



Cell 1 Regional Coastal Monitoring Programme Analytical Report 15: 'Full Measures' Survey 2022

North Tyneside Council



January 2023

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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)
	Whitley Sands to King Edward's Bay
HAT	3.1
MHWS	2.4
MHWN	1.3
MLWN	-0.8
MLWS	-1.9

Source: UKHO Admiralty Tide Tables, 2020

Glossary of Terms

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

Preamble

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

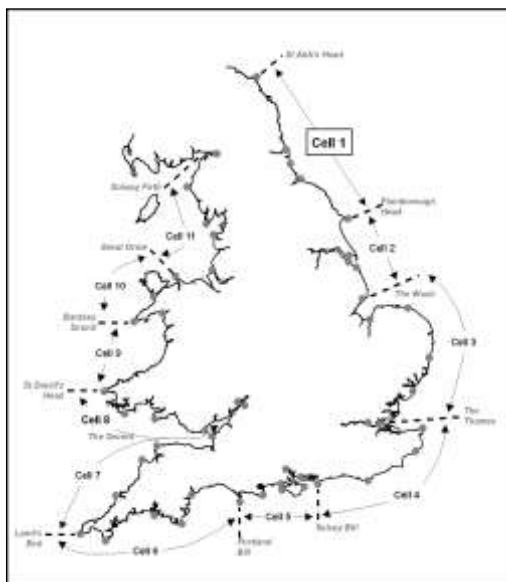


Figure 1 Sediment Cells in England and Wales

The programme commenced in its present guise in September 2008¹ and is managed by Scarborough Borough Council on behalf of the North East Coastal Observatory. It is funded by the Environment Agency, working in partnership with the following organisations:



¹ Prior to 2008, coastal monitoring was undertaken on a consistent basis across Northumberland and North Tyneside as part of the (then) Northumbrian Coastal Authorities Group's monitoring programme which commenced in 2002, whilst several authorities between the River Tyne and Flamborough Head undertook their own local monitoring programmes.

Royal HaskoningDHV has been appointed to provide Analytical Services in relation to the present phase of the Cell 1 Regional Coastal Monitoring Programme, between 2016 - 2027.

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

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

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

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

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

To date the following reports have been produced:

Table 1 Analytical, Update and Overview Reports Produced to Date

Year		Full Measures		Partial Measures		Cell 1 Overview Report
		Survey	Analytical Report	Survey	Update Report	
1	2008/09	Sep-Dec 08	May 09	Mar-May 09	Jun 09	
2	2009/10	Sep-Dec 09	Mar 10	Feb-Mar 10	Jul 10	
3	2010/11	Aug-Nov 10	Feb 11	Feb-Apr 11	Aug 11	Sep 11
4	2011/12	Oct-Nov 11	Oct 12	Mar-May 12	Feb 13	
5	2012/13	Sep-Oct 12	Mar 13	Mar-Apr 13	Jun 13	
6	2013/14	Sep-Oct 13	Feb 14	Mar-Apr 14	Jul 14	
7	2014/15	Oct-Nov 14	Feb 15	Mar 15	Jul 15	
8	2015/16	Oct-Nov 15	Feb 16	Mar 16	Jul 16	Jun 16
9	2016/17	Sep 16	Feb 17	Mar 17	Jul 17	
10	2017/18	Sep-Oct 17	Feb 18	Mar 18	May 18	
11	2018/19	Sep-Oct 18	Jan 19	Feb-Mar 19	Aug 19	
12	2019/20	Sep-Nov 19	Dec 19	Mar 20	Mar 20	
13	2020/21	Sep 20	Nov 20	Mar 21	Apr 21	Aug 21
14	2021/22	Aug 21	Dec 21	Mar-Apr 22	May 22	
15	2022/23	Aug 22	Jan 23(*)			

(*) The present report is **Analytical Report 15** and provides an analysis of the 2022 Full Measures survey for North Tyneside Council's frontage.

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

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

Table 2 Sub-divisions of the Cell 1 Coastline

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

1. Introduction

1.1 Study Area

North Tyneside Council's frontage extends from Hartley (just south of Blyth) in the north, to the River Tyne in the south. For the purposes of this report and for consistency with previous reporting, it has been sub-divided into four areas, namely:

- Whitley Sands
- Cullercoats Bay
- Tynemouth Long Sands
- King Edward's Bay

1.2 Methodology

Along North Tyneside Council's frontage, the following surveying is undertaken:

- Full Measures survey annually each autumn/early winter comprising:
 - Beach profile surveys along eight transect lines (commenced 2002)
 - Beach profile surveys along an additional two transects (commenced 2010)
 - Topographic survey along Whitley Sands (commenced 2010)
 - Topographic survey along Tynemouth Long Sands (commenced 2011)
- Partial Measures survey annually each spring comprising:
 - Beach profile surveys along all ten transect lines (commenced 2010)

The location of these surveys is shown in Figure 1. The beach profiles and topographic surveys were undertaken between the 25th and 26th August 2022. The weather conditions varied throughout the survey; further details can be found in the surveyor's reports.

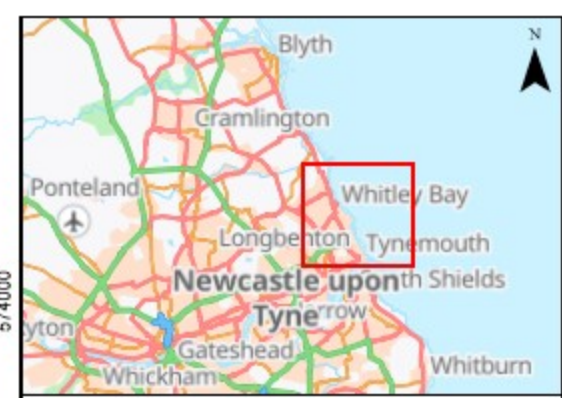
All data have been captured in a manner commensurate with the principles of the Environment Agency's *National Standard Contract and Specification for Surveying Services* and stored in a file format compatible with the software systems being used for the data analysis, namely SANDS and ArcGIS. This data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

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

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

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

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



SURVEY LOCATIONS

Topographic Profile

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

Topographic Area

- 6 monthly (Light Green)
- yearly (Yellow)
- 5 yearly (Light Purple)

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

Title: **Figure 2 - Map 1**
WHITLEY SANDS TO KING EDWARD'S BAY
North Tyneside Council Frontage

Report: **Survey Report**

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	n/a	TC	NJC	A4	1:32,000

Co-ordinate system: British National Grid

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2. Analysis of Survey Data

2.1 Whitley Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
25 th August 2022	<p>Beach Profiles:</p> <p>Whitley Sands is covered by five beach profile lines for the Full Measures survey (Appendix A). Four of these (1aNTDC01 to 1aNTDC04) were initially surveyed in April 2002 and were surveyed annually to 2009 (Full Measures, autumn 2009) and bi-annually thereafter. From March 2010 (Partial Measures, spring 2010) onwards, an additional beach profile line (NTDC04A) has been surveyed at the southern end of the frontage. All profiles were last surveyed in March 2021 for the Partial Measures survey.</p> <p>1aNTDC01 is located in the north of Whitley Sands, along the undefended cliffs immediately south of Trinity Road car park. The cliff was not measured due to dangerous access. There has been accretion of the upper beach profile by to 0.4m from the toe of the cliff to chainage 69m. The middle beach between chainages 69-106m has lowered by up to 0.2m. Seaward of this point, the lower beach has risen by up to 0.4m. Overall, the upper beach profile is at a medium level, whilst the mid and lower beach profile is at a low level when compared to the range recorded from previous surveys.</p> <p>Profile 1aNTDC02 is located in the northern part of Whitley Sands. A seawall is present at the back of the beach. On the upper beach, between the seawall at chainage 50m and chainage 91m there has accretion of up to 0.7m. The rest of the beach profile from chainage 91m to 143m has lowered by up to 0.2m. Seaward of this point the beach has lowered by up to 0.4m, exposing a patch of rocks at the end of the survey. The profile is generally at a medium-high level on the upper and middle beach, and medium level on the lower beach when compared with the range recorded from previous surveys.</p> <p>Profile 1aNTDC03 is located at the centre of Whitley Sands. The upper beach has risen by up to 0.7m from the toe of the seawall to chainage 61m. The lower beach from chainage 61m to the end of the survey has lowered by up to 0.5m, exposing some rocks at chainage 90m. The profile is at a high level on the upper and middle beach, whilst the lower -beach is at a low level compared to the range recorded from previous surveys.</p>	<p>Since the last survey, there has generally been accretion on the upper and middle beach, and erosion on the lower beach, except in the south of the bay where accretion has occurred across the beach profiles. The general trend indicates a landward movement of material, which is characteristic of summertime conditions.</p> <p>Longer term trends: Beach levels are generally at a medium-high range compared to earlier surveys, except on the lower beach of 1aNTDC03 which is at a low level.</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
	<p>Profile 1aNTDC04 is located in the southern part of Whitley Sands. There has been relatively little change between the seawall and chainage 21m. The beach profile between chainages 21-77m has risen by up to 0.2m. Similar to profile 1aNTDC03, the lower beach seaward of chainage 77m has lowered by up to 0.4m. The rock patch previously exposed at chainage 65m remains covered. Overall, the beach is at a medium-high level compared with the range recorded in previous surveys.</p> <p>Profile 1aNTDC04a is located towards the southern end of Whitley Sands. There has been accretion across the entire beach profile, by up to 0.6m on the upper beach, 0.5m on the middle beach and 0.6m on the lower beach. Overall, the profile is at a high level compared to the range recorded from previous surveys, particularly between chainage 60-82m which is at its highest level recorded.</p>	
<p>August 2022</p>	<p>Topographic Survey:</p> <p>Whitley Sands is covered by an annual topographic survey, which commenced in October 2010.</p> <p>Data from the most recent topographic survey (Full Measures, autumn 2022) have been used to create a digital ground model (DGM) (Appendix B – Map 1) using a GIS. A difference plot has also been produced using the DGM (Appendix B – Map 3) produced from the last produced topographic survey (Full Measures, autumn 2021) and the present survey.</p> <p>The difference plot shows that the north of the beach is dominated by erosion on the upper-middle beach, and little change ($\pm 0.1\text{m}$) on the lower beach. This trend transitions in the centre of the bay to predominantly low-level accretion ($< 0.75\text{m}$) and little change ($\pm 0.1\text{m}$). The south of the bay is dominated by accretion, which reaches up to 1.5m on the lower beach towards the southern extent of the survey. Areas of accretion and erosion occur in shore-parallel bands and the magnitude of change is generally less than 1.5m. This is a comparison of annual surveys, rather than a biannual comparison like the beach profiles and therefore explains why the patterns do not match with those described above, which generally show accretion on the upper beach and erosion on the lower beach, except in the south where accretion has occurred across the profile.</p>	<p>The most recent topographic survey difference plot shows a mixture of erosion and accretion, however the most dominant trend is erosion in the north of the bay, and accretion in the centre and south of the bay.</p>

2.2 Cullercoats Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
26 th August 2022	<p>Beach Profiles:</p> <p>Cullercoats Bay is covered by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile 1aNTDC05, the survey report notes that the cliff was not measured due to dangerous access. There has been variable change across the beach profile. A small amount of accretion has occurred at the cliff toe by up to 0.1m between chainage 25-27m. Erosion occurs on the upper to middle beach by up to 0.1m and on the lower beach by up to 0.4m. The profile is general at a low level on the upper beach, a high level on the middle beach and medium level on the lower beach compared to the range recorded from previous surveys.</p>	<p>As in previous surveys access to the cliff has not been possible.</p> <p>The data shows only limited change related to short-term patterns of sediment movement.</p> <p>Longer term trends: The amount of change is within the past range. Much of the profile is at medium level compared with previous surveys.</p>

2.3 Tynemouth Long Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
26 th August 2022	<p>Beach Profiles:</p> <p>Tynemouth Long Sands is covered by three beach profile lines for the Full Measures survey (Appendix A). Profiles 1aNTDC06 and 1aNTDC07 were initially surveyed annually each autumn between 2002 and 2009. A third profile, 1aNTDC06A, was then added in the centre of the frontage. From spring 2010 (Partial Measures) onwards, all profiles have been surveyed bi-annually.</p> <p>Profile 1aNTDC06 is located approximately 150m south of the access ramp towards the north of the bay. The top of the cliff has not changed since the last survey however, the remainder of the cliff profile cannot be reviewed due to lack of data points in the profile plot as the survey report notes '<i>no access to middle of section 6 due to seed protection fences</i>'. The beach profile starts at c.35m chainage and shows minimal change to chainage 50m. The upper beach berm at chainage 70m has lowered by up to 0.6m to chainage 80m. Seaward of this point, the middle and lower beach has risen by up to 0.4m to the end of the survey at chainage 191m. Overall, the upper and middle beach is at a high level and the lower beach is at a low level compared with the range from previous surveys.</p> <p>At profile 1aNTDC06A, the dune-cliff face has not significantly changed in form or position. As with section 6, the survey report notes '<i>no access to middle of section 6a due to seed protection fences</i>'. There has generally been accretion across the beach profile, by up to 0.8m on the upper beach between chainages 96-132m and up to 0.2m between chainage 175m to the end of the survey at chainage 285m. The middle beach has lowered by up to 0.4m between chainages 132-175m. Overall, the autumn 2022 profile is at a high level compared to the range recorded from the previous surveys, particularly between chainages 102-132m which is at their highest levels recorded.</p> <p>Profile 1aNTDC07 is located approximately 50m south of the access route through the dunes towards the southern end of the bay. The dune-cliff has not significantly changed in form or position since the last survey. As with section 6 and 6a, the survey report notes '<i>no access to middle of section 7 due to seed protection fences</i>'. There has been variable erosion and accretion across the beach profile, however this is limited to ± 0.2m, except between chainages 106-150m which has risen by up to 0.6m. Overall the autumn 2022 profile is at a high level compared to the range recorded from the previous surveys, particularly between chainages 111-140m which is at its highest level recorded.</p>	<p>Since the last survey the dunes have retained the same form and position.</p> <p>The profiles in the centre and south of Long Sands show variable erosion and accretion, with no clear trend. Profile 1aNTDC06A and 1aNTDC07 show a similar trend to Whitley Sands, with movement of material onshore.</p> <p>Longer term trends: Overall, the beaches have retained a similar form and are in the medium-high range of previous surveys. Several sections have reached their highest level (profile 1aNTDC06A (102-132m) and profile 1aNTDC07 (111-140m)).</p>

Survey Date	Description of Changes Since Last Survey	Interpretation
<p>August 2022</p>	<p>Topographic Survey:</p> <p>The first survey was undertaken for the Full Measures survey in October 2010.</p> <p>Data from the current topographic survey have been used to create a digital ground model (DGM) (Appendix B – Map 2) using a Geographical Information System (GIS). A difference plot has also been produced by comparing the current DGM (Appendix B – Map 4) with that produced from the last topographic survey in March 2022.</p> <p>The centre and south of the bay is dominated by shore parallel bands of erosion (on the middle beach and lower beach) and accretion (upper beach and mid-lower beach) with areas of little change ($\pm 0.1\text{m}$) in-between. The north of the bay is dominated by low-level accretion and little change, with only isolated patches of erosion (on the lower beach in the very north of the bay). The magnitude of change is relatively small for both accretion and erosion in the ($\pm 0.55\text{m}$) but is of larger magnitude in the central bay ($\pm 1.75\text{m}$).</p>	<p>The pattern shown in the difference plot supports the patterns identified in the profiles, with shore parallel bands of erosion and accretion exhibiting berm movement.</p>

2.4 King Edward's Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
26 th – August 202	<p>Beach Profiles:</p> <p>King Edward's Bay is monitored by one beach profile line for the Full Measures survey (Appendix A). This was surveyed annually between 2002 and 2009. From spring 2010 onwards, it has been surveyed bi-annually.</p> <p>At profile 1aNTDC08, the beach has undergone minimal change to chainage 24m, except for a small section where the beach lowered by up to 0.2m. The beach between chainage 24-54m has risen by up to 0.2m, switching to a lowering of 0.3m to chainage 74m. The rest of the beach profile has risen by 0.7m across the middle and lower beach, forming a shallow berm at chainage 170m. The survey extends a further 77m compared to the previous survey. Overall, the beach profile is at a medium-high level on the upper and middle beach and a low level on the lower beach when compared with the range recorded from previous surveys.</p>	<p>Since the last survey, the upper beach at King Edward's Bay has experienced movement of sediment in a seaward direction in the form of a berm.</p> <p>Longer term trends: The profile is at a medium-high level on the upper and middle beach, and a low level on the lower beach compared with the range of previously observed surveys at this location. Changes between the spring 2022 and autumn 2022 survey show a seasonal movement of sediment across the beach in the form of a berm.</p>

3. Problems Encountered and Uncertainty in Analysis

Individual Profiles

- At profile 1aNTDC01 the cliff was not measured due to access problems.
- At profile 1aNTDC05 the cliff was not measured due to access problems. Access to this profile is noted to have been dangerous in previous Partial Measures and Full Measures reports, and it is recommended that the beach profile should start at the cliff toe and that the cliff be monitored using the aerial survey data.
- At Tynemouth Long Sands (profiles 1aNTDC06, 1aNTDC06A and 1aNTDC07) there was no access to the dunes in the middle of the profile due to seed protection fences. This means it has not yet been possible to monitor the effectiveness of the dune stabilisation scheme.

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

- It is recommended that the beach profile at 1aNTDC05 in Cullercoats Bay should start at the cliff toe and that the cliff be monitored using the aerial survey data.
- It is recommended that access to the stabilised dunes at Tynemouth Long Sands be attempted in future surveys to monitor the effectiveness of the stabilisation fences.

5. Conclusions and Areas of Concern

- At Whitley Sands there has generally been accretion on the upper and middle beach, and erosion on the lower beach, except in the south of the bay where accretion has occurred across the beach profile. For the most part, the beach is at a medium-high level in the range recorded from previous surveys. The topographic survey does not exhibit a clear pattern of sediment movement between the two surveys at Whitley Sands and is dominated by erosion in the north of the bay, and accretion in the south of the bay indicating a potential movement of material northwards.
- At Cullercoats Bay, there has been variable change across the beach profile, limited to $\pm 0.4\text{m}$. The results fall within the range of previously recorded results and there are no causes for concern.
- At Tynemouth Long Sands, the majority of recorded profiles are within the previously recorded range with berm building processes dominating. The profiles present no cause for concern. The topographic survey results generally demonstrate shore-parallel bands of erosion and accretion associated with seasonal distribution of sediment. Change in the centre of the bay is of larger magnitude ($\pm 1.75\text{m}$) than the north and south of the bay.
- At King Edward's Bay, there appears to have been a seaward movement of sediment in the form of a berm. There are no causes for concern and the results fall within the range recorded in previous surveys.

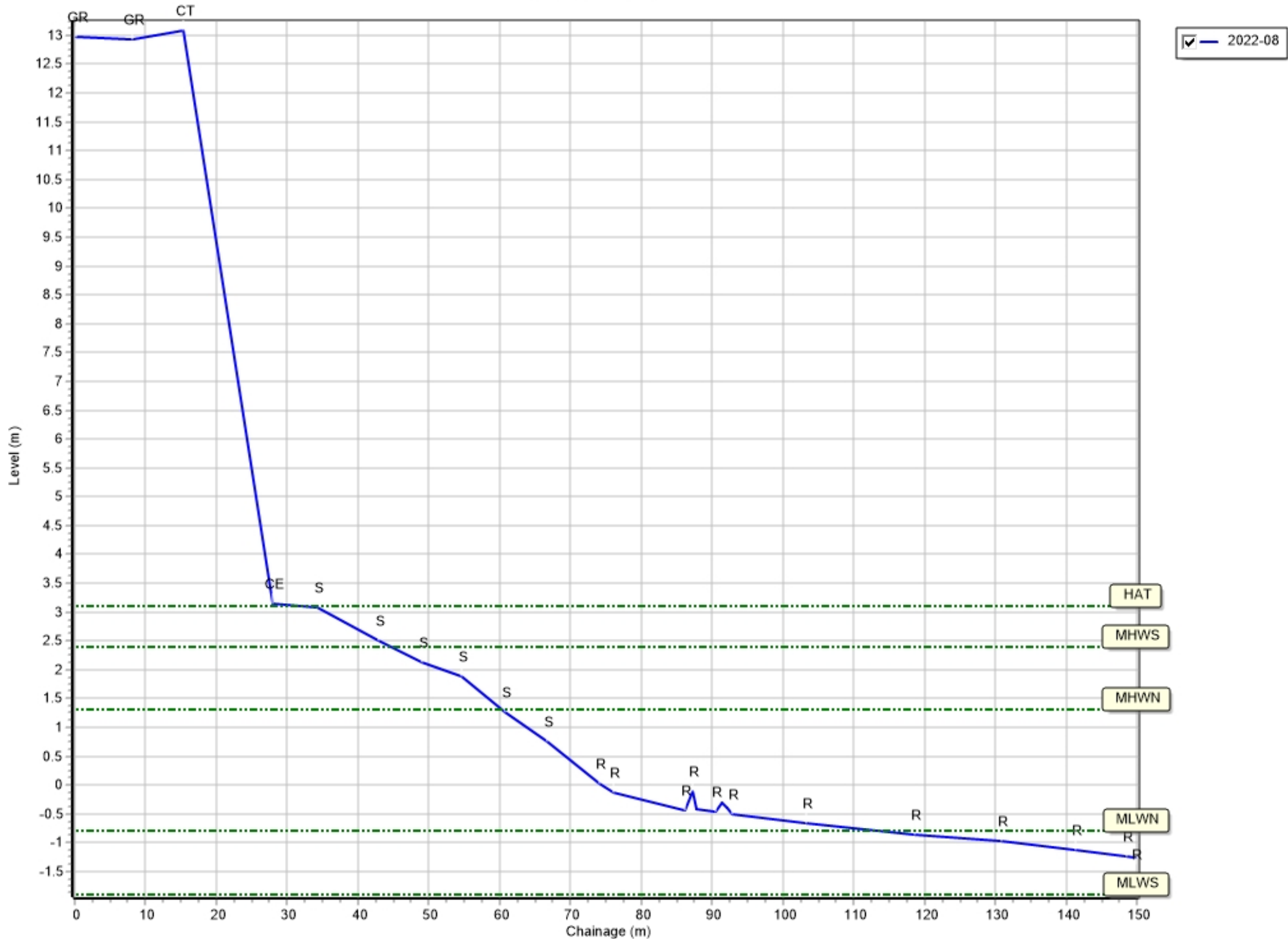
Appendices

Appendix A
Beach Profiles

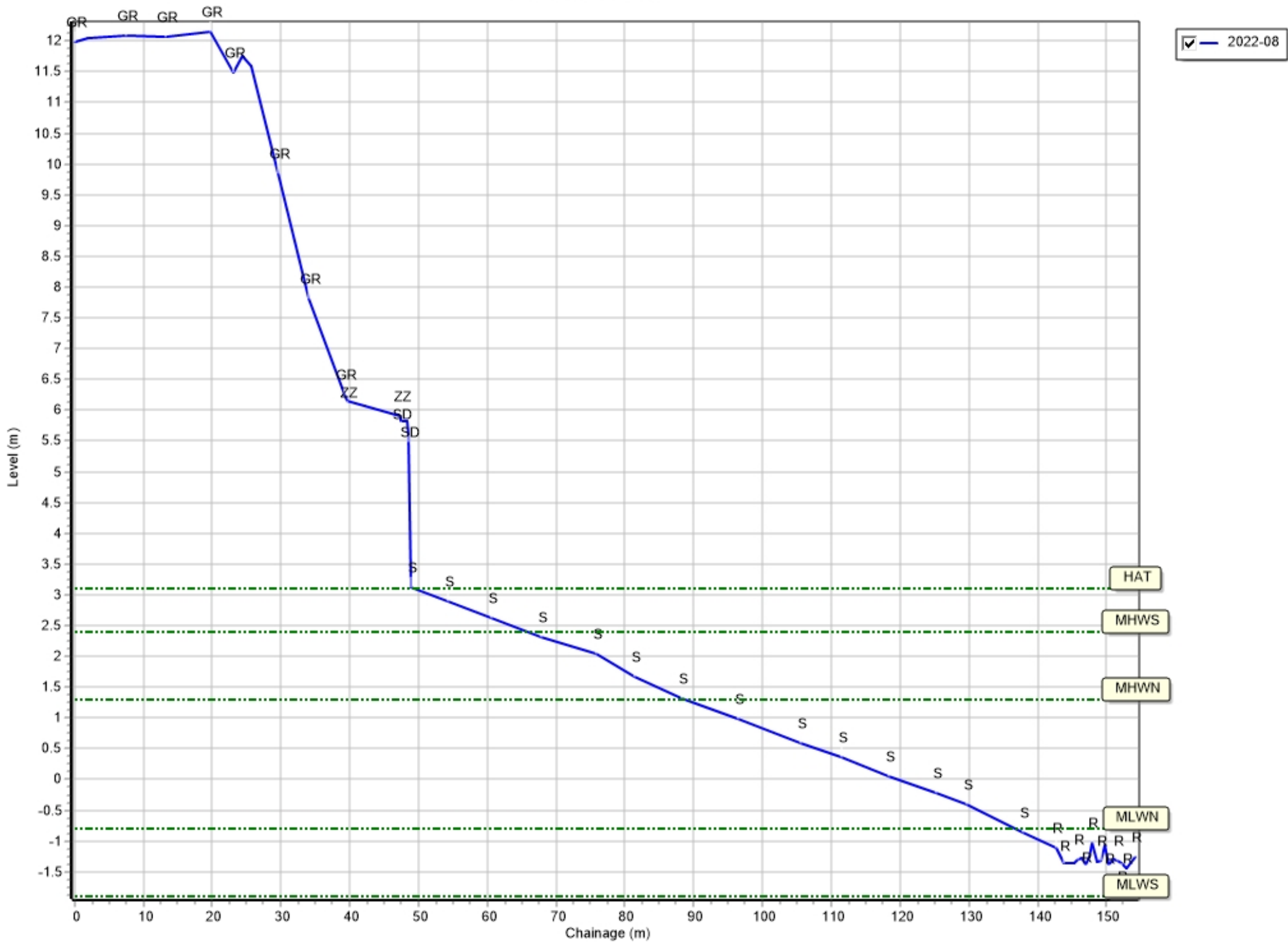
The following sediment feature codes are used on some profile plots:

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

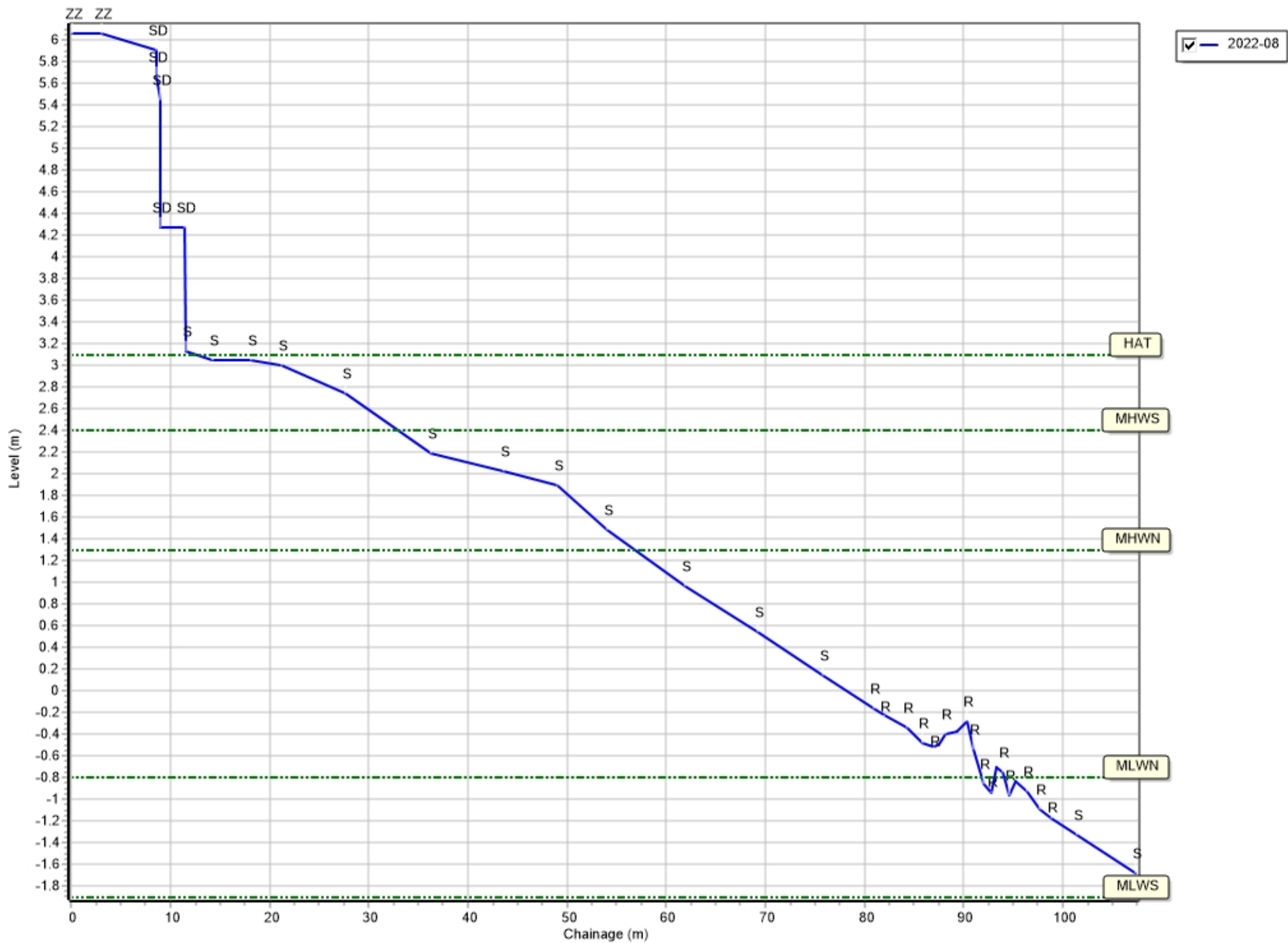
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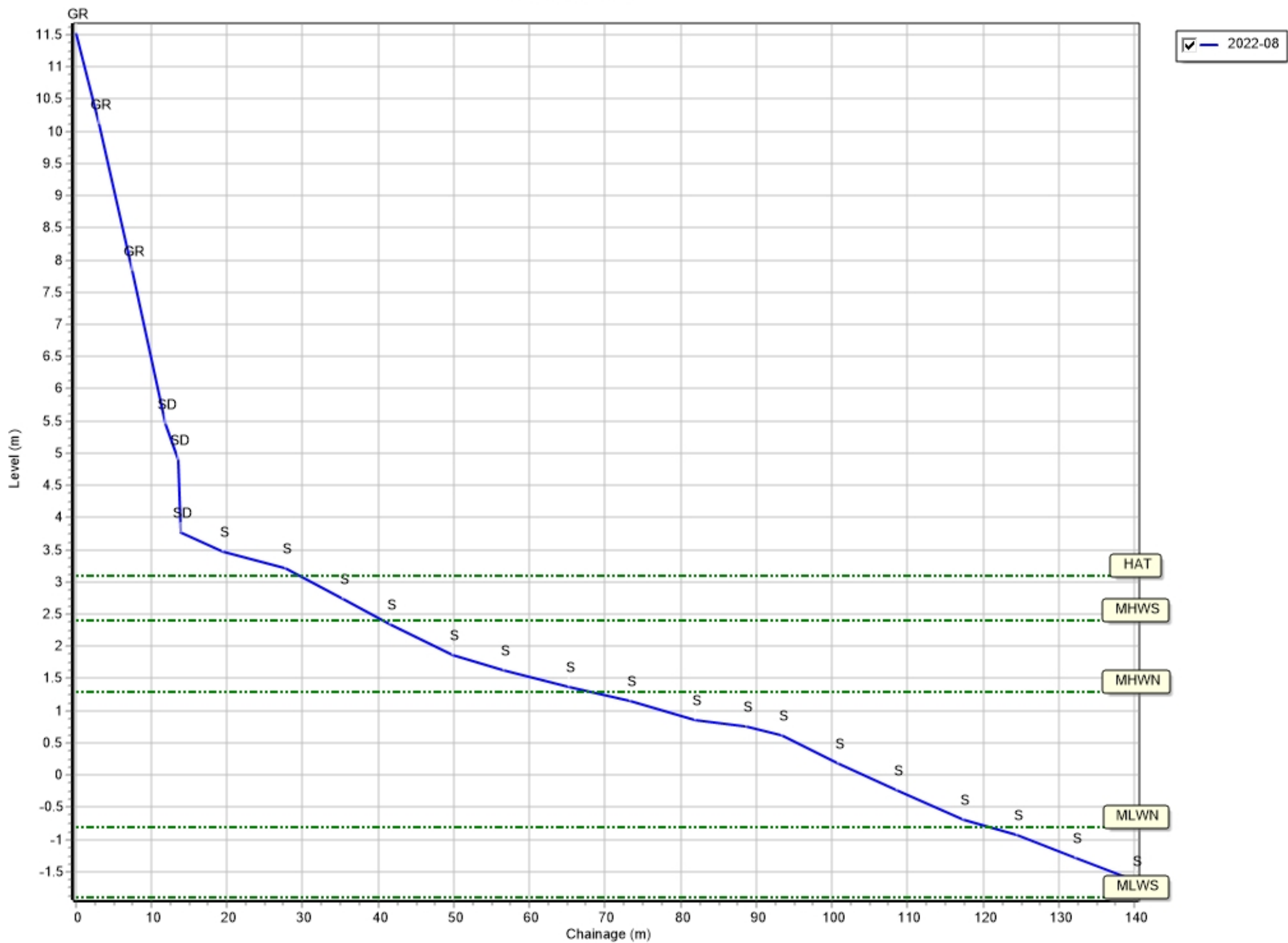
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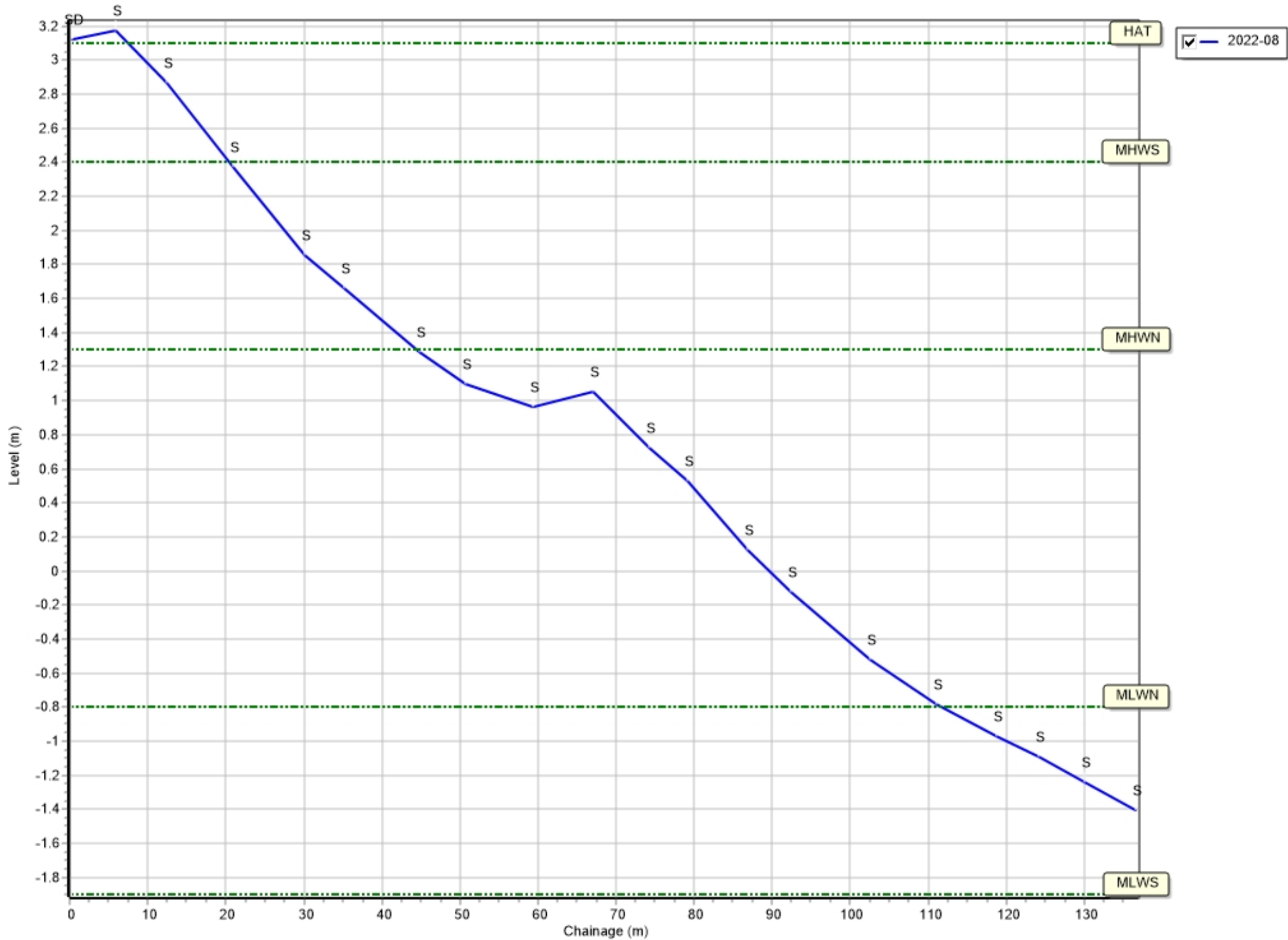
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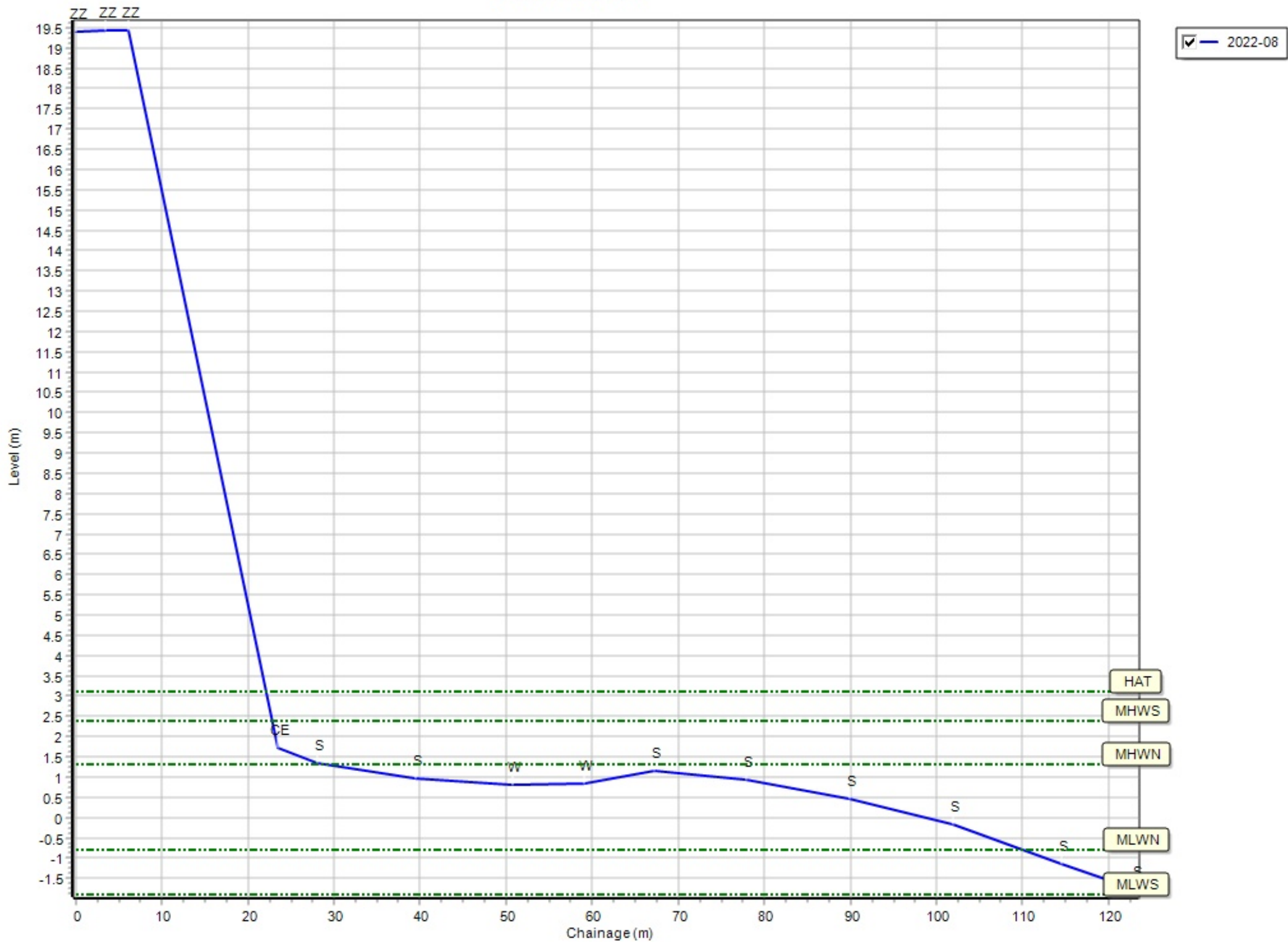
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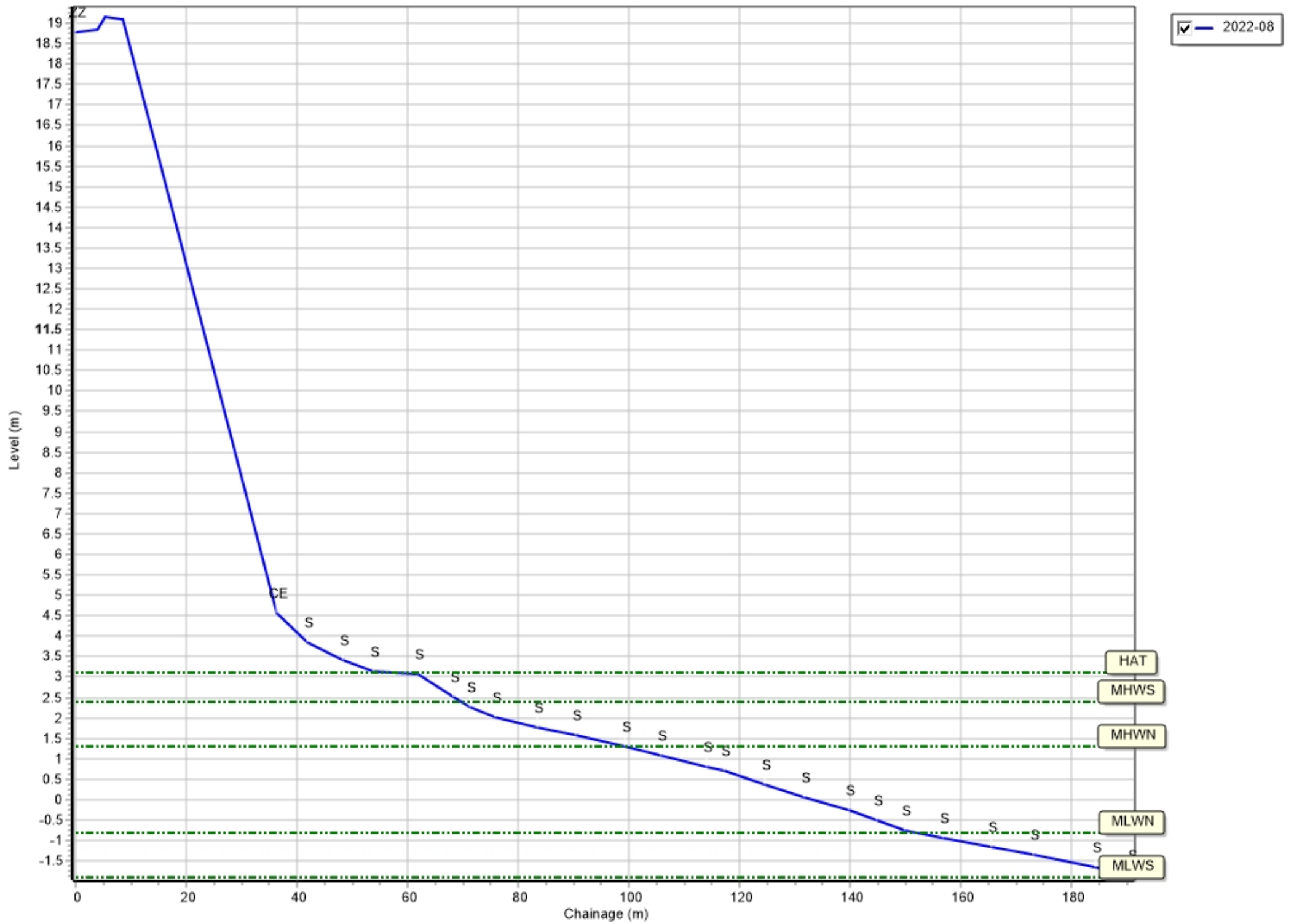
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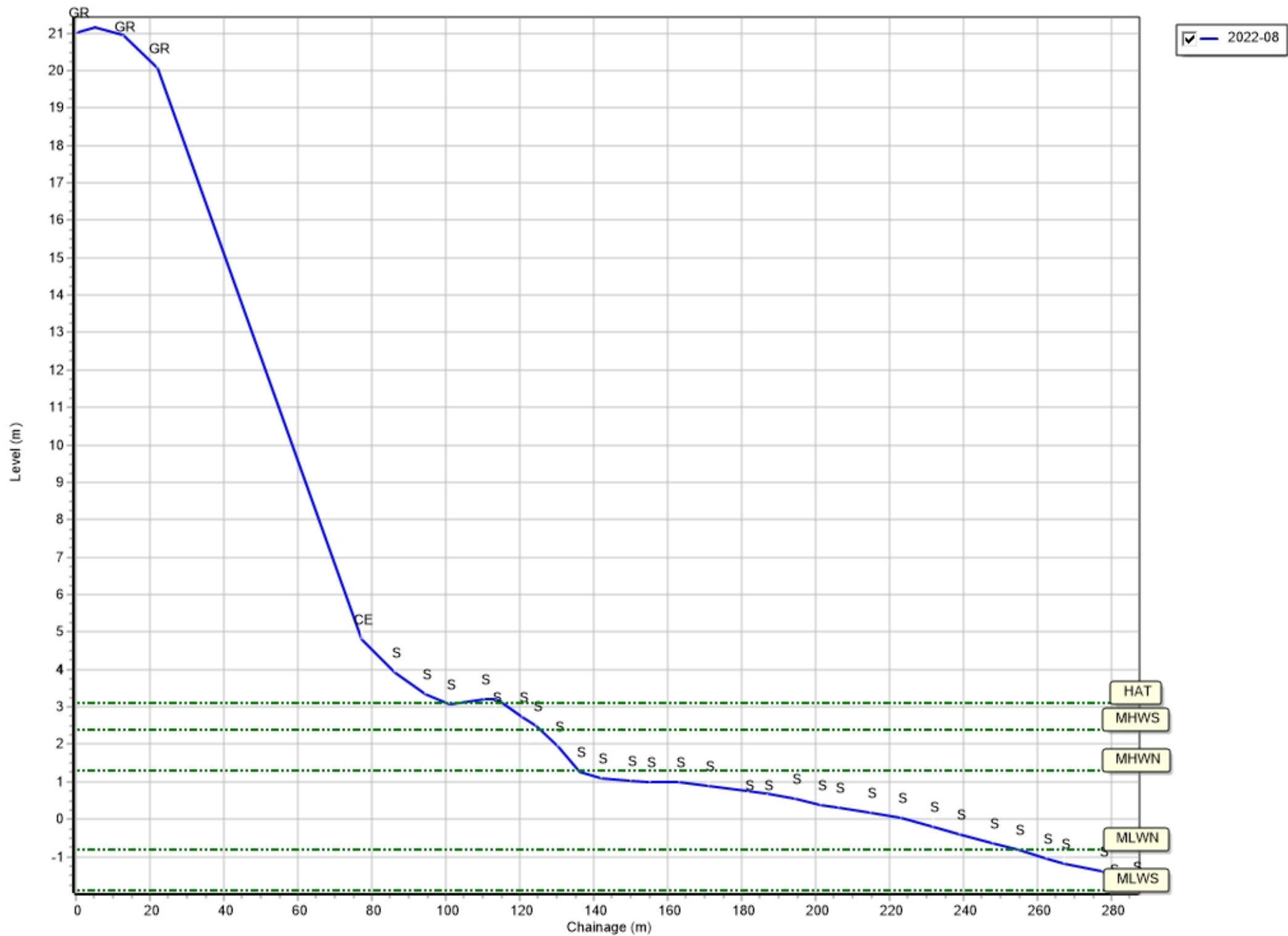
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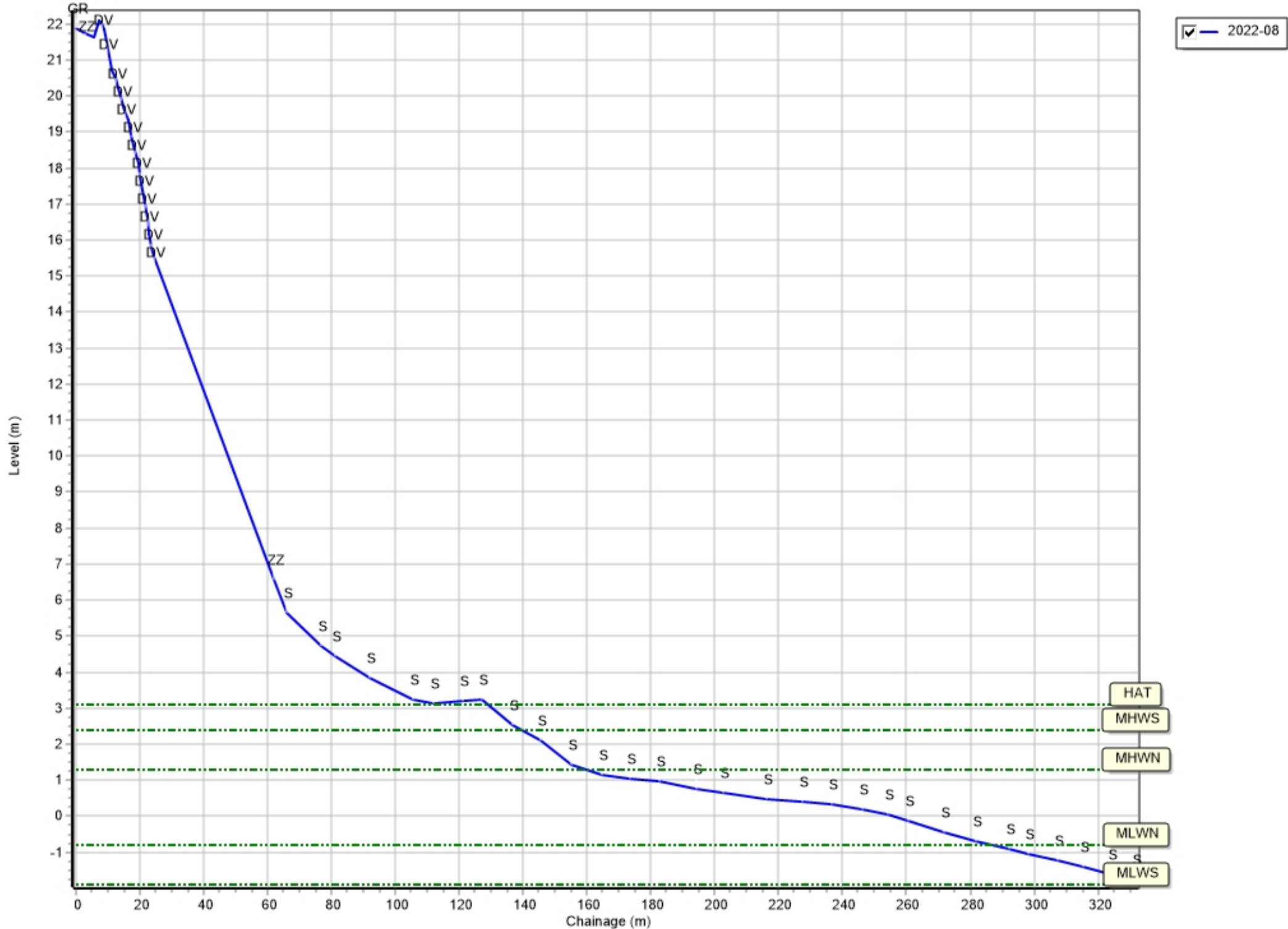
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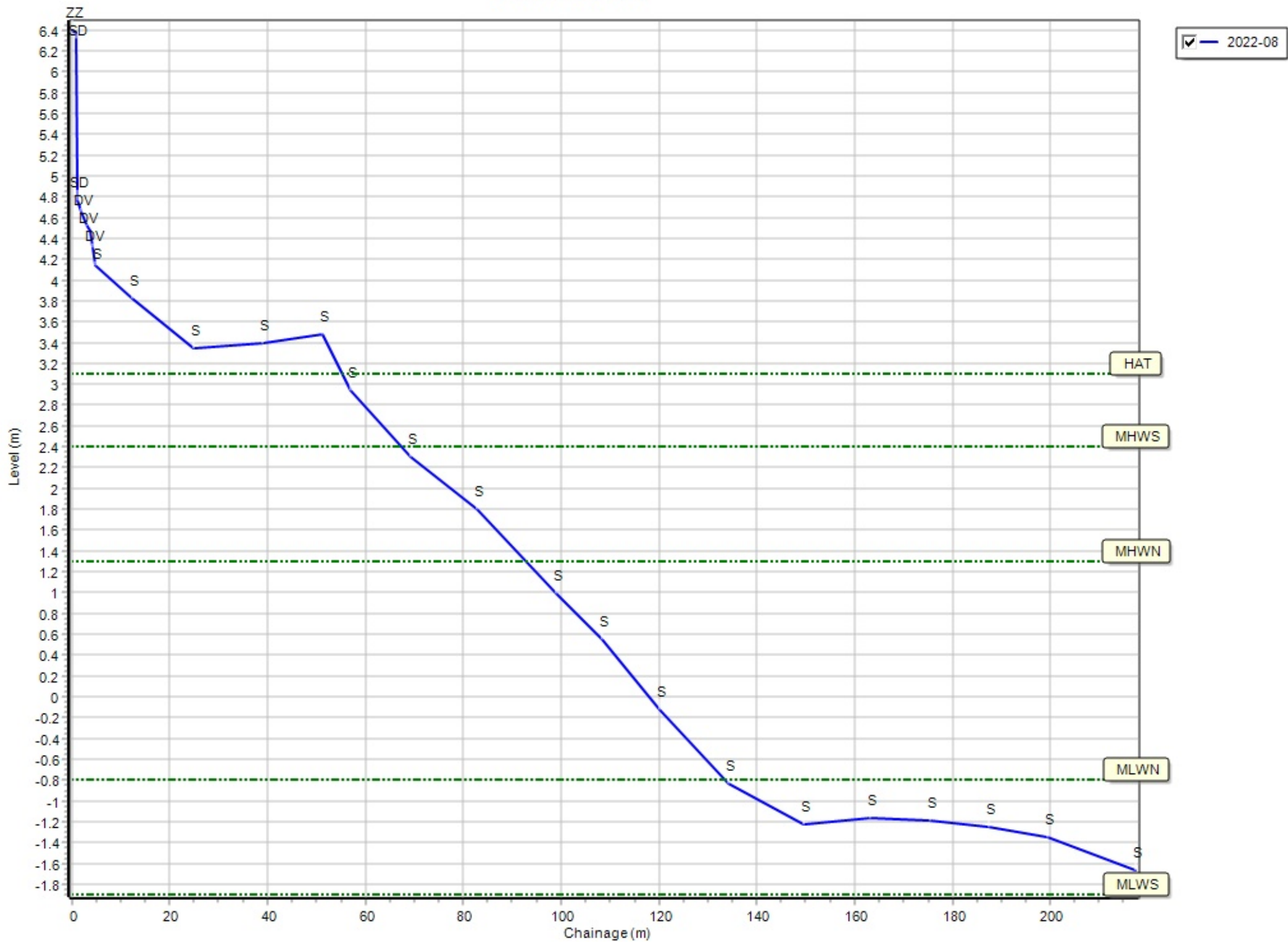
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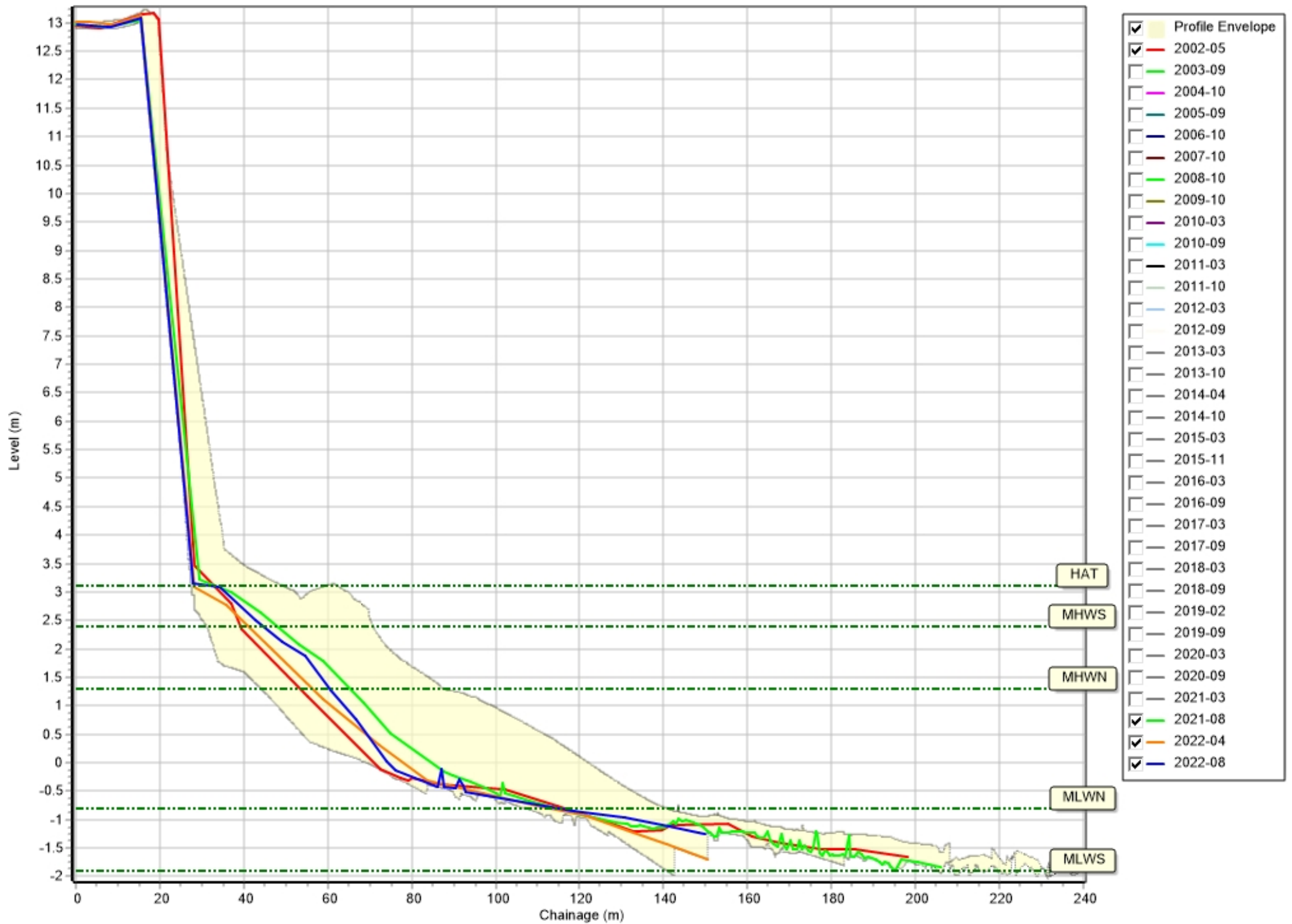
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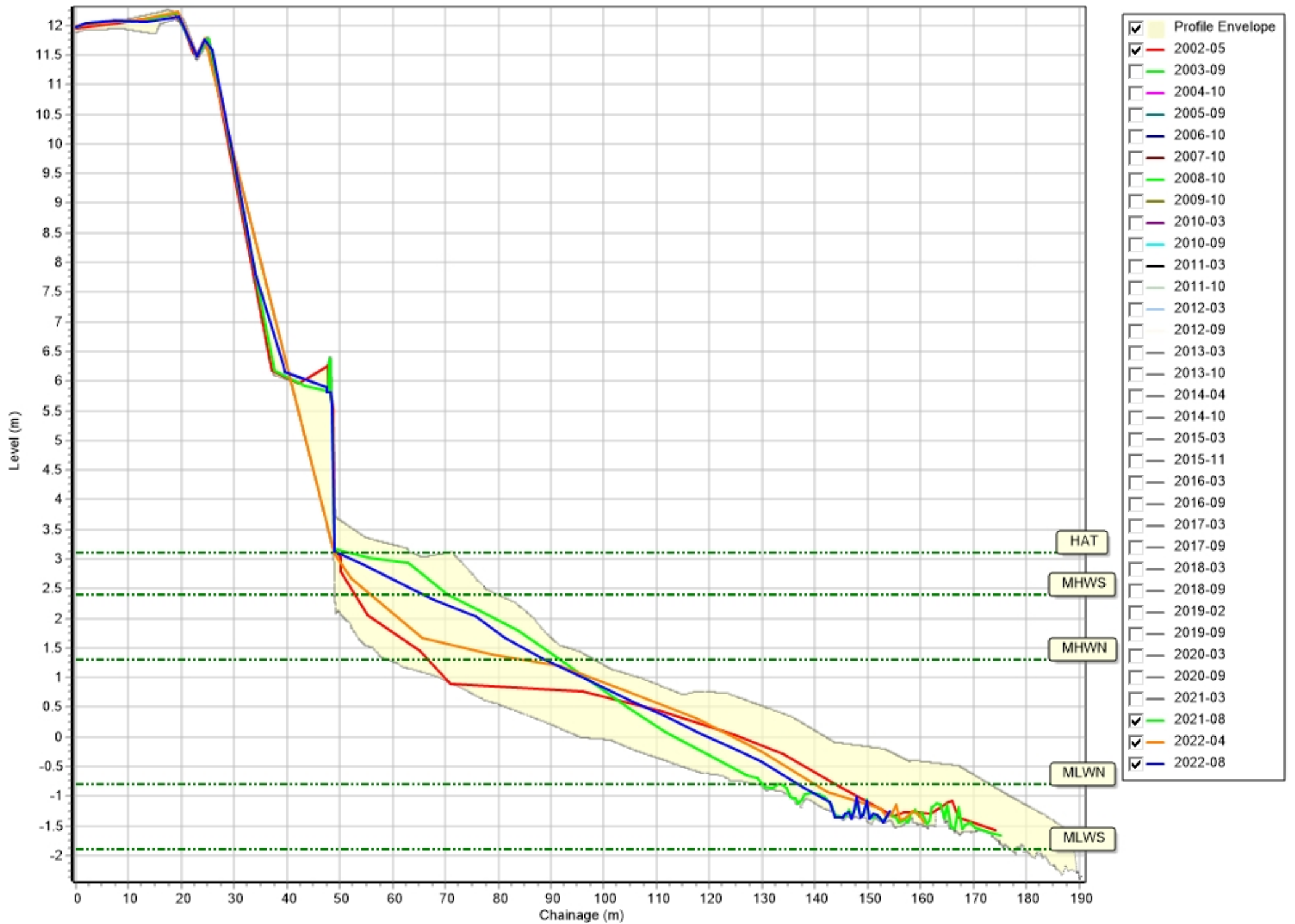
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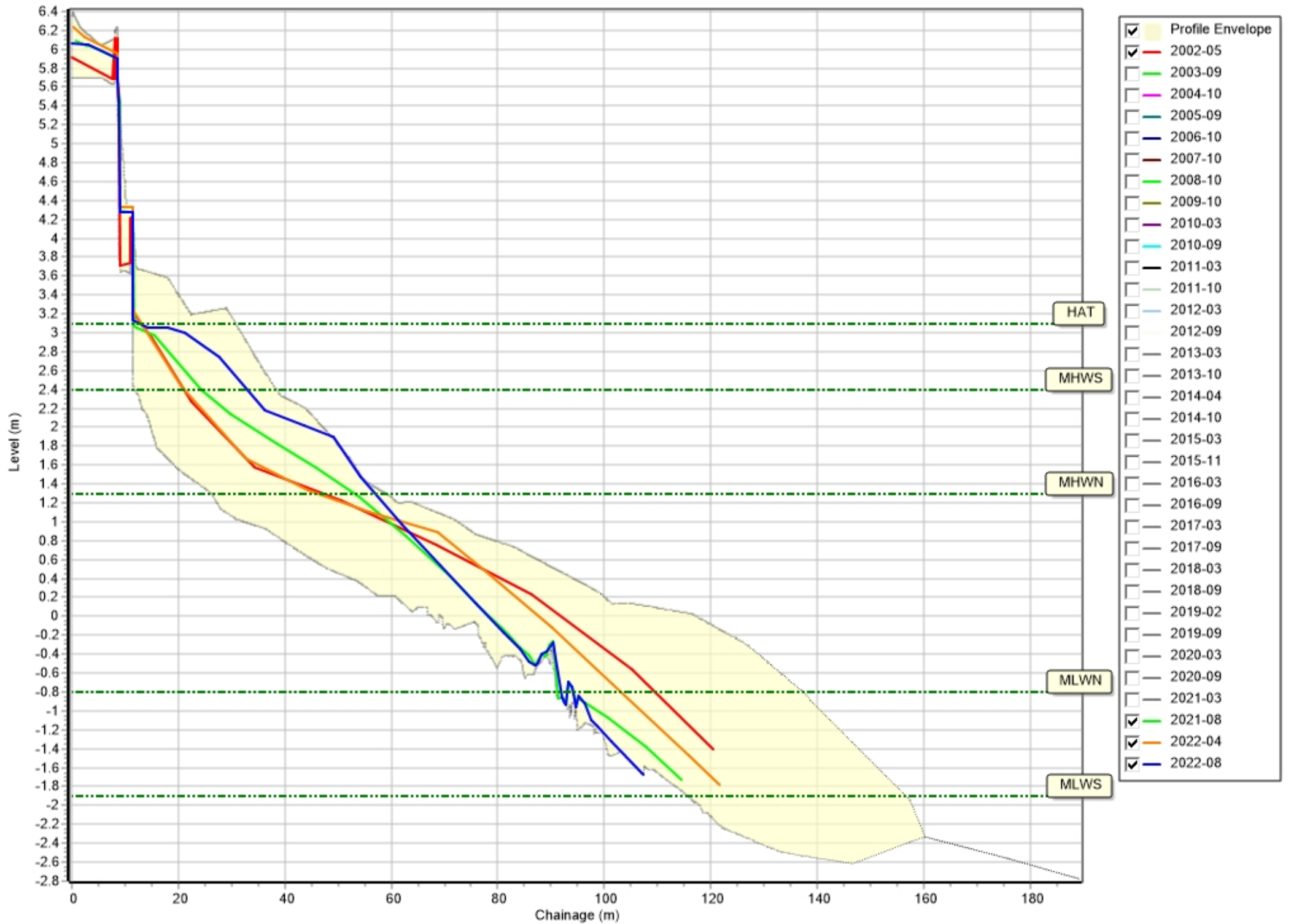
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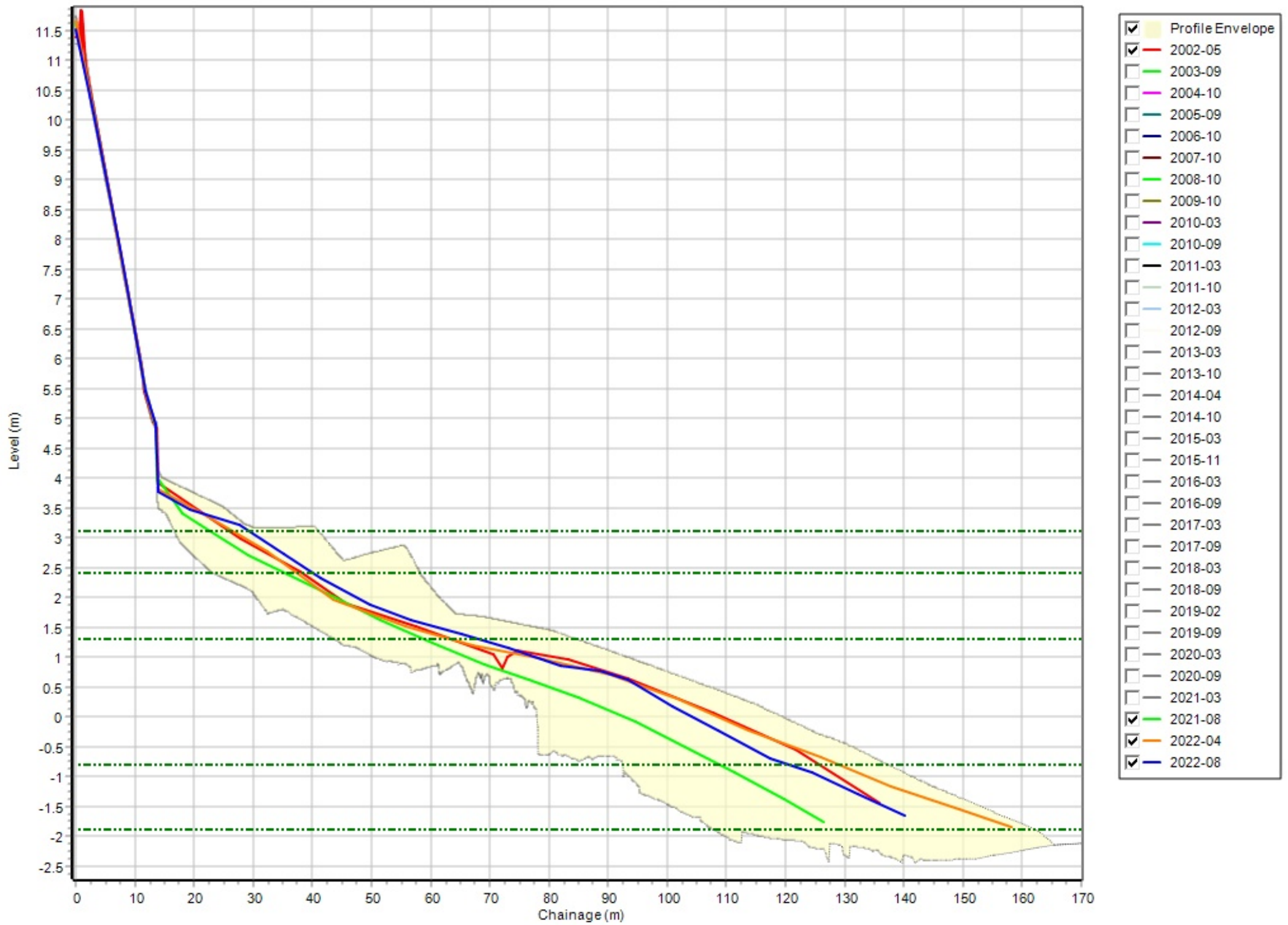
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Profiles: 1aNTDC03



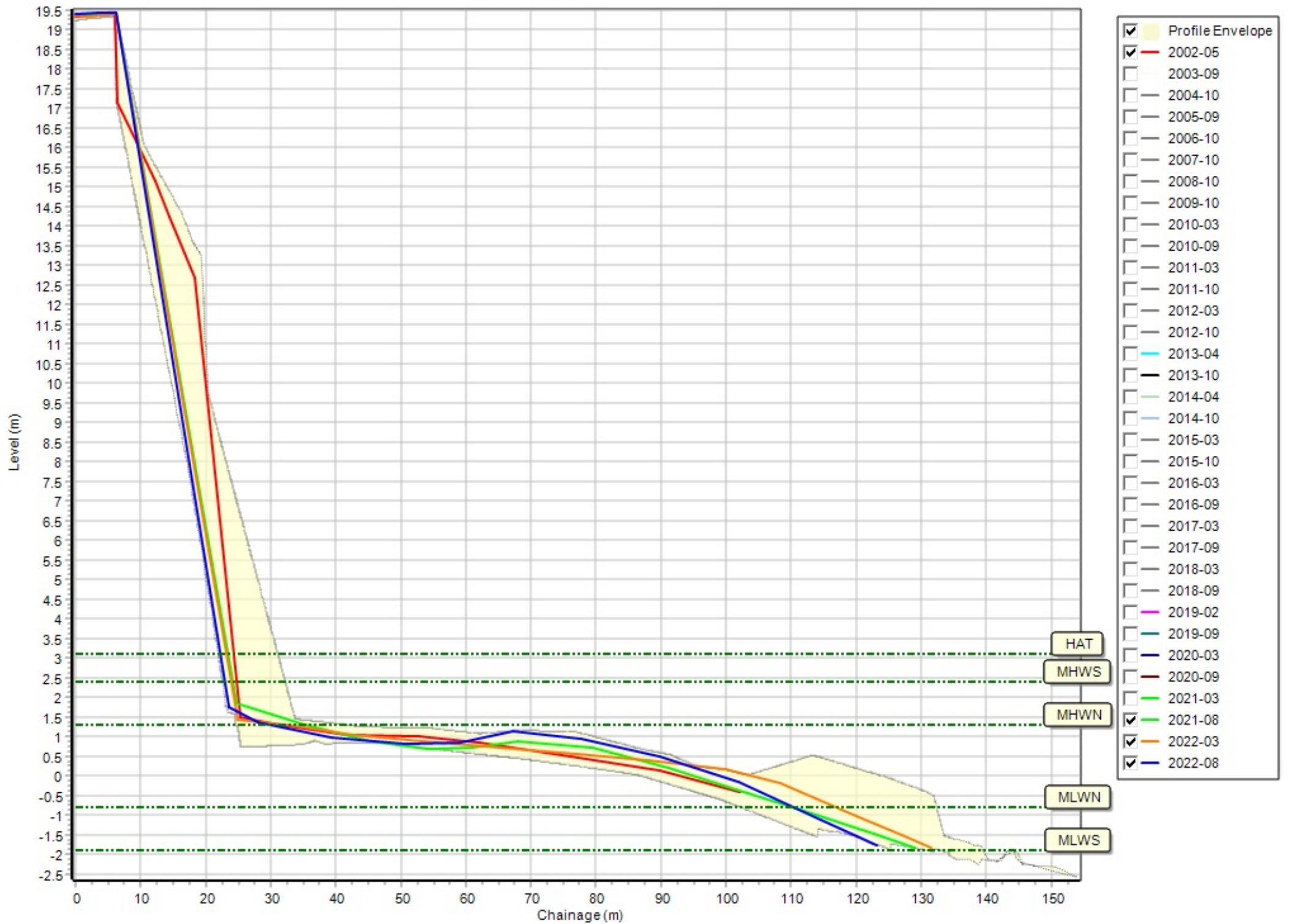
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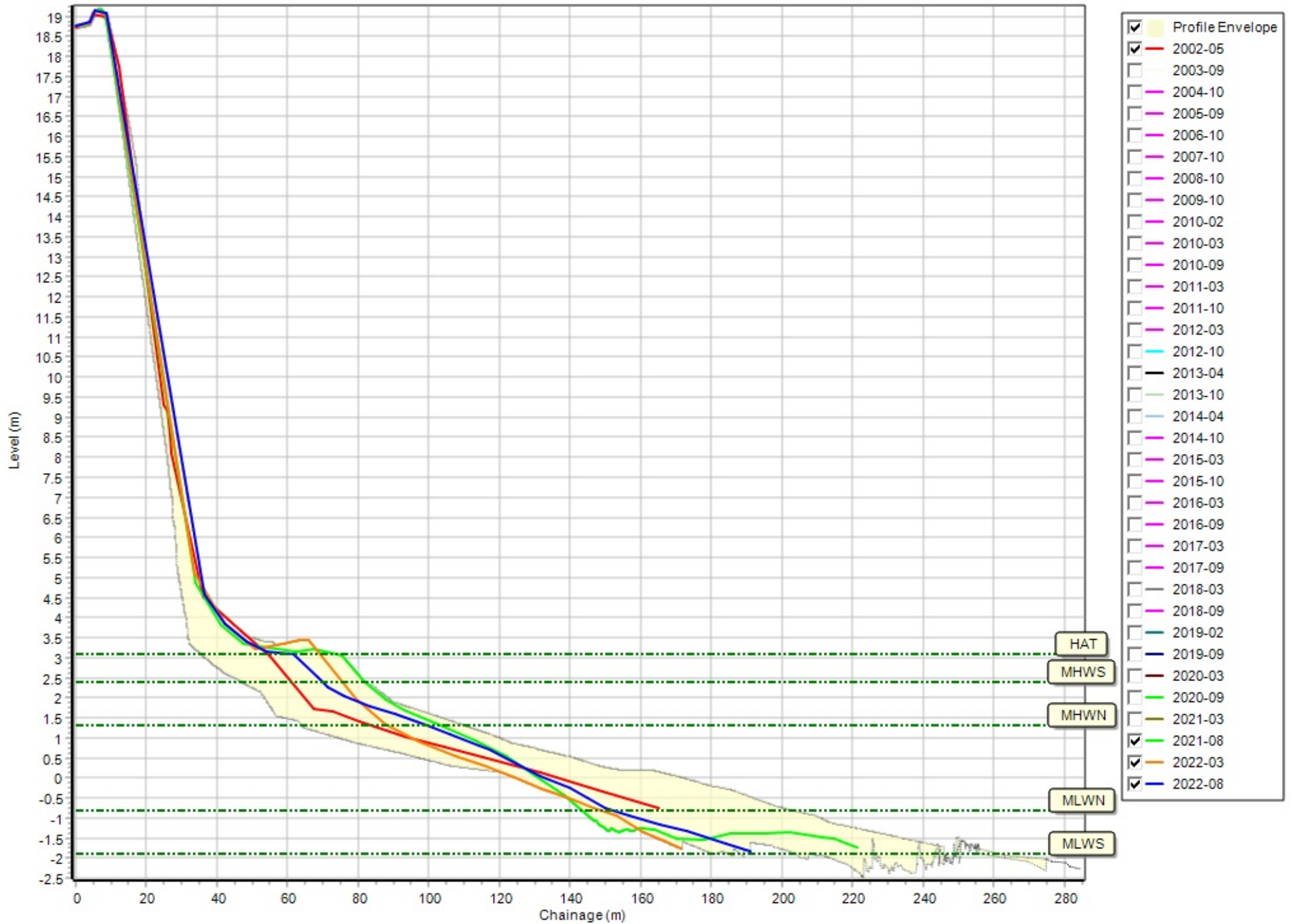
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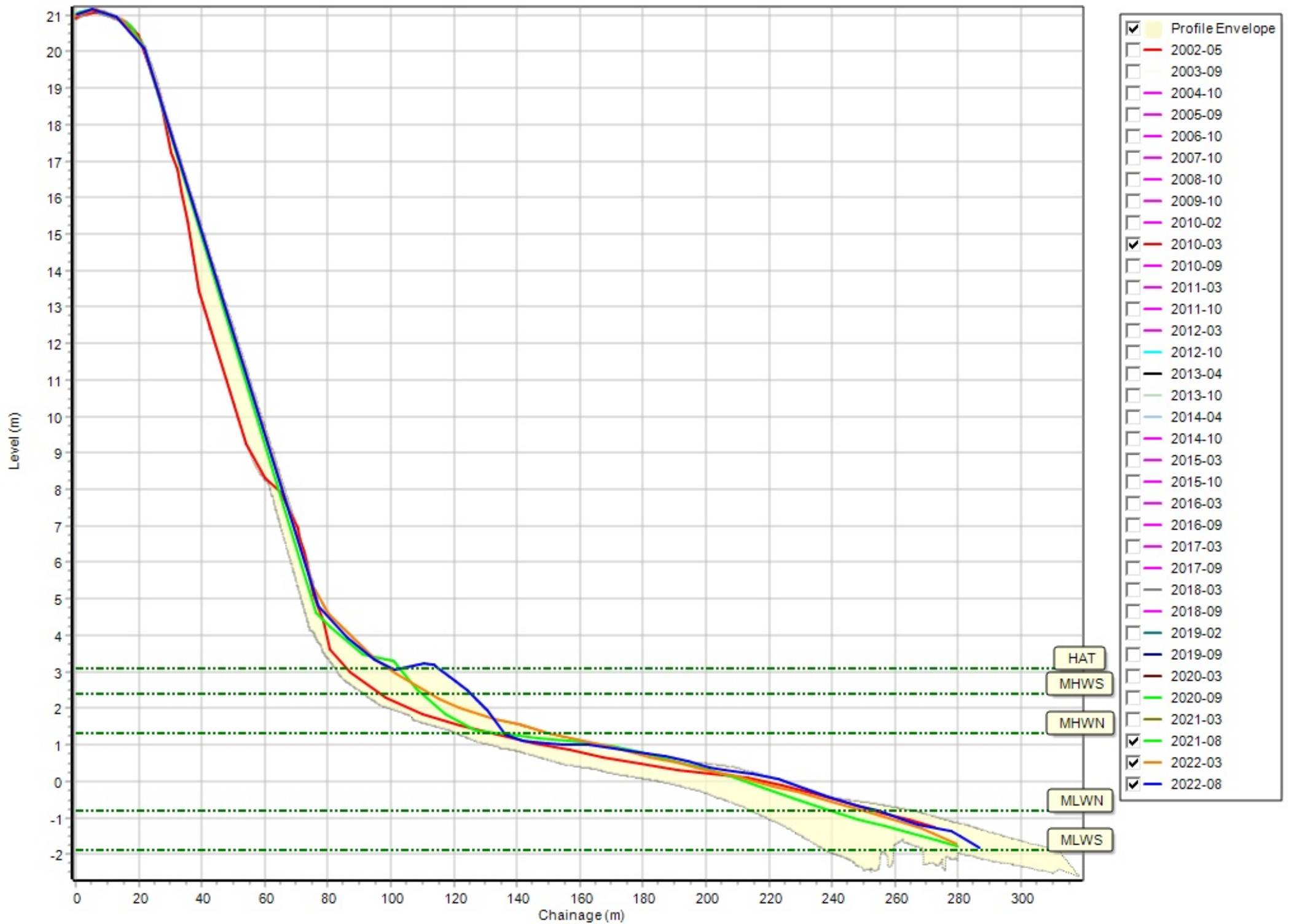
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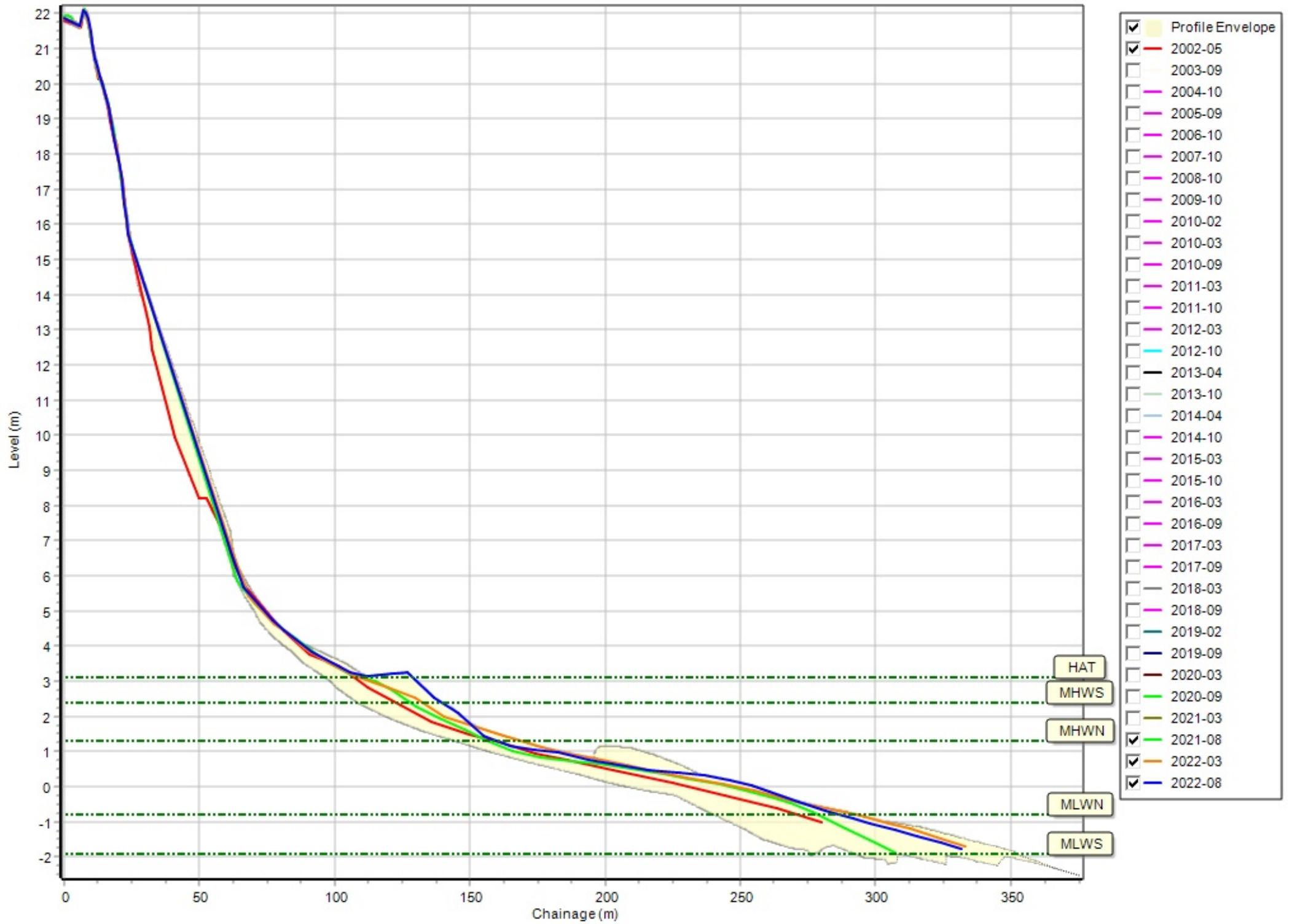
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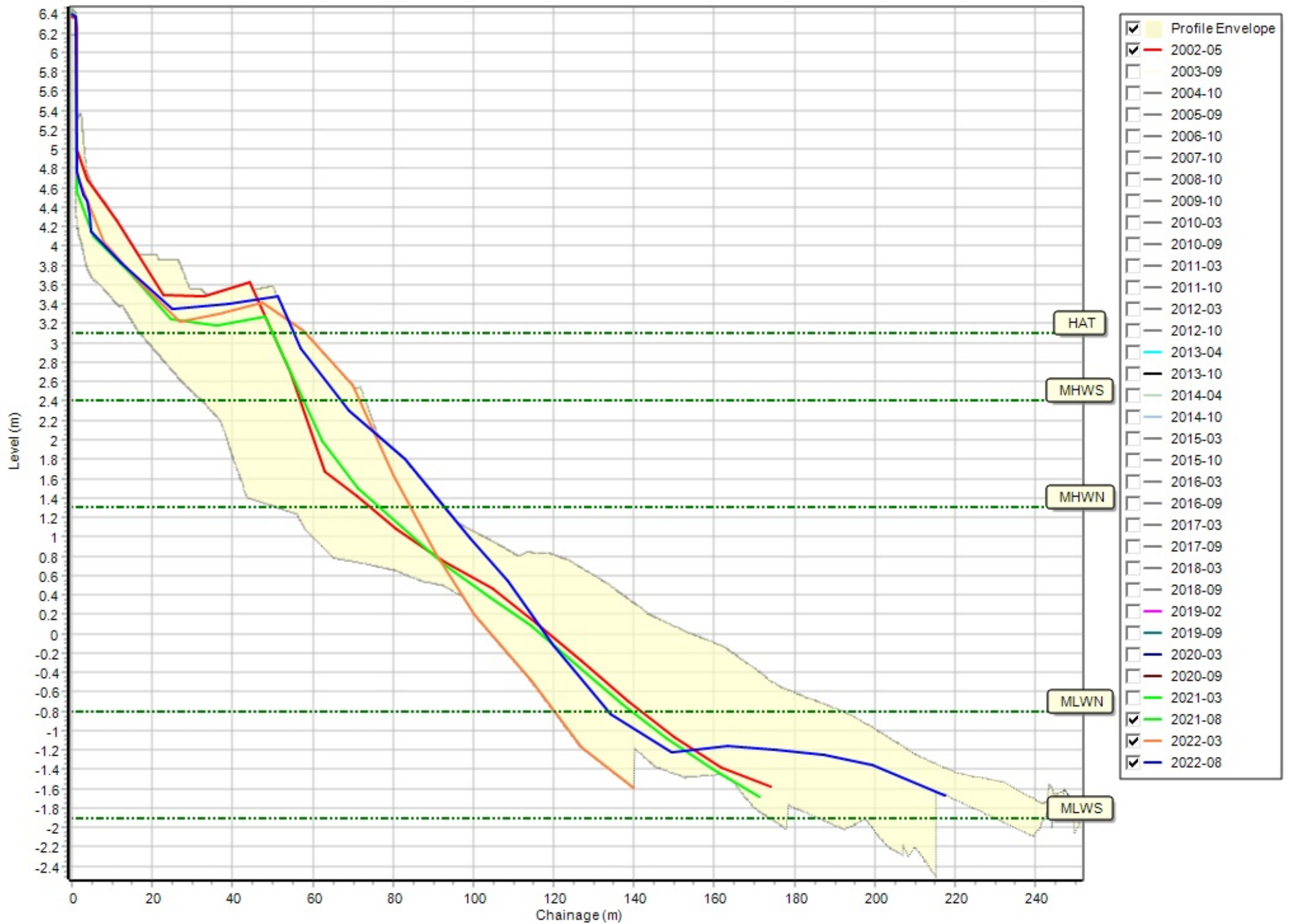
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Profiles: 1aNTDC07



Profiles: 1aNTDC08



Appendix B
Topographic Survey



TOPOGRAPHIC SURVEY (August 2022)

Elevation (mOD)	Contours (mOD)*
-1.5 - -1.5	— 1.0m interval
-1.4 - -1	
-0.9 - -0.5	* Contours only cover sandy beach areas.
-0.4 - 0	
0.1 - 0.5	
0.6 - 1	
1.1 - 1.5	
1.6 - 2	
2.1 - 2.5	
2.6 - 3	
3.1 - 3.5	
3.6 - 4	
4.1 - 4.5	
4.6 - 5	

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

Title:

Appendix B - Map 1

WHITLEY SANDS

North Tyneside Council Frontage

Report:

Analytical Report
'Full Measures' Survey 2022

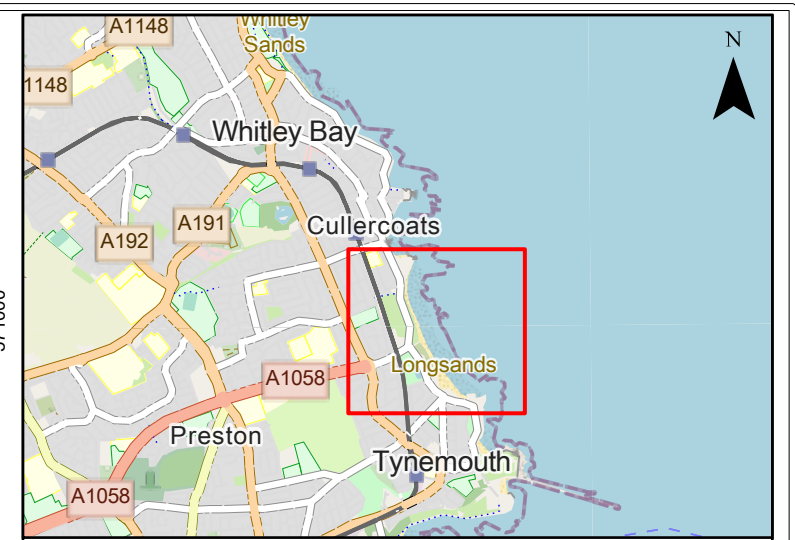
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	07/12/2022	TC	NJC	A3	1:8,000

Co-ordinate system: British National Grid

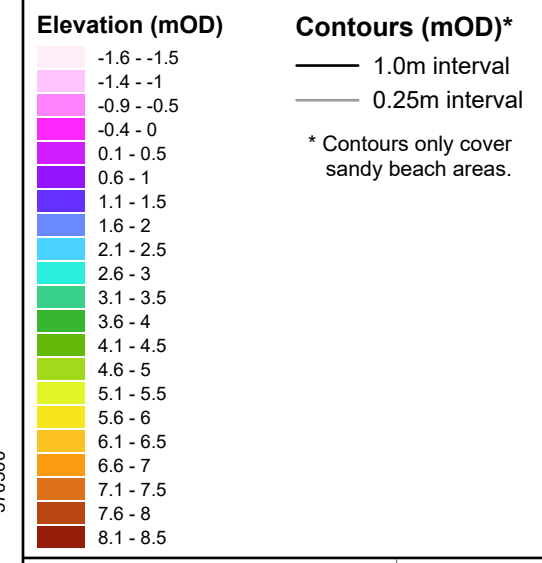
Royal HaskoningDHV
Enhancing Society Together

North East Coastal Observatory

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TOPOGRAPHIC SURVEY (August 2022)



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

Title:

Appendix B - Map 2

LONGSANDS

North Tyneside Council Frontage

Report:

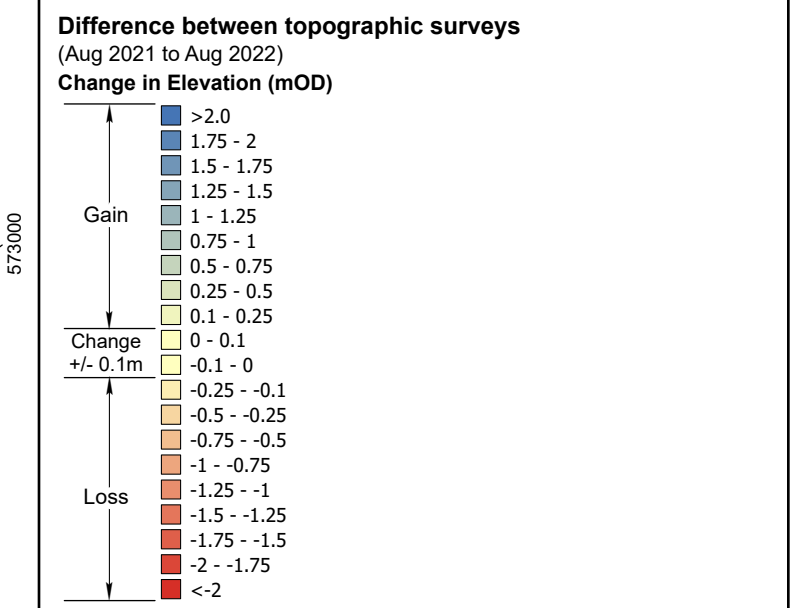
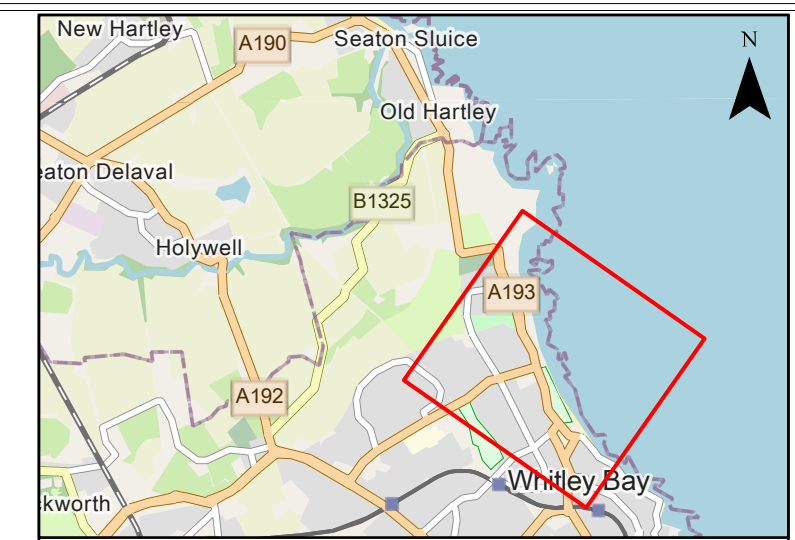
Analytical Report
'Full Measures' Survey 2022

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	07/12/2022	TC	NJC	A3	1:5,000

Co-ordinate system: British National Grid

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

Title:

Appendix B - Map 3
WHITLEY SANDS
North Tyneside Council Frontage

Report:

Analytical Report
'Full Measures' Survey 2022

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	07/12/2022	TC	NJC	A3	1:8,000

Co-ordinate system: British National Grid



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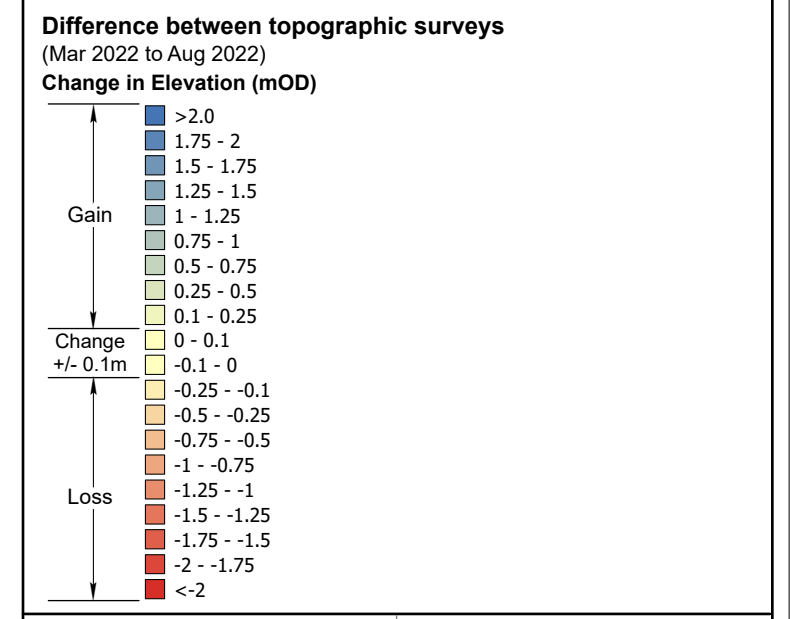


437000

571000

570000

437000



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

Title:

Appendix B - Map 4

LONGSANDS

North Tyneside Council Frontage

Report:

Analytical Report
'Full Measures' Survey 2022

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
0	07/12/2022	TC	NJC	A3	1:5,000

Co-ordinate system: British National Grid



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