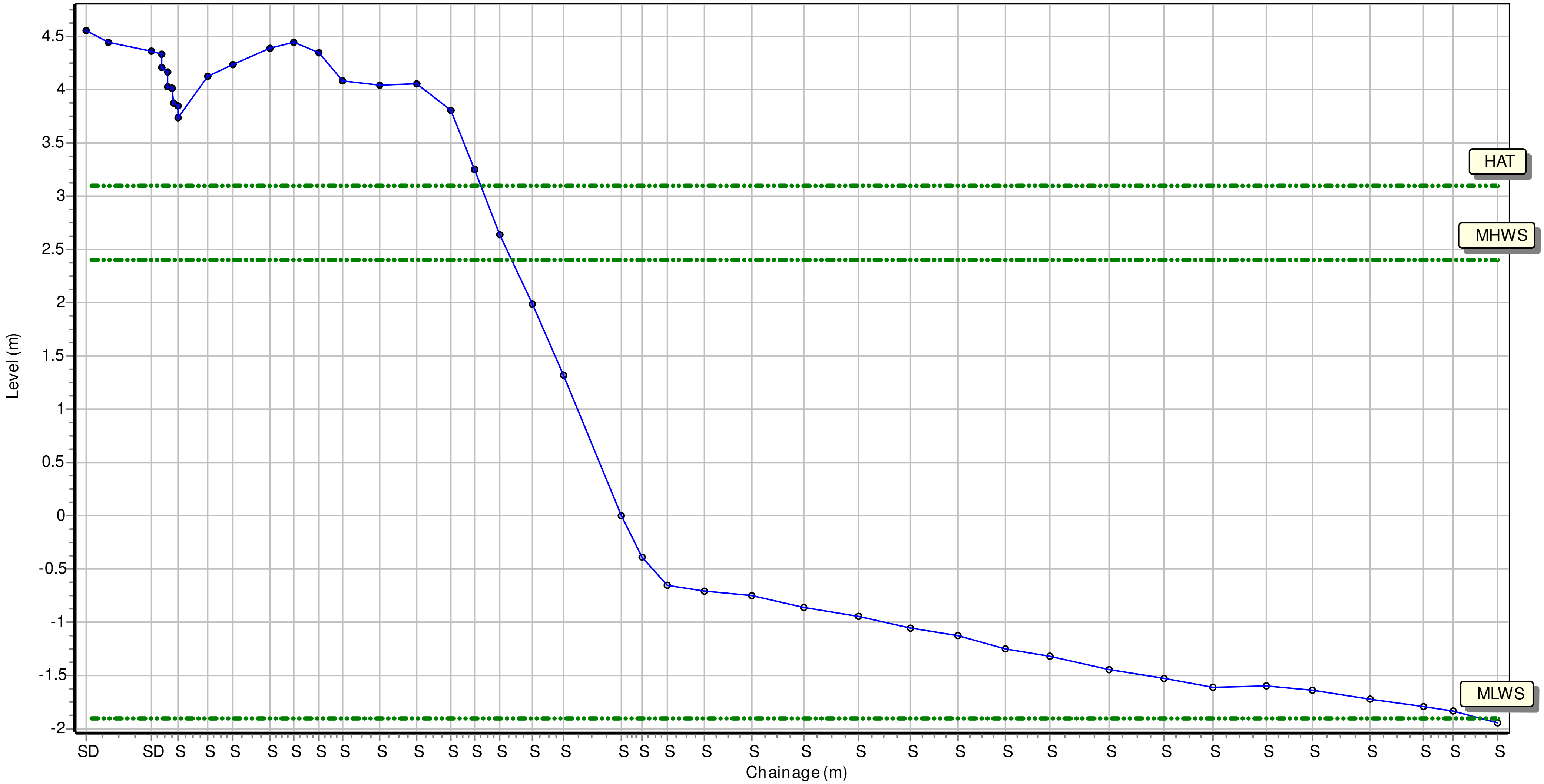
Location: 1aNWB18

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



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Beach Profile

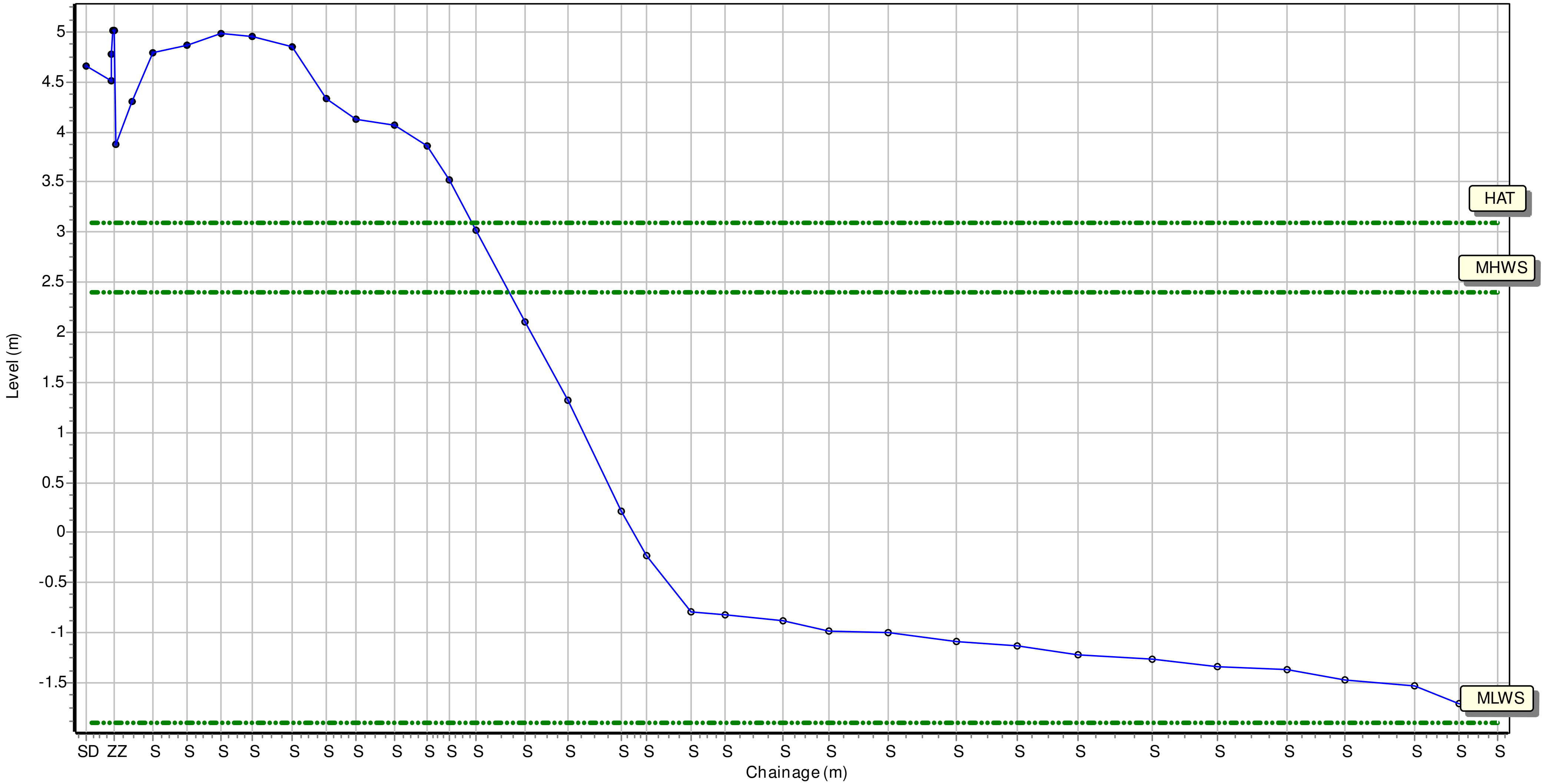
Location: **1aNWB19**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



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Beach Profile

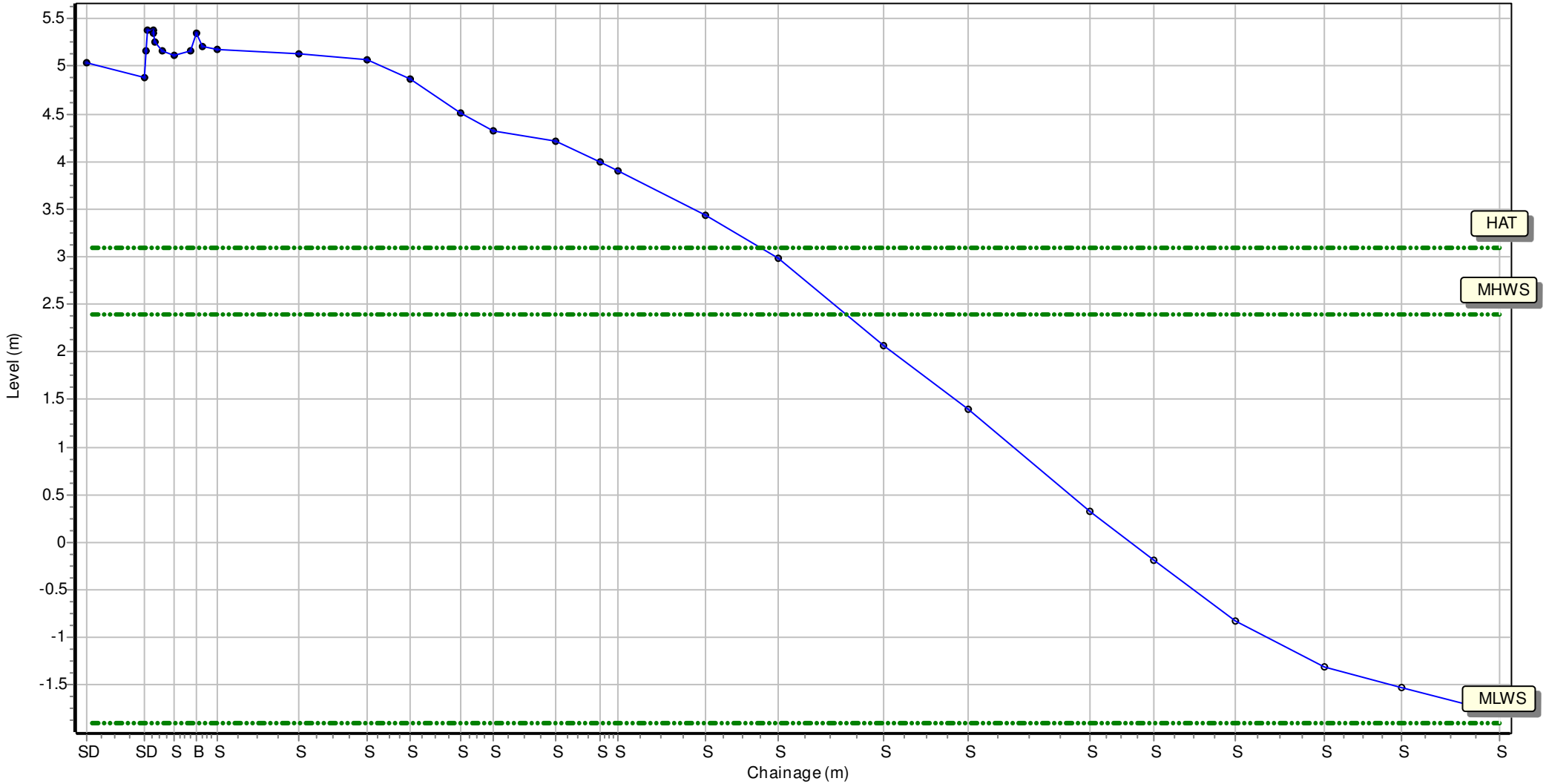
Location: **1aNWB20**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

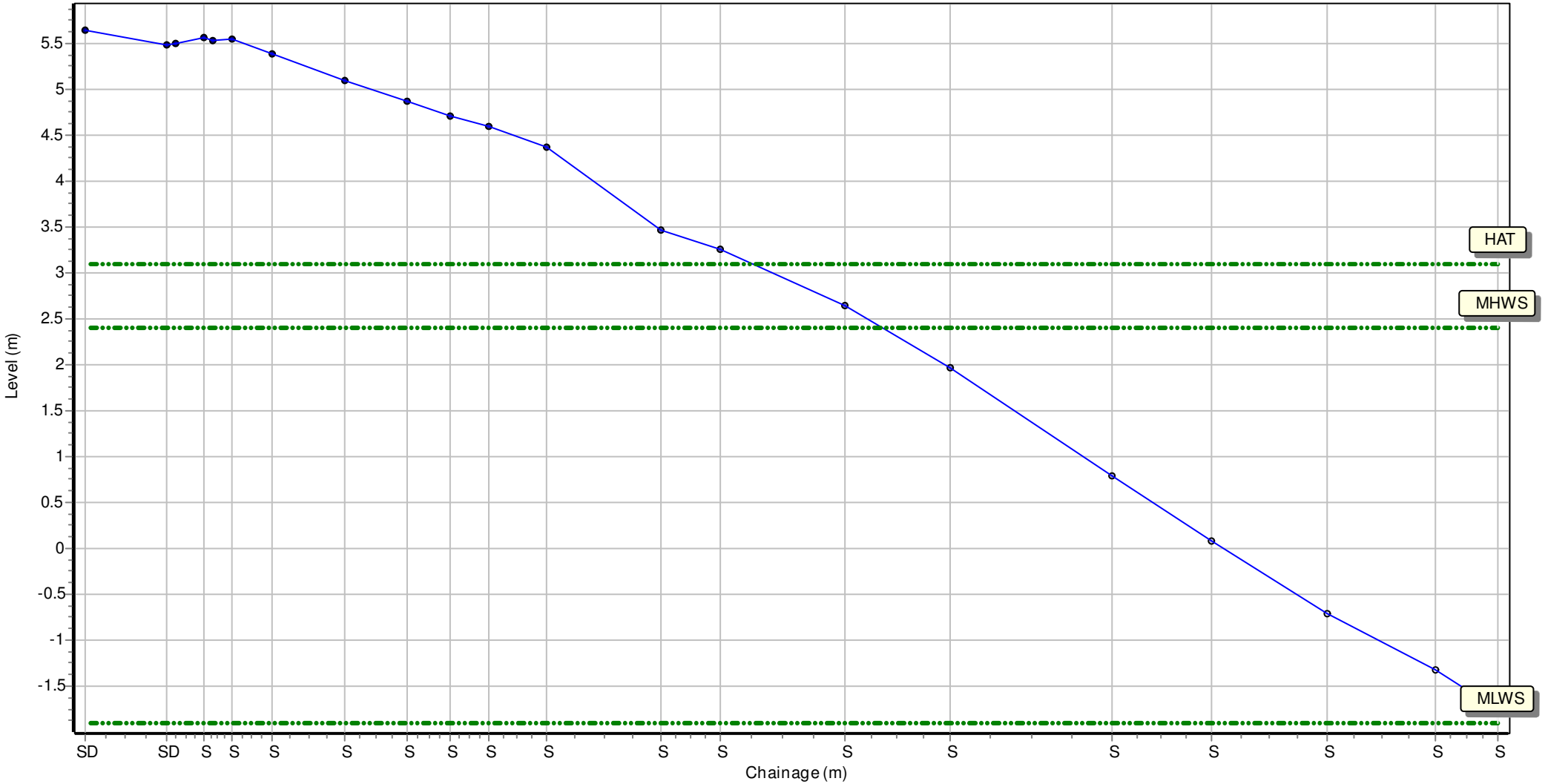
Location: **1aNWB21**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

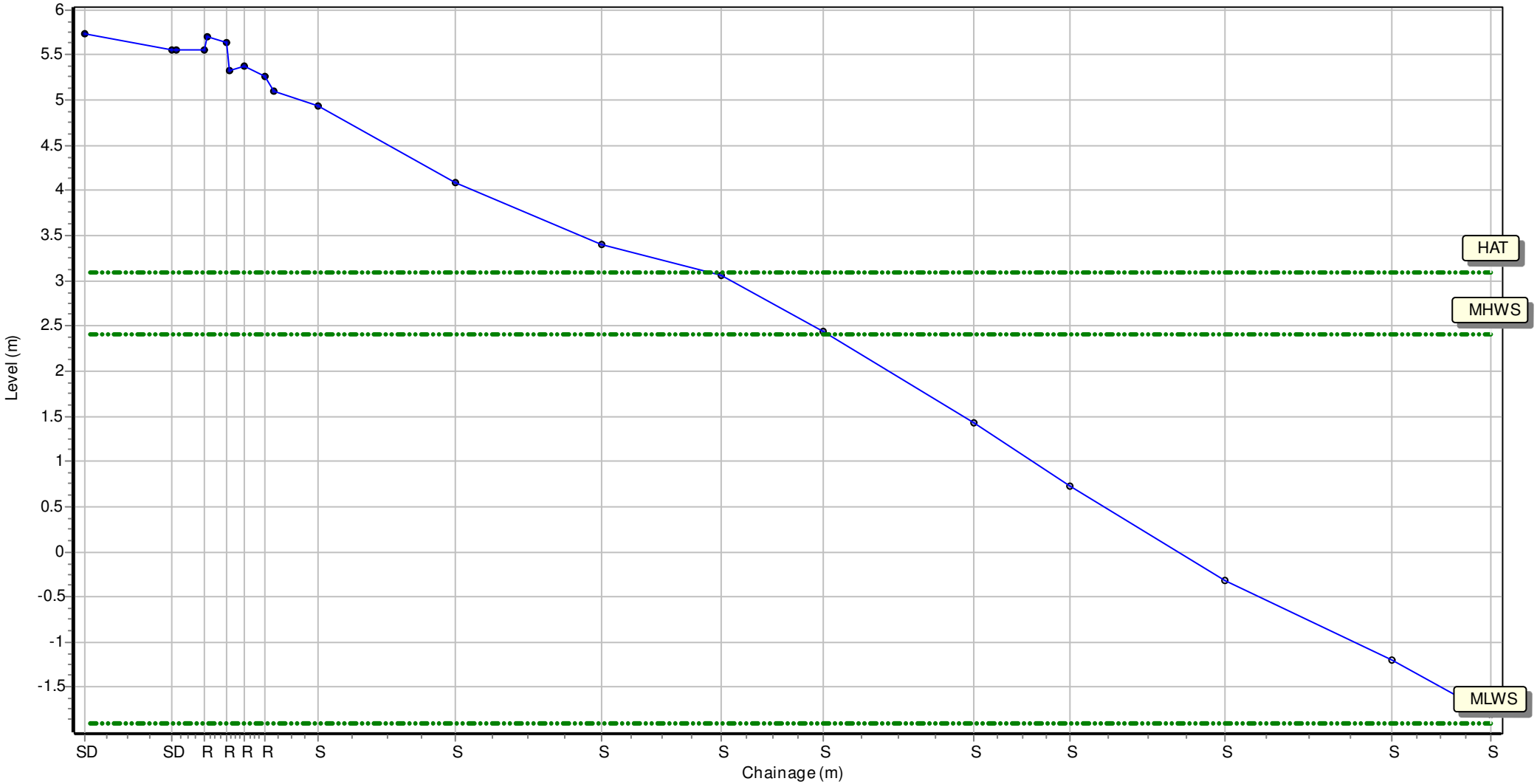
Location: **1aNWB22**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

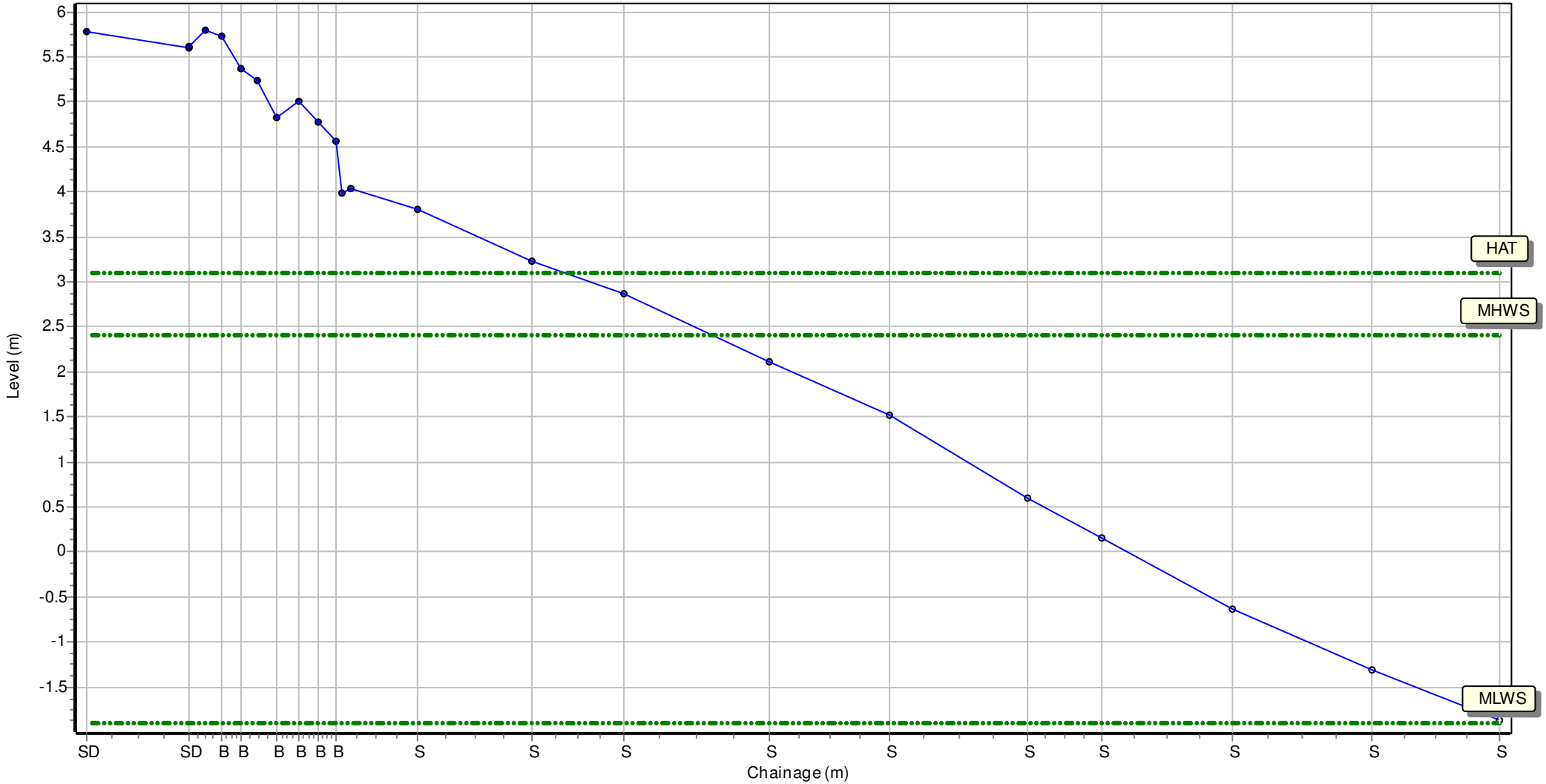
Location: **1aNWB23**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

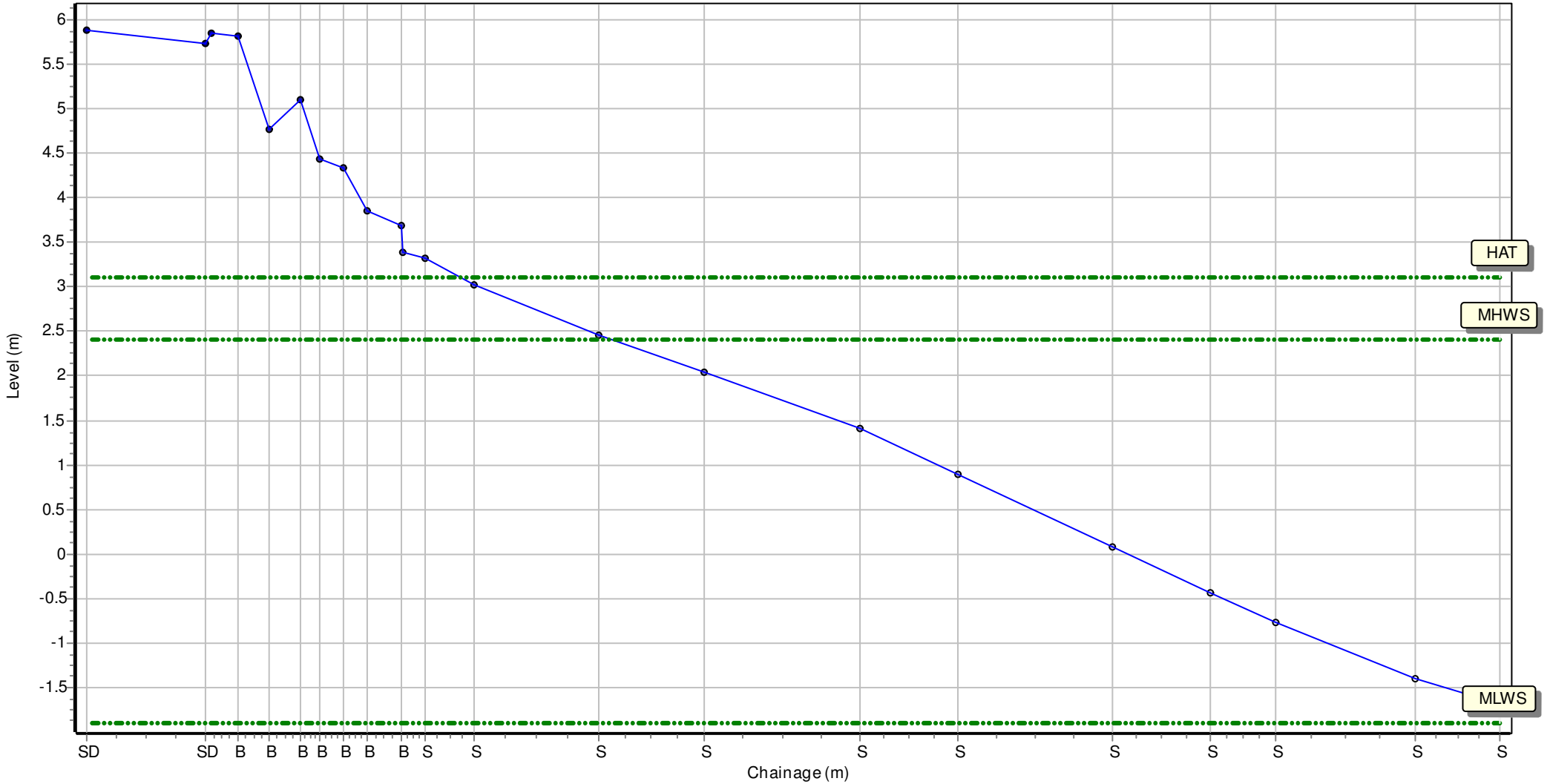
Location: **1aNWB24**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

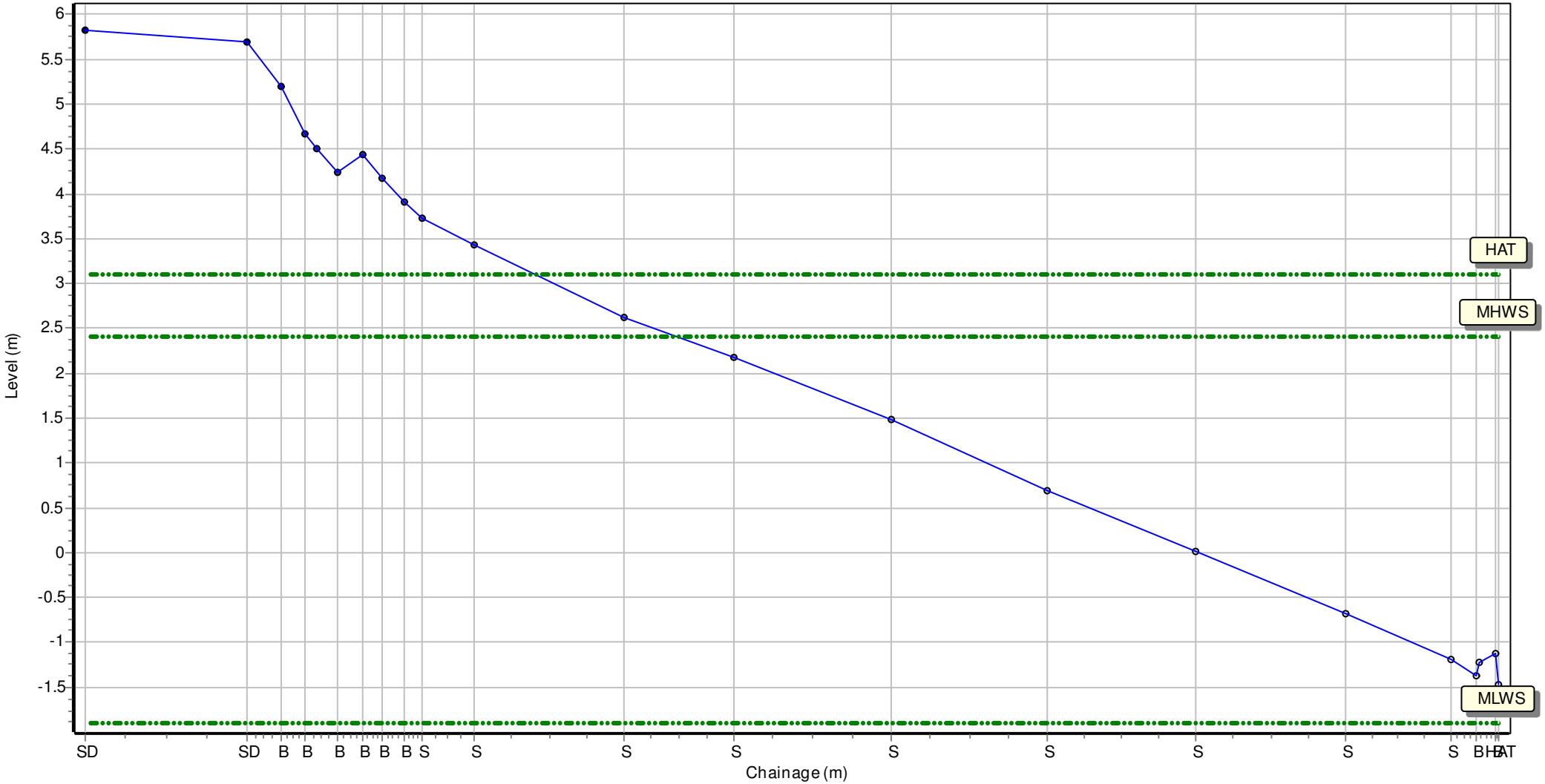
Location: **1aNWB25**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

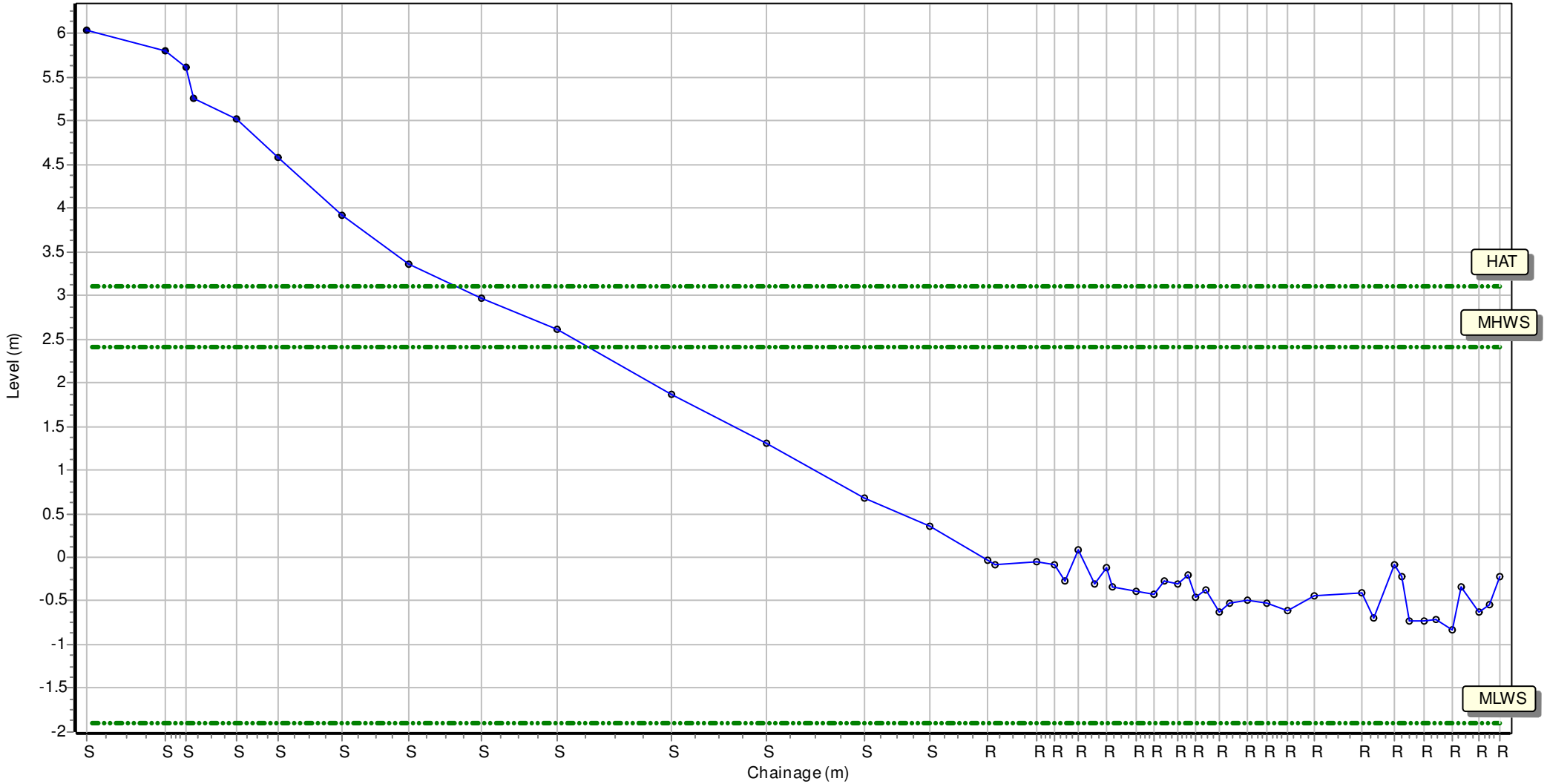
Location: **1aNWB26**

Date: 09/04/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

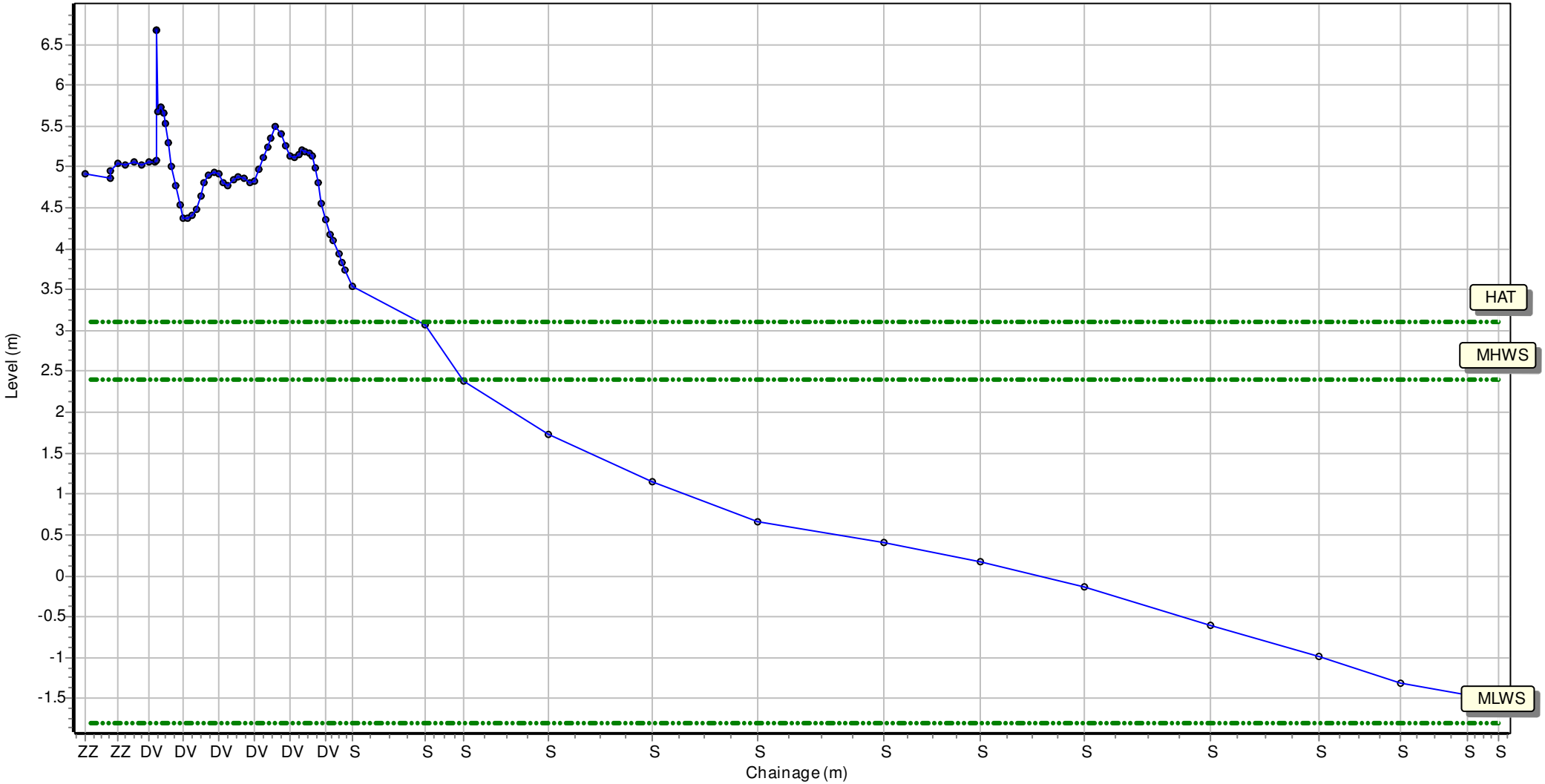
Location: **1aBVBC01**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

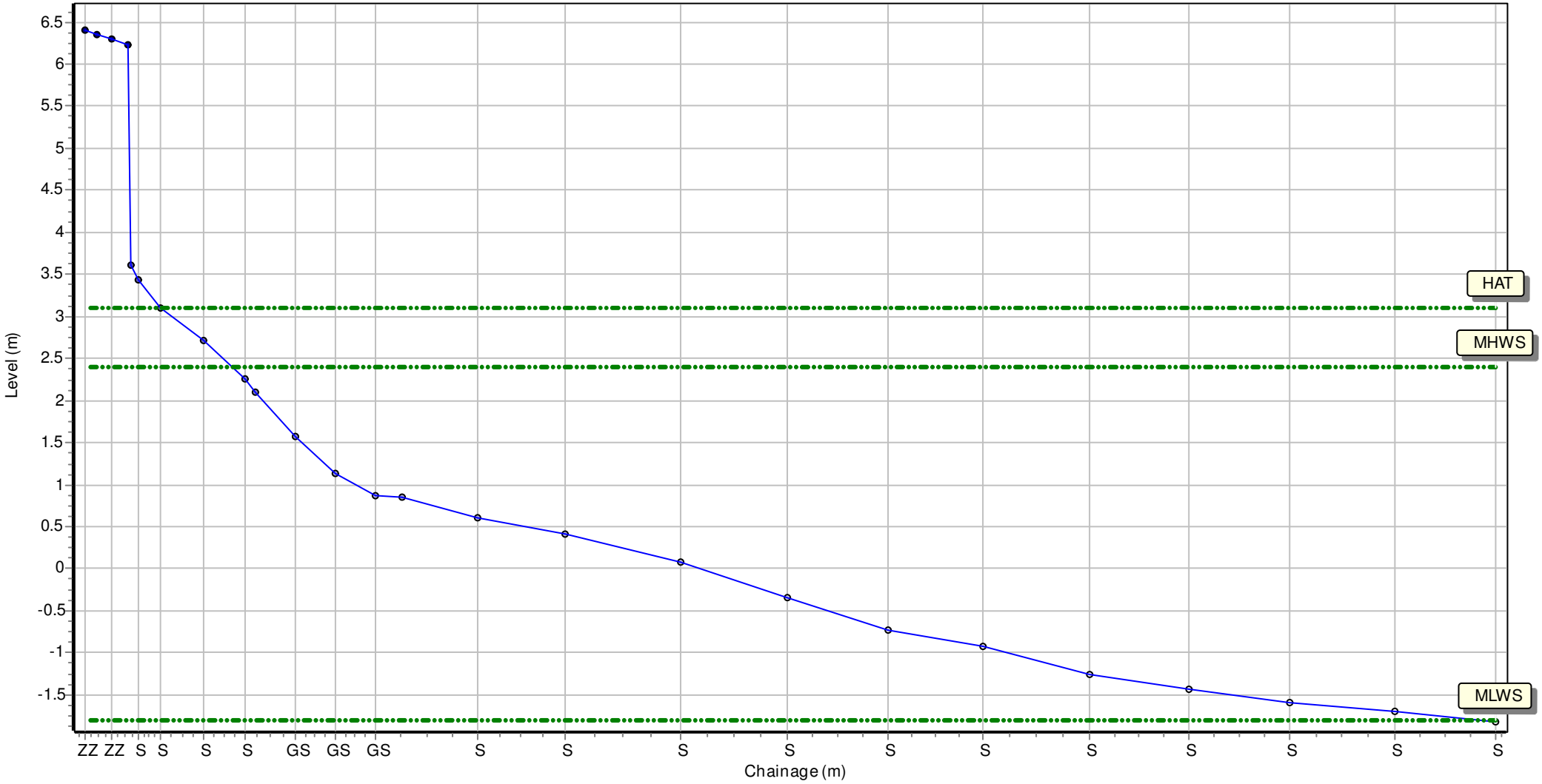
Location: **1aBVBC02**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

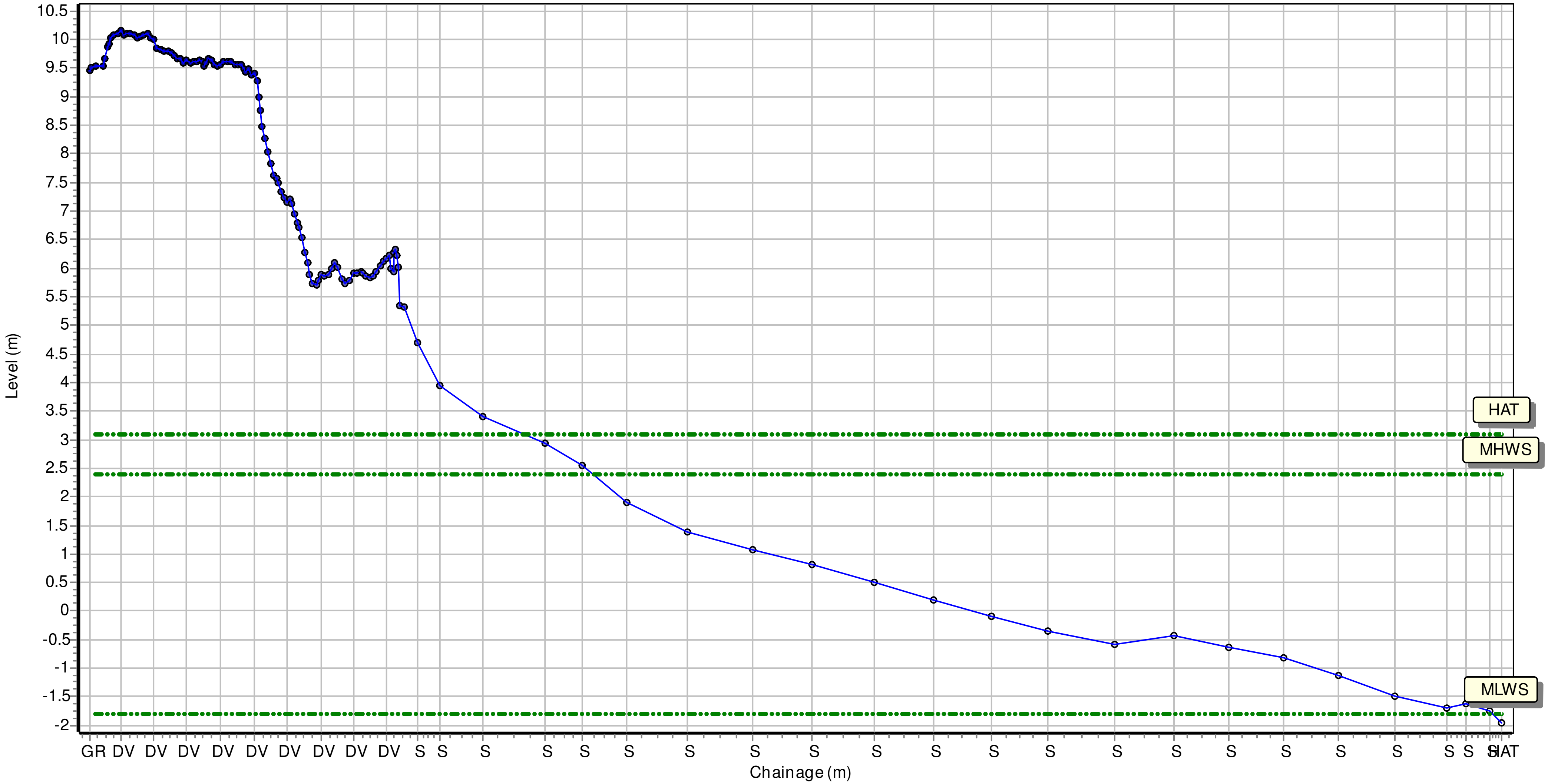
Location: **1aBVBC03**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



http://www.sandsuser.com

SANDS

Beach Profile

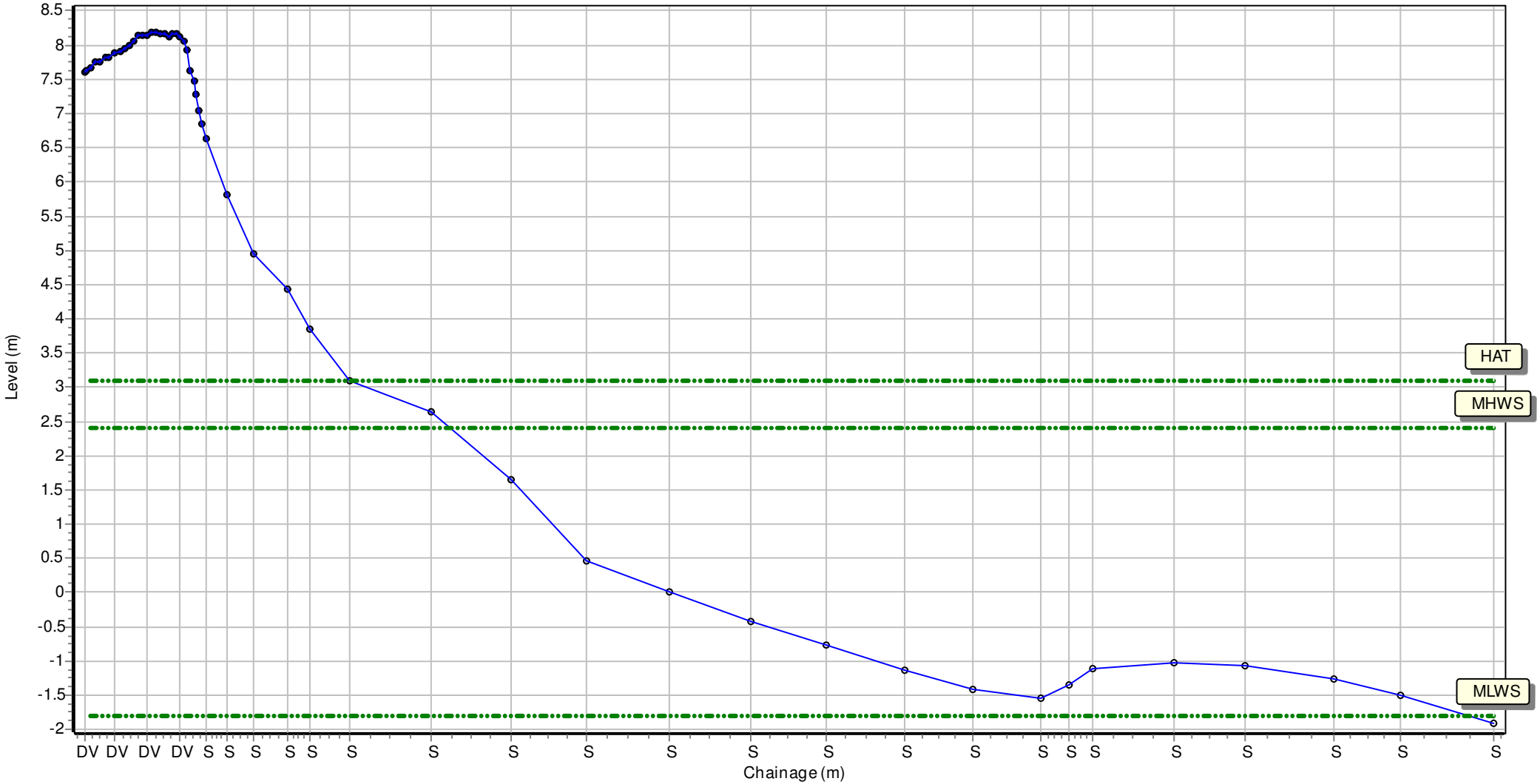
Location: **1aBVBC04**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

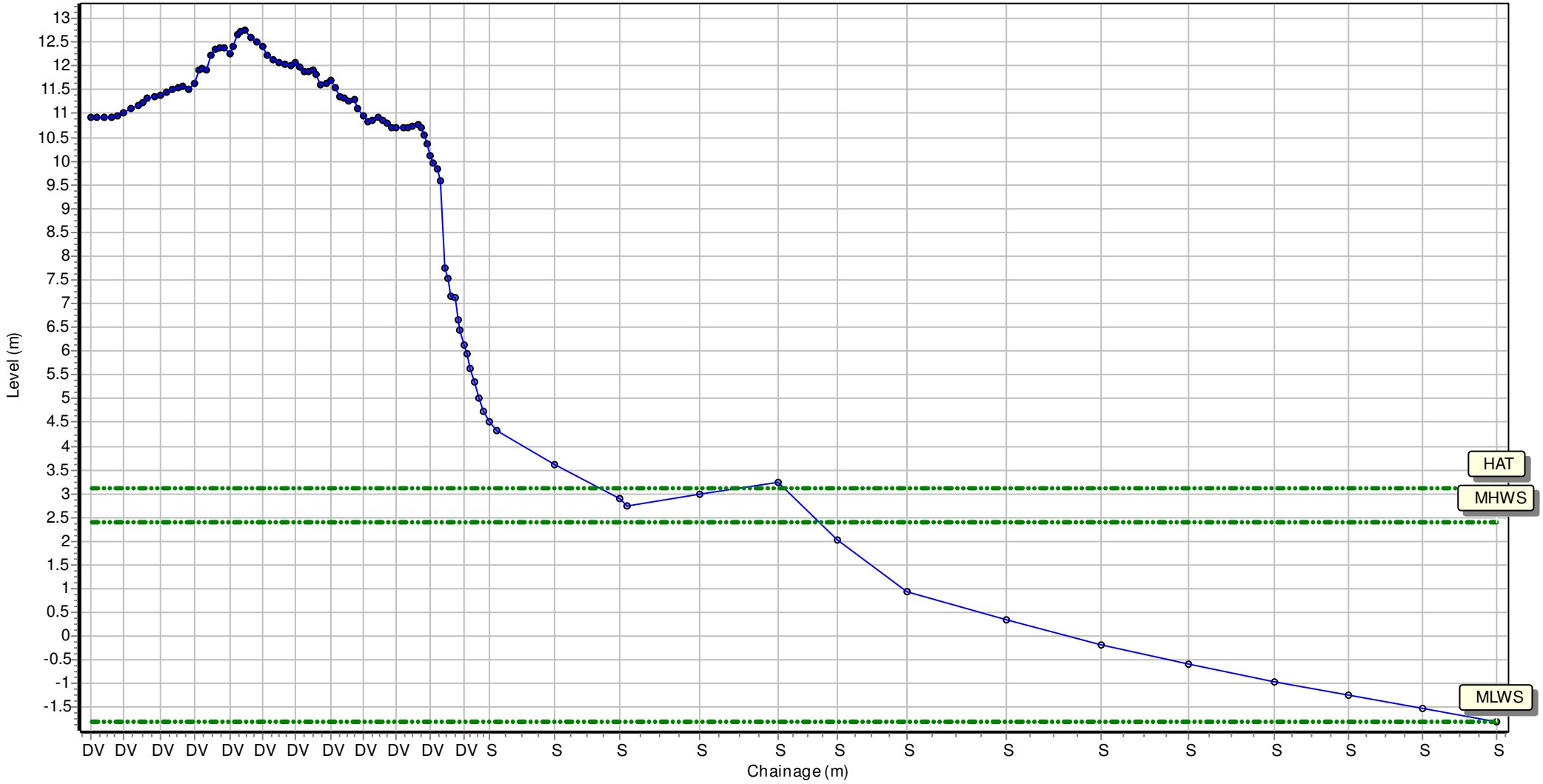
Location: **1aBVBC05**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

Summary: 2019 Partial Measures Topo Survey

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



Beach Profile

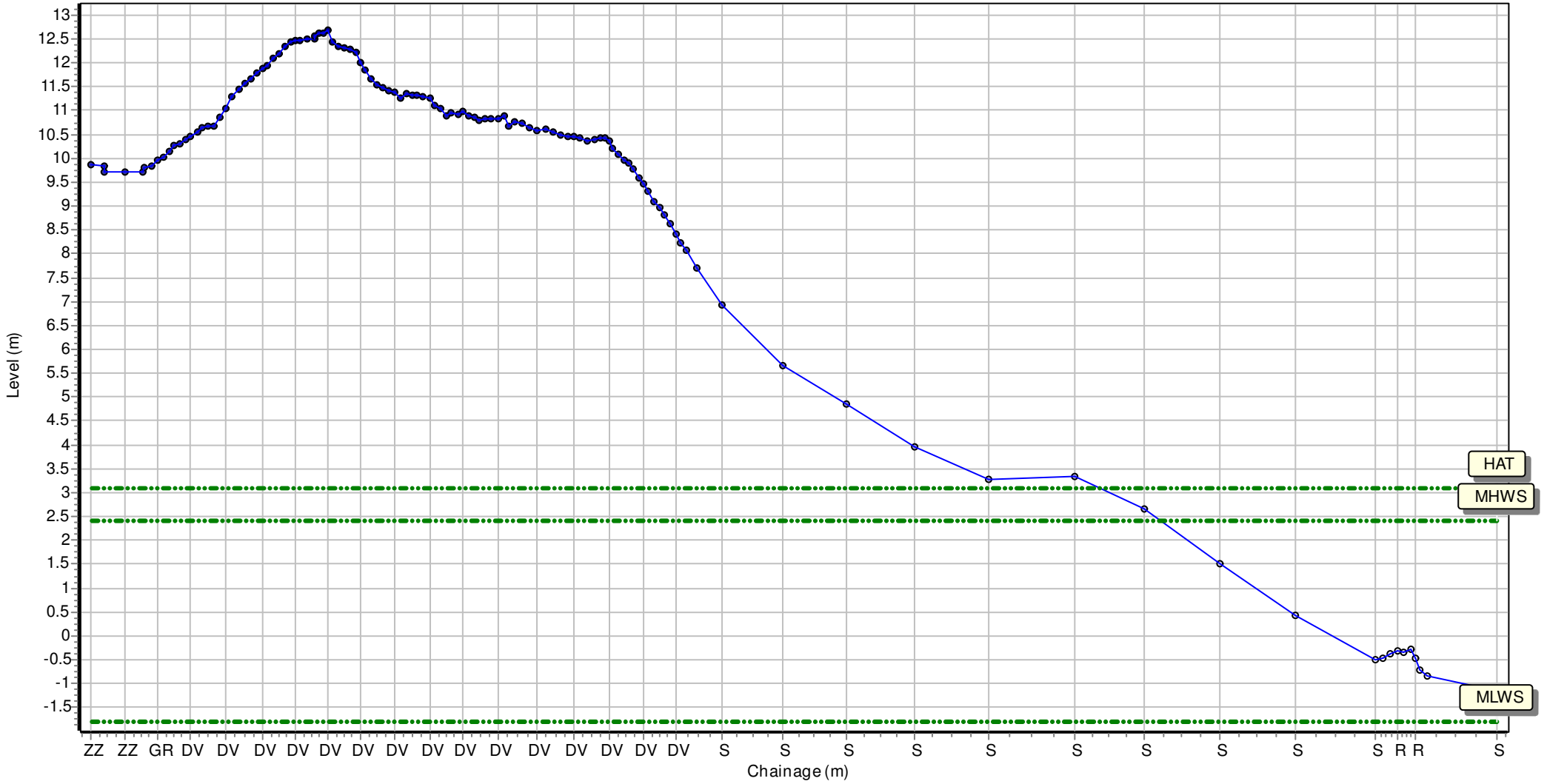
Location: **1aBVBC06**

Date: 20/02/2019 **Inspector:** AG **Low Tide:** **Low Tide Time:**

Wind **Sea State:** **Visibility:** **Rain:**

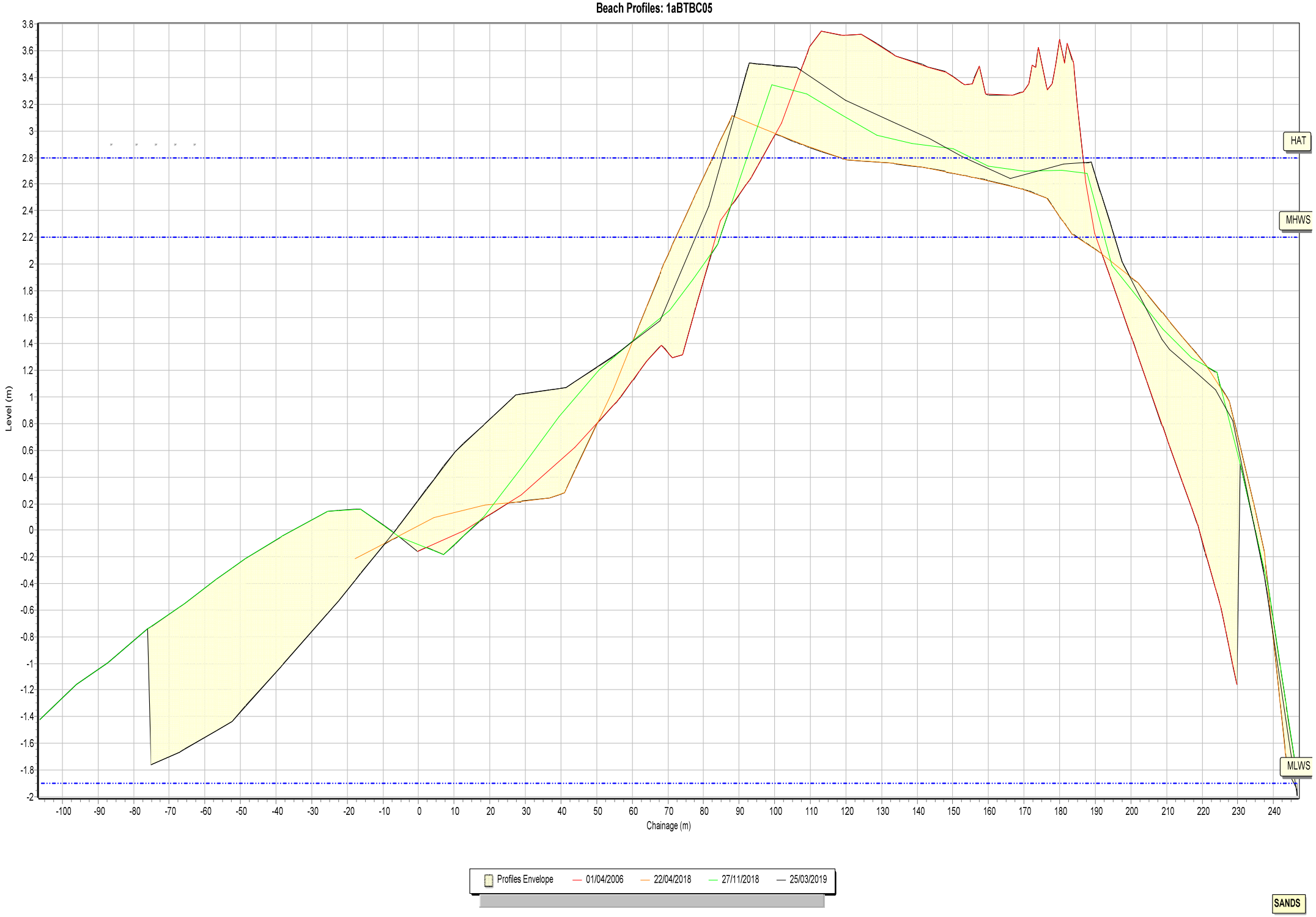
Summary: 2019 Partial Measures Topo Survey

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




Beach Profiles: 1aBTBC02
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/04/2006
22/04/2018
27/11/2018
25/03/2019
SANDS


Beach Profiles: 1aBTBC04
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/04/2006
22/04/2018
27/11/2018
25/03/2019
SANDS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Chainage (m)
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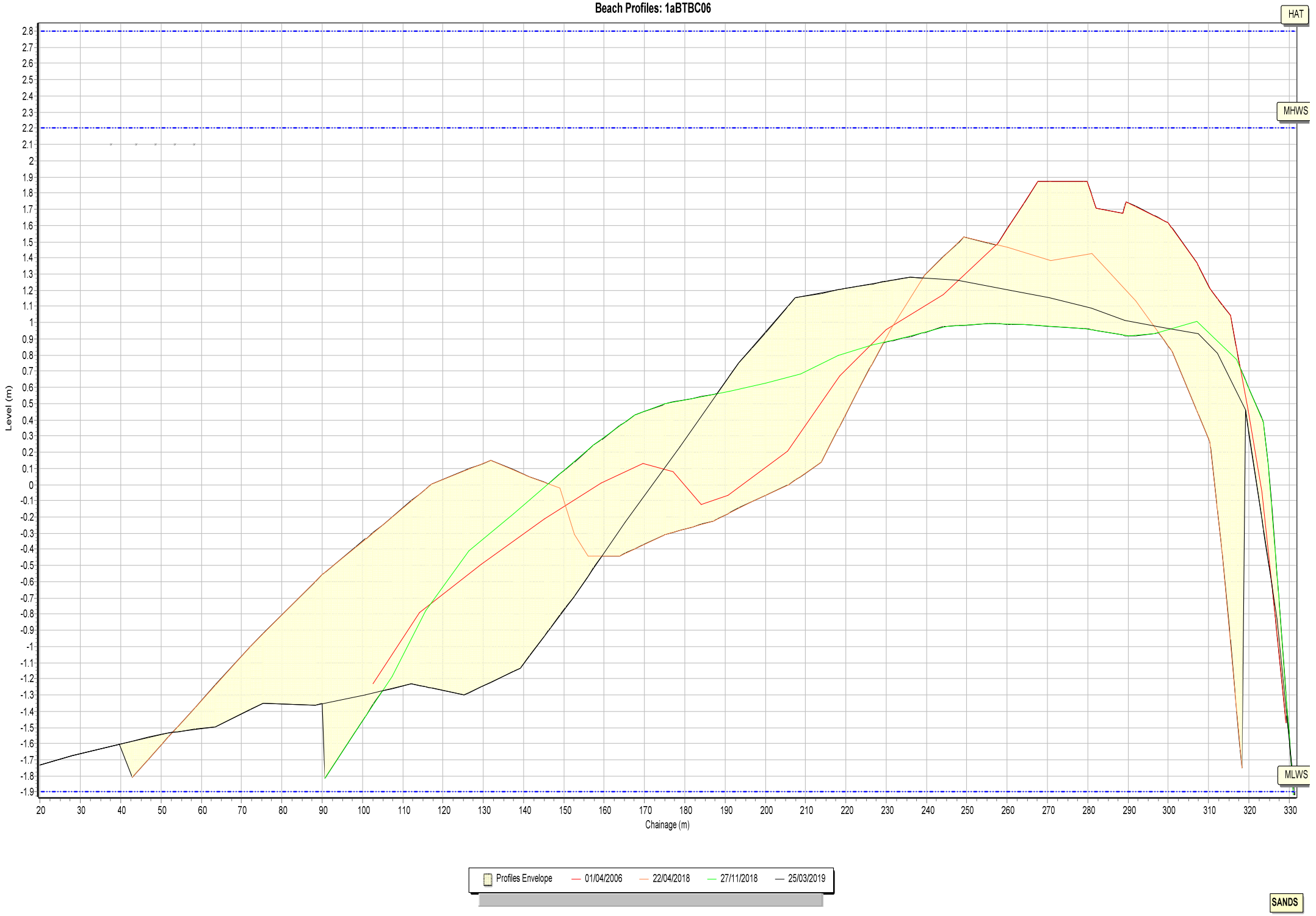
MHWS
MLWS
Profiles Envelope
01/04/2006
22/04/2018
27/11/2018
25/03/2019
SANDS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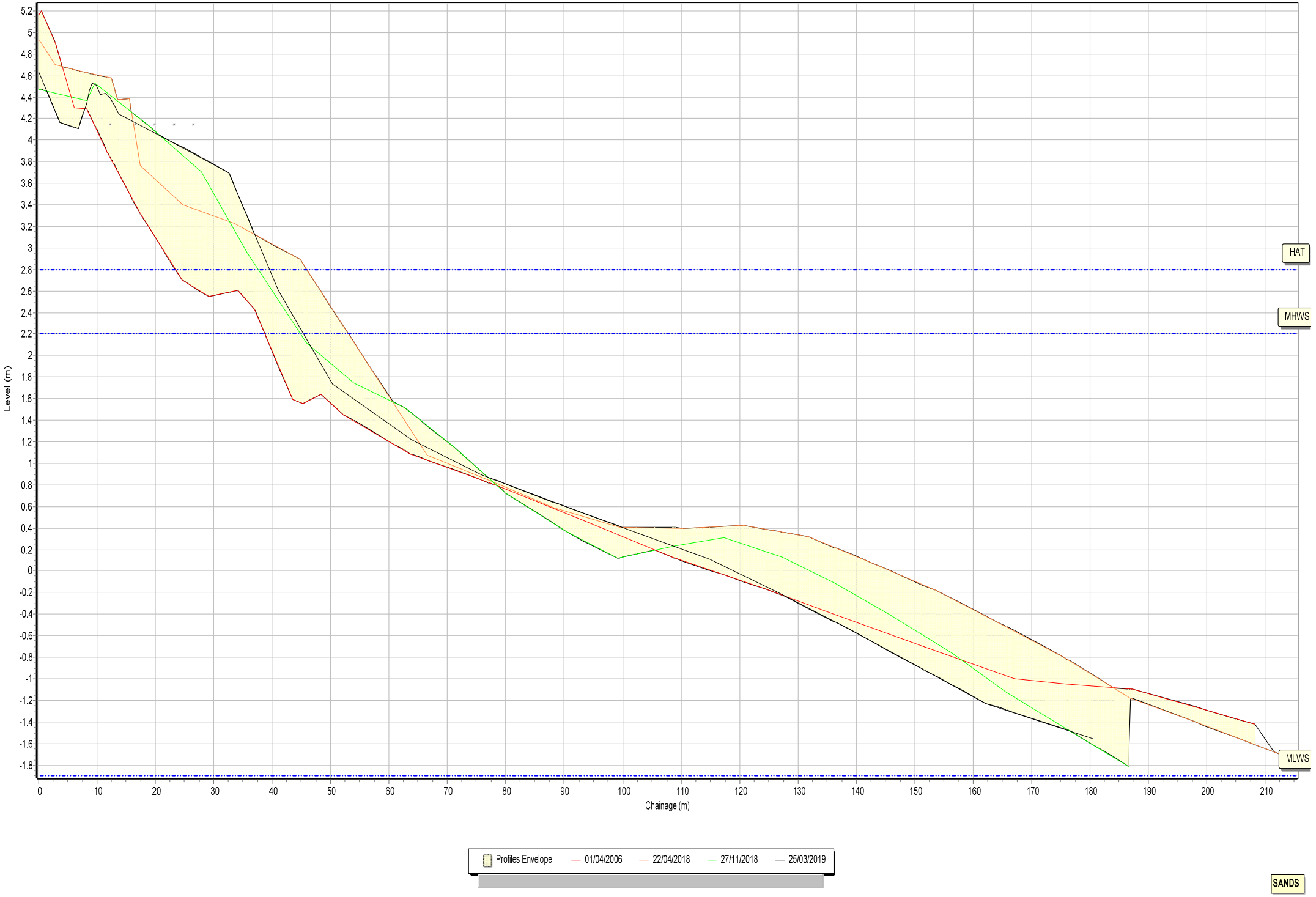
MHWS
MLWS
SANDS
Level (m)
Chainage (m)
Profiles Envelope
01/04/2006
22/04/2018
27/11/2018
25/03/2019

Beach Profiles: 1aBTBC11




Beach Profiles: 1aBTBC13
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Chainage (m)
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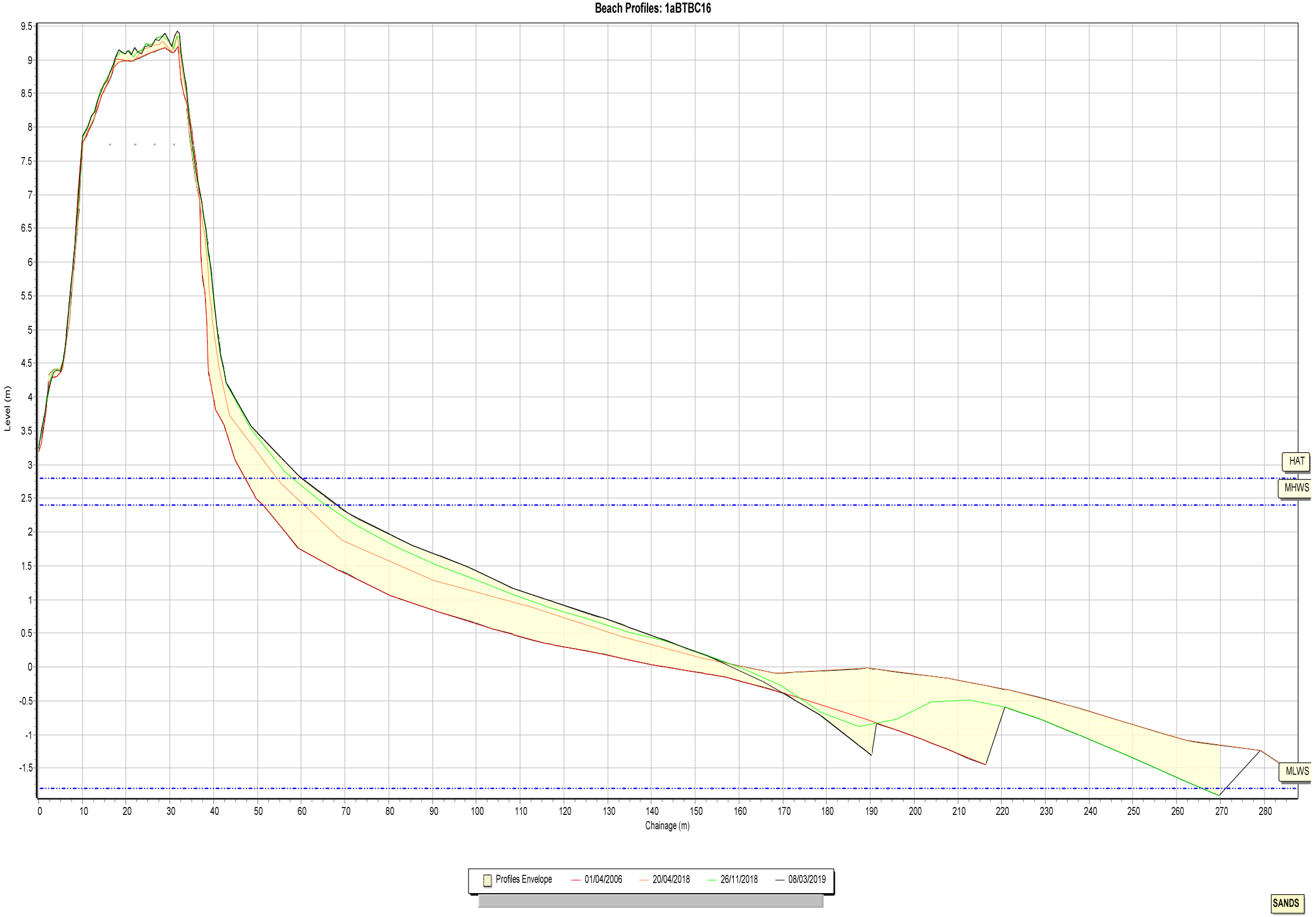
MHWS
MLWS
Profiles Envelope
01/04/2006
22/04/2018
27/11/2018
25/03/2019
SANDS


Beach Profiles: 1aBTBC16
Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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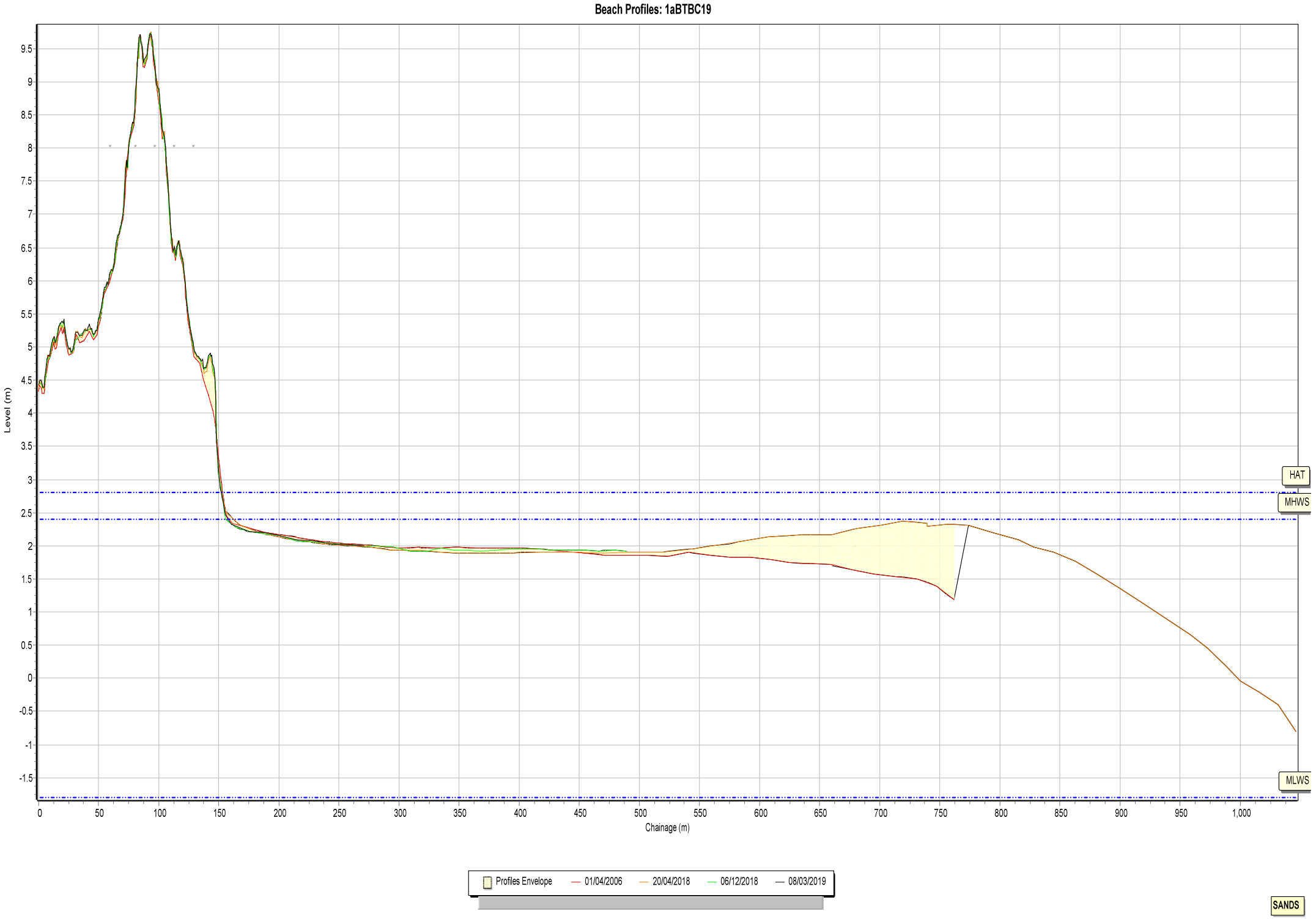
20/04/2018
26/11/2018
08/03/2019
SANDS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4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
HAT
MHWS
MLWS
0
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550
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700
750
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850
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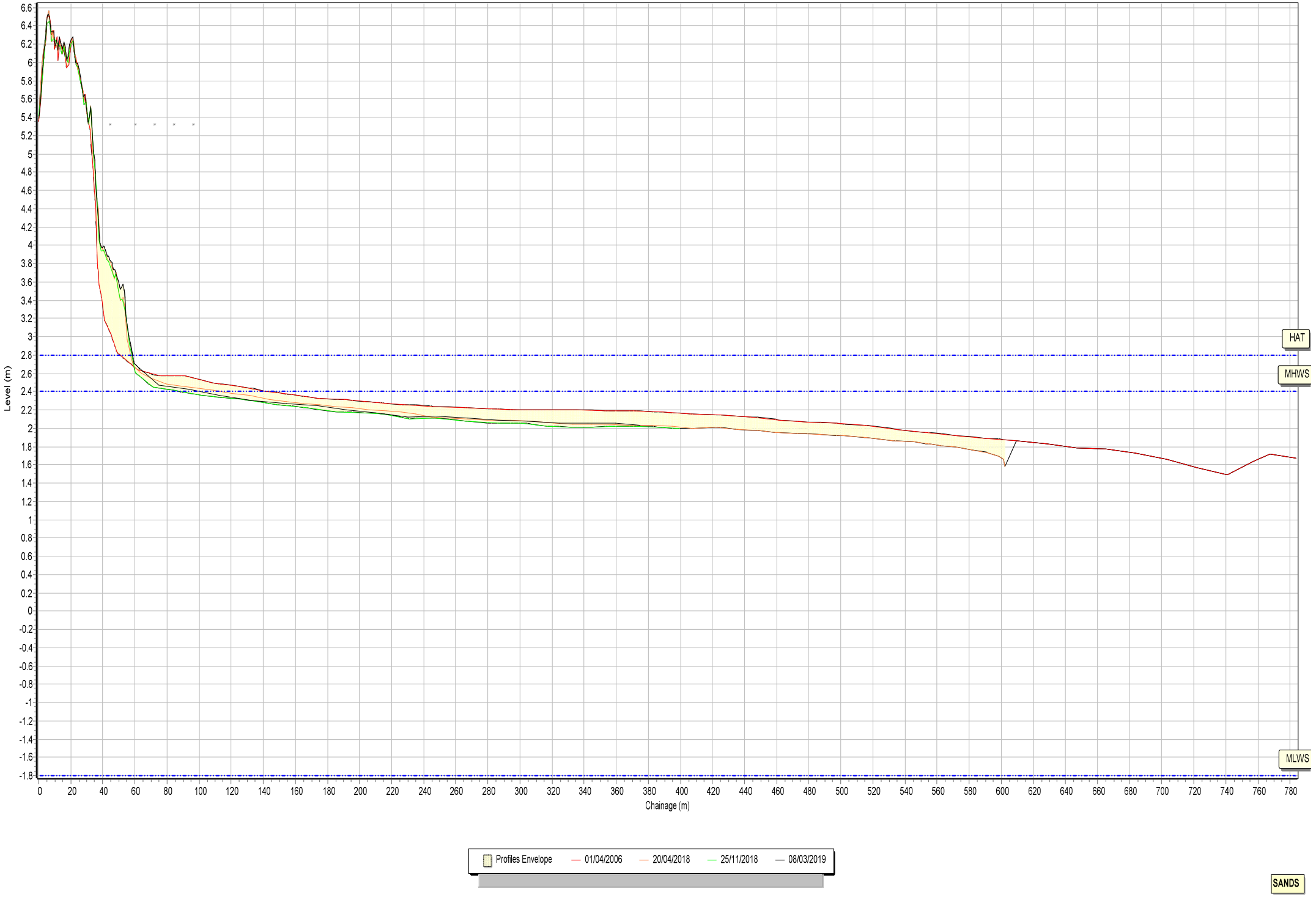
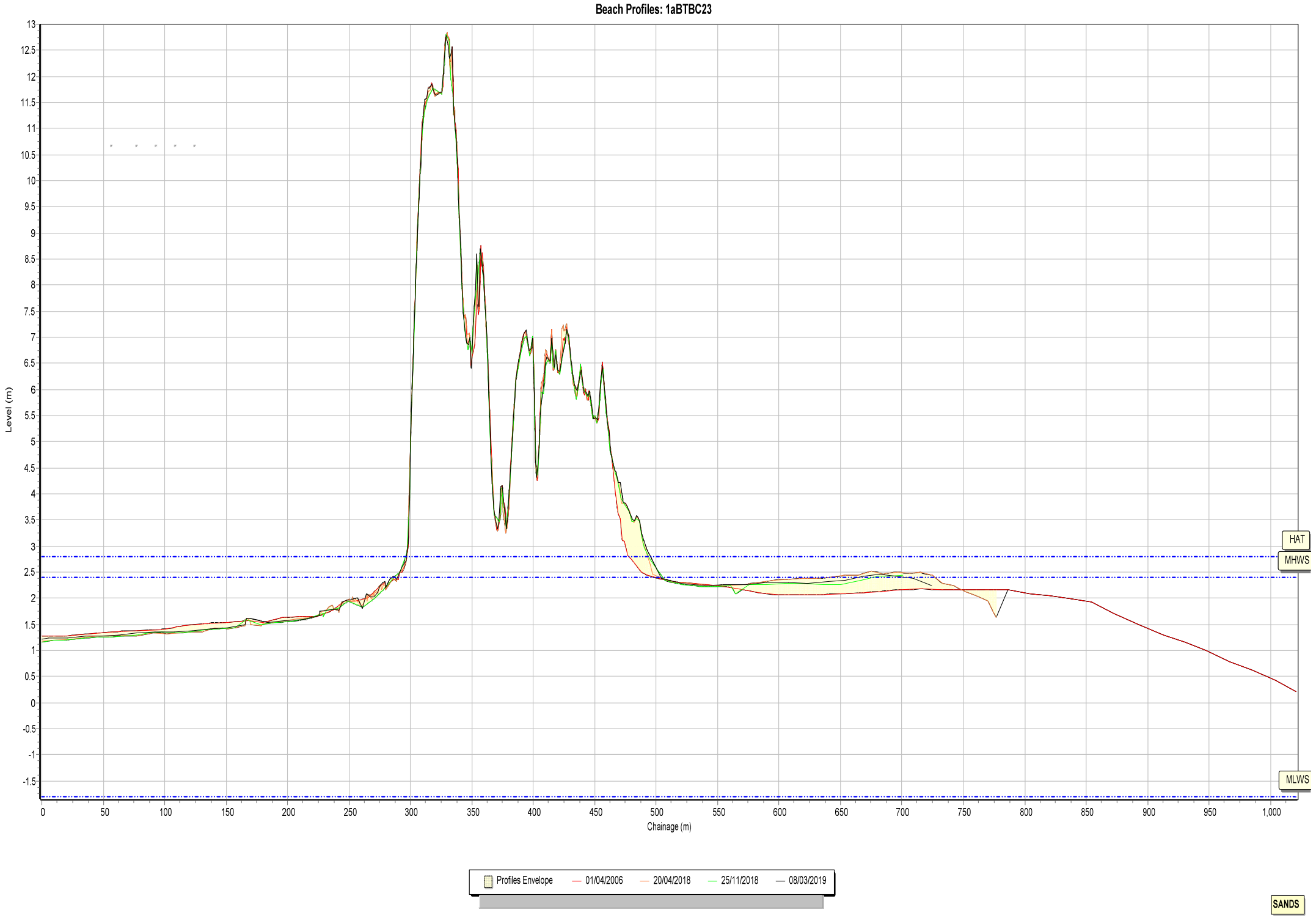
Chainage (m)
Profiles Envelope
01/04/2006
20/04/2018
06/12/2018
08/03/2019
SANDS

Beach Profiles: 1aBTBC21

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7
6.5
6
5.5
5
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3
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2
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1
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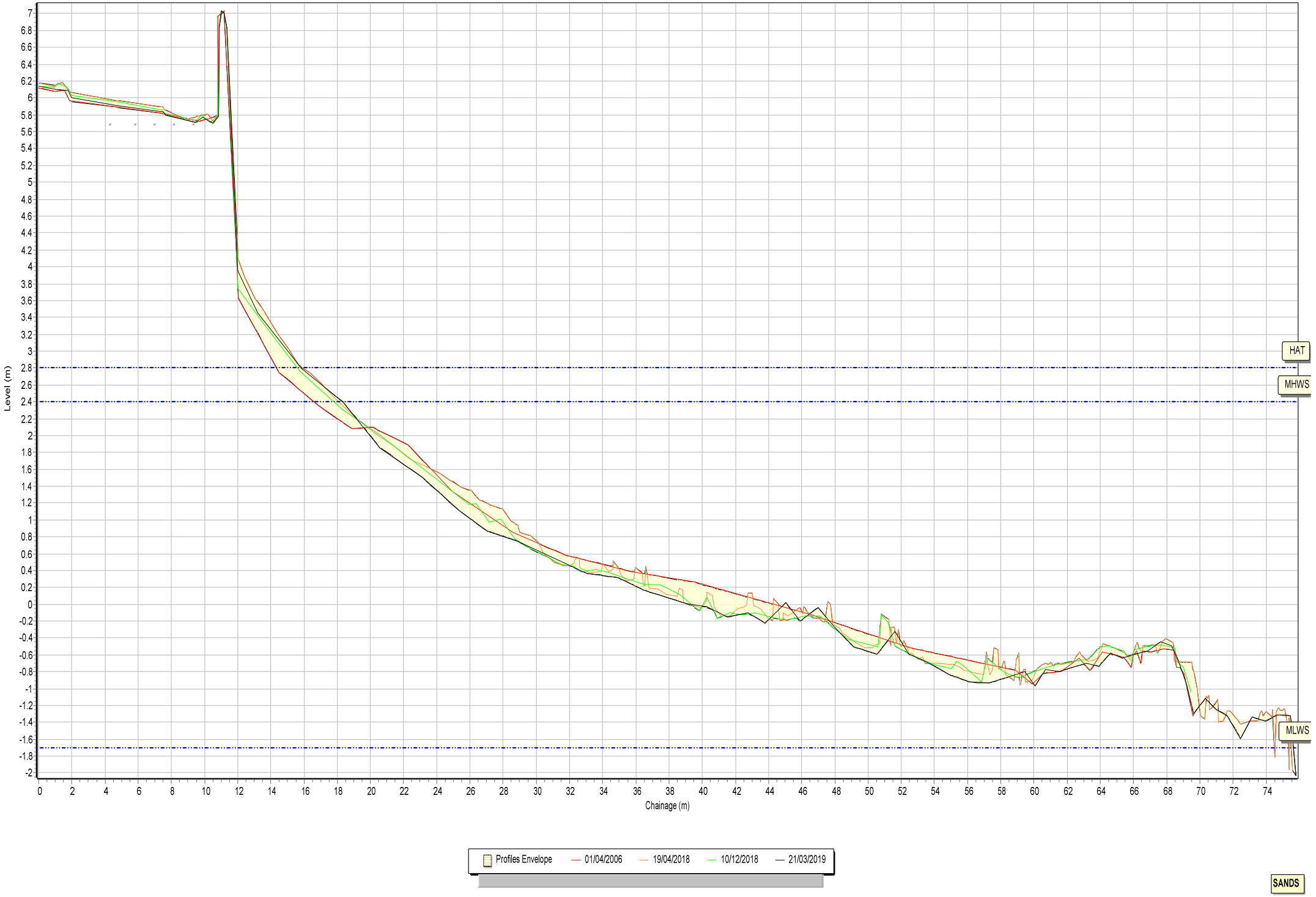
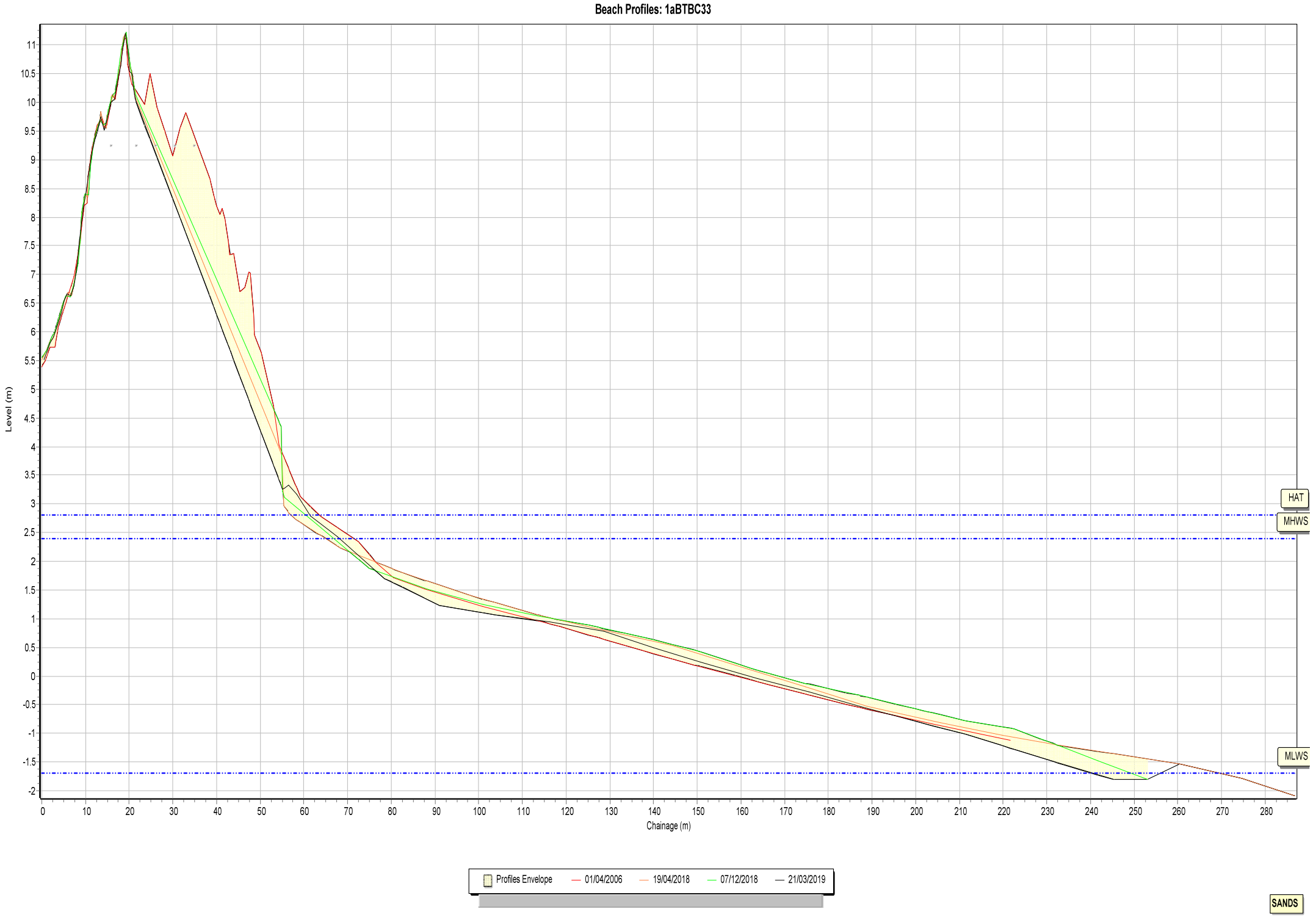
950
1,000
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/04/2006
20/04/2018
25/11/2018
08/03/2019
SANDS

Beach Profiles: 1aBTBC31

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Level (m)
Chainage (m)
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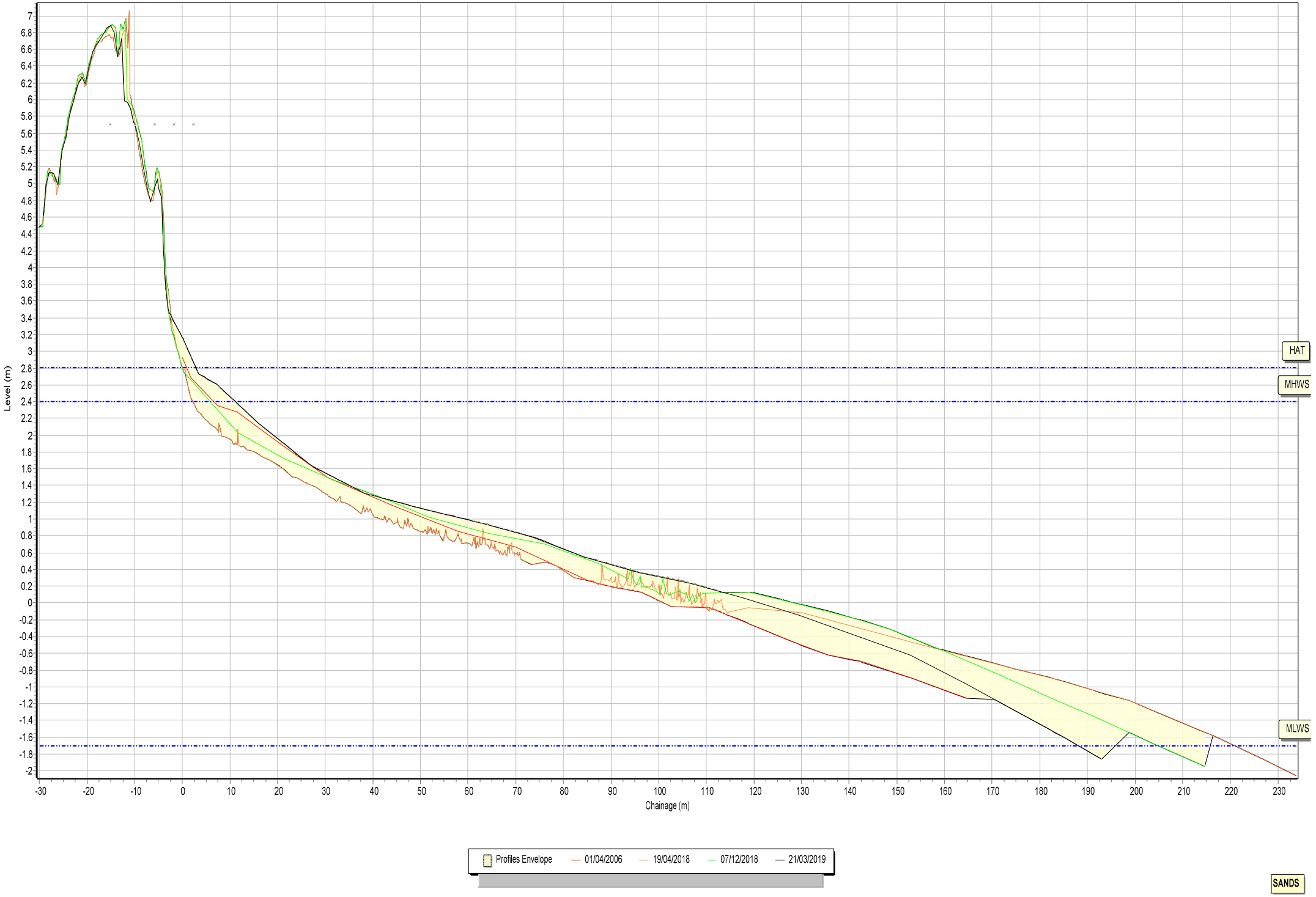
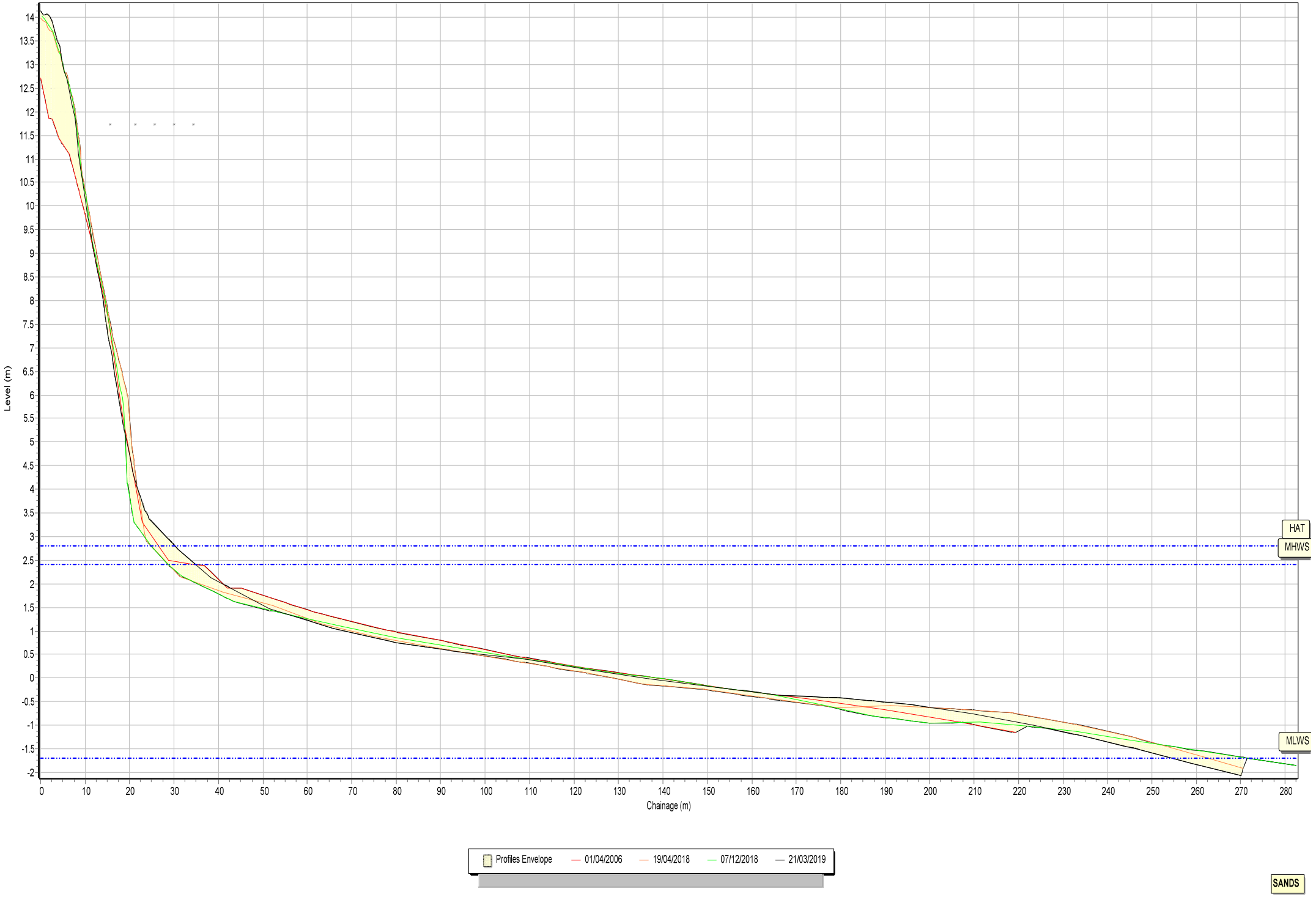
MHWS
MLWS
Profiles Envelope
01/04/2006
19/04/2018
07/12/2018
21/03/2019
SANDS

Beach Profiles: 1aBTBC34



Beach Profiles: 1aBTBC37




Beach Profiles: 1aADC01
Level (m)
Chainage (m)
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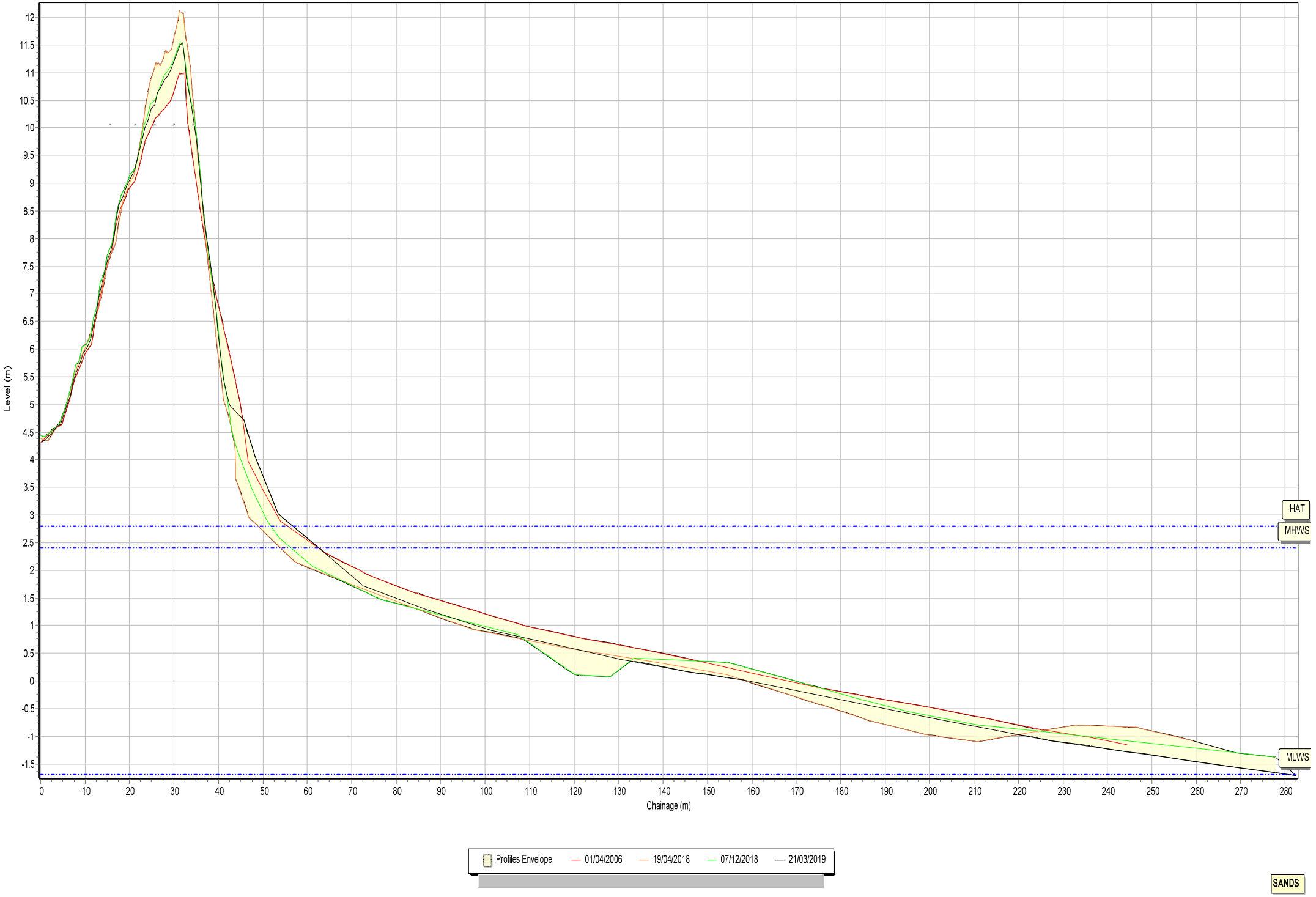
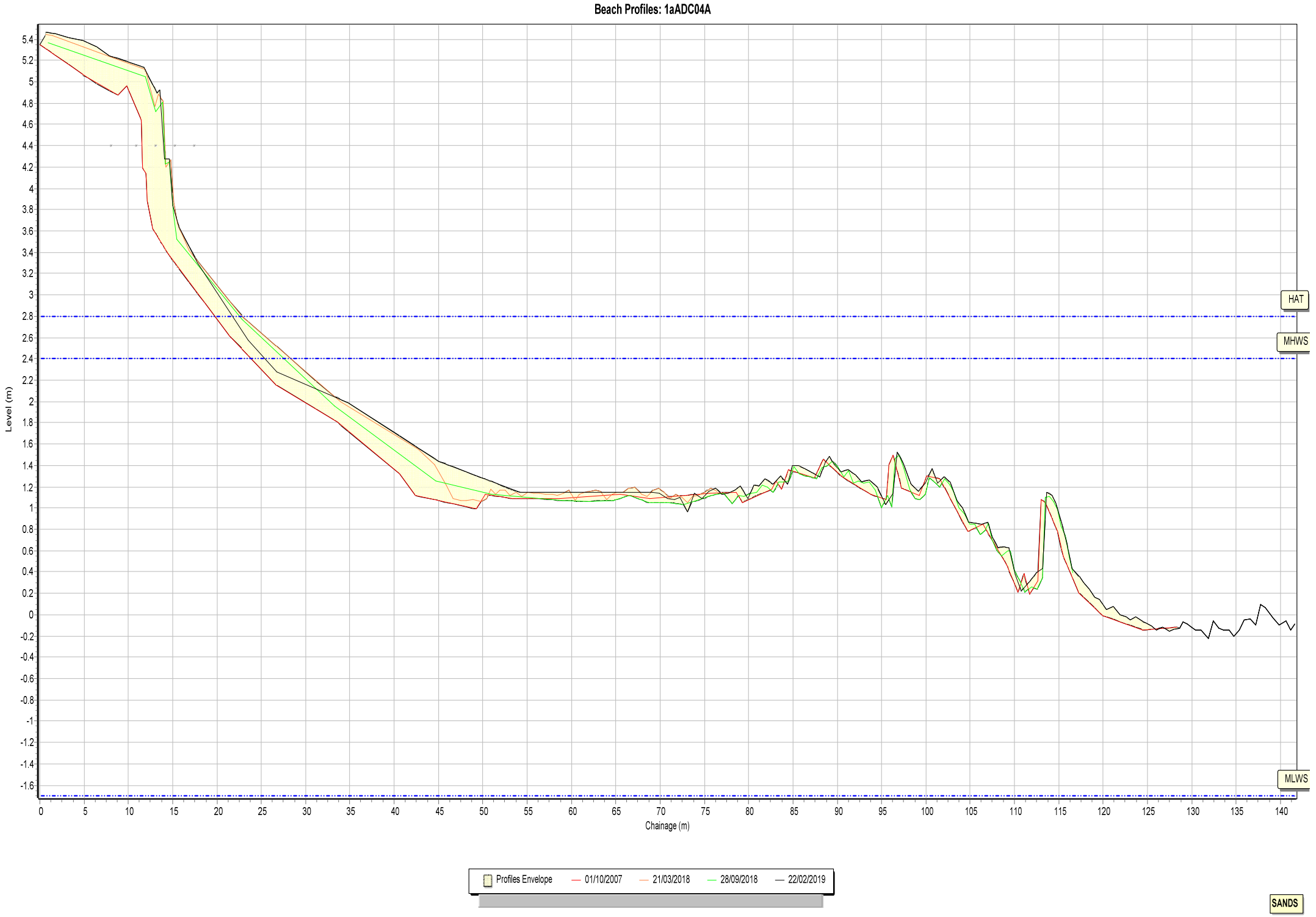
MHWS
MLWS
Profiles Envelope
01/04/2006
19/04/2018
07/12/2018
21/03/2019
SANDS

Beach Profiles: 1aADC02

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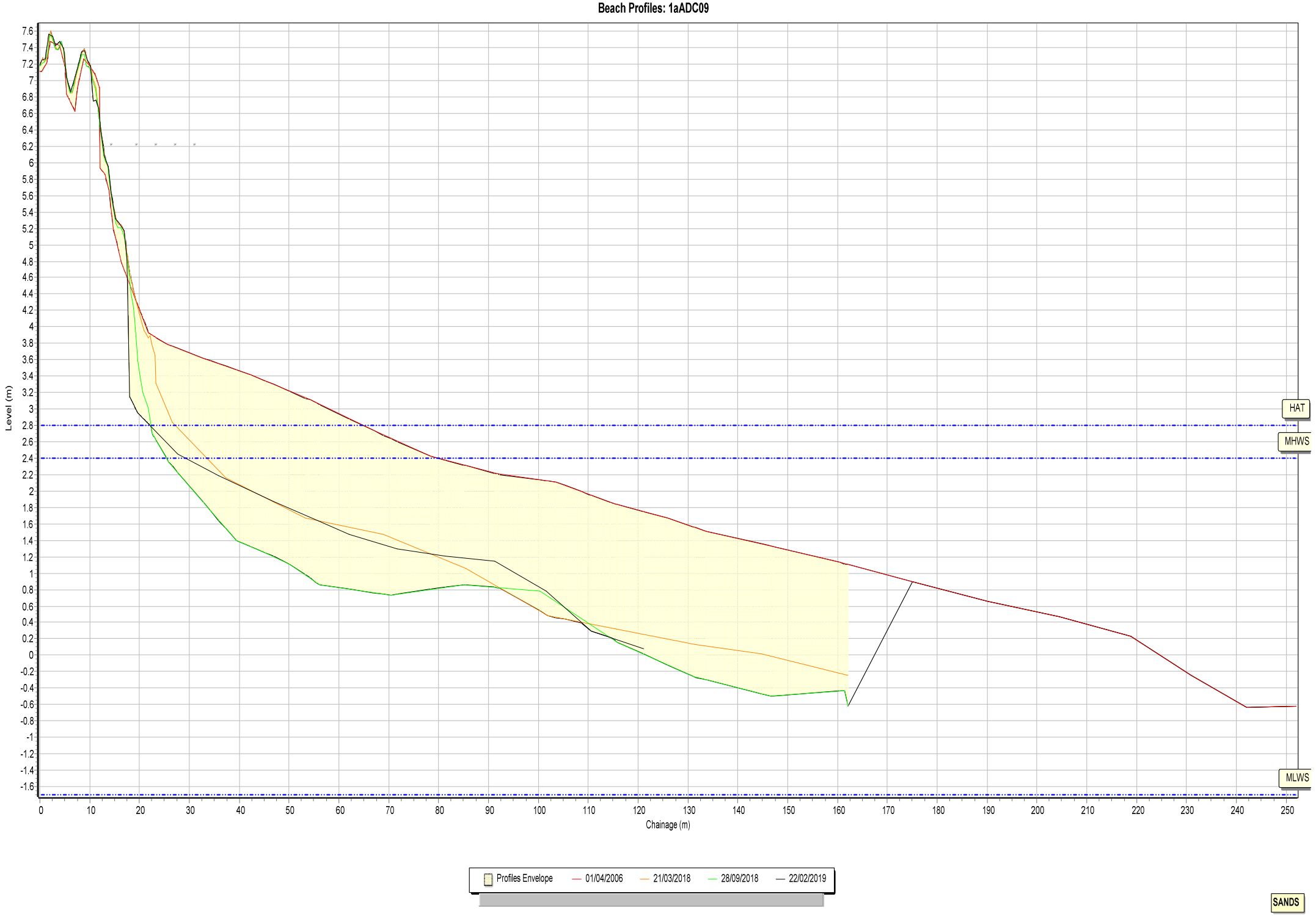
22/02/2019
SANDS

Beach Profiles: 1aADC04B

Beach Profiles: 1aADC07

Beach Profiles: 1aADC08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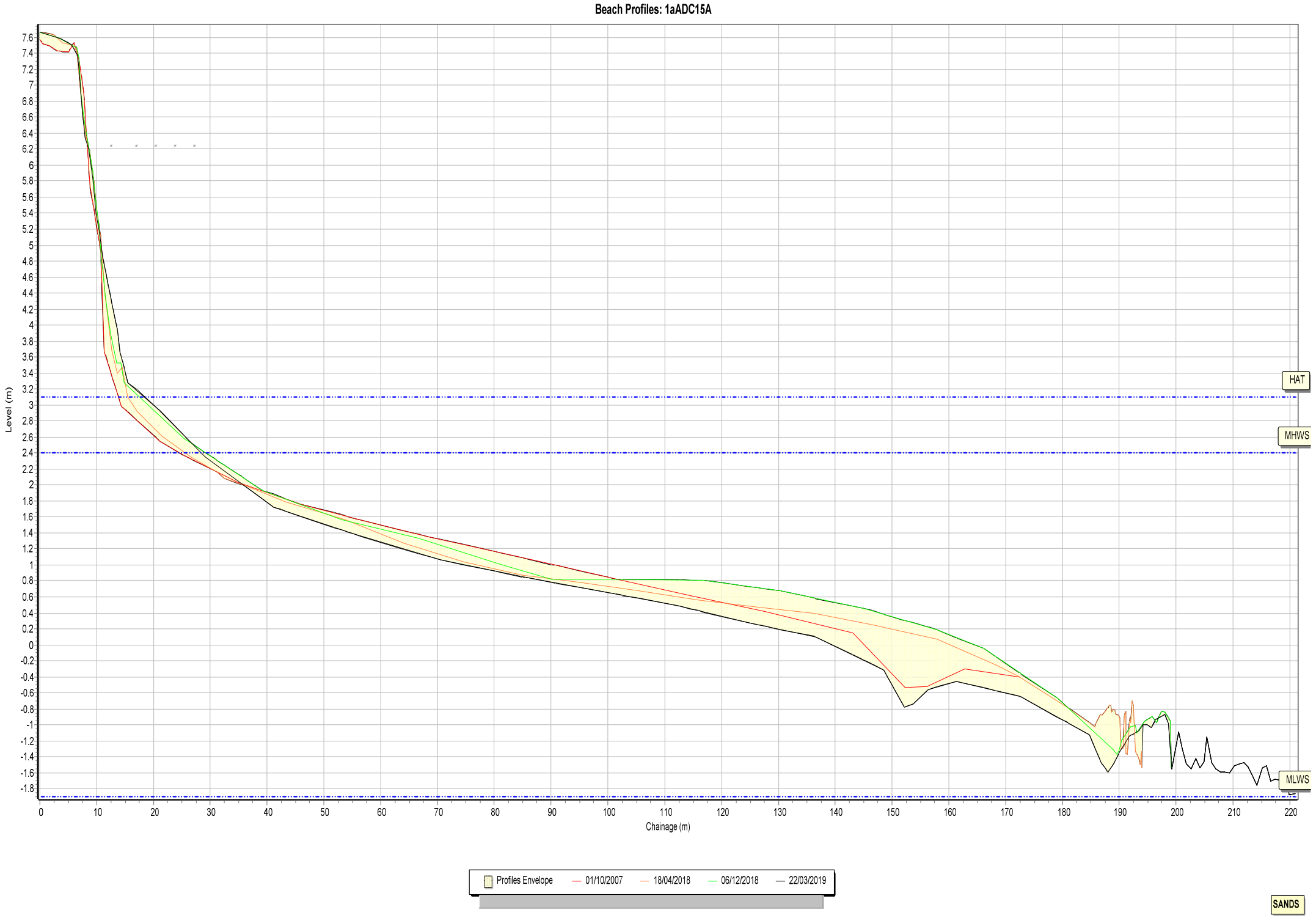
22/02/2019
SANDS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Chainage (m)
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MLWS
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18/04/2018
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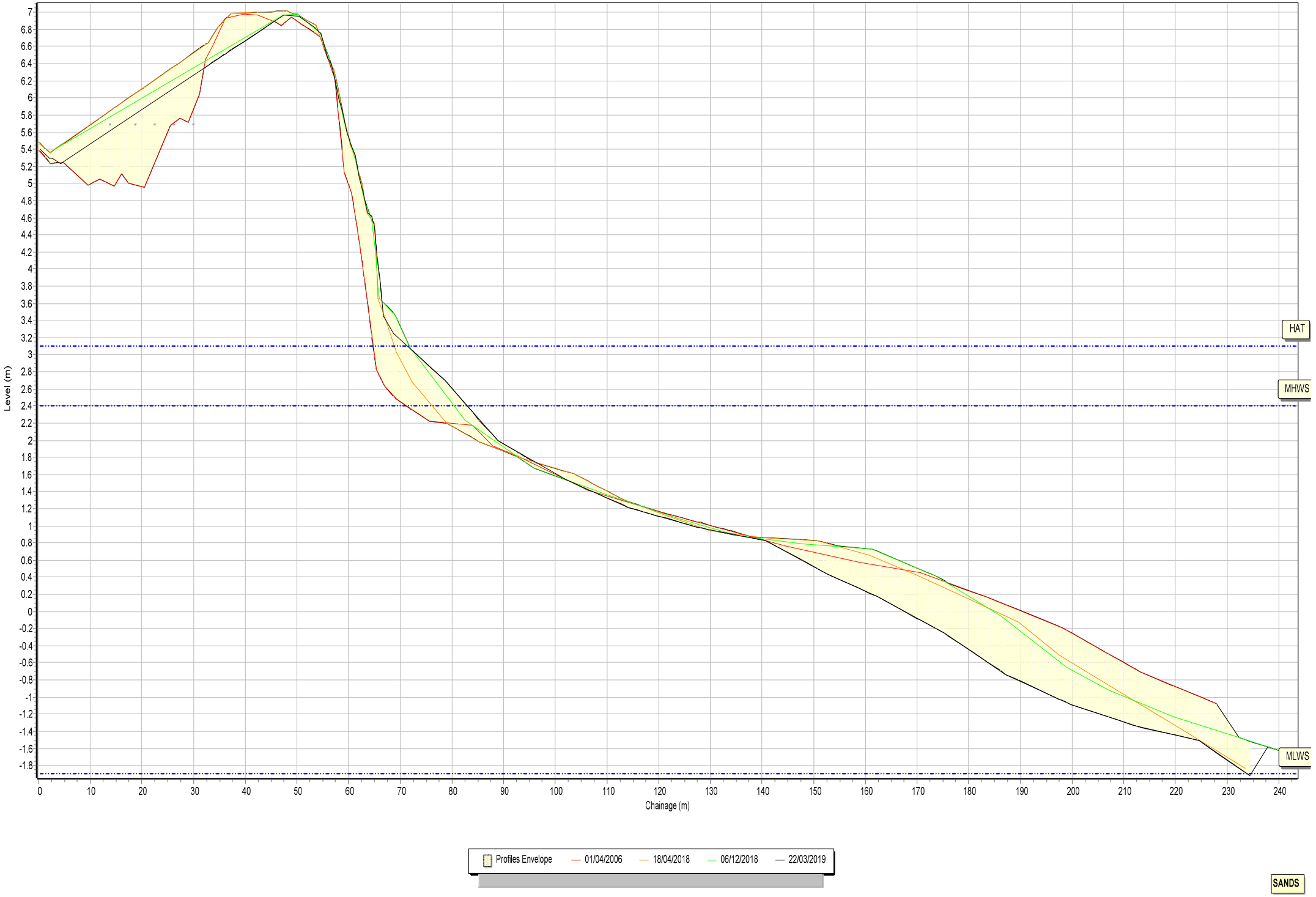
22/03/2019
SANDS

Beach Profiles: 1aADC16

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Chainage (m)
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MLWS
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06/12/2018
22/03/2019
SANDS


Beach Profiles: 1aADC16B
Level (m)
Chainage (m)
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MHWS
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Profiles Envelope
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18/04/2018
06/12/2018
22/03/2019
SANDS

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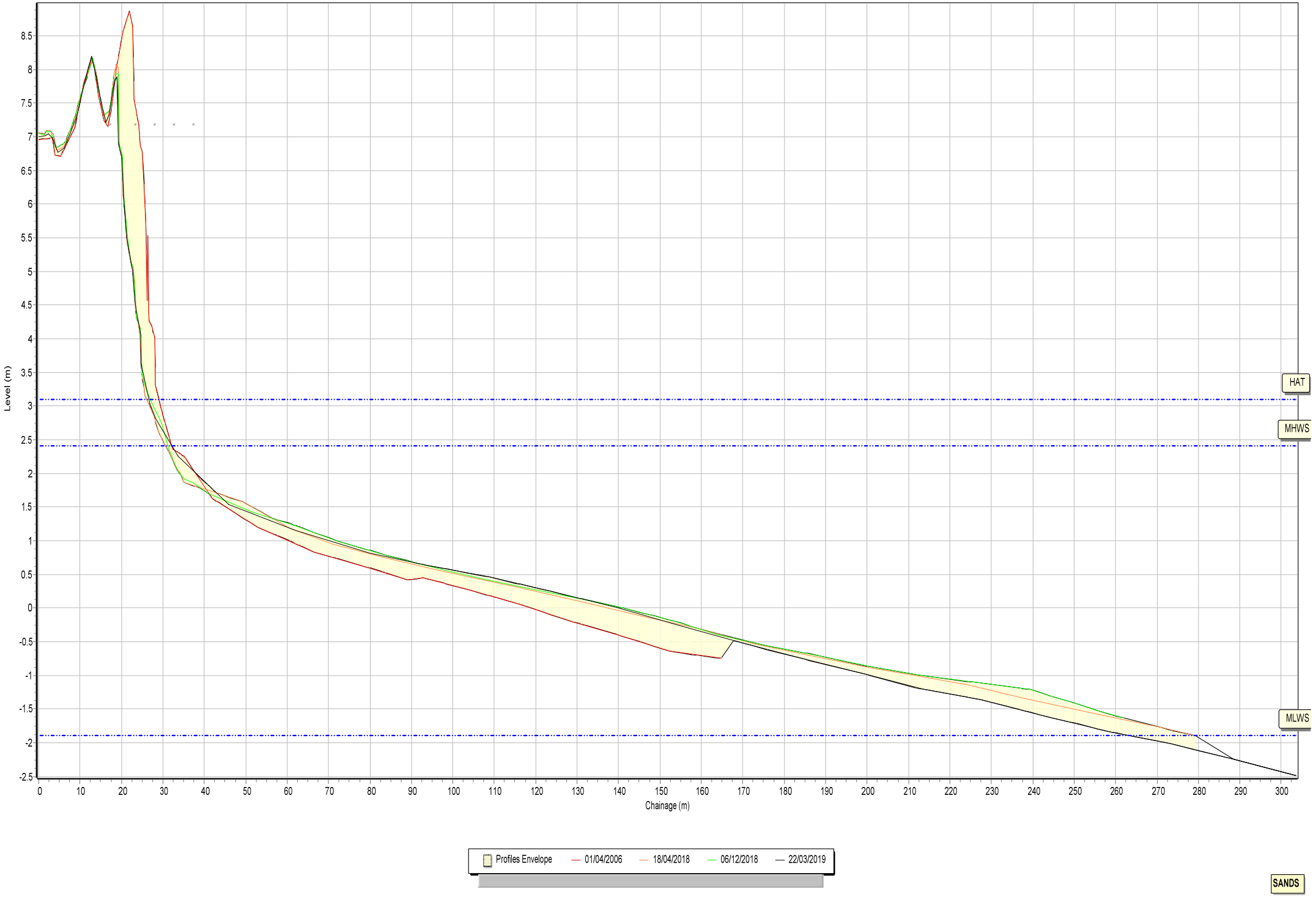

Beach Profiles: 1aADC17A


Beach Profiles: 1aCMBC01
Level (m)
Chainage (m)
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MLWS
Profiles Envelope
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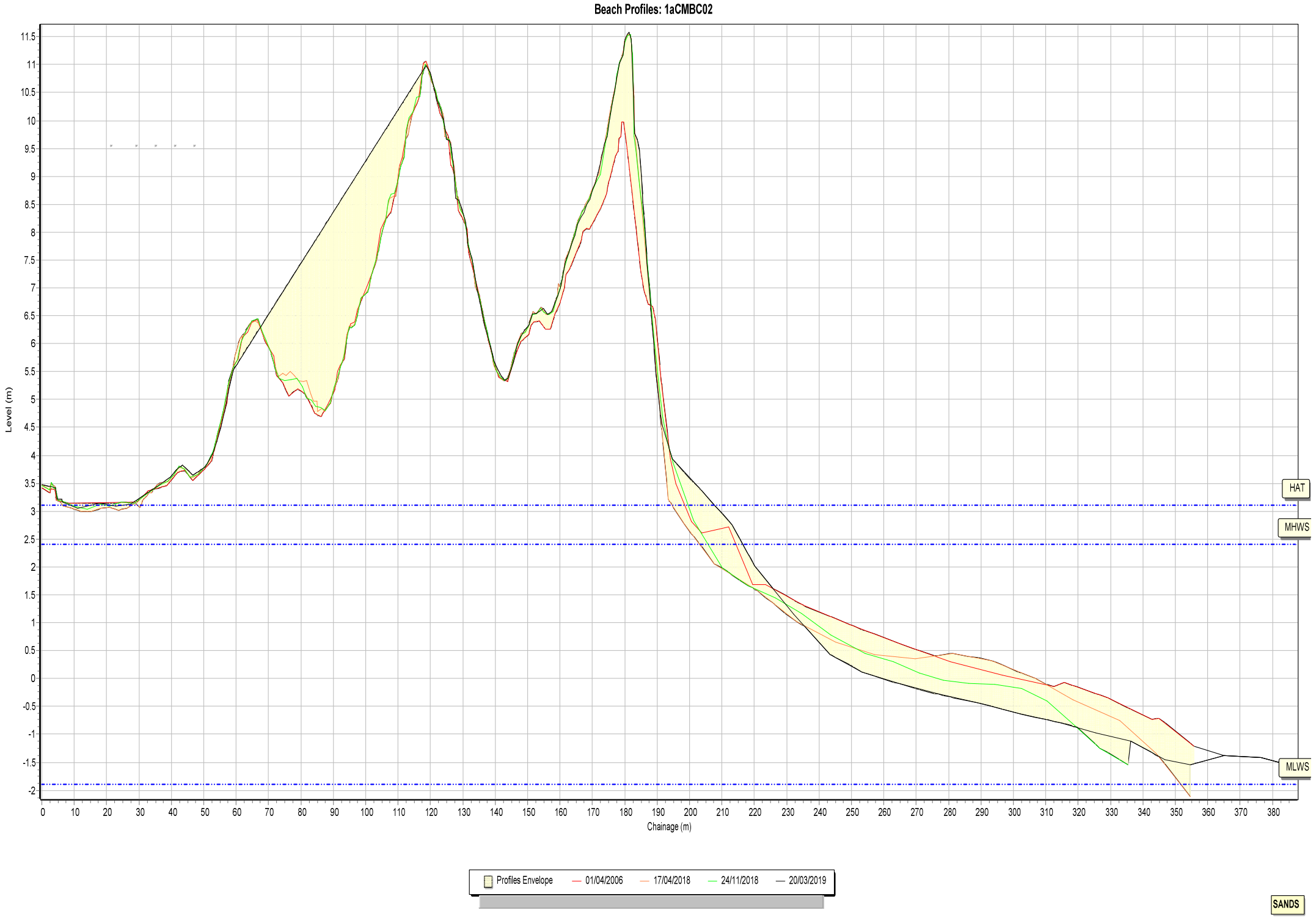
17/04/2018
24/11/2018
20/03/2019
SANDS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Chainage (m)
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MLWS
Profiles Envelope
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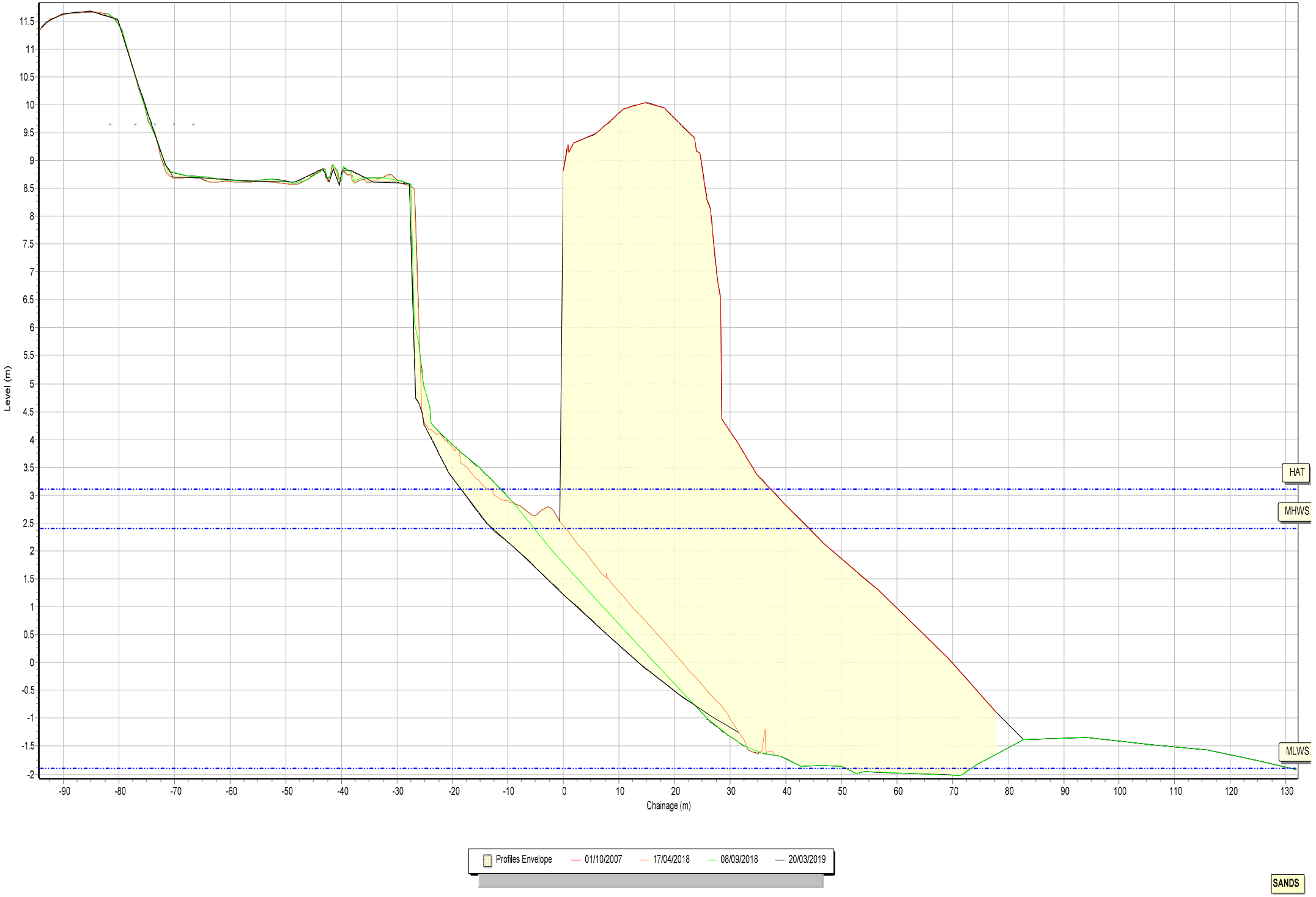
20/03/2019
SANDS

Beach Profiles: 1aCMBC03A

Beach Profiles: 1aCMBC03B



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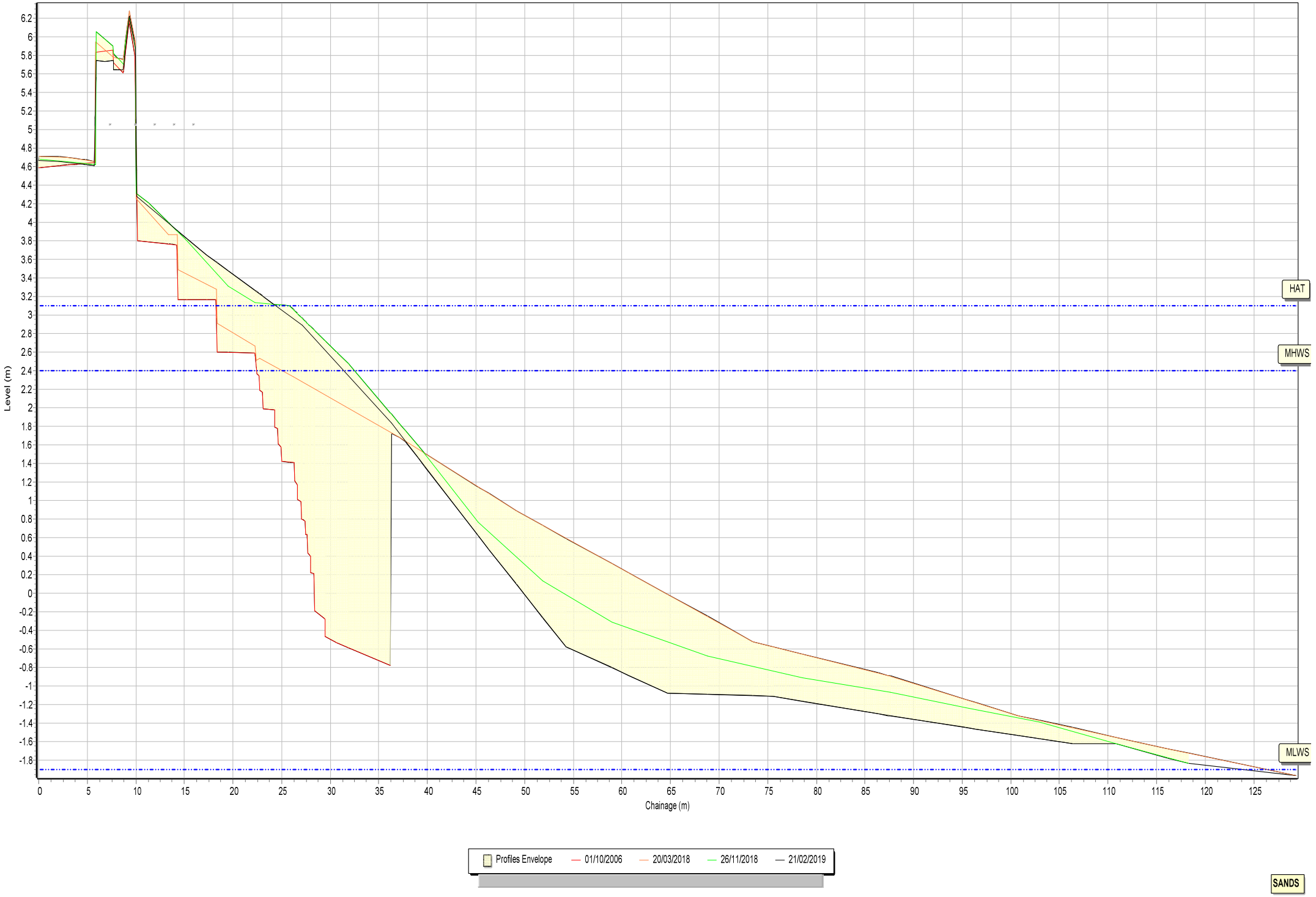
Beach Profiles: 1aWDC06



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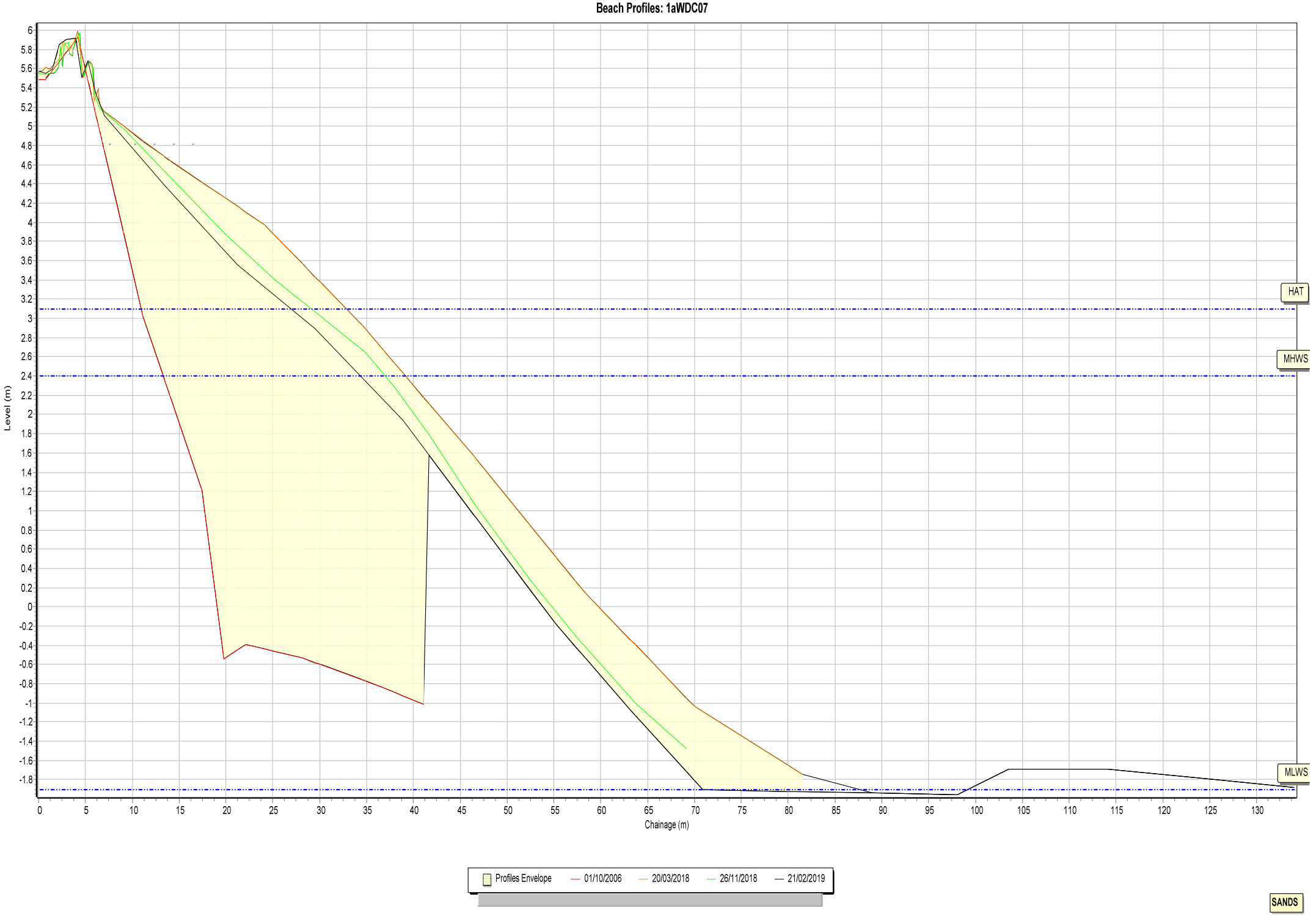
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Level (m)
Chainage (m)
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MLWS
Profiles Envelope
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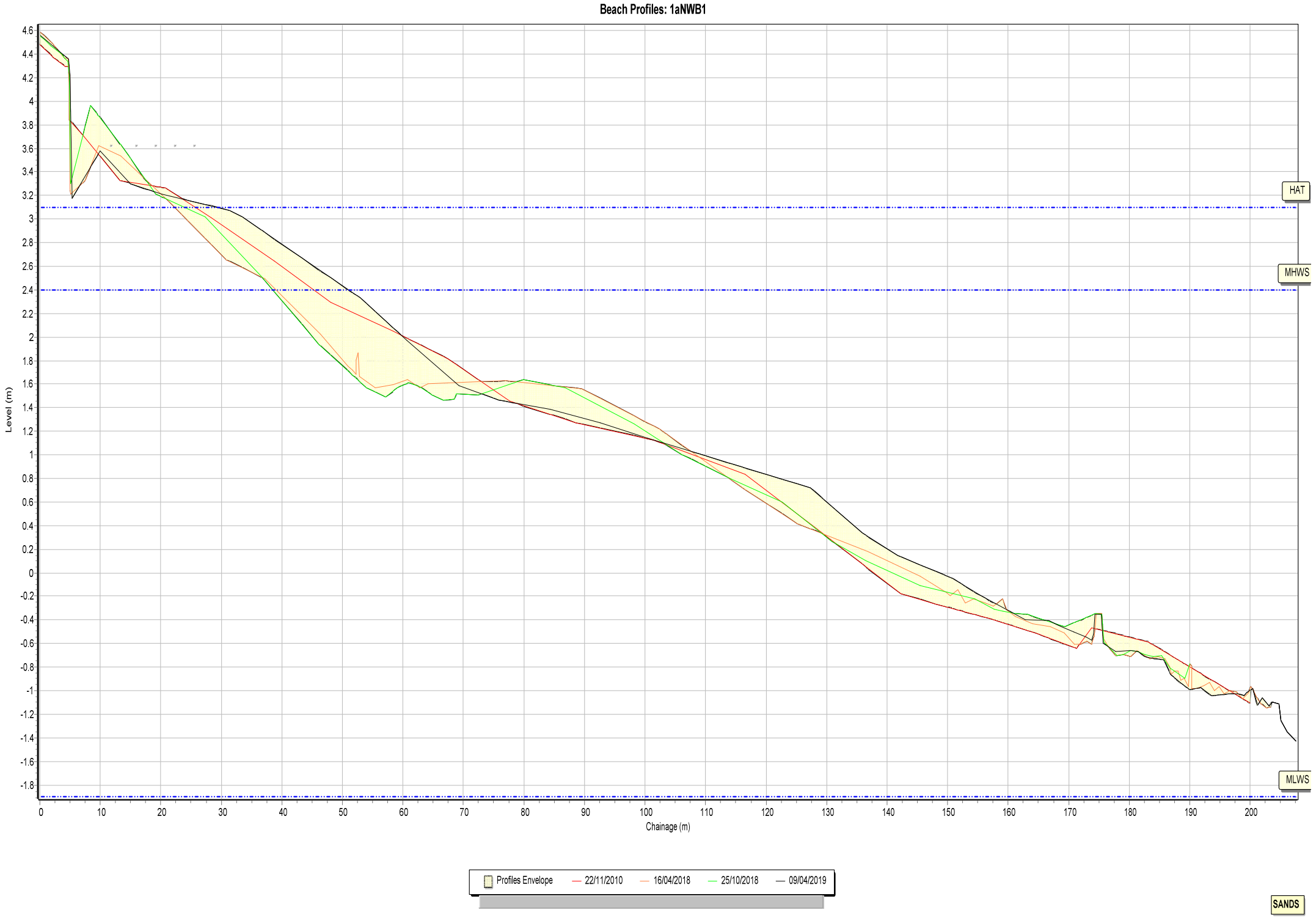
20/03/2018
26/11/2018
21/02/2019
SANDS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Level (m)
Chainage (m)
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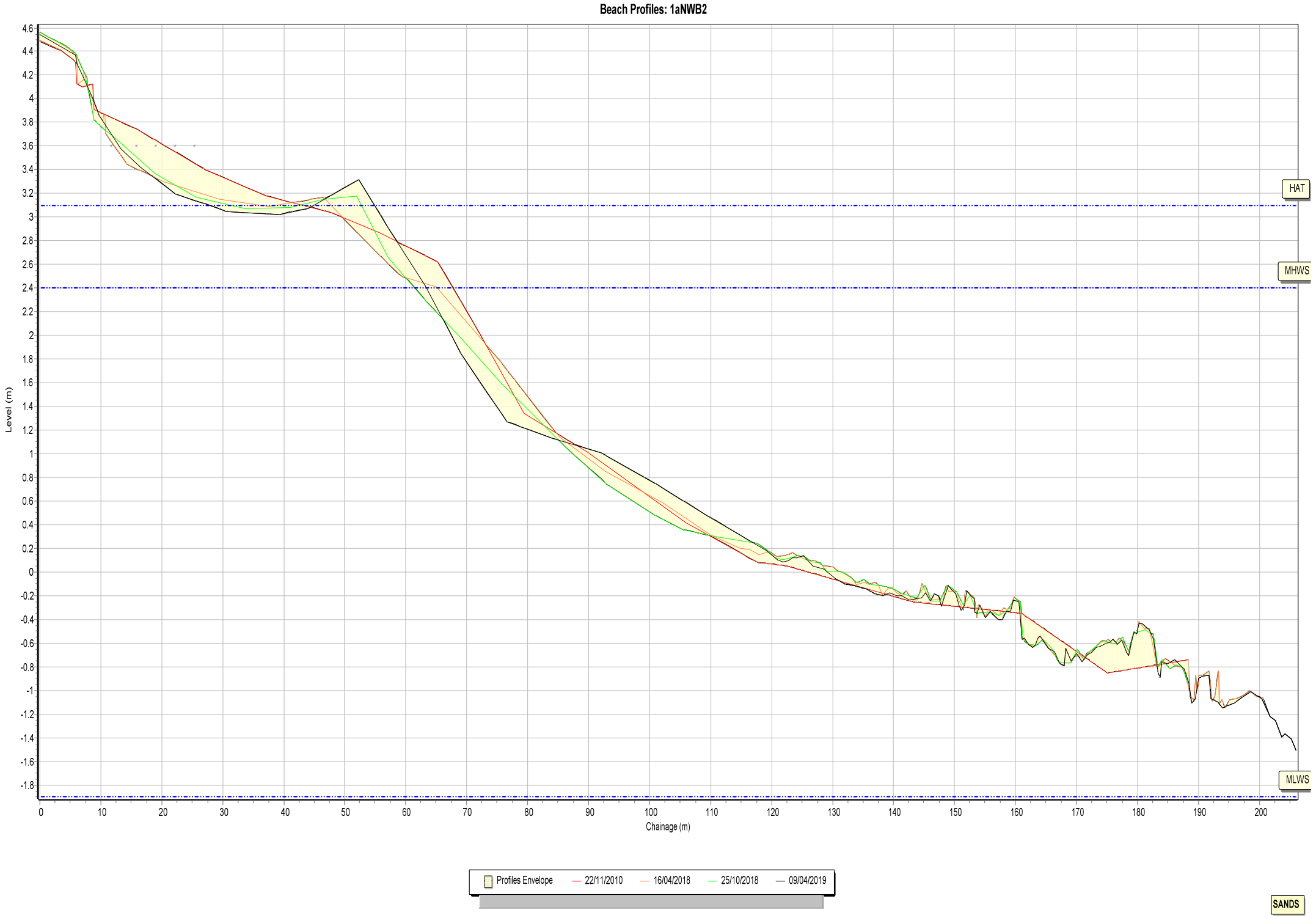
MHWS
MLWS
Profiles Envelope
22/11/2010
16/04/2018
25/10/2018
09/04/2019
SANDS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Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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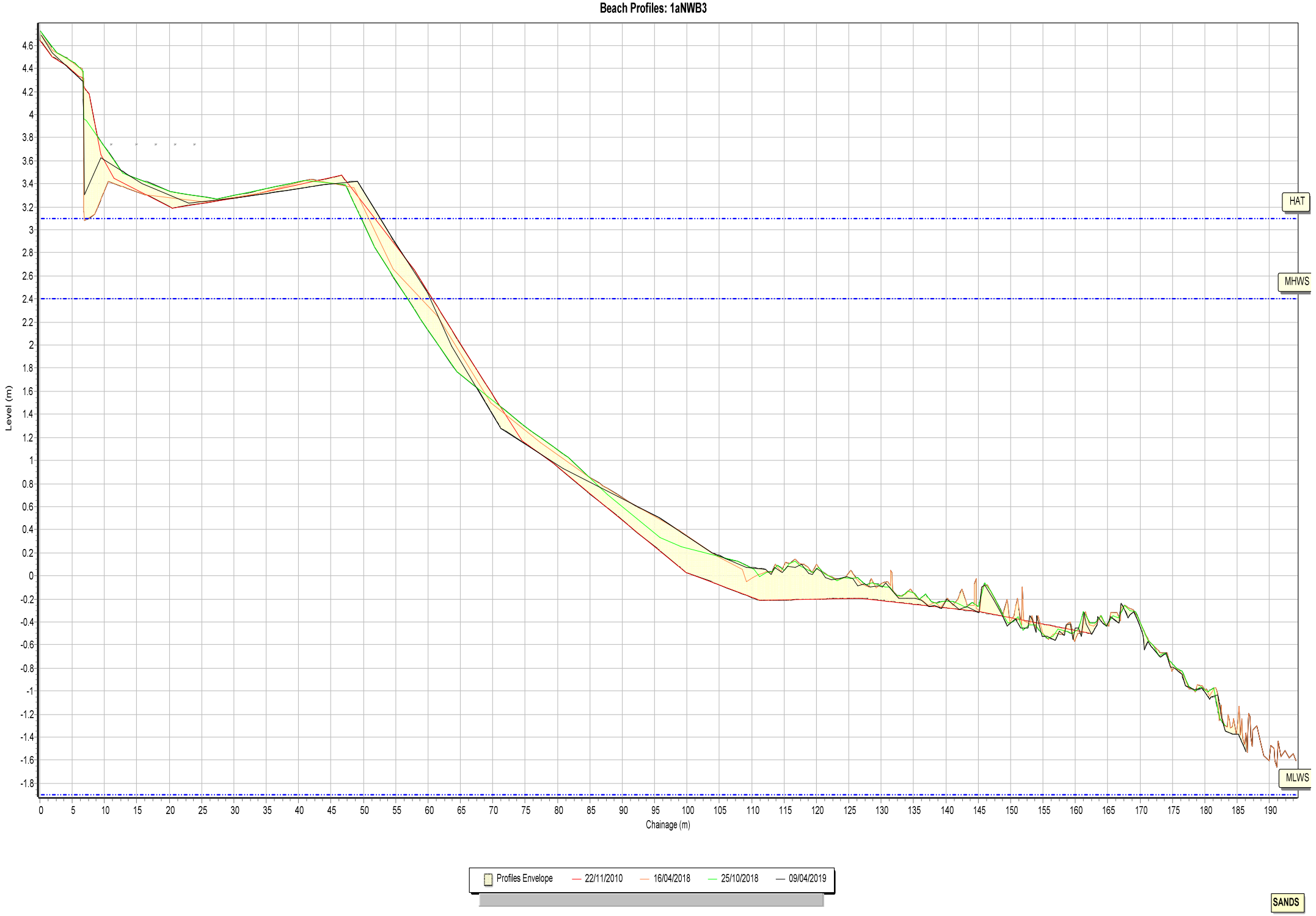
16/04/2018
25/10/2018
09/04/2019
SANDS


Beach Profiles: 1aNWB3
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
22/11/2010
16/04/2018
25/10/2018
09/04/2019
SANDS


Beach Profiles: 1aNWB4
Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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25/10/2018
09/04/2019
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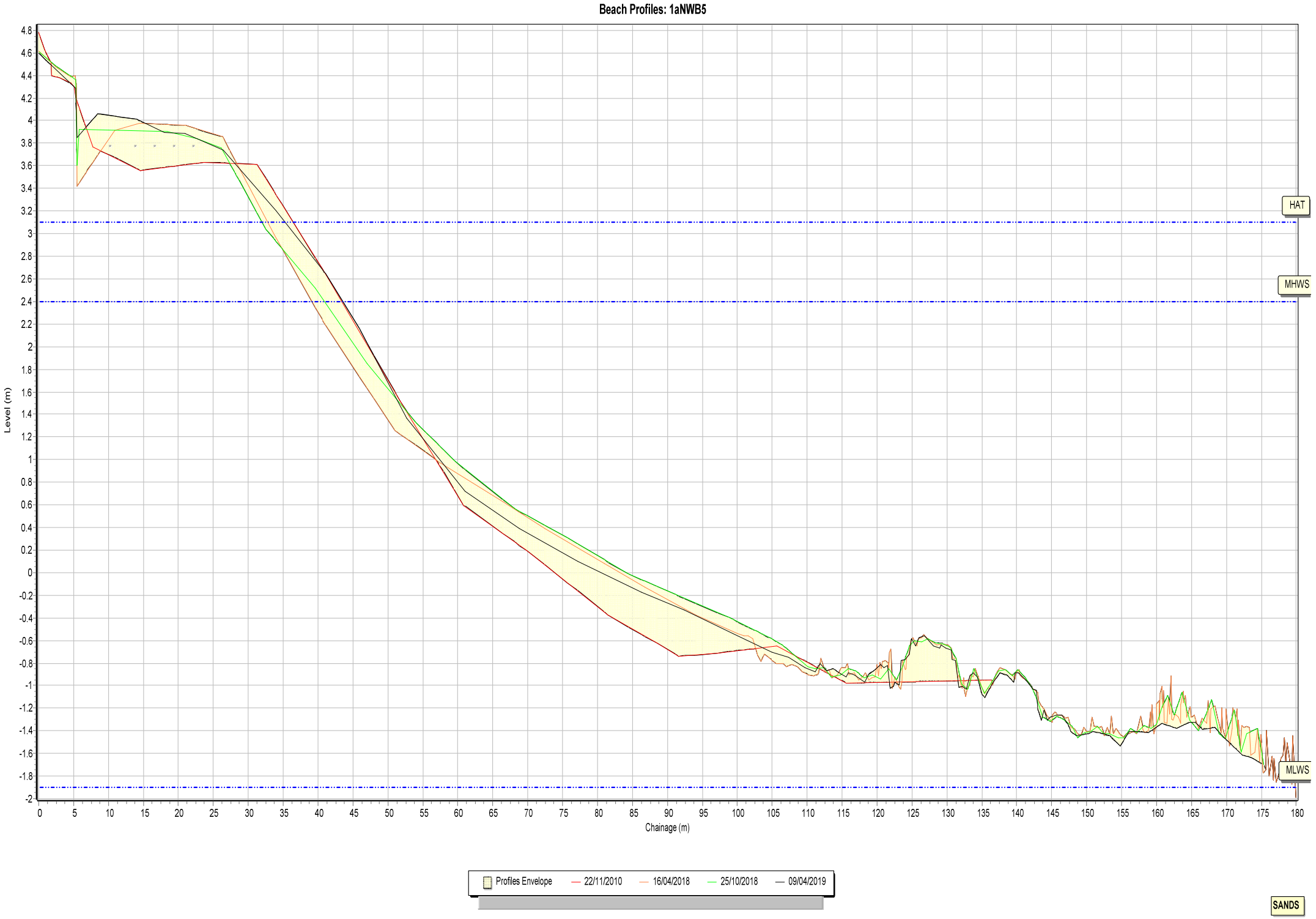
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MLWS
Profiles Envelope
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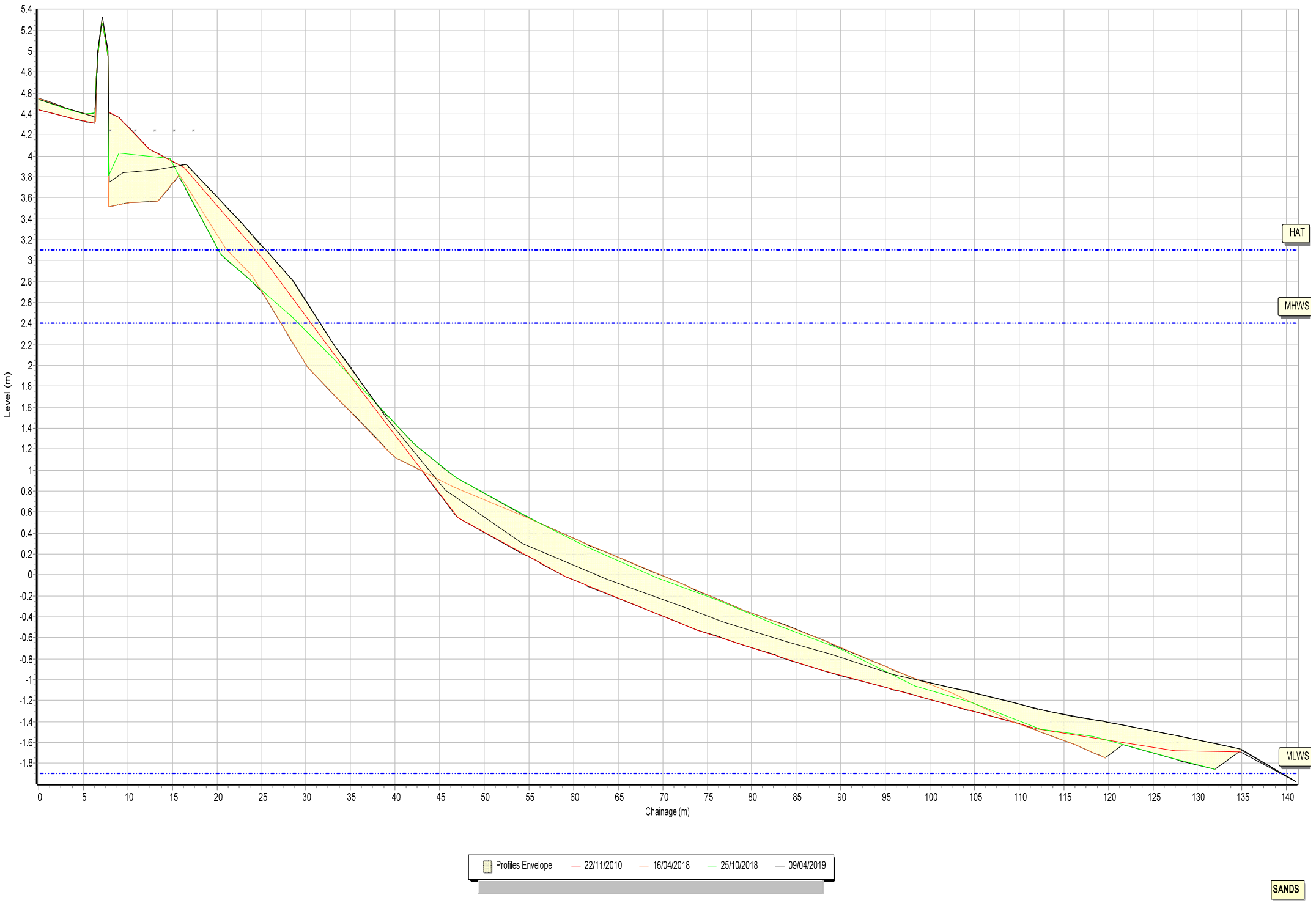
09/04/2019
SANDS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Chainage (m)
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MLWS
Profiles Envelope
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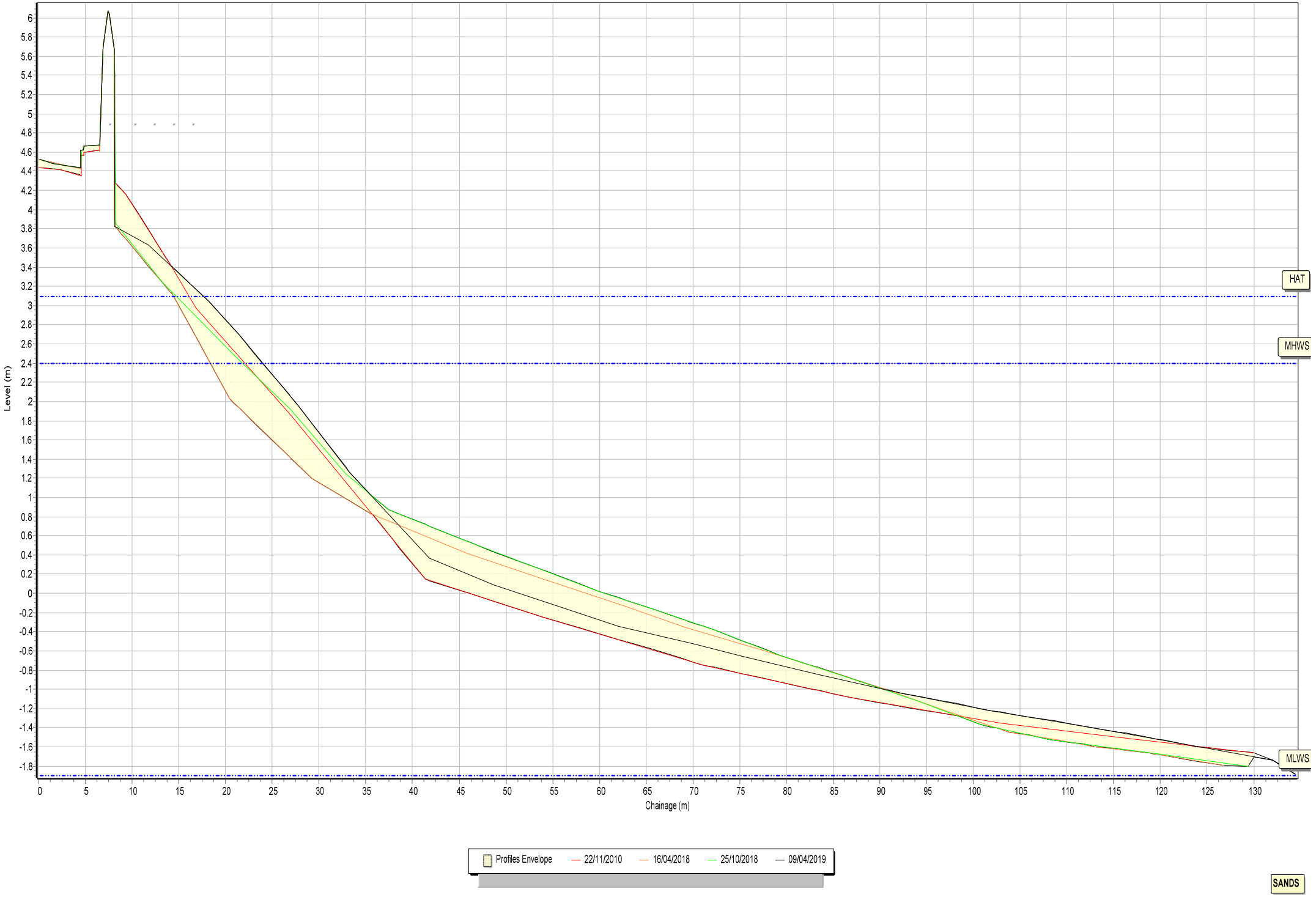
25/10/2018
09/04/2019
SANDS

Beach Profiles: 1aNWB7



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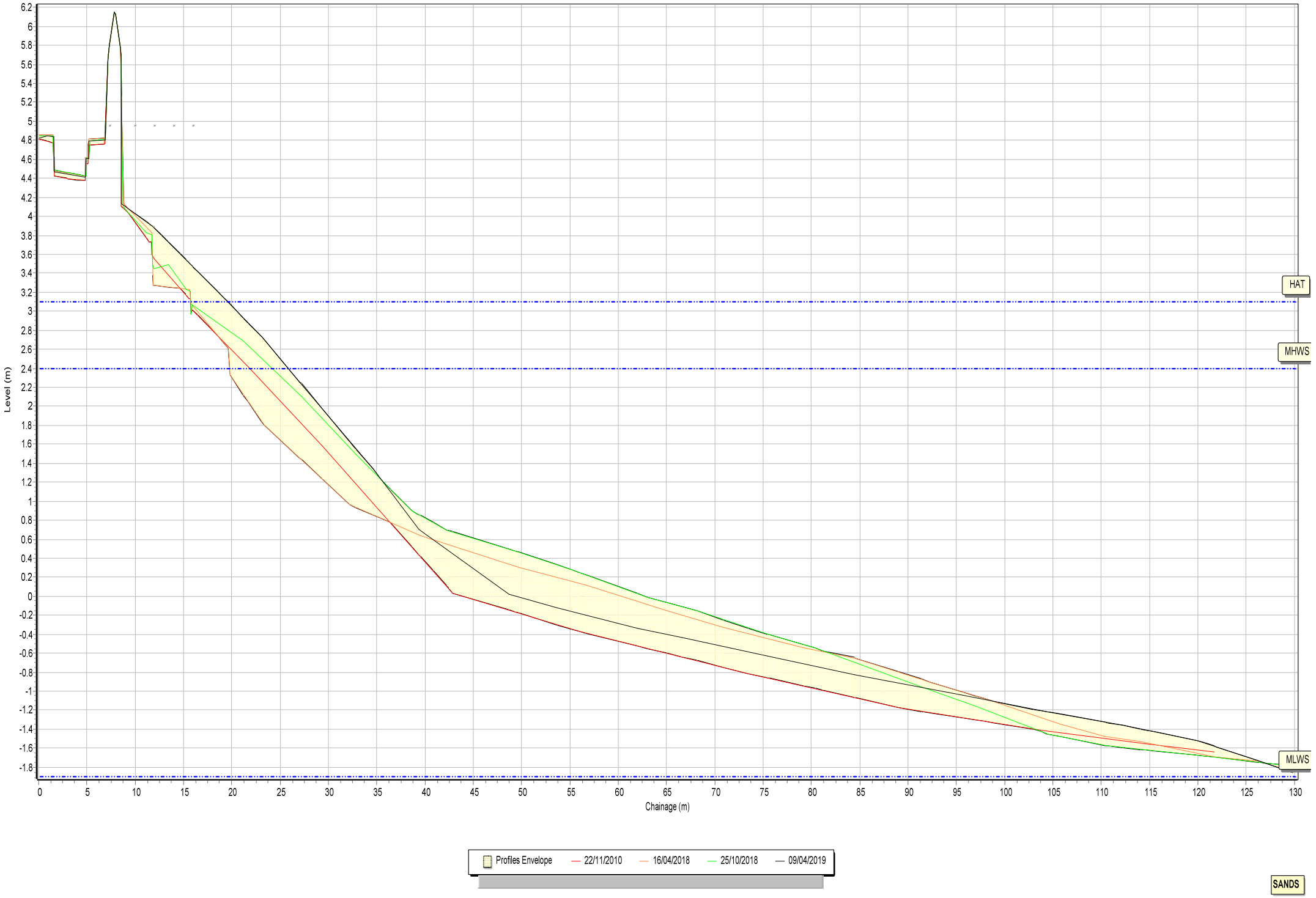

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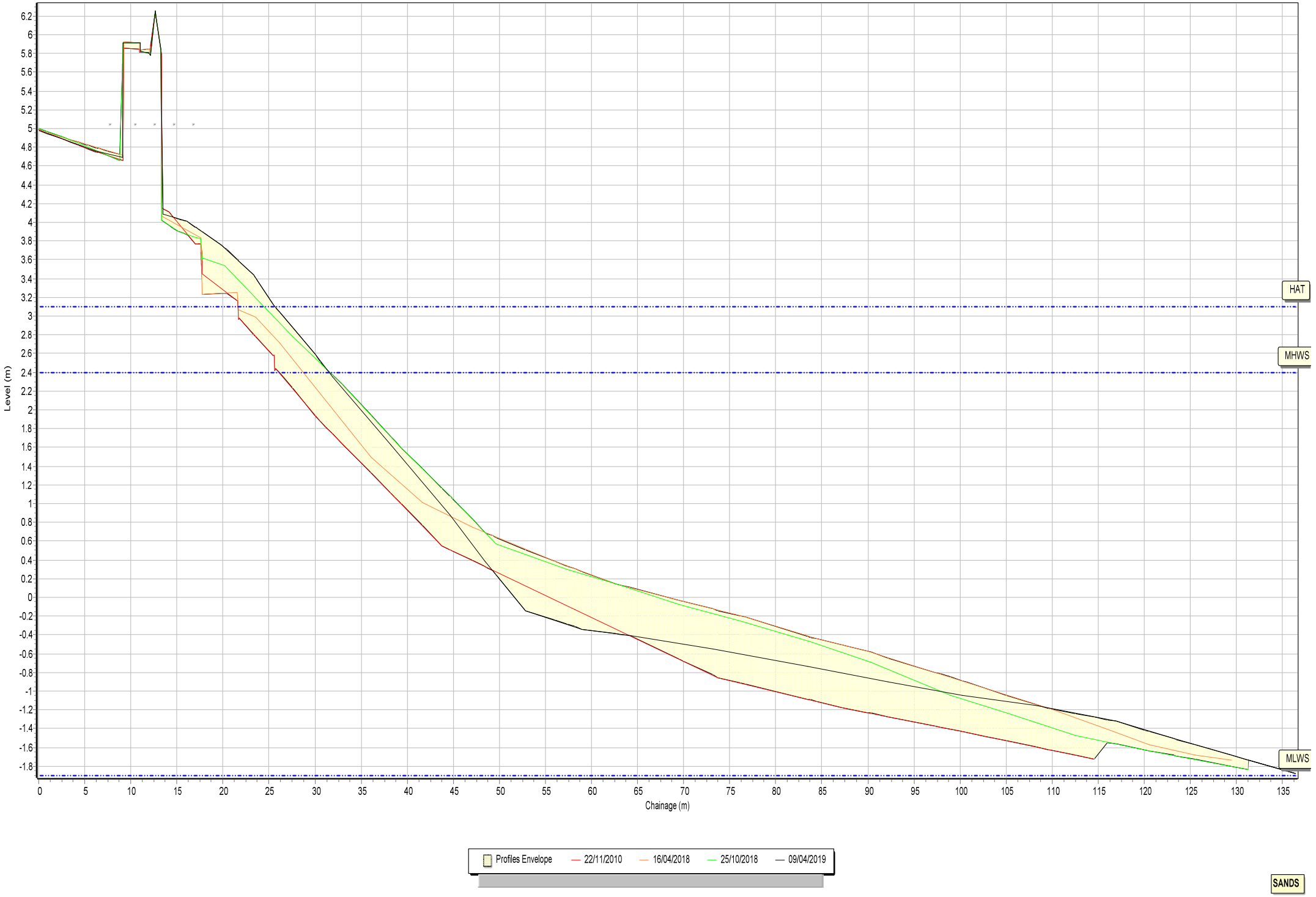

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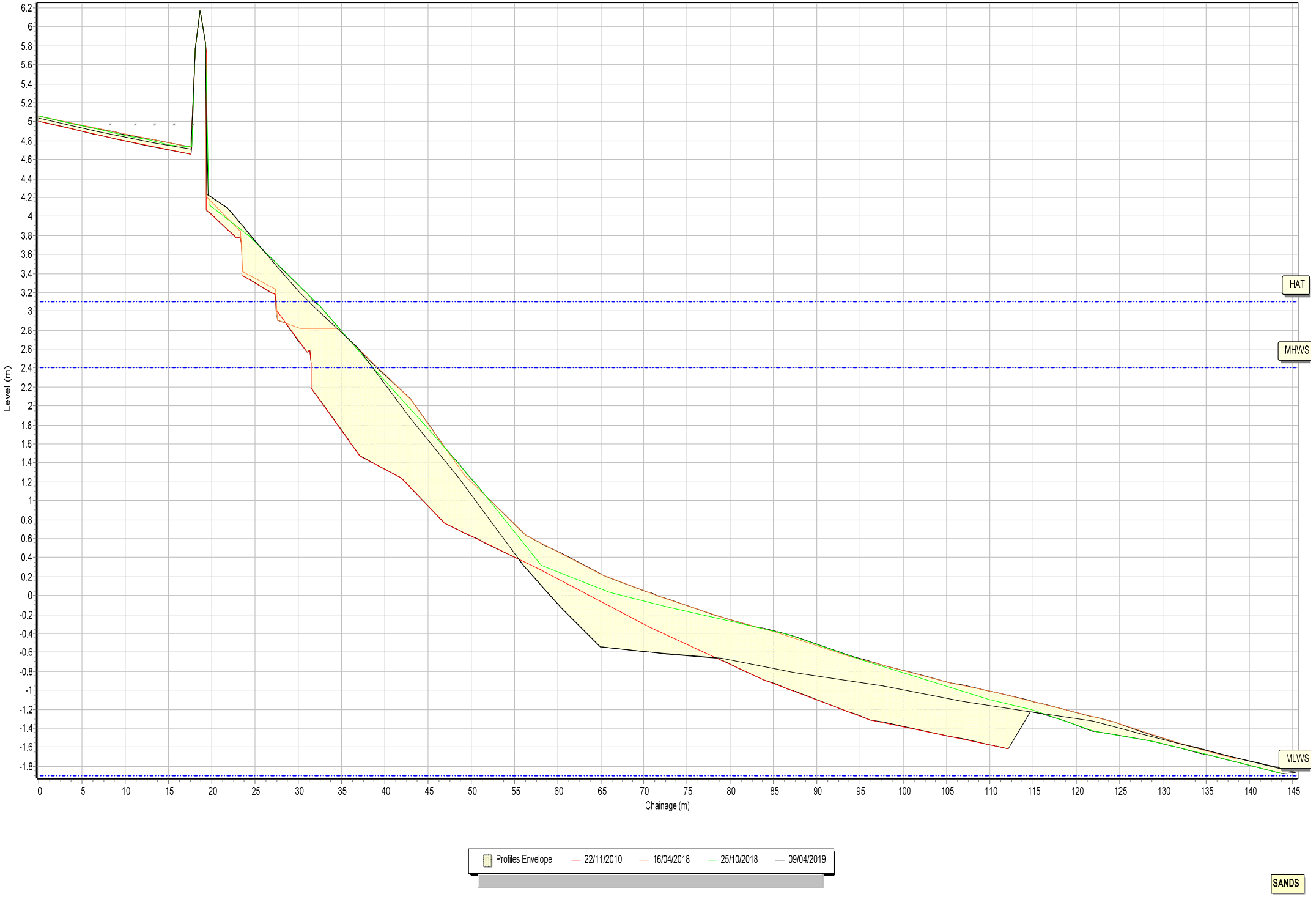

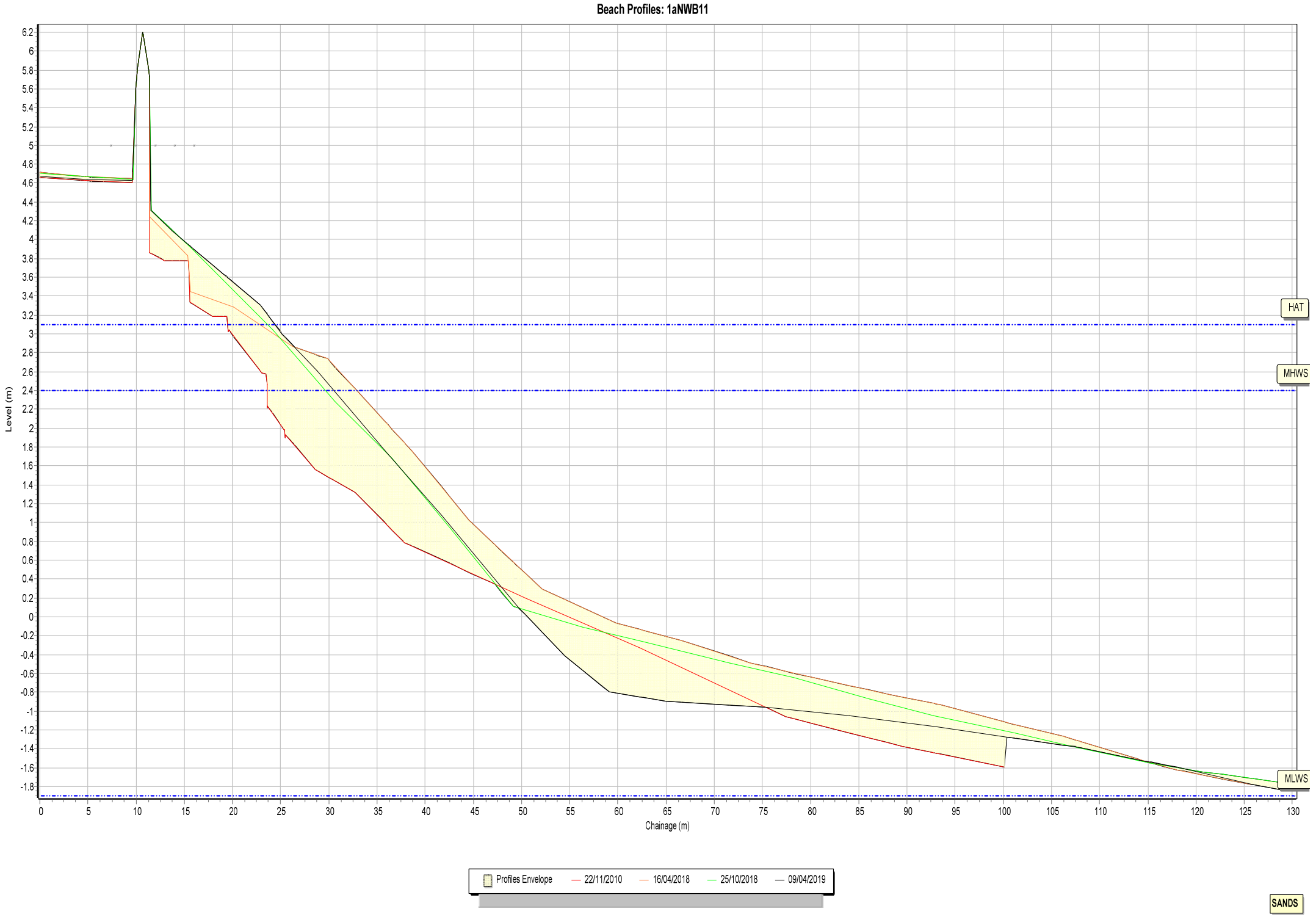
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Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
22/11/2010
16/04/2018
25/10/2018
09/04/2019
SANDS

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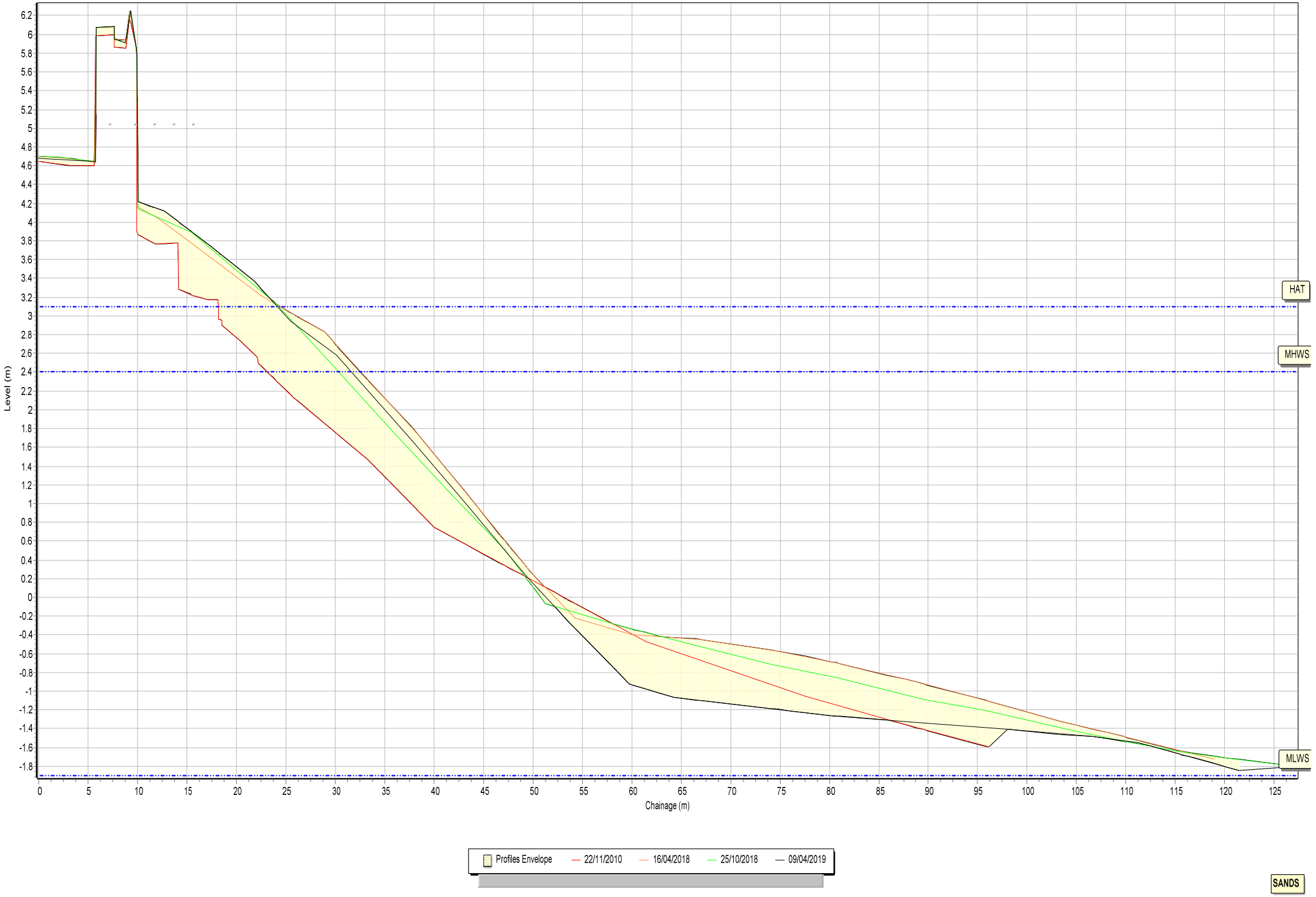

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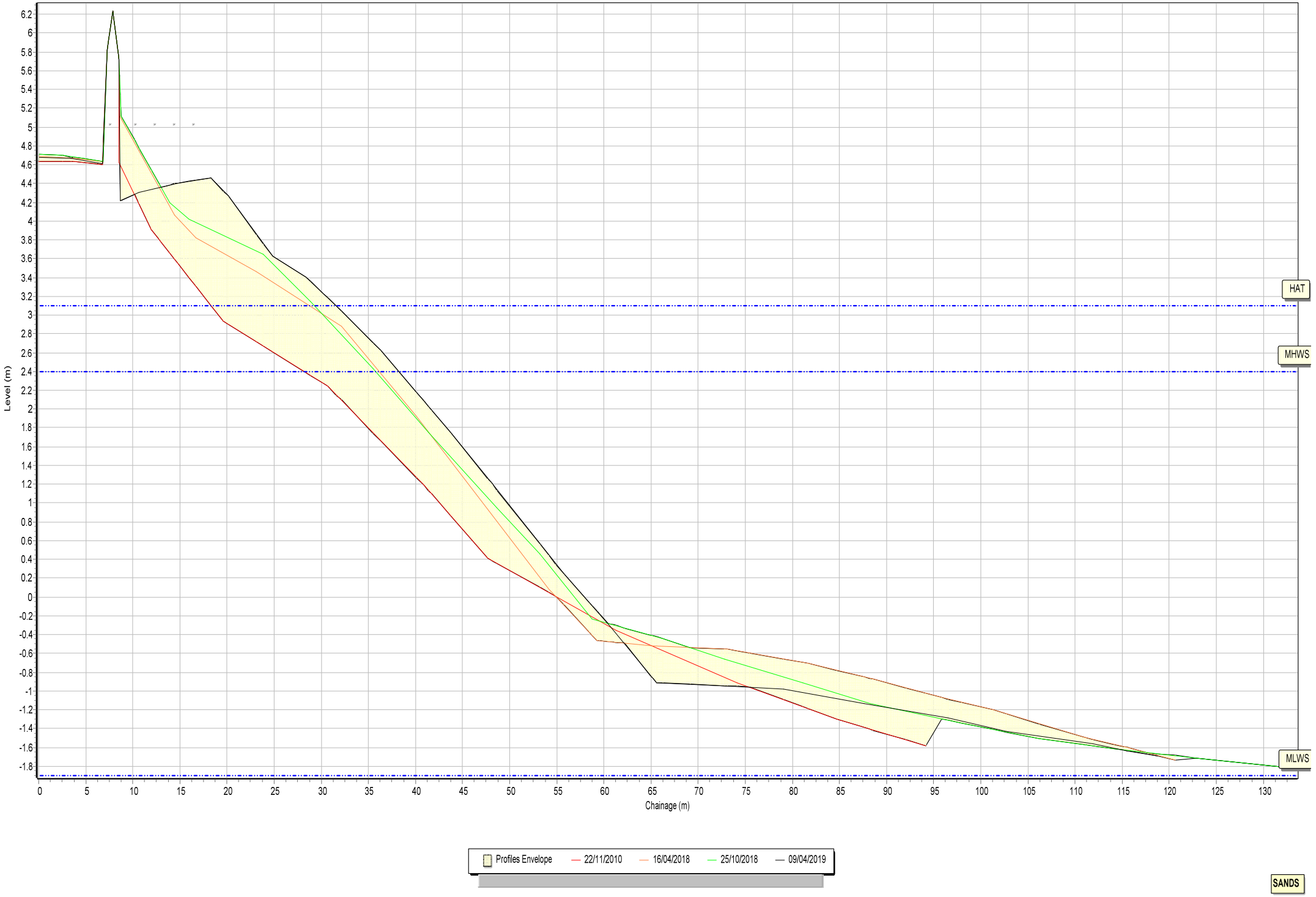

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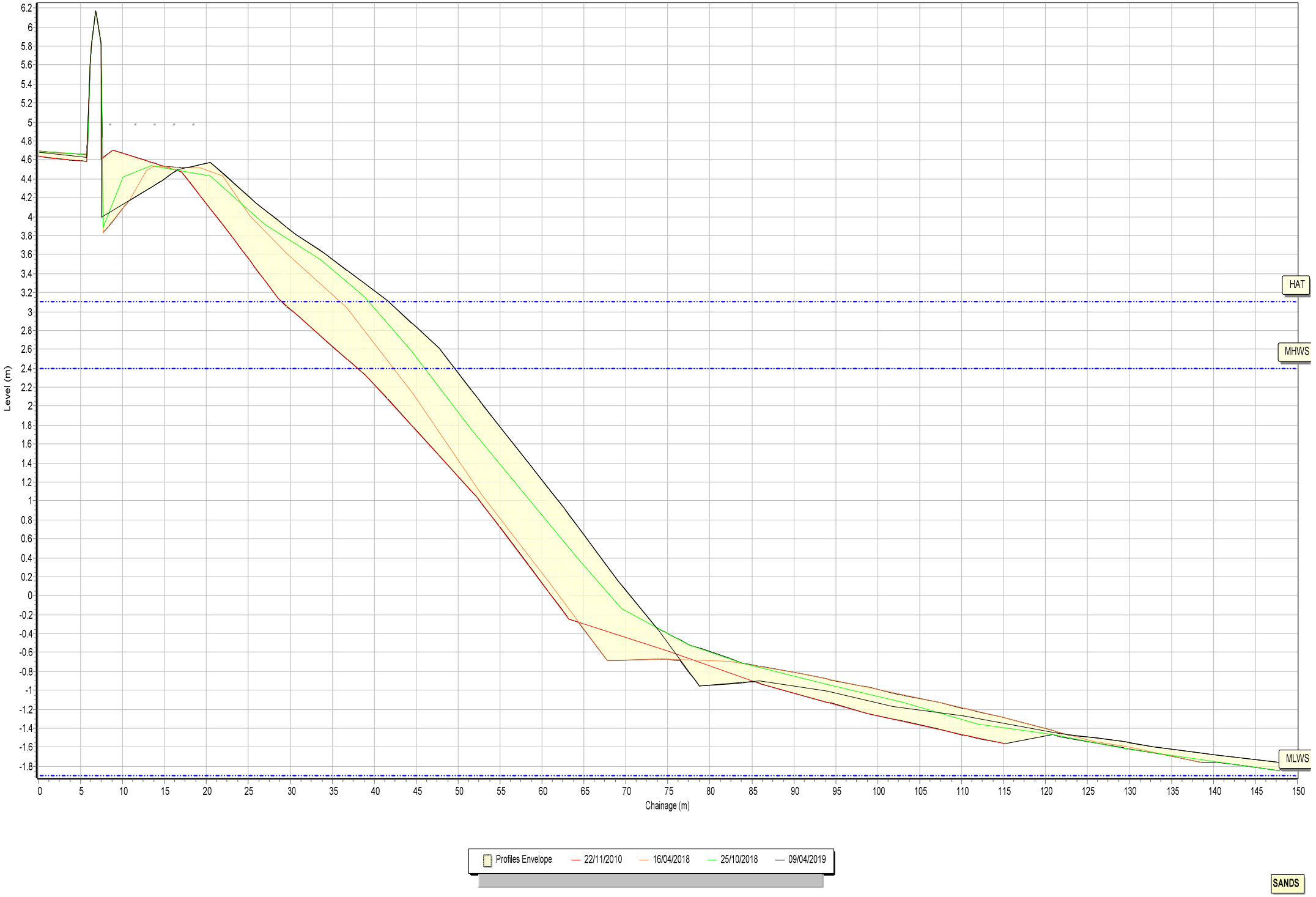

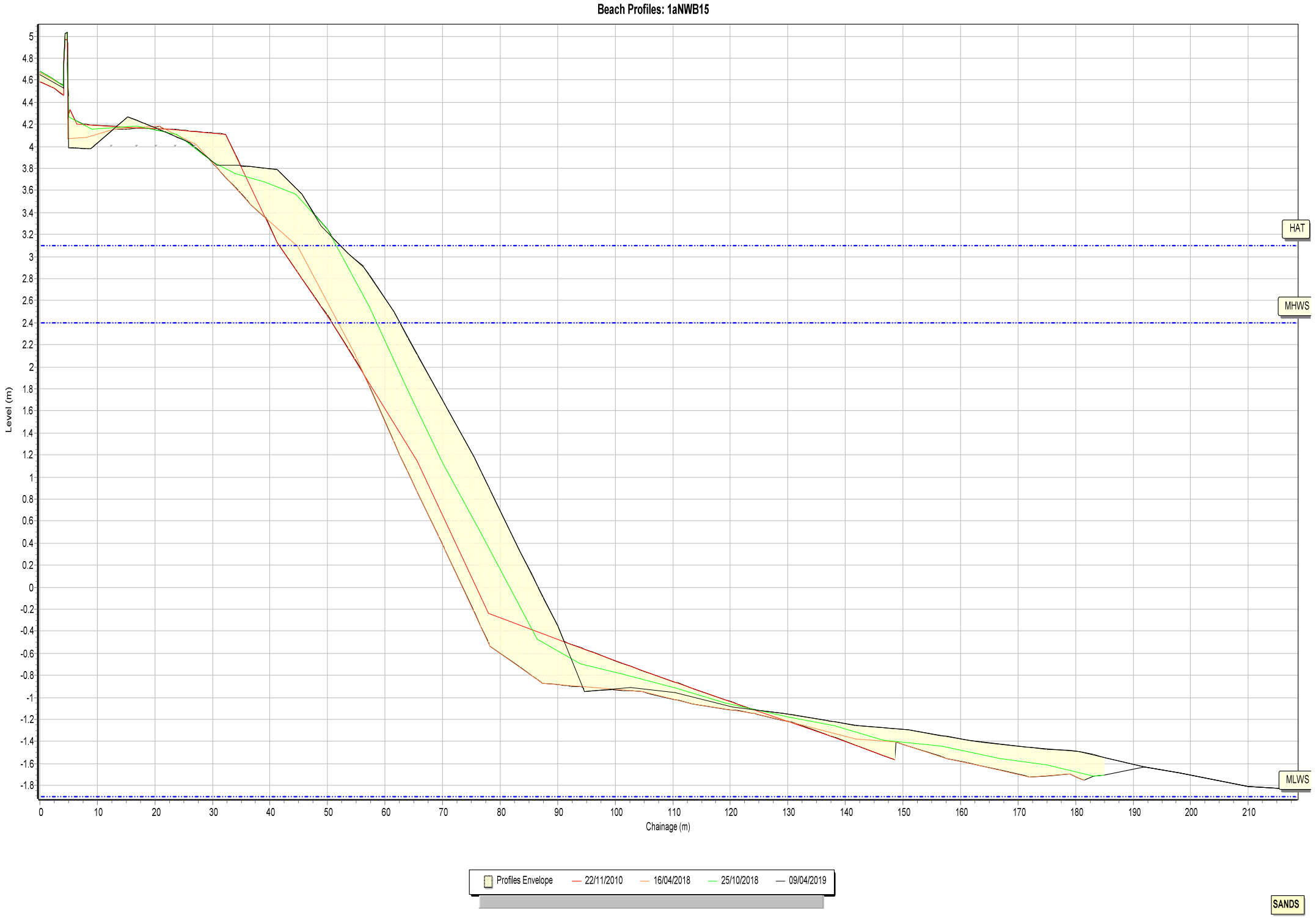
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Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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16/04/2018
25/10/2018
09/04/2019
SANDS

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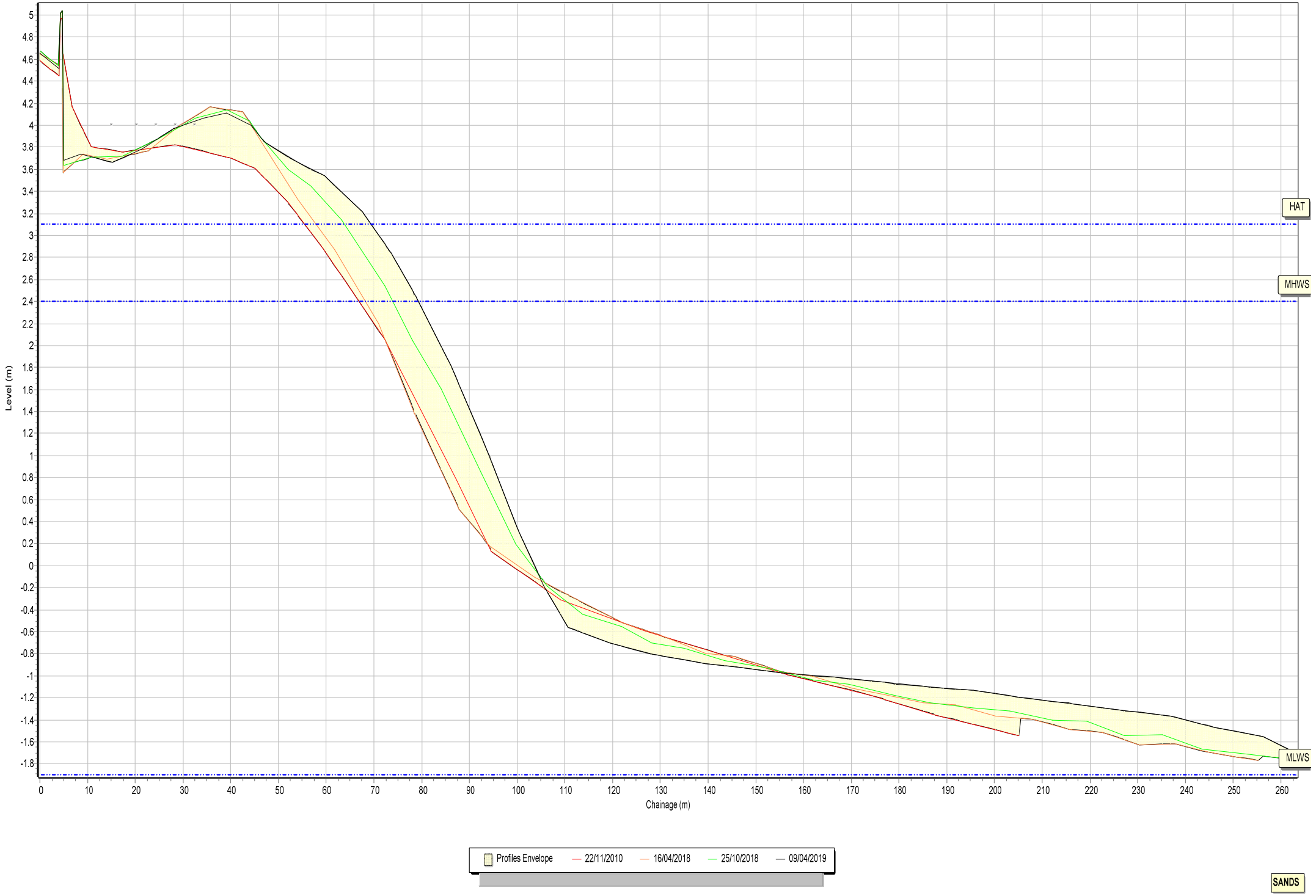

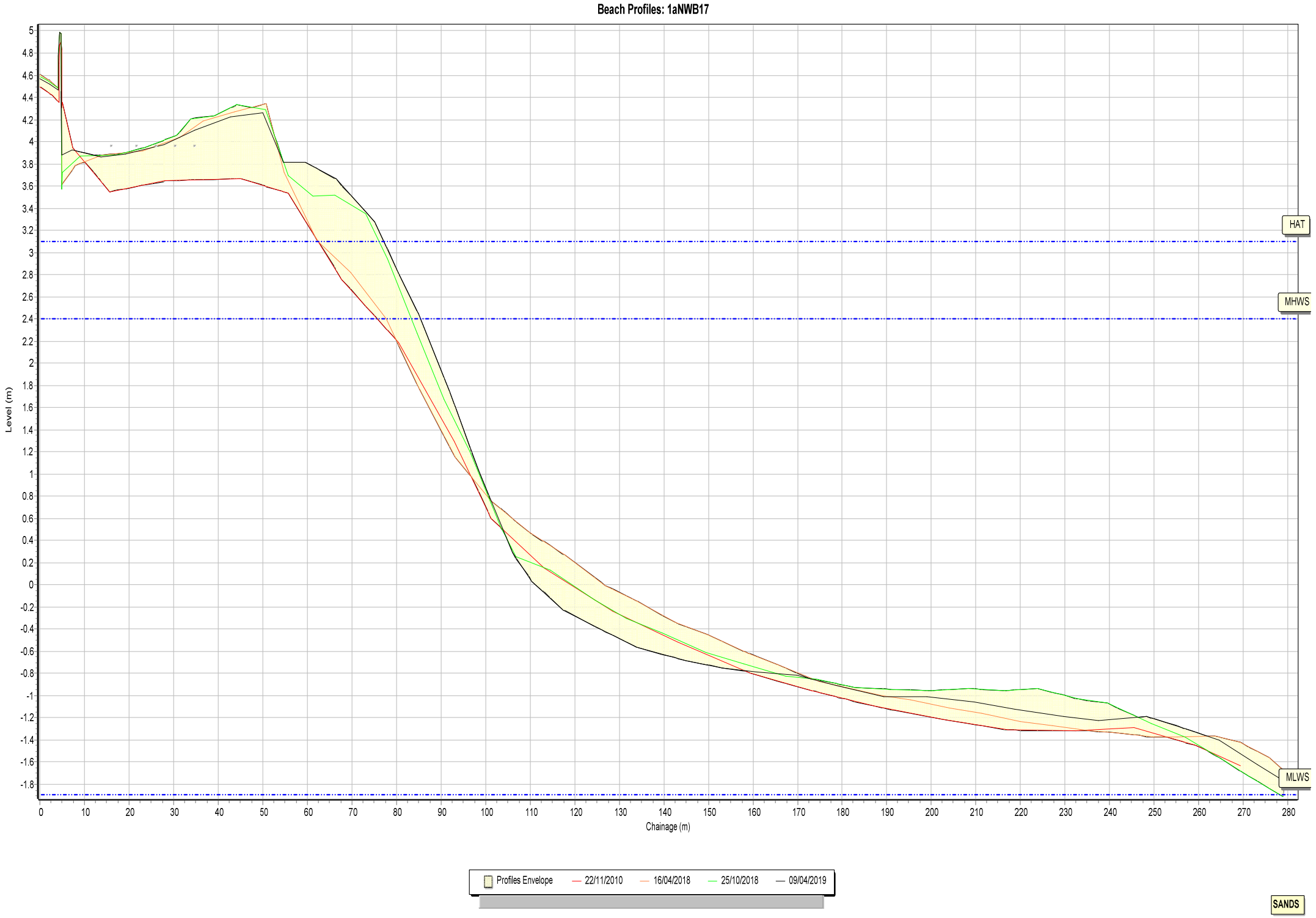
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Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
22/11/2010
16/04/2018
25/10/2018
09/04/2019
SANDS


Beach Profiles: 1aNWB18
Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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25/10/2018
09/04/2019
SANDS

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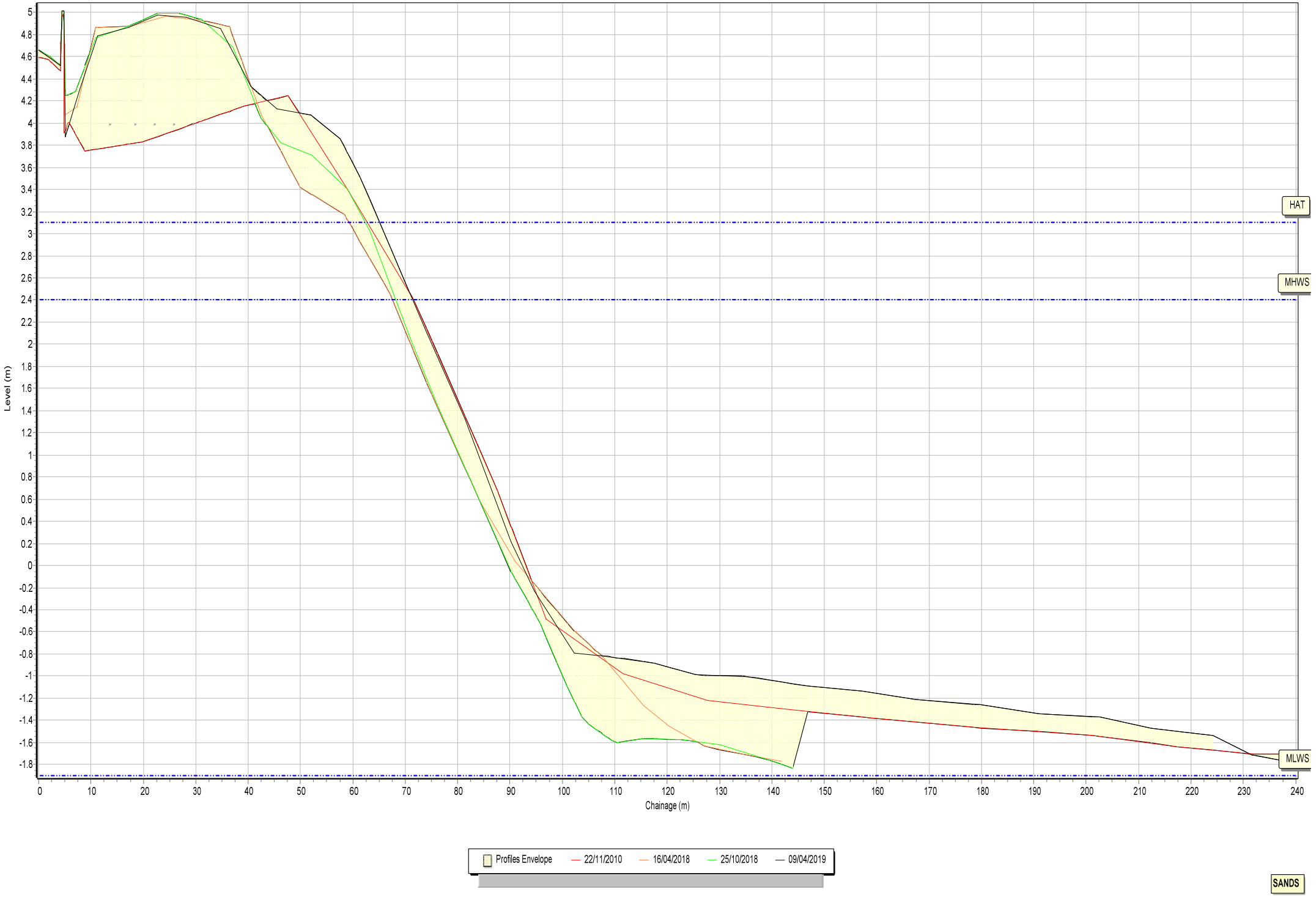

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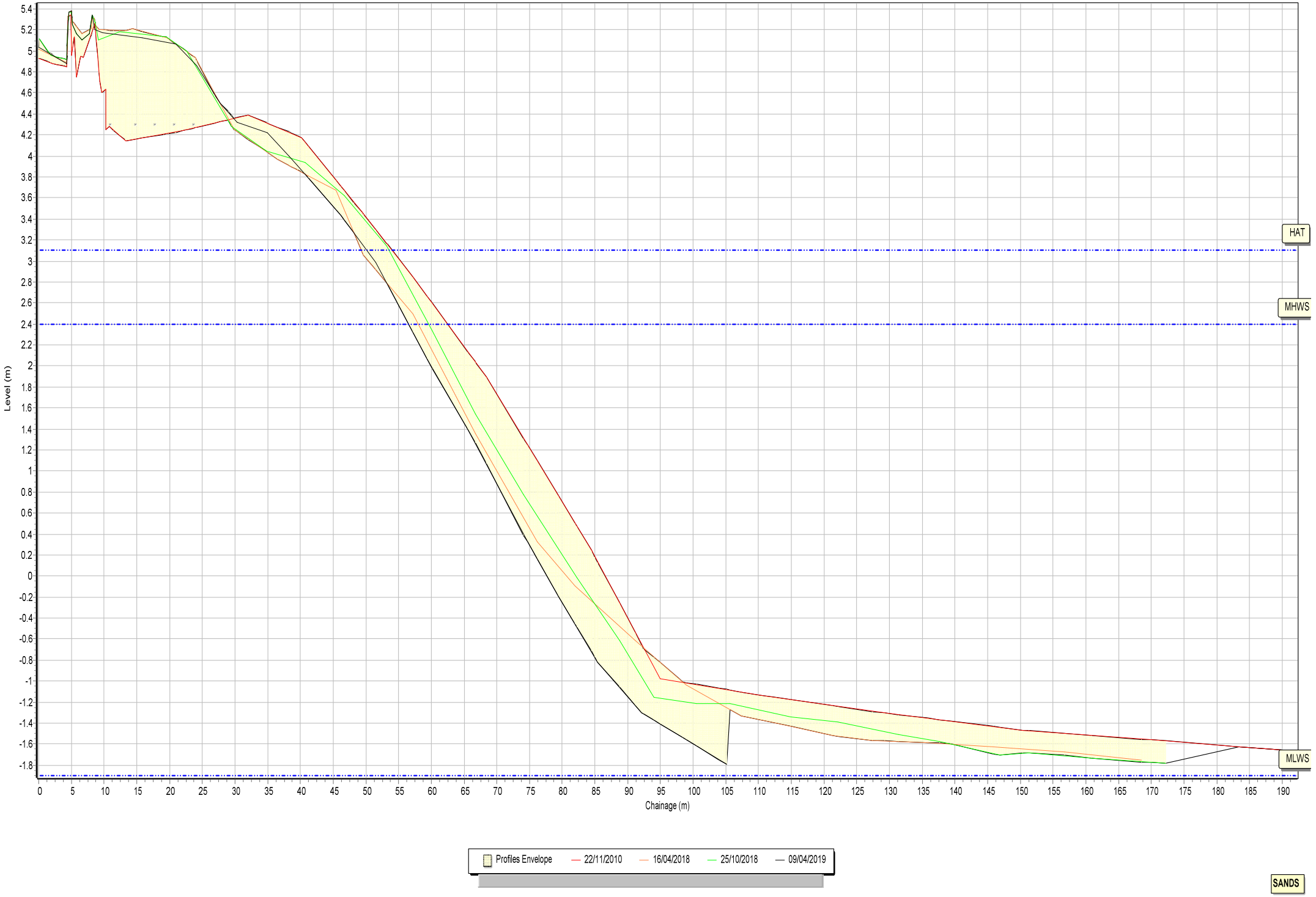

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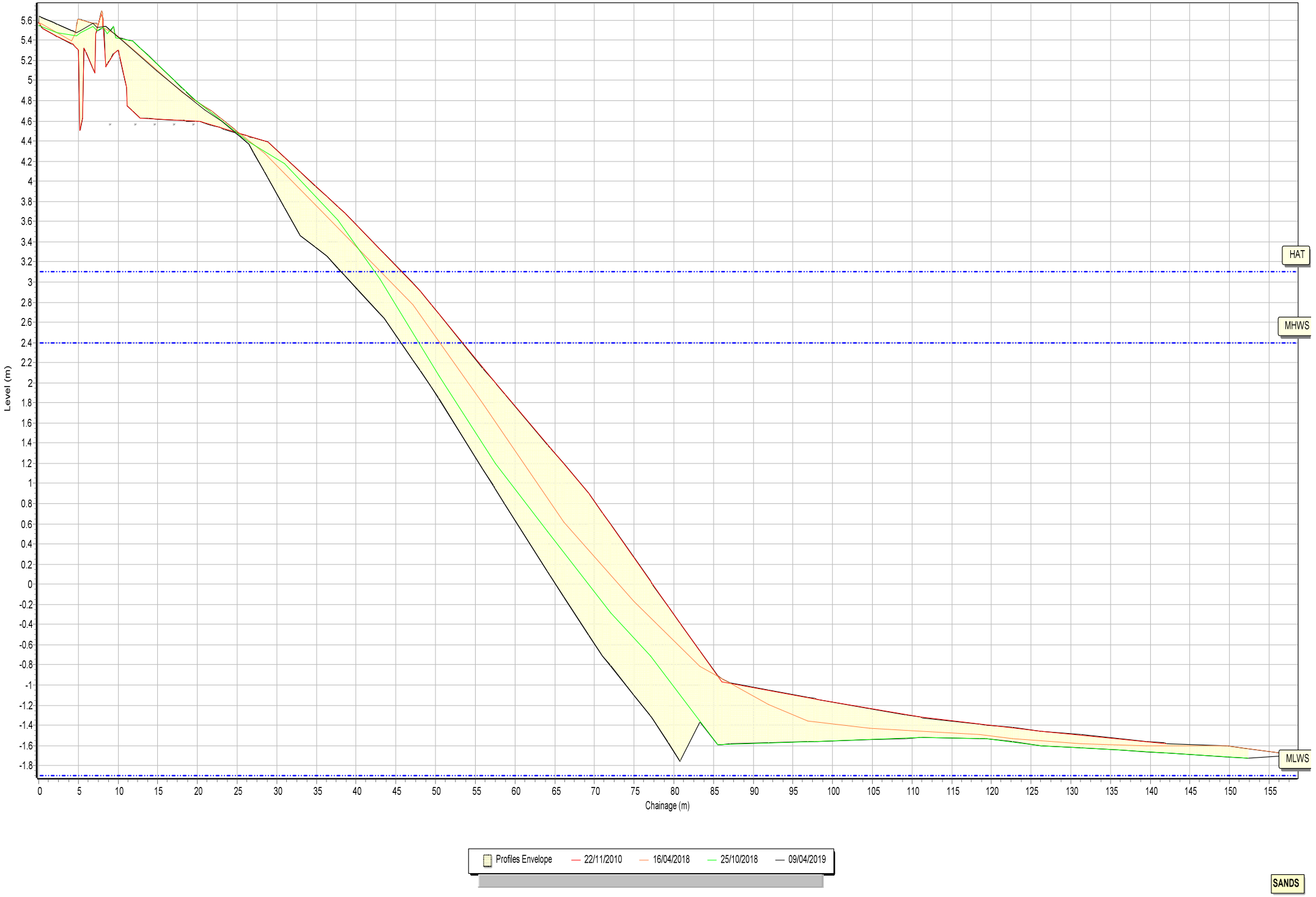

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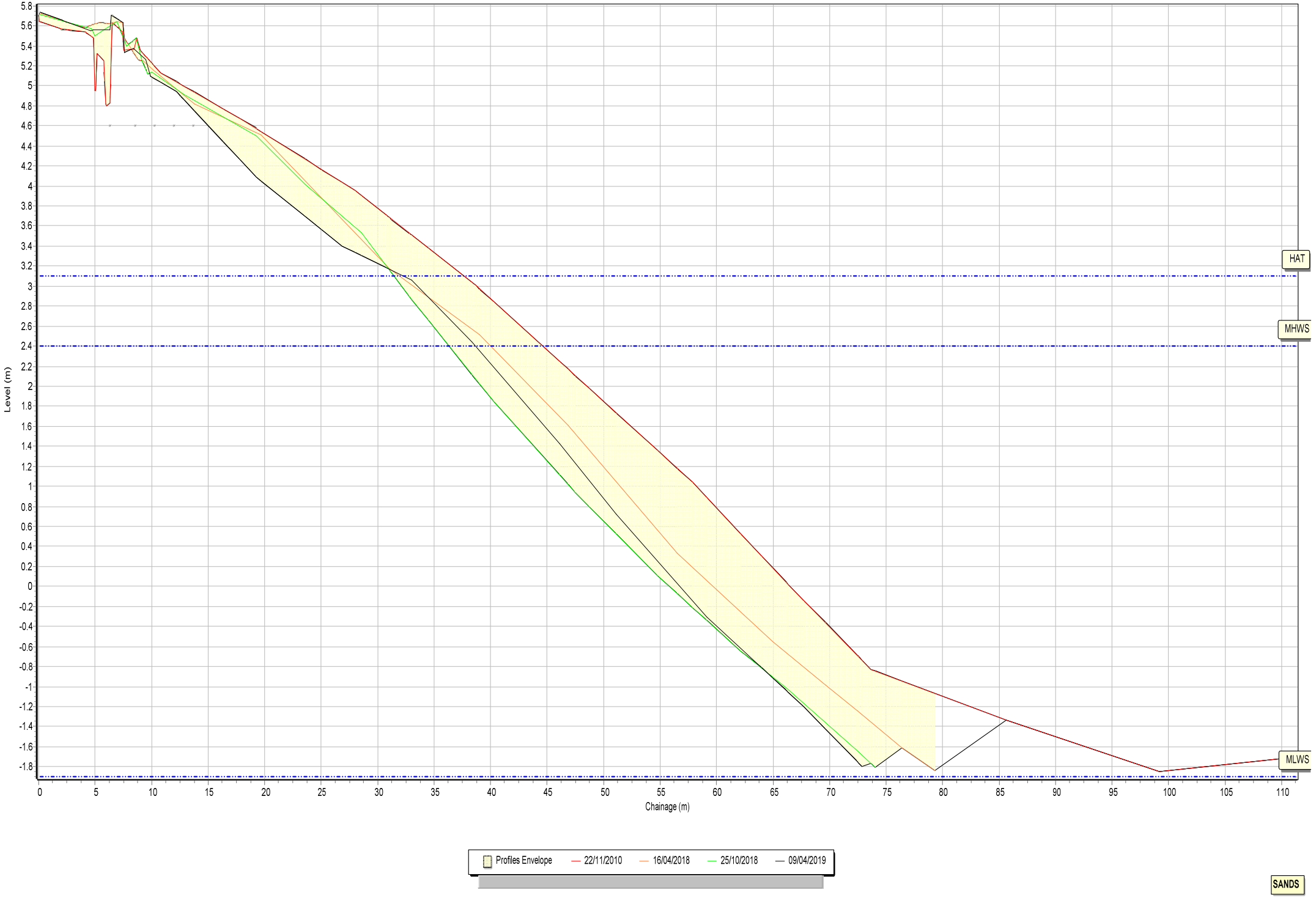

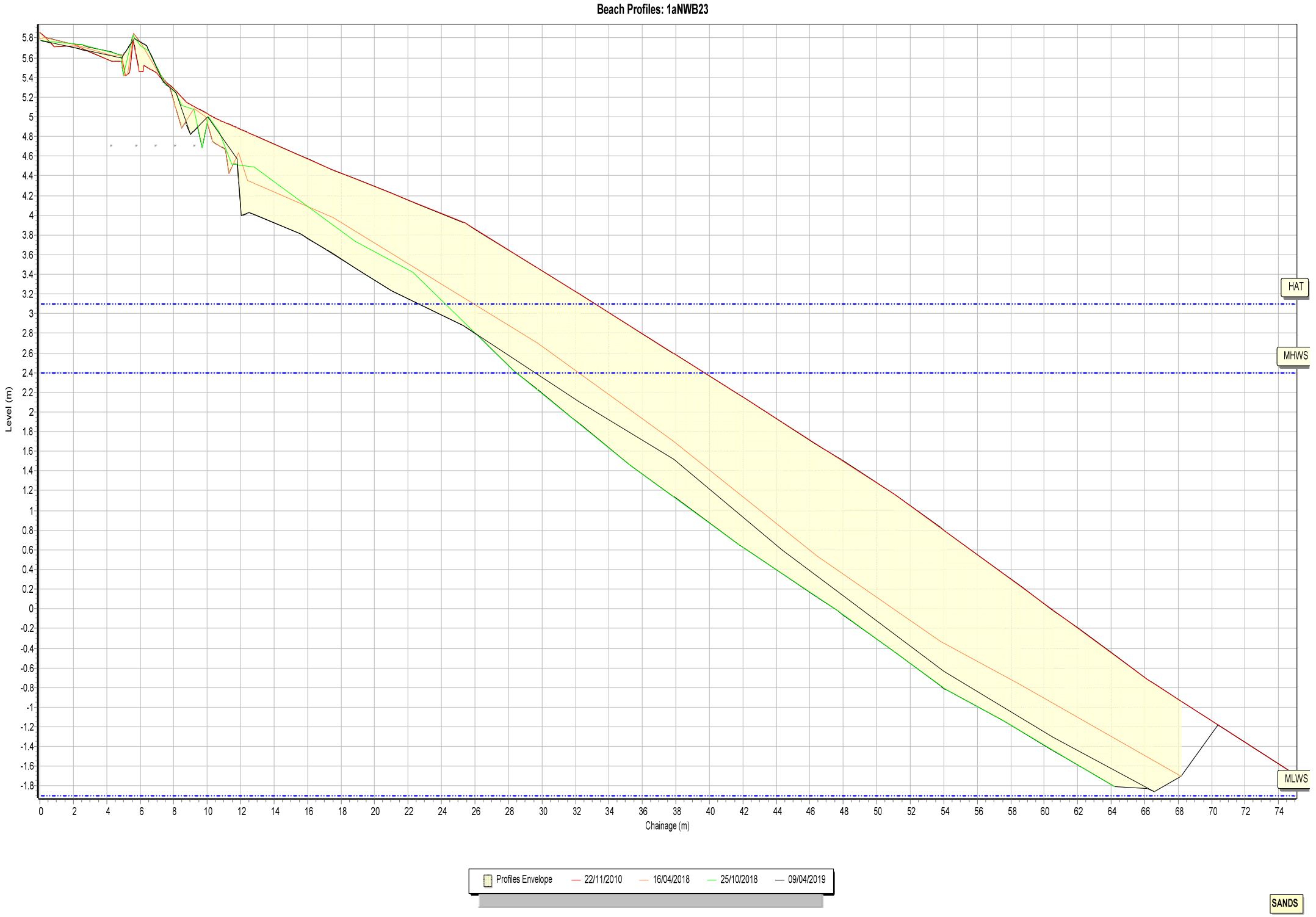
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Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
22/11/2010
16/04/2018
25/10/2018
09/04/2019
SANDS

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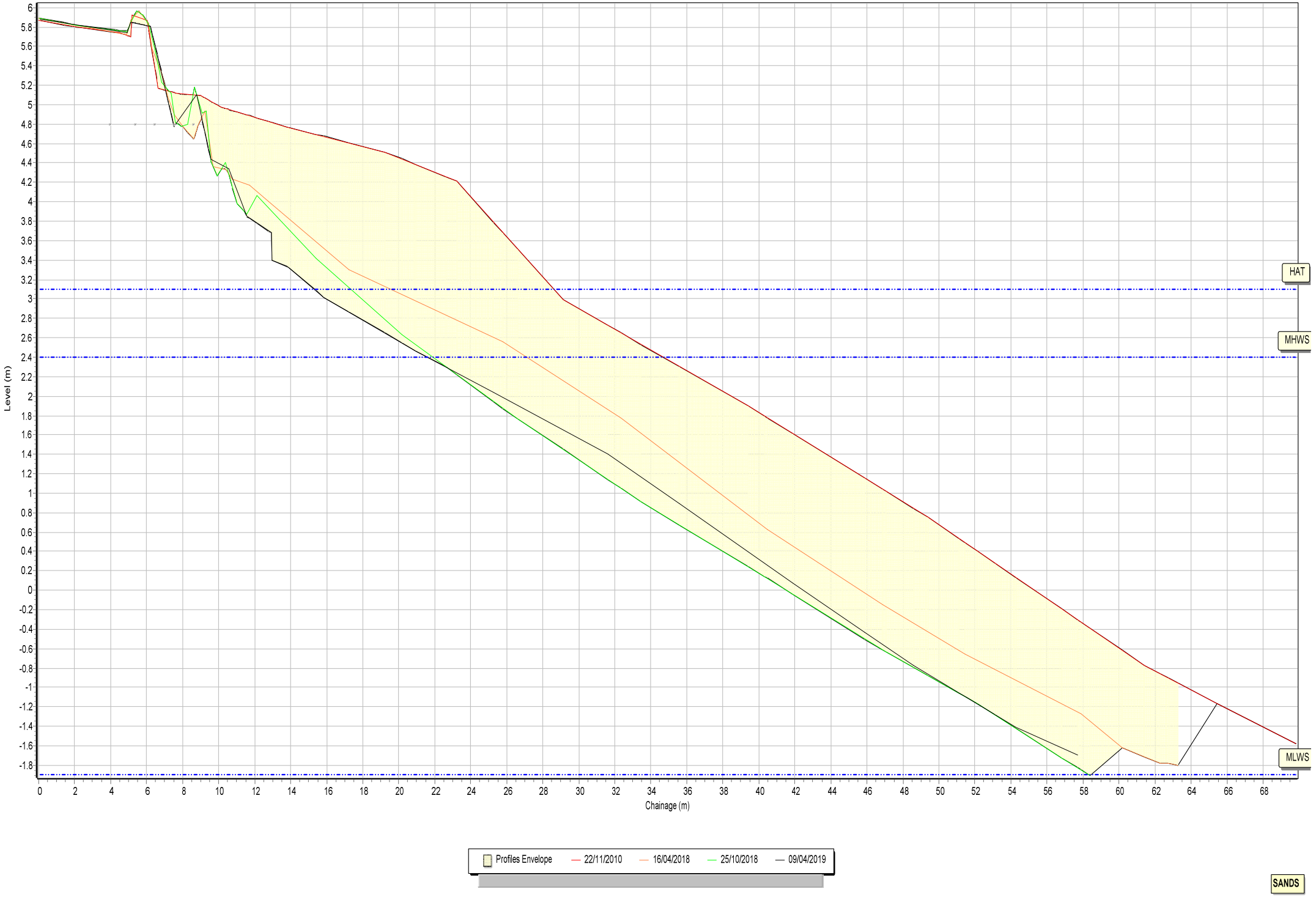

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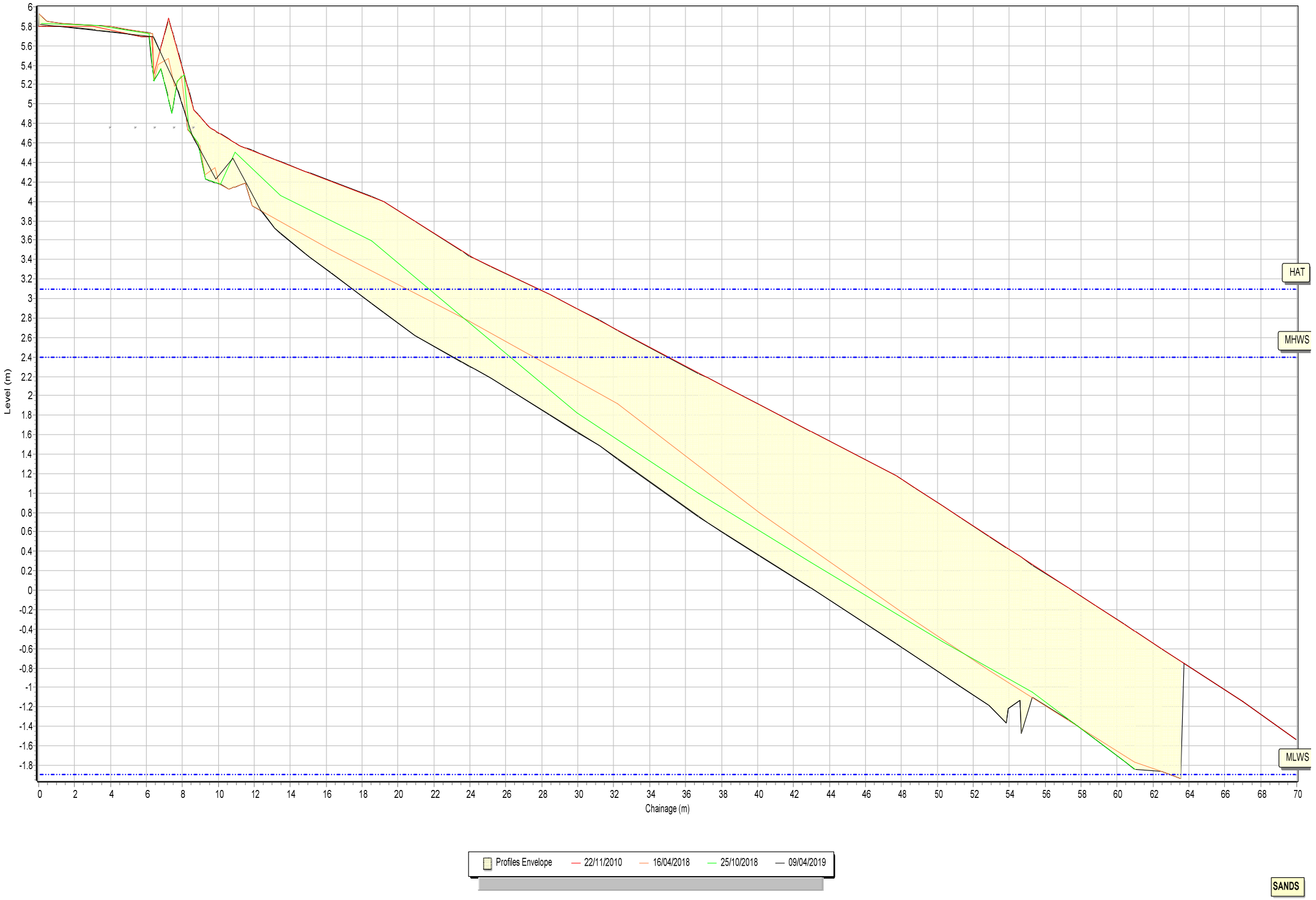

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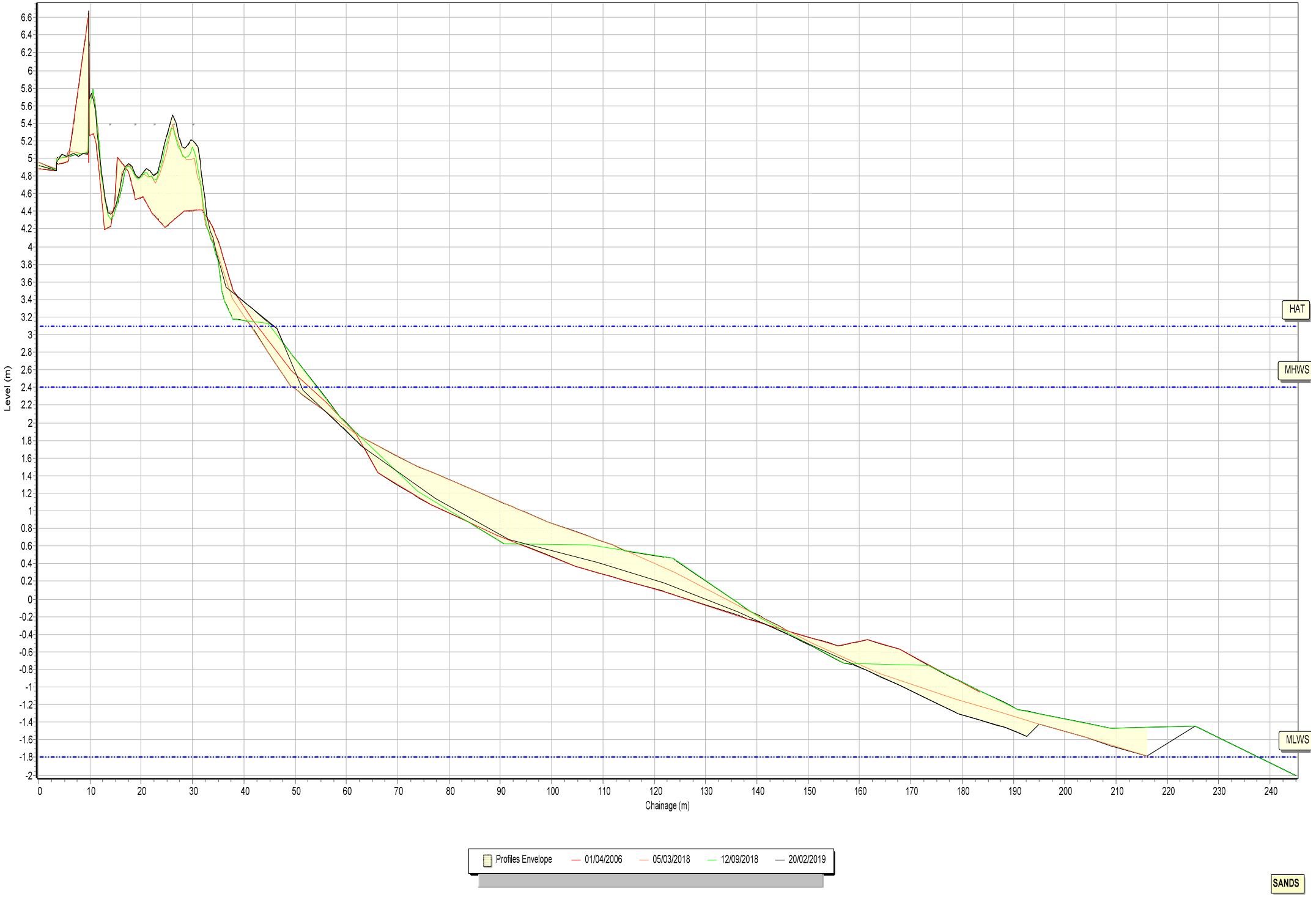

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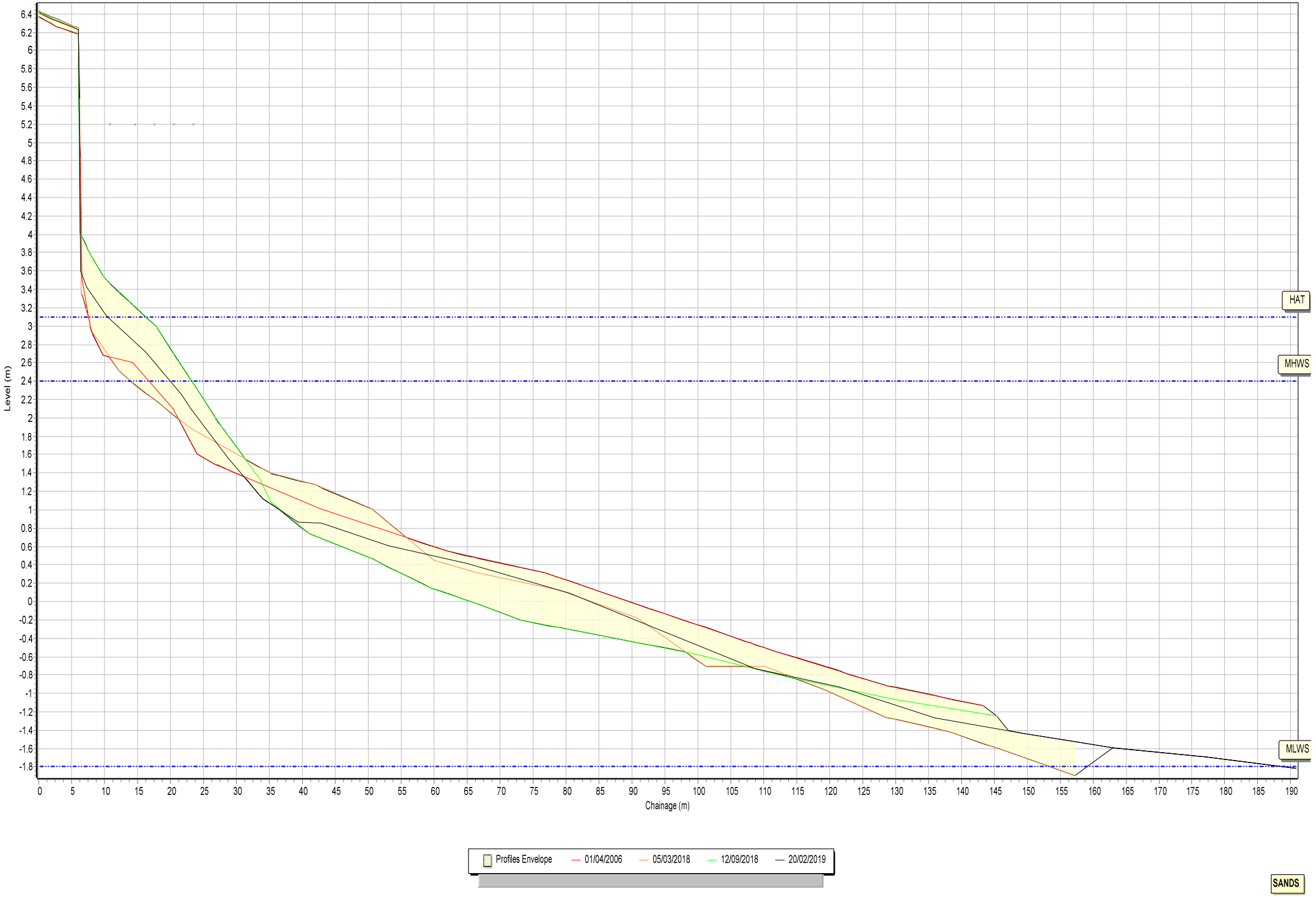


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Level (m)
Chainage (m)
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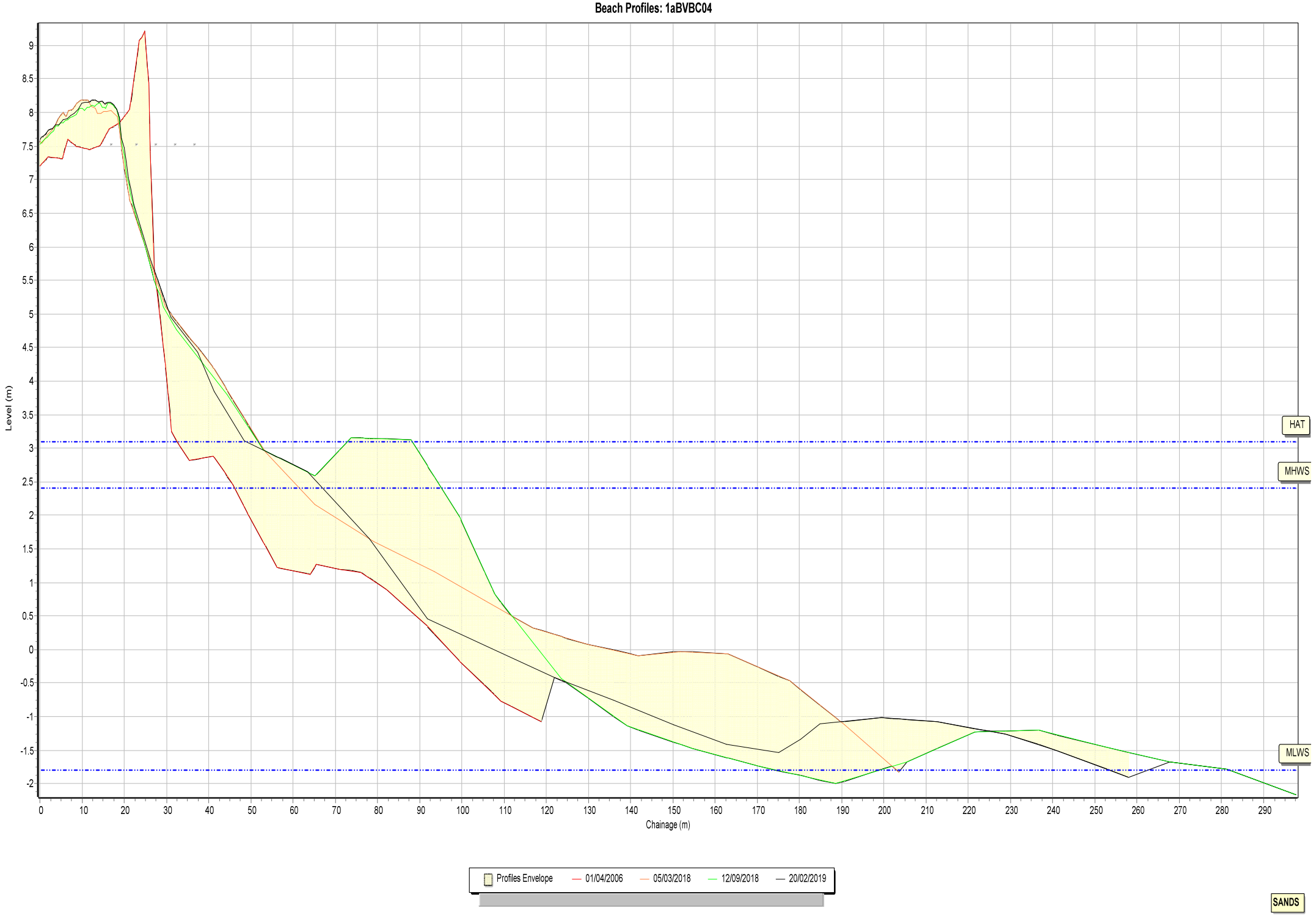
MHWS
MLWS
Profiles Envelope
01/04/2006
05/03/2018
12/09/2018
20/02/2019
SANDS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Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
01/04/2006
05/03/2018
12/09/2018
20/02/2019
SANDS


Beach Profiles: 1aBVBC05
Level (m)
Chainage (m)
HAT
MHWS
MLWS
Profiles Envelope
01/04/2006
05/03/2018
12/09/2018
20/02/2019
SANDS


Beach Profiles: 1aBVBC06
Level (m)
Chainage (m)
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MHWS
MLWS
Profiles Envelope
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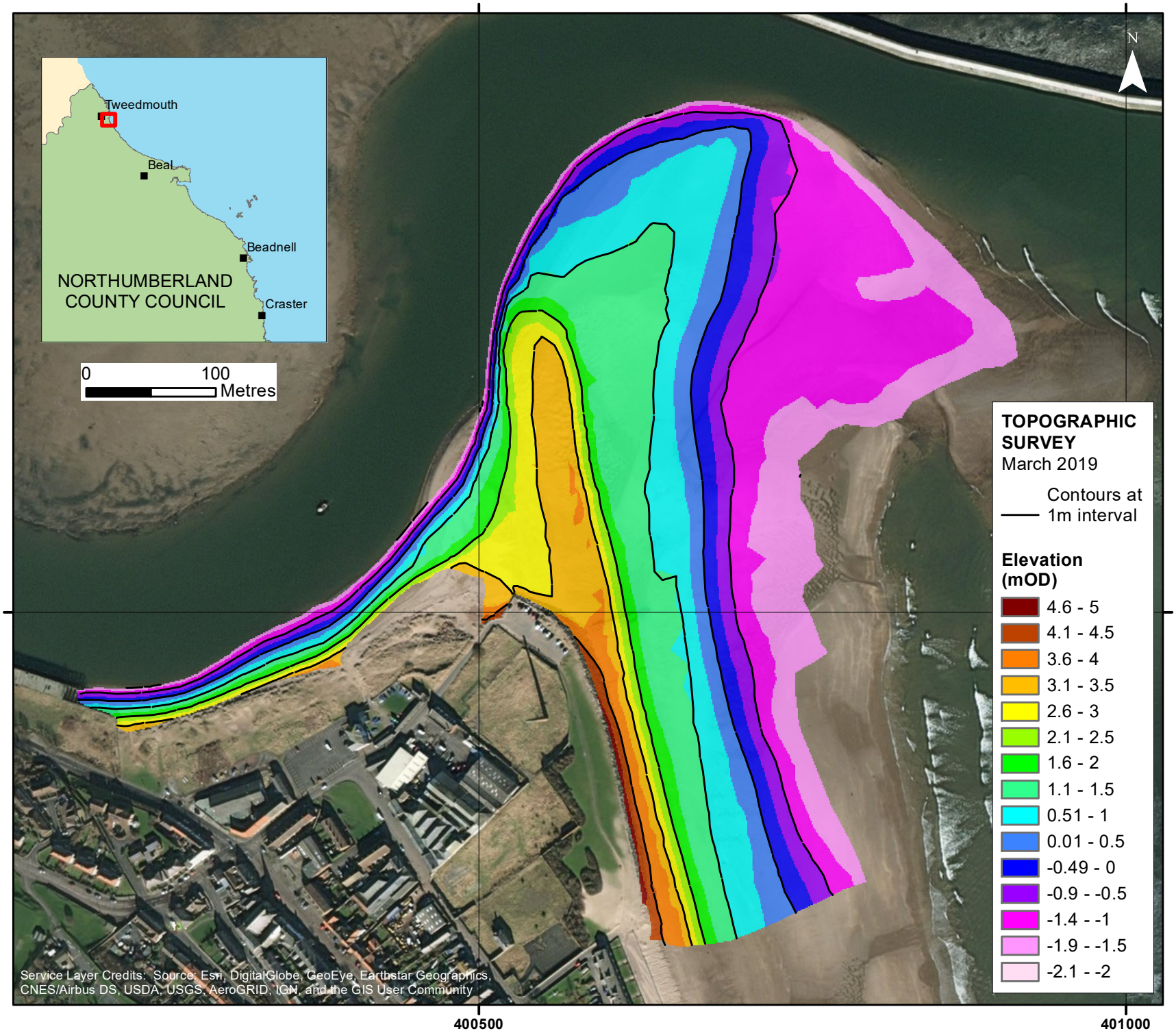
05/03/2018
12/09/2018
20/02/2019
SANDS

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

Update Report
'Partial Measures' Survey 2019

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

Royal HaskoningDHV
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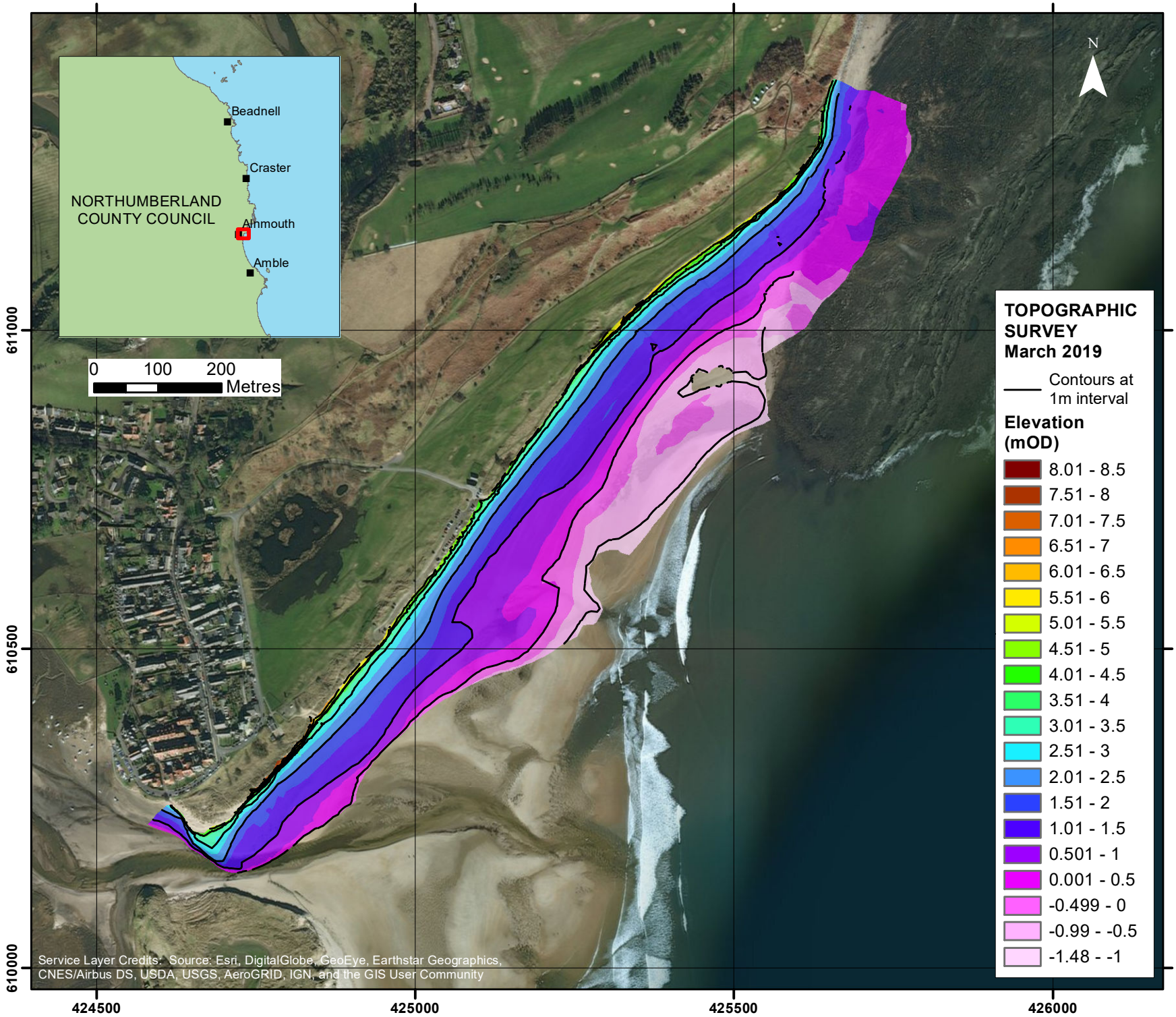

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 2

ALNMOUTH

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:8,000

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

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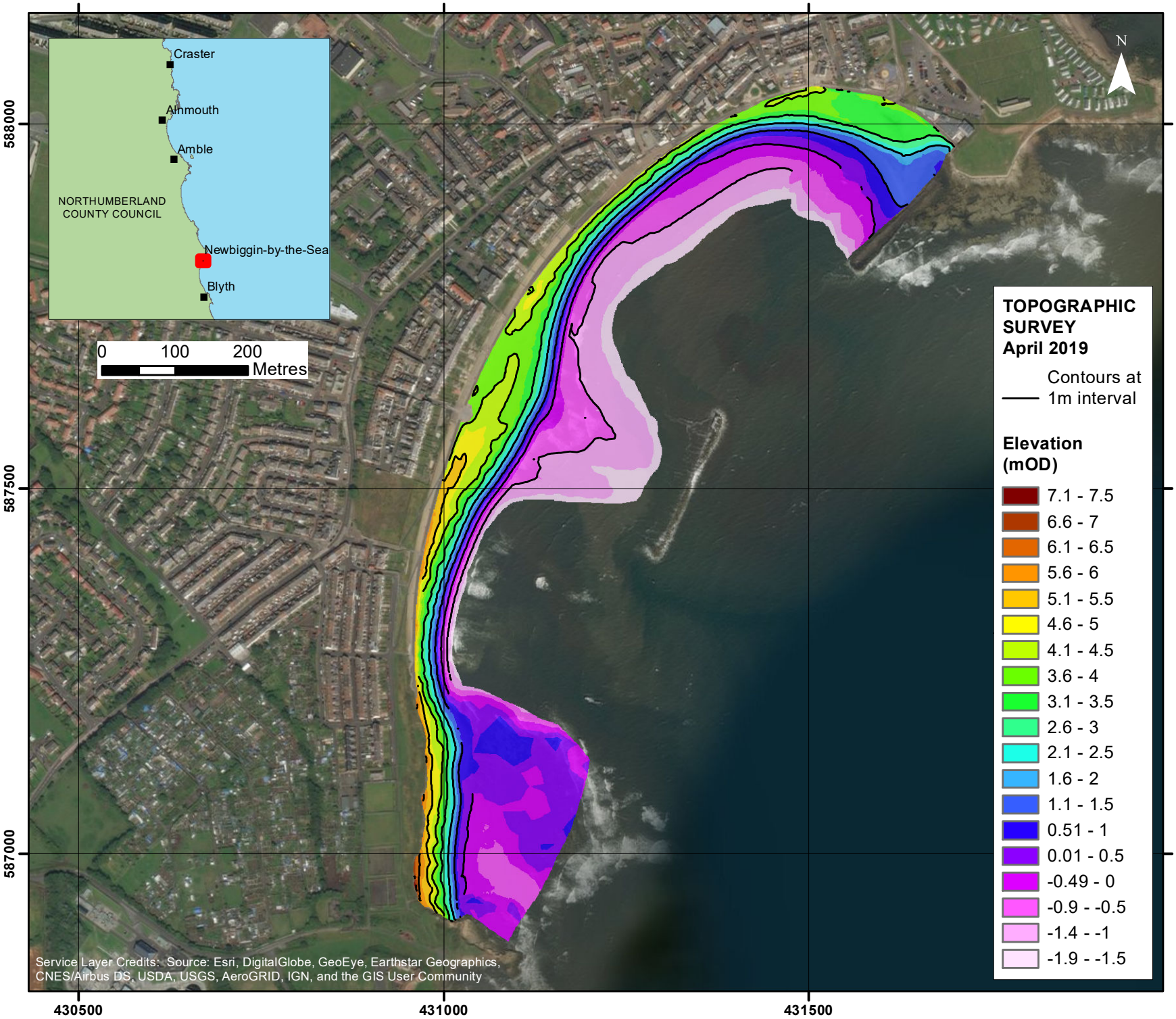

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 3

NEWBIGGIN-BY-THE-SEA

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:7,000

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

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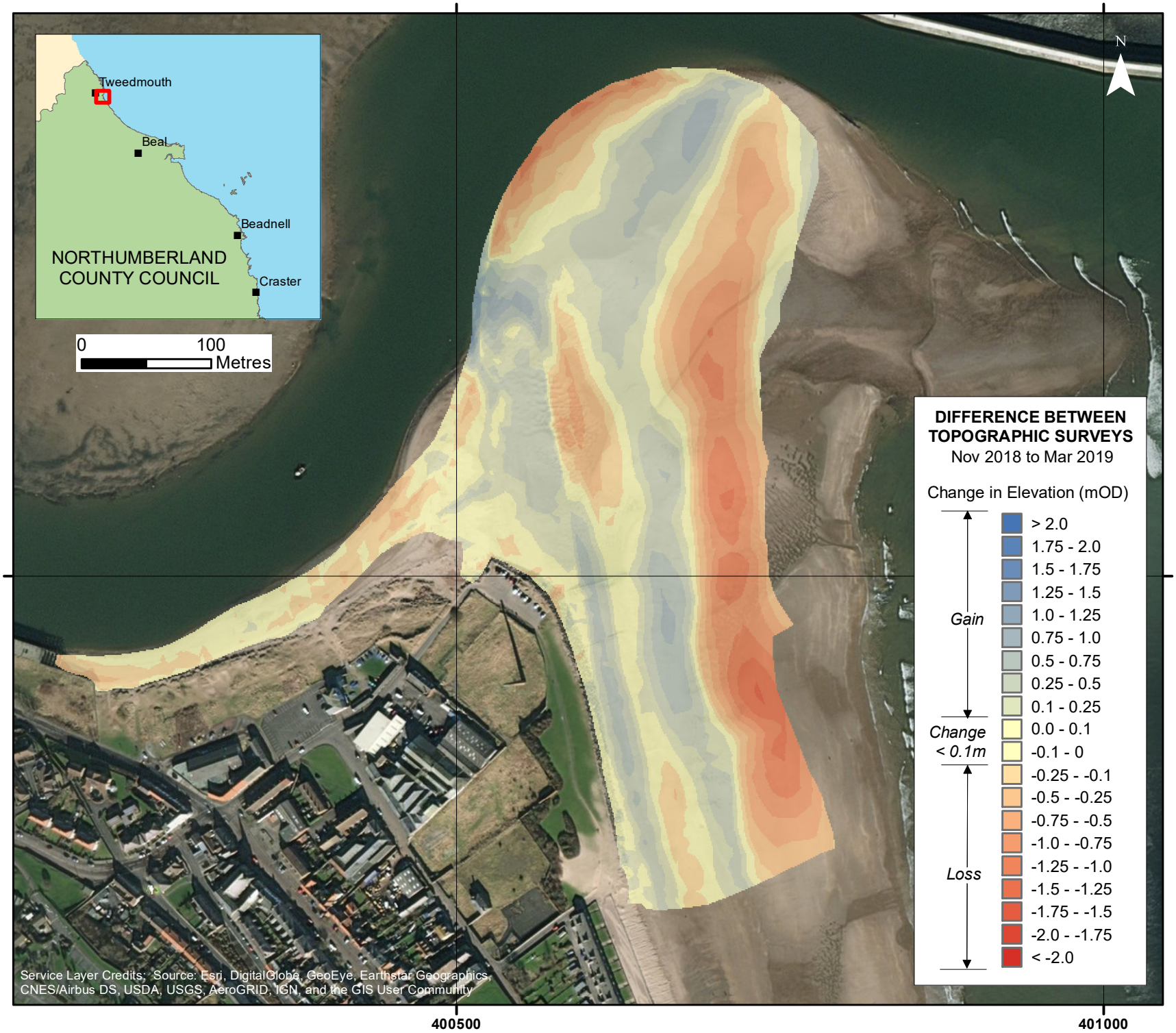

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 4

BERWICK

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2019

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

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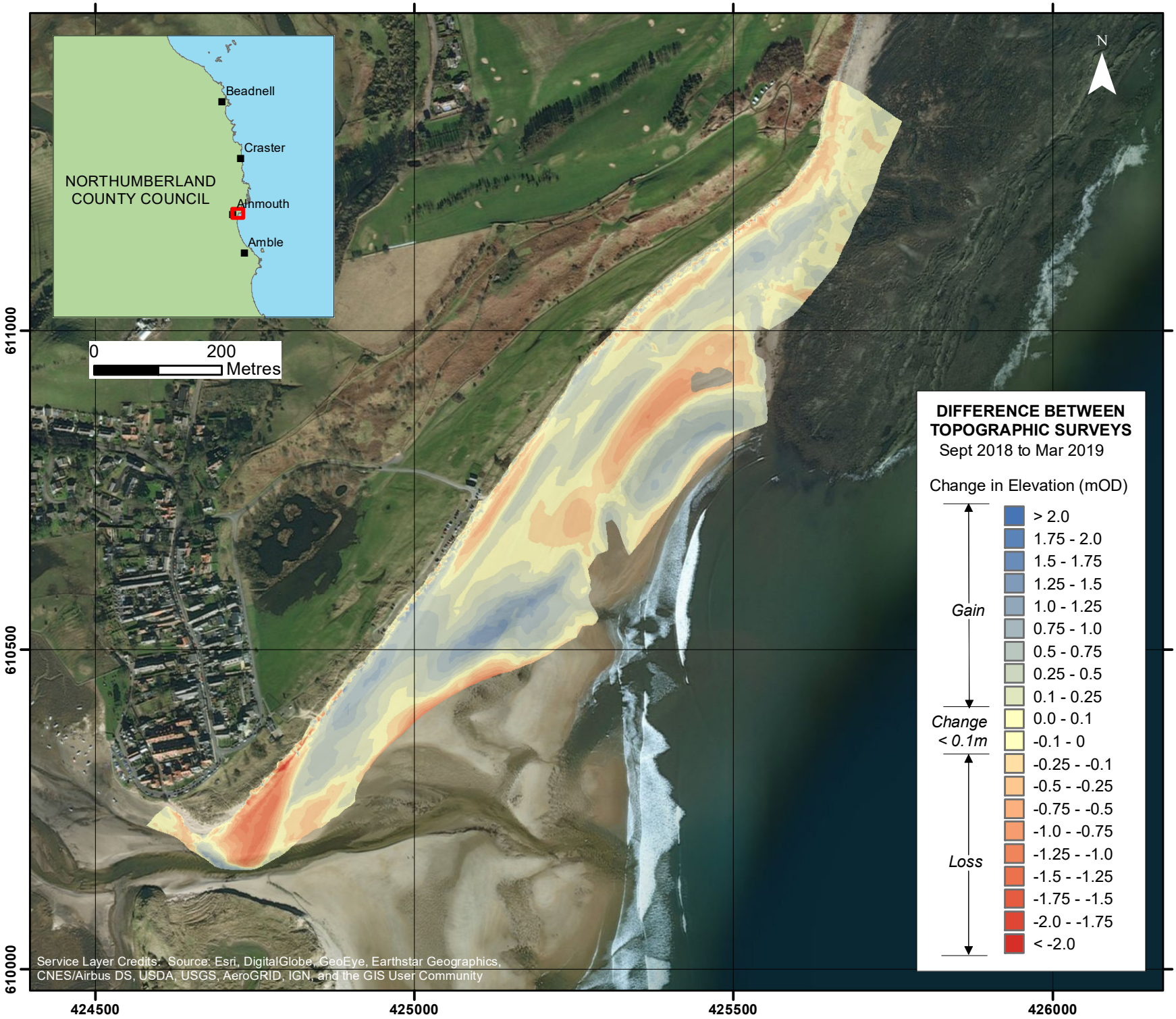

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 5

ALNMOUTH

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:8,000

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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

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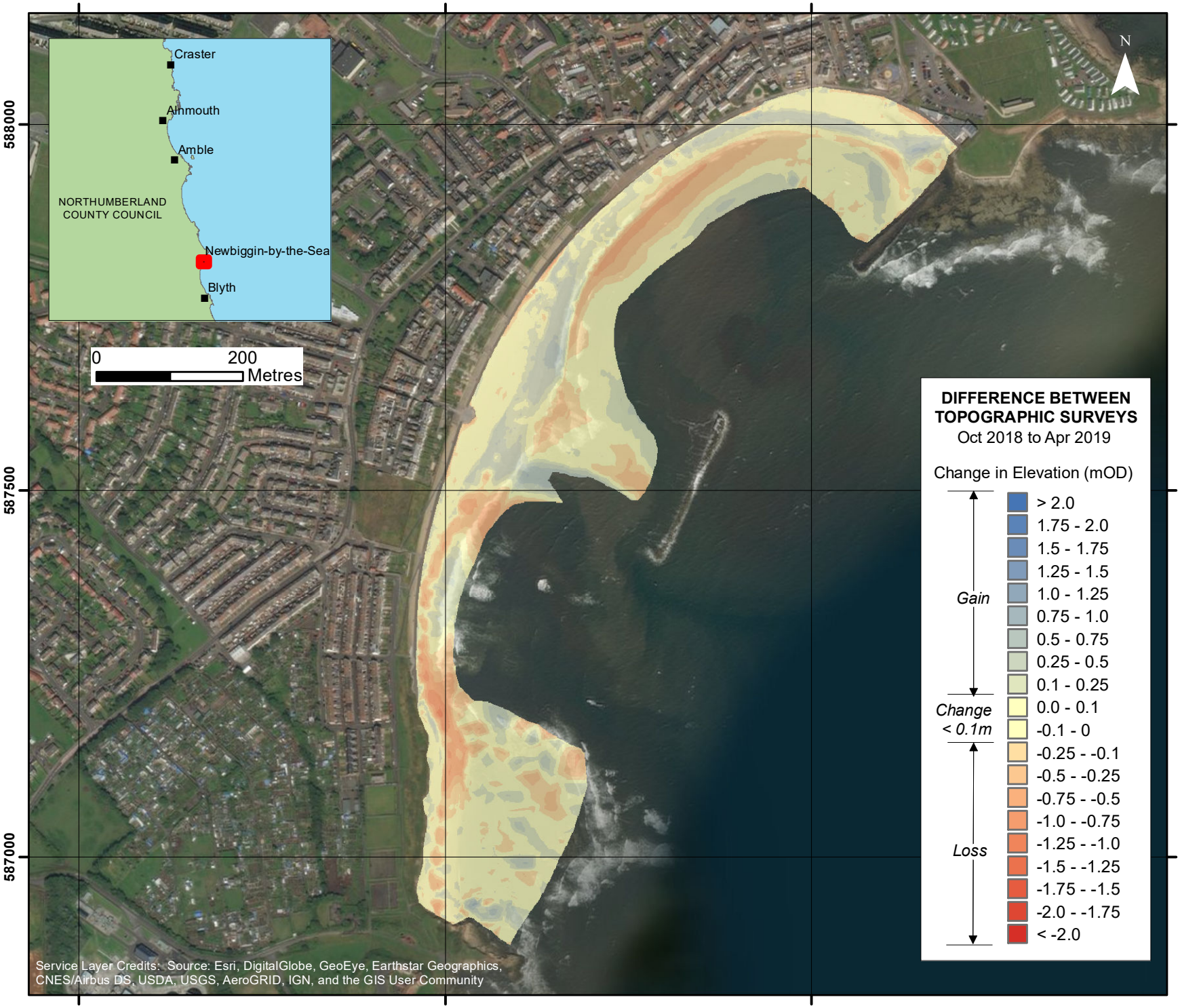

Client: North East Coastal Group

Project: Cell 1 Regional Coastal Monitoring Programme

Appendix B - Map 6

NEWBIGGIN-BY-THE-SEA

Northumberland County Council Frontage

Update Report
'Partial Measures' Survey 2019

Drawing Scale at A4 1:7,000

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

Tel: +44 (0)191 211 1300
Fax: +44 (0)191 211 1313
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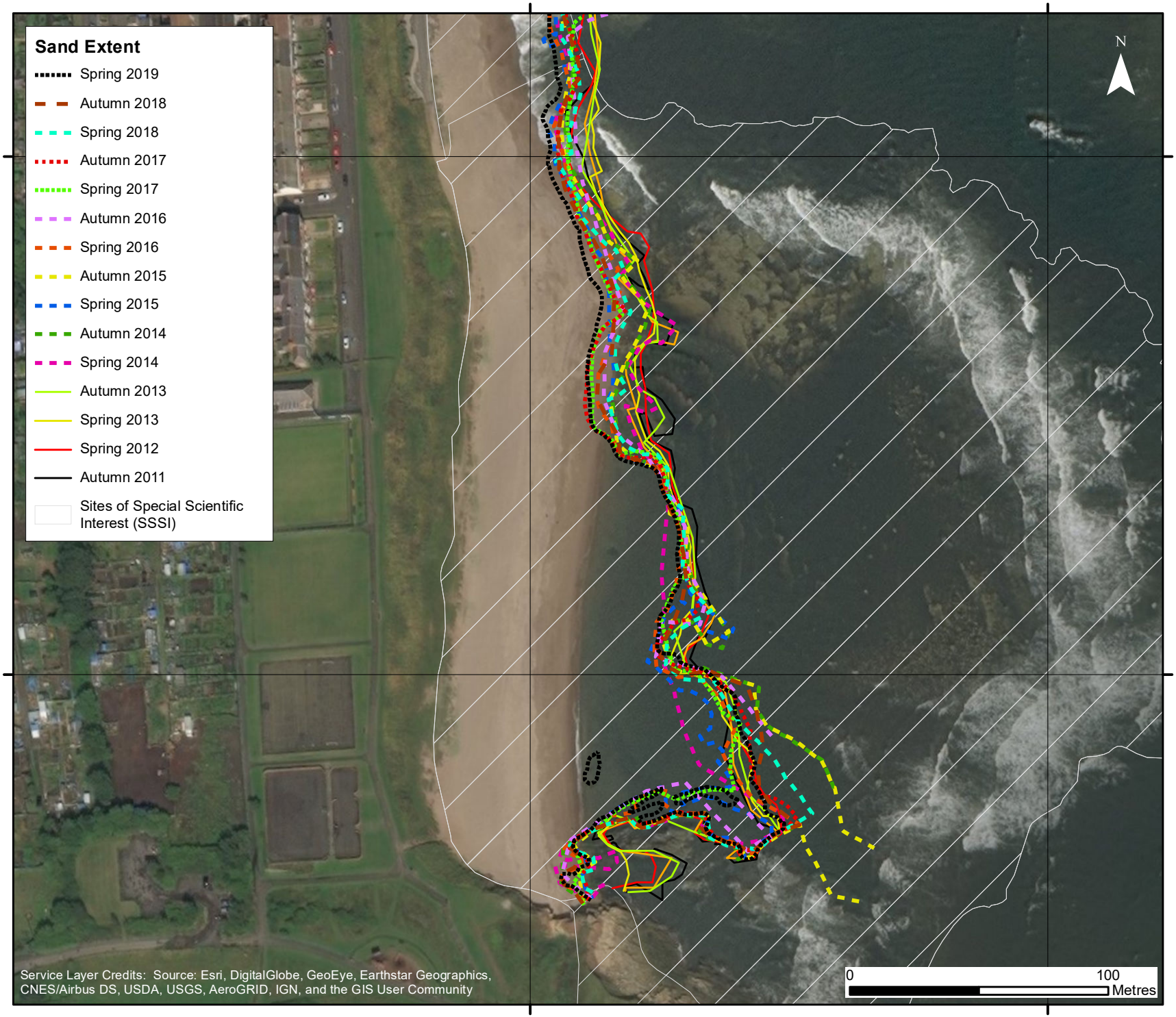
Appendix C

Sand Extent Survey



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 2019

Drawing Scale at A4 1:2,000

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

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