ROYAL HASKONING

Cell 1 Regional Coastal Monitoring Programme
Update Report 2: 'Partial Measures' Survey 2010

North Tyneside Council

North Tyneside Council
Final Report

May 2010

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Authors	
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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
m	metres
MHWN	Mean High Water Neap
MHWS	Mean High Water Spring
MLWS	Mean Low Water Neap
MLWS	Mean Low Water Spring
MSL	Mean Sea Level
ODN	Ordnance Datum Newlyn

Water Levels Used in Interpretation of Changes

Water Level Parameter	Water Level (mODN) River Tyne
1 in 200 year	3.7
HAT	3.1
MHWS	2.4
MLWS	-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.

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
- walk-over 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.

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	June 09	-
2	2009/10	Sep-Dec 09	Mar 10	Mar-May 10	May 10 (*)	-

(*) The present report is **Update Report 2** and provides an analysis of the 2010 Partial Measures survey for North Tyneside Council's frontage. It is intended as a brief update of the key findings from this survey to maintain an understanding of ongoing changes.

1. Introduction

1.1 Study Area

North Tyneside Council's frontage extends from Hartley in the north to the River Tyne in the south. For the purposes of this report, it has been sub-divided into four areas, namely:

- Whitley Sands
- Cullercoats Bay
- Tynemouth Longsands
- King Edward's Bay (sometimes known as Tynemouth Shortsands)

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 8 no. transect lines (since 2002)
  - Beach profile surveys along an additional 2 no. transects (since 2010)
  - Topographic survey along Whitley Sands (commenced in 2010)

- Partial Measures survey annually each spring comprising:
  - Beach profile surveys along all 10 no. transect lines (since 2010)

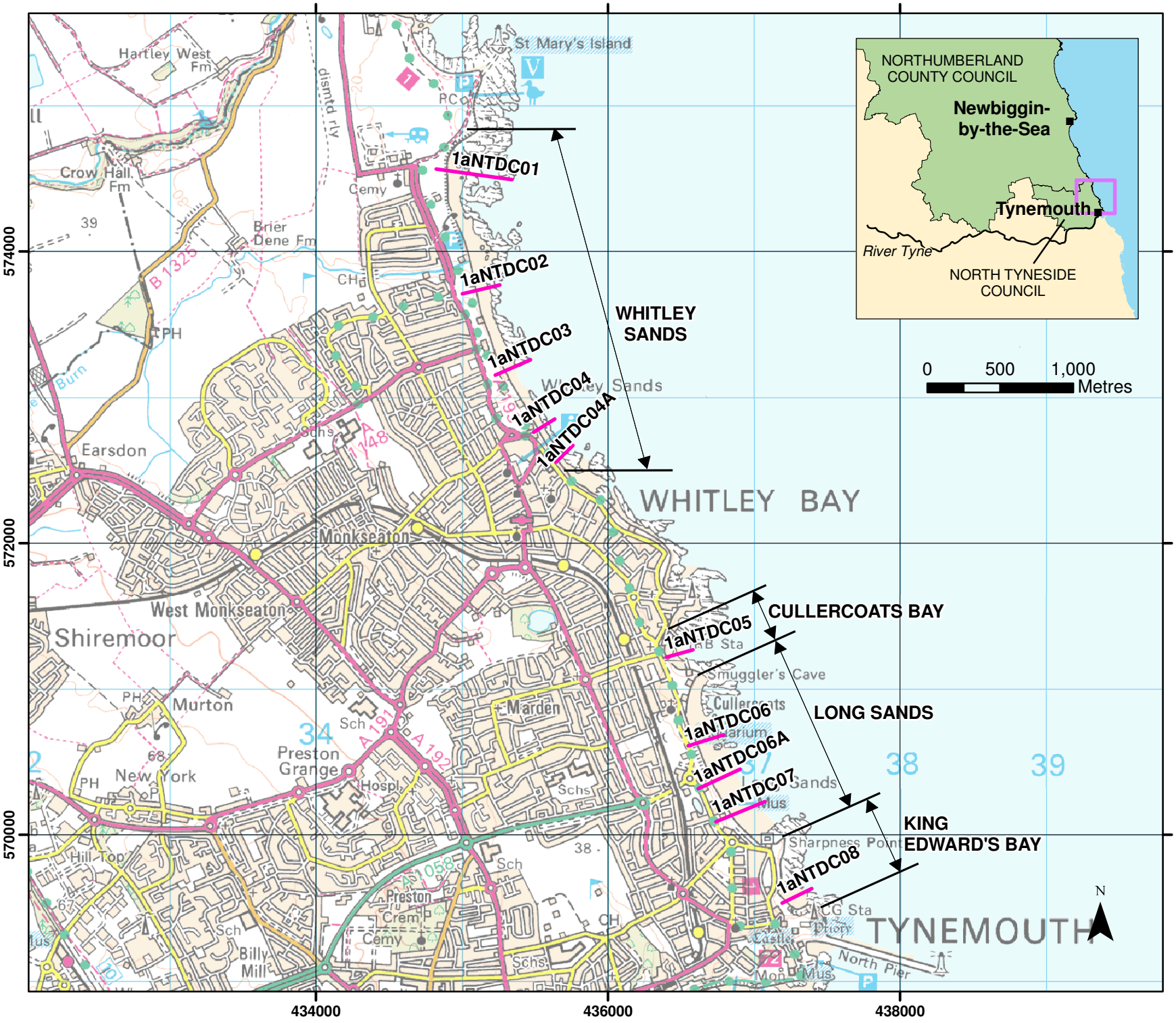
The location of these surveys is shown in Figure 1. They have also previously been provided on a digital file which can be opened in Google Earth showing the locations of the surveys.

The Partial Measures survey was initially undertaken along this frontage in mid February 2010, when tidal conditions were favourable, weather conditions were generally fine with the odd foul day and the sea state was mostly calm. A short but particularly heavy storm period then caused significant changes to a number of beaches in late February 2010 and therefore the profiles were re-surveyed at the end of March 2010. This now provides a useful pre- and post-storm comparison during the Partial Measures 2010 survey, although it should be noted that a series of storms occurred throughout a particular severe winter in late 2009 and early 2010, so some storm-related changes would already have been inherent in the mid-February 2010 surveys.

This Analytical 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
- 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 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 1 - Map 1 North Tyneside Council Frontage

Update Report 2
'Partial Measures' Survey 2010

Drawing Scale 1:35,000 at A4

Drawn by:	TC	Date:	19/05/2010
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2. Analysis of Survey Data

2.1 Whitley Sands

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2010	**Beach Profiles:** Whitley Sands is covered by five beach profile lines (Appendix A). Four of these were initially surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, they have been surveyed 6-monthly and a fifth profile has been added at the southern end of the frontage. NTDC01 is located in the north of Whitley Sands, along the undefended cliffs just to the south of Trinity Road Car Park. The cliff face has eroded landward by up to 1.5m in places, with a recession of the cliff top position also occurring, albeit at a lesser rate. Between October 2009 and February 2010 foreshore levels immediately at, and 10m seaward of, the cliff toe reduced to match the previous record low values. Between February 2010 and March 2010 material was driven towards this area by the storm, enabling the foreshore here to partially build up again, although further seaward along the profile, between chainages of 40m and 80m, the storm caused foreshore lowering. NTDC02 to NTDC04 extend across the cliffs/slopes, promenade and seawall before progressing across the foreshore towards low water. All three of these profiles show significant changes since the previous surveys. Along NTDC02, material was flattened from the large berm that was evident along this transect in October 2009 and drawn down the profile to become deposited on the lower foreshore, with some export to the sub-tidal zone, by February 2010. Levels at a chainage of 60m along equalled the previous record low values. Along NTDC03, the massive berm that was evident in October 2009 had been totally flattened by mid-February 2010. This resulted in a lowering of beach levels by 1.8m at a chainage of 30m (where the crest of the berm had previously been located) and 0.6m at the toe of the sea wall.	The general trend between 2002 and 2008 along NTDC01 was that the cliff form remained relatively stable, despite fluctuations in beach levels at the cliff toe and upper to mid beach commonly occurring. Changes, indicative of a small slump in the cliff face, with erosion debris being deposited on the foreshore, were then observed between October 2008 and October 2009. More marked changes have since been observed to February 2010 with up to 1.5m cut-back in the cliff face. The cliff top does not seem to have eroded as much as the cliff face, leading to over-steepened conditions that made it unsafe for the surveyors to approach the cliff edge in late March 2010. This suggests that a further slump in the cliff top could be imminent. Foreshore levels here can be volatile, with an envelope of up to 2m variation in beach level being recorded a short distance from the toe of the cliff along this profile. Along the defended sections of Whitley Sands, as measured by NTDC02 to NTDC04, there has been a history of successive berm formation and removal on the upper beach with associated foreshore lowering and recovery, respectively. This has previously been interpreted as storm-related changes in the foreshore and this trend has continued to the current survey. The berms that were present along the foreshore in October 2009 no doubt provided some (temporary) buffering against the winter storms but ultimately this material was removed, causing upper beach lowering and lower foreshore deposition, resulting in the flatter profile more typically associated with stormy winter wave climates.

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2010	A similar trend to above, with flattening of the upper berm and lower foreshore accretion, was observed along NTDC04, although here two small berms remained evident by mid-February 2010; one at around MHWS and the other at around MHWN. Between mid-February and end-March 2010, material along NTDC02 and NTDC03 transects had become partially moved from the lower beach (from around or below MSL) and pushed up the profile to the mid and upper beach in the form of a fairly evenly spread deposition rather than a single large berm which often occurs along Whitley Sands. In contrast, along NTDC04 material from the two small berms that were still apparent in mid-February 2010 was redistributed down the profile where it became thinly deposited below around MSL by end-March 2010. Profile NTDC04A was recorded for the first time during the March 2010 survey. It is located at the southern end of the Whitley Sands frontage and extends from the promenade, some 3m down the face of the sea wall to its toe, and then across the predominantly sandy foreshore.	Along NTDC04, the surveyors' notes record that the slope was considered unstable, with both local landslips and large cracks visible. This will be investigated further during the 2010 walk-over inspections of this frontage. The March 2010 survey along the new transect NTDC04A provides a baseline against which future 6-monthly surveys will be compared. Future Full Measures surveys (starting in autumn 2010) will also include a topographic survey of Whitley Sands to help inform understanding of the seasonal and storm-related changes that have been observed.

2.2 Cullercoats Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2010	**Beach Profiles:** Cullercoats Bay is covered by one beach profile line (Appendix A). This was surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, it has been surveyed 6-monthly. Between October 2009 and mid-February 2010, there was relatively little change in the cliff face and foreshore along profile NTDC05. In late March 2010, when the post-storm survey was undertaken, the cliff face was not surveyed on Health and Safety grounds as it was wet and slippery. This leads to the profile having experienced an 'apparent' recession, but in fact this is due to the steep and jutting cliff face not being surveyed. The foreshore accreted slightly between mid-February and late March 2010.	Whilst the foreshore and cliffs remained relatively stable to February 2010, the surveyors did not attempt the cliff section of the survey in March 2010 because the weather conditions on the day were wet and slippery.

2.3 Tynemouth Longsands

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2010	**Beach Profiles:** Tynemouth Longsands is covered by three beach profile lines (Appendix A). Two of these were initially surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, they have been surveyed 6-monthly and a third profile has been added in the centre of the frontage. NTDC06 is located approximately 150m south of the access road/ramp towards the north of the bay. Here, the profile cut back severely at the toe of the dunes between October 2009 and mid-February 2010, resulting in the lowest recorded beach levels since monitoring began in April 2002. Foreshore levels remained low some 75m seaward of the dune toe, but then increased further seaward, setting record high levels along the lower foreshore and down to low water. Between mid-February 2010 and late March 2010, some further cut-back occurred at the dune toe, but the foreshore levels, started to recover through a modest, evenly distributed increase across most of the profile length. A new profile, NTDC06A, was added to the surveys for the first time and will provide a baseline against which future surveys will be compared. It extends from the dune crest, at an elevation of around 21mODN, down the dune face to its toe at a level of around HAT and then extends across the sandy foreshore down to low water. Profile NTDC07 is located approximately 50m south of the access route through the dunes towards the southern end of the bay. Here, the surveyors did not attempt access to part of the profile because dune vegetation was being re-seeded and the area was fenced off. Along the profile, beach levels reached record low values at levels of around HAT and MHWS, and remained relatively low along the remainder of the profile until a chainage of around 210m.	The storms across winter 2009/2010 caused measurable damage along Tynemouth Longsands. This was particularly recorded along transect NTDC06 which exhibited notable erosion at the dune toe and redistribution of the eroded sand seaward across the lower sections of the beach profile. This is representative of 'text-book' dune and beach behaviour in response to storm activity. Along NTDC07, upper beach and dune toe damage similarly occurred, although it is interesting to note that the dune face has previously been recorded in a more landward position, in April 2002, indicating that this frontage can be storm-damaged and then gradually recover over time.

2.4 King Edward's Bay

Survey Date	Description of Changes Since Last Survey	Interpretation
03-2010	**Beach Profiles:** King Edward's Bay is covered by one beach profile line (Appendix A). This was surveyed annually each autumn between 2002 and 2009. From spring 2010 onwards, it has been surveyed 6-monthly. Profile NTDC08 experienced notable change between October 2009 and February 2010, with the berm previously present being totally removed and the beach abouve around MHWN severing quite notable lowering, resulting in record low beach levels being recorded. Along the lower foreshore, however, record high beach levels were observed.	King Edward's Bay experienced a notable redistribution of sediment from the upper beach to the lower beach throughout the winter of 2009/2010, with continuation of that trend, albeit on a lesser scale, during the storm that occurred in late February 2010. The foreshore fluctuations do not appear to have caused lowering of beach levels at the toe of the sea wall.

3. Problems Encountered and Uncertainty in Analysis

Along profile NTDC05 in Cullercoats Bay, the cliff face was not surveyed in March 2010 due to wet and slippery footing associated with the foul weather on the day of the survey.

Along profile NTDC07 part of the dunes was not surveyed because the area was fenced off in order to attempt to establish dune vegetation.

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

Following implementation of the recommendation made in *Analytical Report 2* for the introduction of beach profile surveys to the Partial Measures campaign along all 10 no. transects, there are no further changes recommended at the present time.

The first of a series of annual topographic surveys at Whitley Sands will be undertaken during the Full Measures surveys 2010. This will help provide further understanding relating to what are quite clear seasonal variations in foreshore level and form.

5. Conclusions and Areas of Concern

- The North Tyneside frontage has always demonstrated measurable fluctuations in foreshore level and form between successive surveys. Across the winter of 2009/2010 such fluctuations have continued in response to storms, resulting in some significant changes along this frontage.

- Along several profiles, the lowest levels were observed since monitoring began in April 2002 along the upper beach sections.

- Much of the eroded sand was transported seawards and deposited along the lower foreshore. In some cases this resulted in some of the highest levels ever recorded along corresponding sections of lower foreshore. It is expected that some of the eroded sand would also have been transported further offshore still, into the nearshore zone.

- Significantly, the low levels along the upper foreshore triggered measurable recession of the undefended cliffs in the northern section of Whitley Sands (to the south of the Trinity Road car park access road).

- The cliff face retreated by up to 1.5m along transect NTDC01, although the cliff top recession was less than this value. This means, however, that the cliff is now over-steepened in places and local slumping is expected to continue in response.

- The low levels recorded along the upper beach also resulted in measurable erosion of the dune toe throughout Tynemouth Longsands, particularly along transect NTDC06.

Profile NTDC06 – Measurable erosion of the dune toe

- The historic profile from April 2002 along NTDC07 does show, however, that following storm damage the dunes at Longsands can recover over time and this process is expected to occur progressively over the summer of 2010 (further major storms notwithstanding).

- Along profile NTDC04, towards the southern end of Whitley Sands by the café, the slope was noted by the surveyors as being unstable, with small landslips and large cracks visible. This frontage may require some remedial attention to prevent a slump; this will be further investigated during the forthcoming walk-over inspections in summer 2010.

Profile NTDC04 – The surveyors noted an unstable slope, with small lansdslips and large cracks visible (not seen in photograph)

Appendices

Appendix A

Beach Profiles

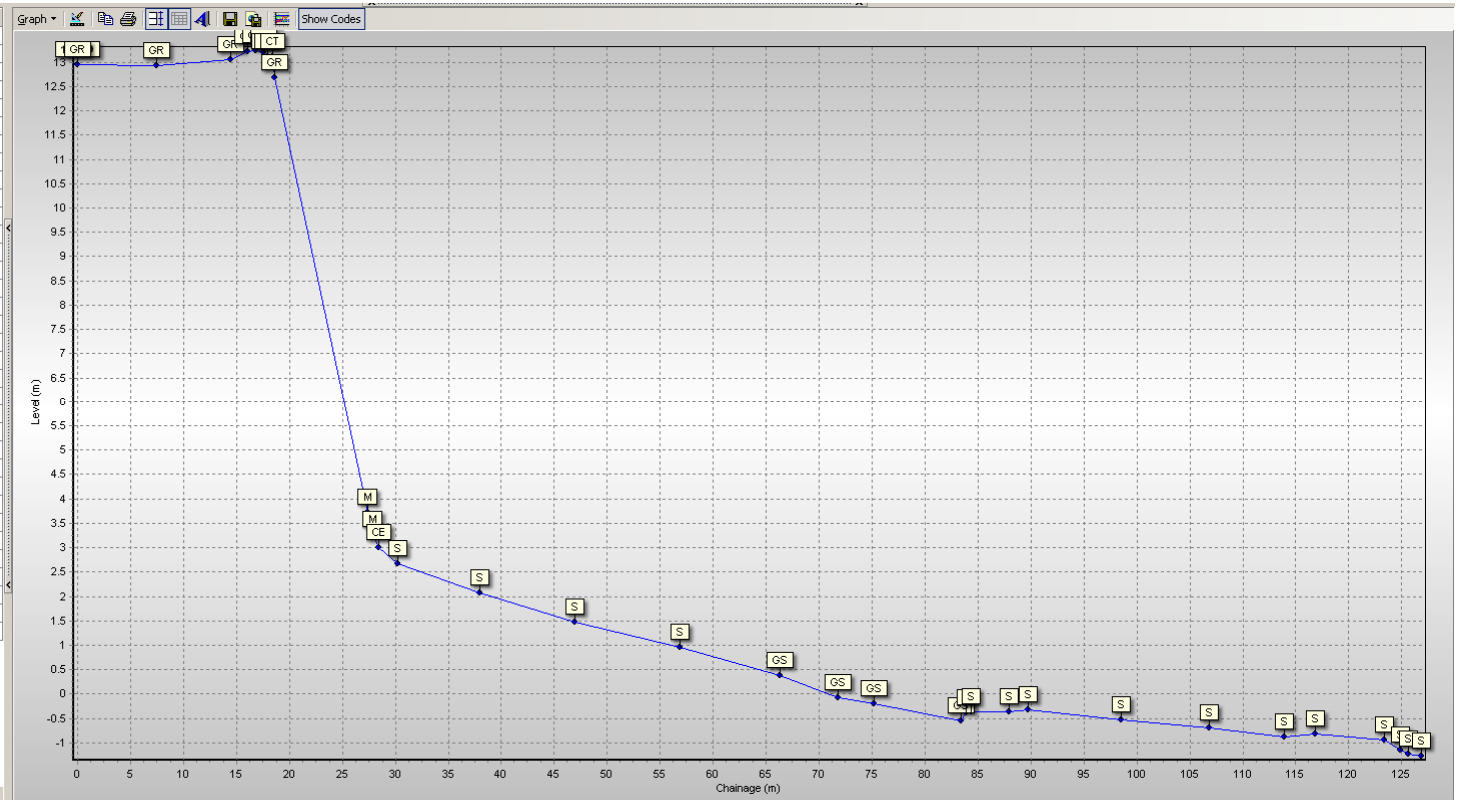
The following sediment feature codes are used on some profile plots:

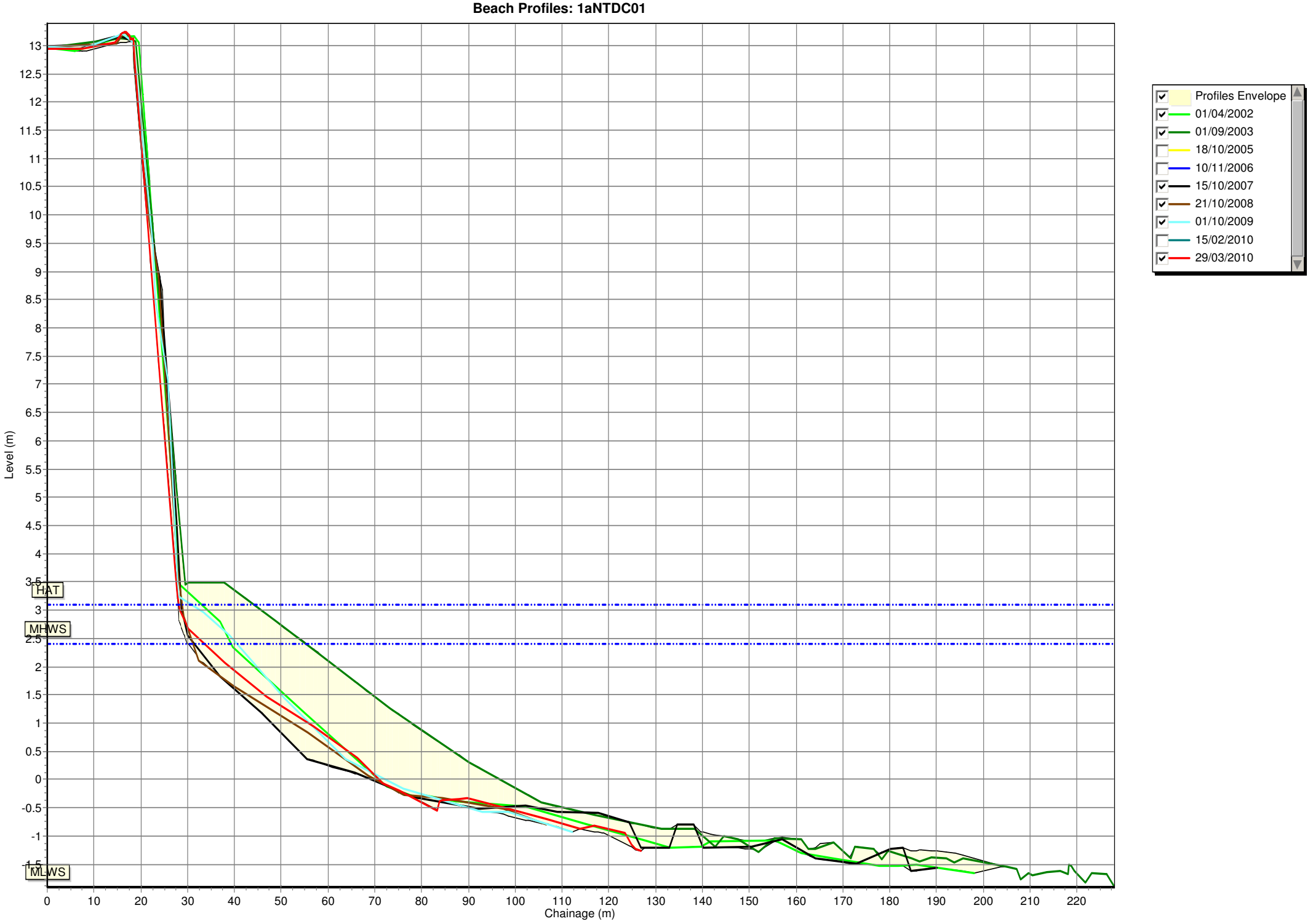
Code	Description
M	Mud
S	Sand
G	Gravel
GS	Gravel & Sand
GM	Gravel & Mud
MS	Mud & Sand
B	Boulders
R	Rock
SD	Sea Defence
SM	Salt Marsh
GR	Grass
D	Dune (non-vegetated)
DV	Dune (vegetated)
F	Forested
X	Mixture
FB	Obstruction
CT	Cliff Top
CE	Cliff Edge
CF	Cliff Face
SH	Shell
W	Water Body
ZZ	Unknown

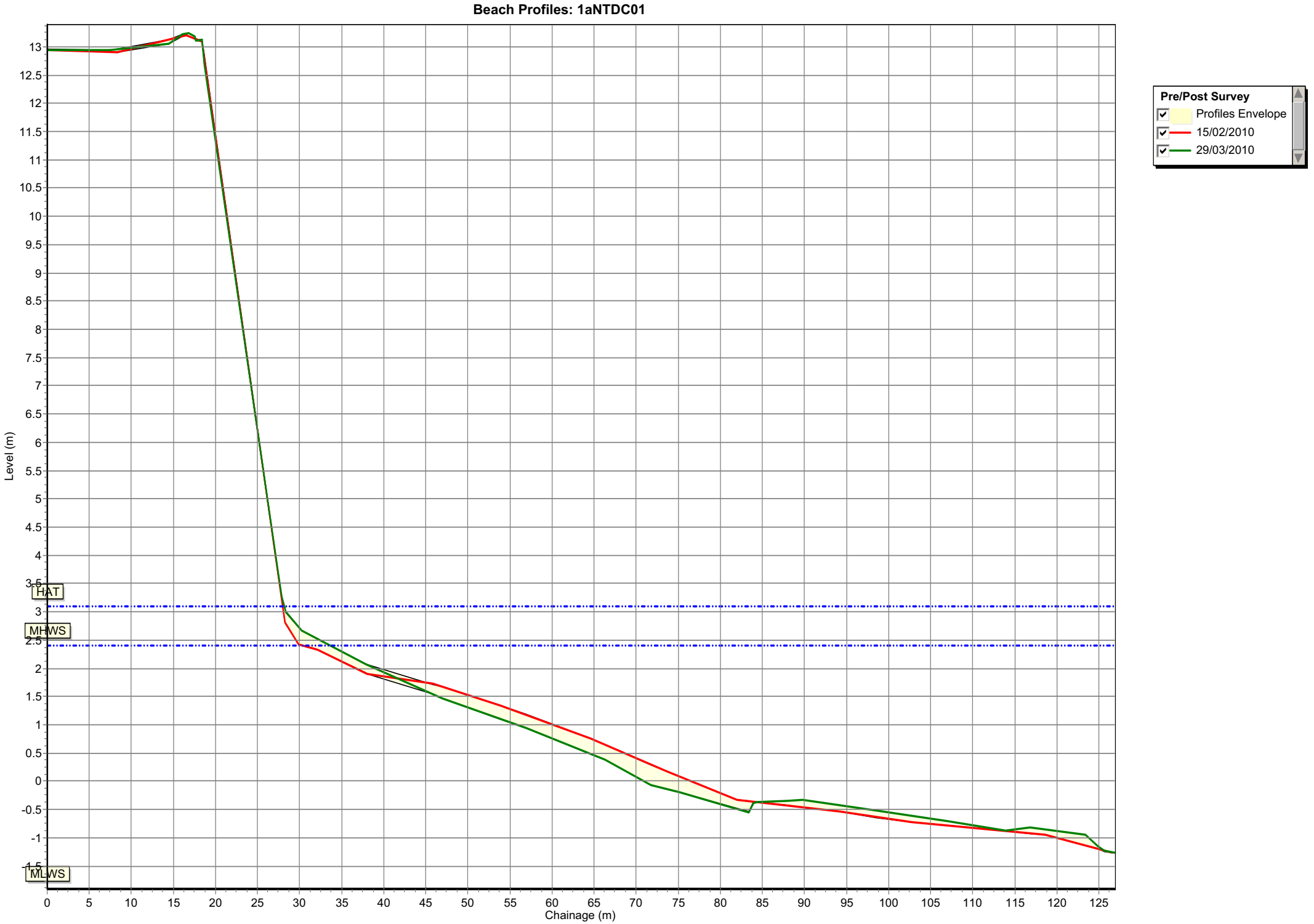
North Tyneside

1aNTDC01 - 29/03/2010

Chainage	Level	Code
0.000	12.949	
0.024	12.949	GR
7.501	12.936	GR
14.440	13.053	GR
16.028	13.219	GR
16.836	13.240	GR
17.599	13.191	GR
17.641	13.107	GR
17.916	13.108	GR
18.436	13.119	CT
18.643	12.679	GR
27.407	3.729	M
27.857	3.264	M
28.394	2.994	CE
30.214	2.668	S
37.961	2.066	S
46.972	1.465	S
56.877	0.951	S
66.265	0.384	GS
71.752	-0.071	GS
75.190	-0.205	GS
83.392	-0.544	GS
83.902	-0.382	S
84.389	-0.366	S
87.979	-0.352	S
89.774	-0.328	S
98.541	-0.517	S
106.851	-0.696	S
113.891	-0.875	S
116.838	-0.814	S
123.387	-0.944	S
124.885	-1.151	S
125.645	-1.235	S
126.860	-1.270	S

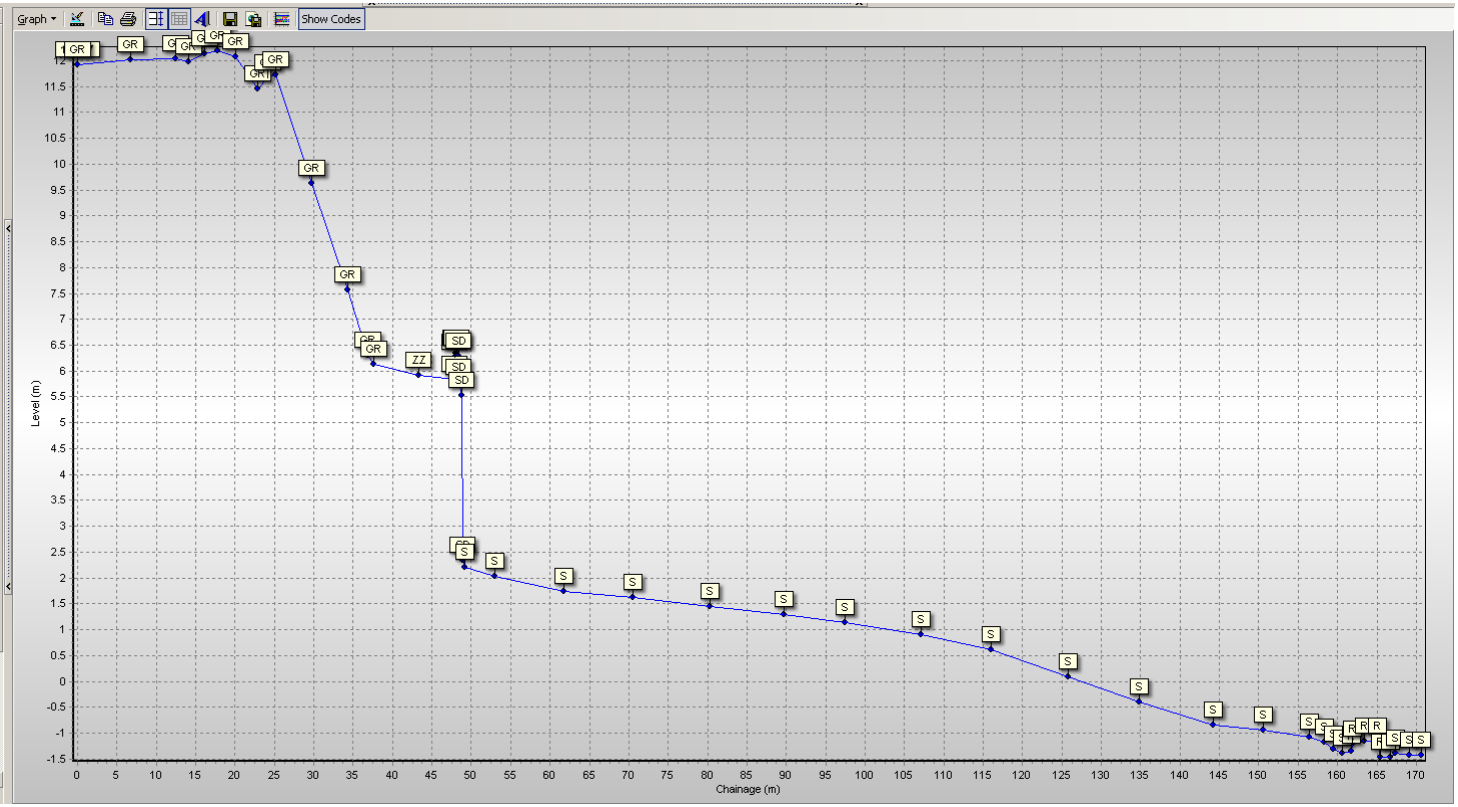



Beach Profiles: 1aNTDC01
Profiles Envelope
01/04/2002
01/09/2003
18/10/2005
10/11/2006
15/10/2007
21/10/2008
01/10/2009
15/02/2010
29/03/2010
HAT
MHWS
MLWS
Level (m)
Chainage (m)
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220

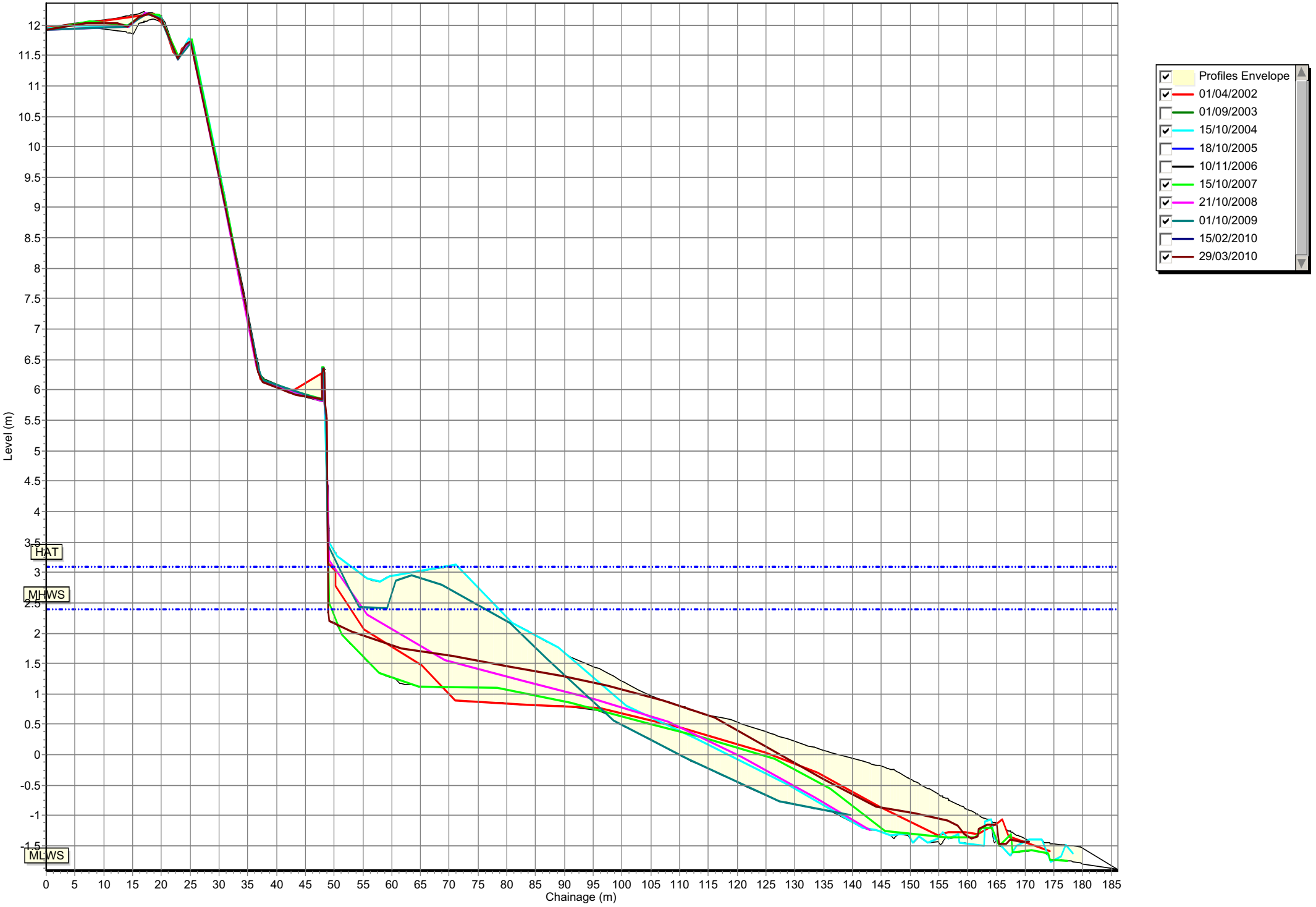

Beach Profiles: 1aNTDC01
Pre/Post Survey
Profiles Envelope
15/02/2010
29/03/2010
HAT
MHWS
MLWS
Level (m)
Chainage (m)
13
12.5
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125

1aNTDC02 - 29/03/2010

Chainage	Level	Code
0.000	11.927	
0.054	11.927	GR
6.698	12.024	GR
12.402	12.032	GR
14.121	11.975	GR
16.142	12.140	GR
17.788	12.193	GR
20.122	12.081	GR
22.894	11.445	GR
24.169	11.674	GR
25.109	11.729	GR
29.721	9.633	GR
34.253	7.564	GR
36.807	6.310	GR
37.635	6.132	GR
43.302	5.922	ZZ
47.902	5.842	SD
47.909	6.276	SD
47.981	6.342	SD
48.222	6.349	SD
48.351	6.278	SD
48.399	5.773	SD
48.737	5.533	SD
48.942	2.343	SD
49.209	2.202	S
53.032	2.035	S
61.736	1.746	S
70.586	1.627	S
80.300	1.456	S
89.750	1.295	S
97.455	1.141	S
107.095	0.901	S
116.011	0.609	S
125.846	0.093	S
134.874	-0.392	S
144.190	-0.847	S
150.589	-0.951	S
156.470	-1.074	S
158.330	-1.168	S
159.415	-1.315	S
160.625	-1.380	S
161.760	-1.343	R



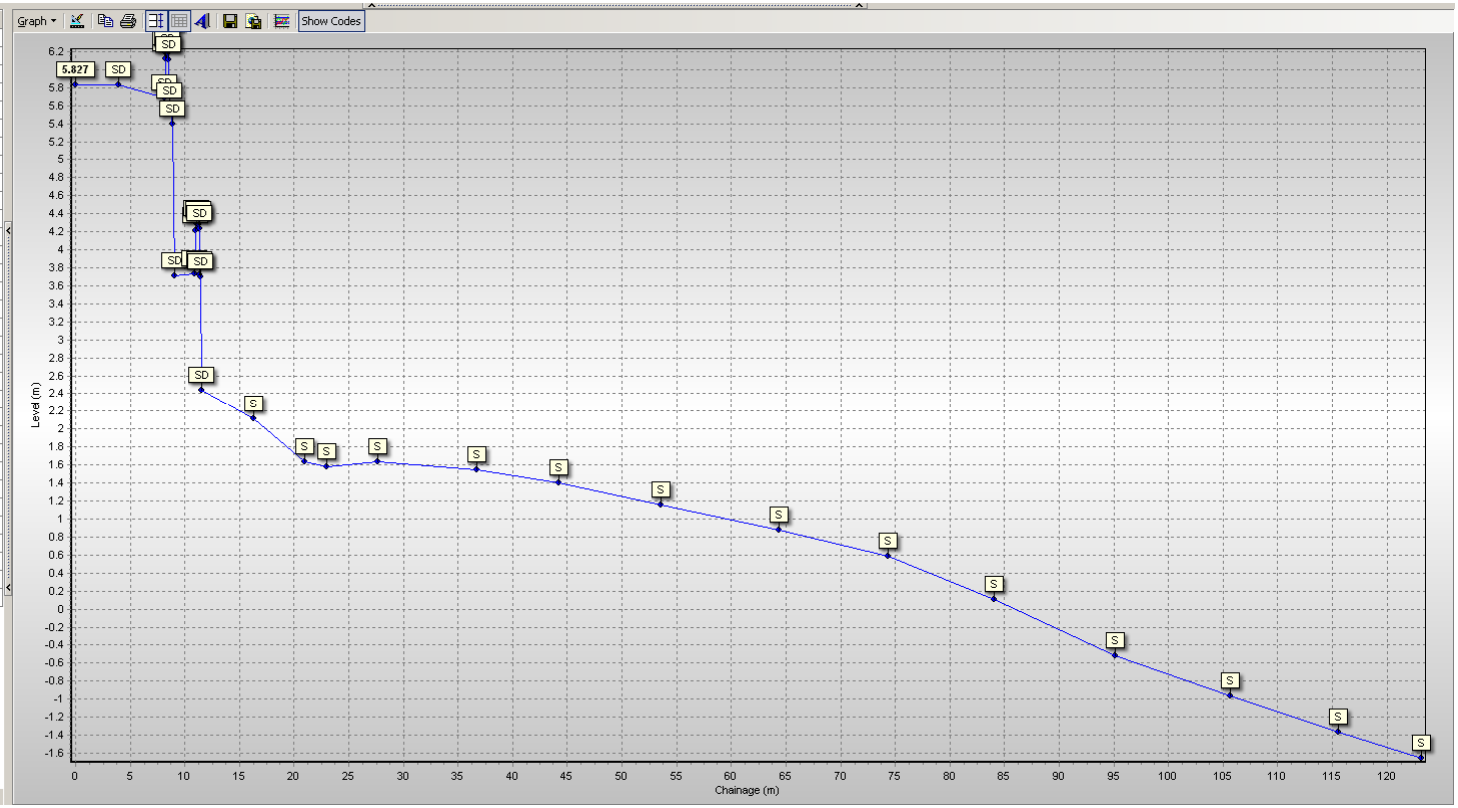
Beach Profiles: 1aNTDC02




Beach Profiles: 1aNTDC02
Pre/Post Survey
Profiles Envelope
15/02/2010
29/03/2010
HAT
MHWS
MLWS
Level (m)
Chainage (m)
12
11.5
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170

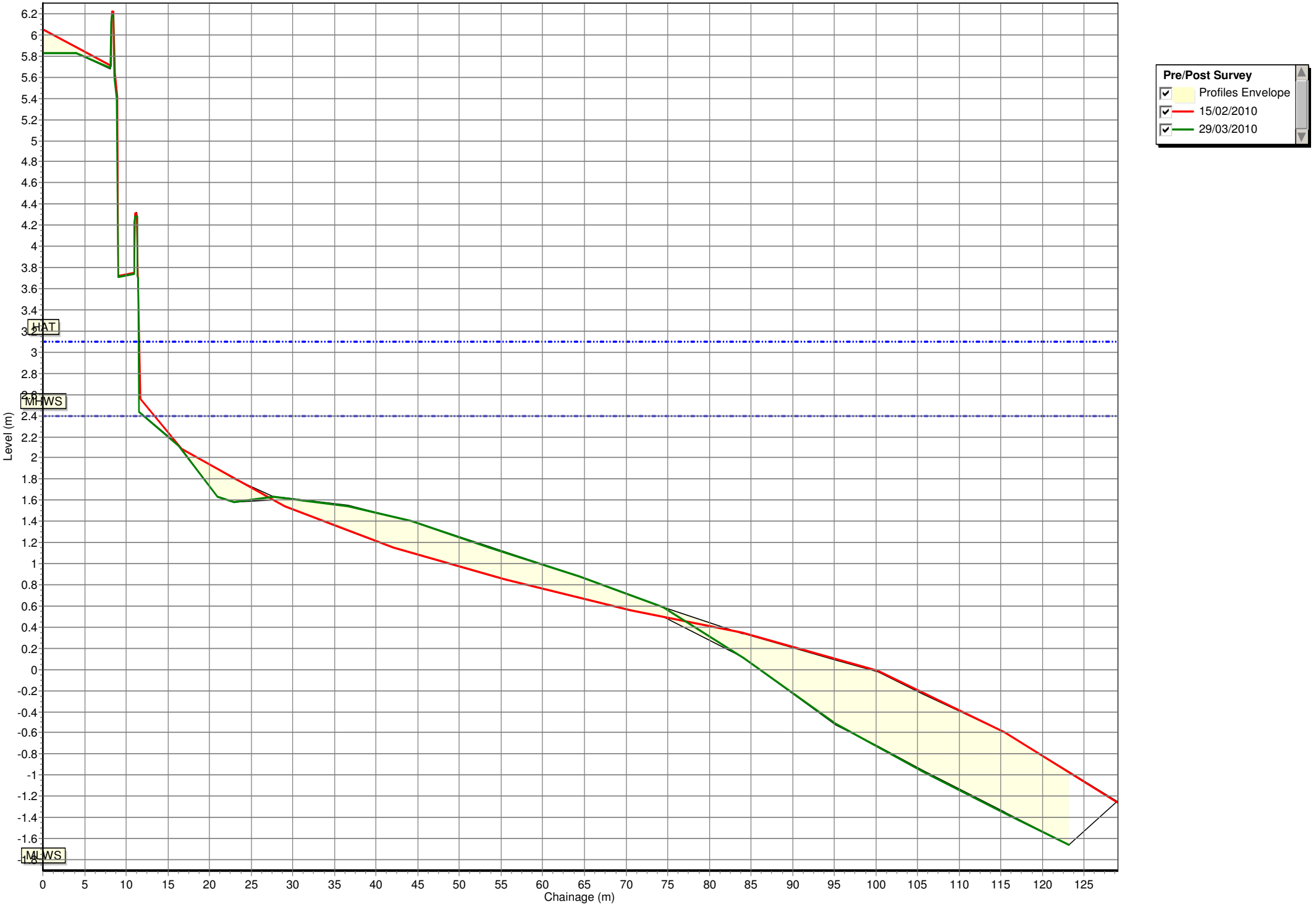
1aNTDC03 - 29/03/2010

Chainage	Level	Code
0.000	5.827	
3.958	5.827	SD
8.122	5.685	SD
8.203	6.118	SD
8.275	6.188	SD
8.439	6.177	SD
8.480	6.108	SD
8.566	5.602	SD
8.898	5.394	SD
9.020	3.715	SD
10.911	3.736	SD
10.971	4.218	SD
11.040	4.286	SD
11.287	4.285	SD
11.333	4.231	SD
11.368	3.718	SD
11.428	3.699	SD
11.549	2.439	SD
16.262	2.117	S
20.922	1.631	S
22.949	1.583	S
27.680	1.630	S
36.670	1.546	S
44.246	1.398	S
53.563	1.156	S
64.364	0.877	S
74.378	0.590	S
84.087	0.106	S
95.154	-0.518	S
105.620	-0.964	S
115.586	-1.364	S
123.146	-1.656	S



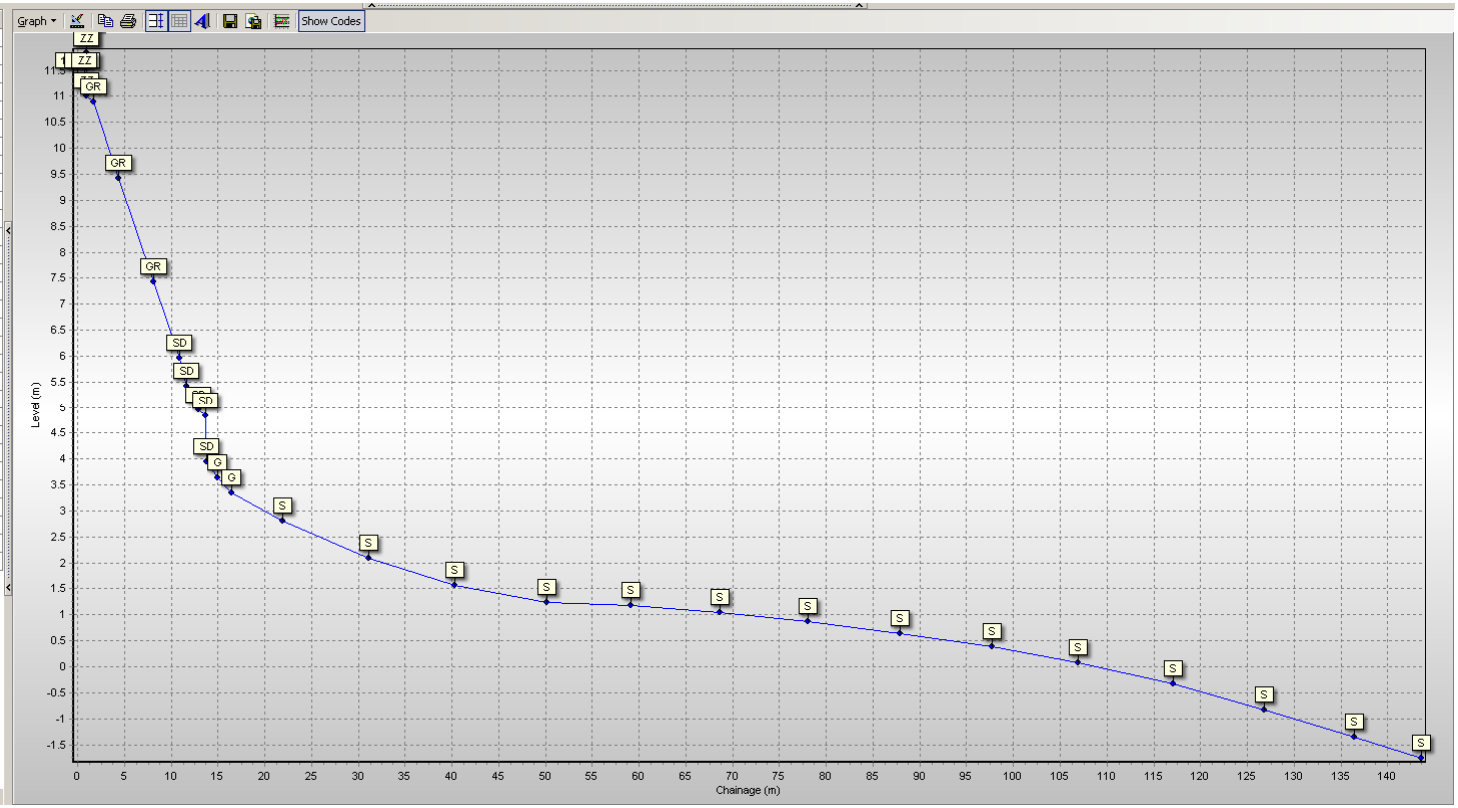
Beach Profiles: 1aNTDC03

Beach Profiles: 1aNTDC03

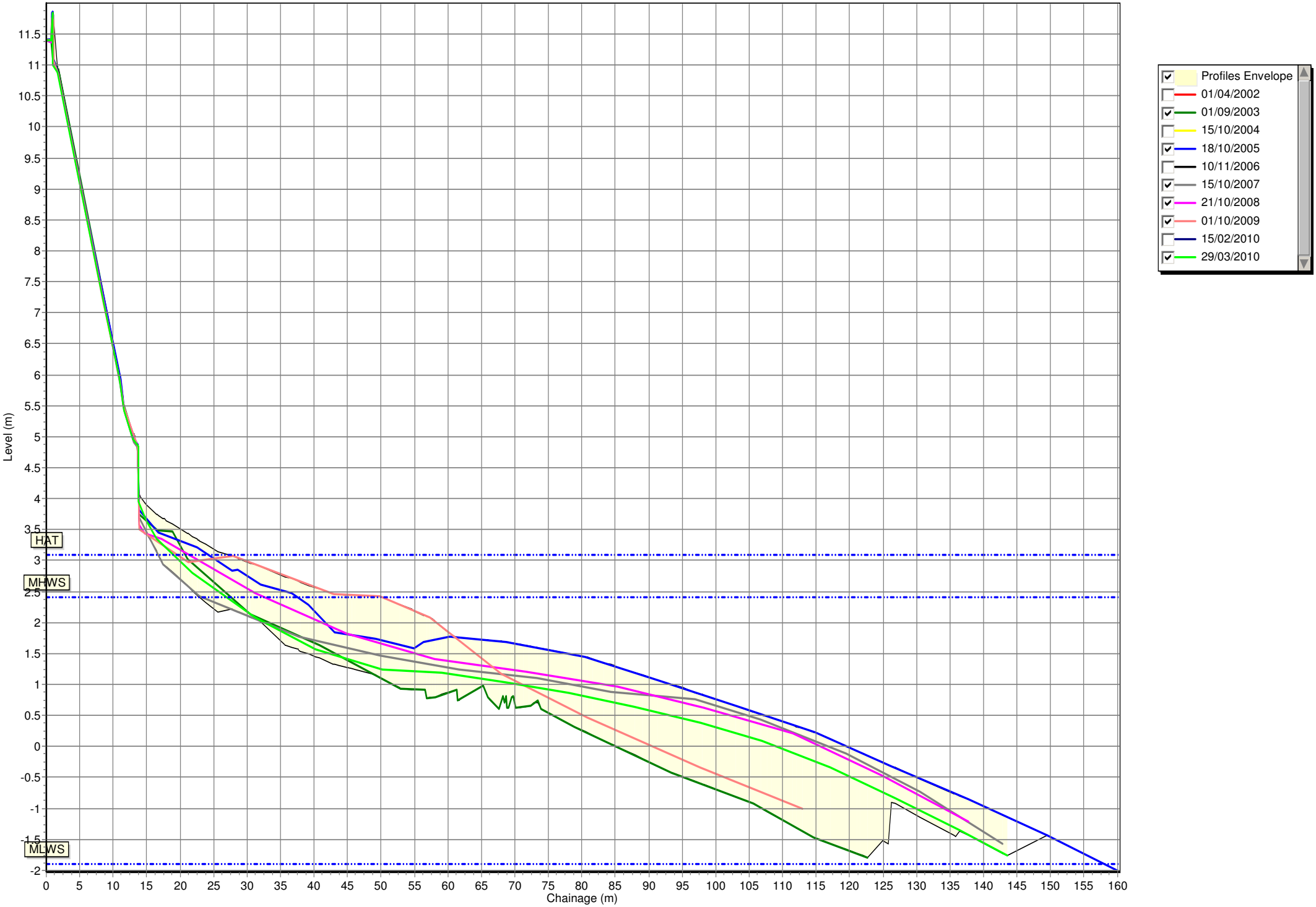


1aNTDC04 - 29/03/2010

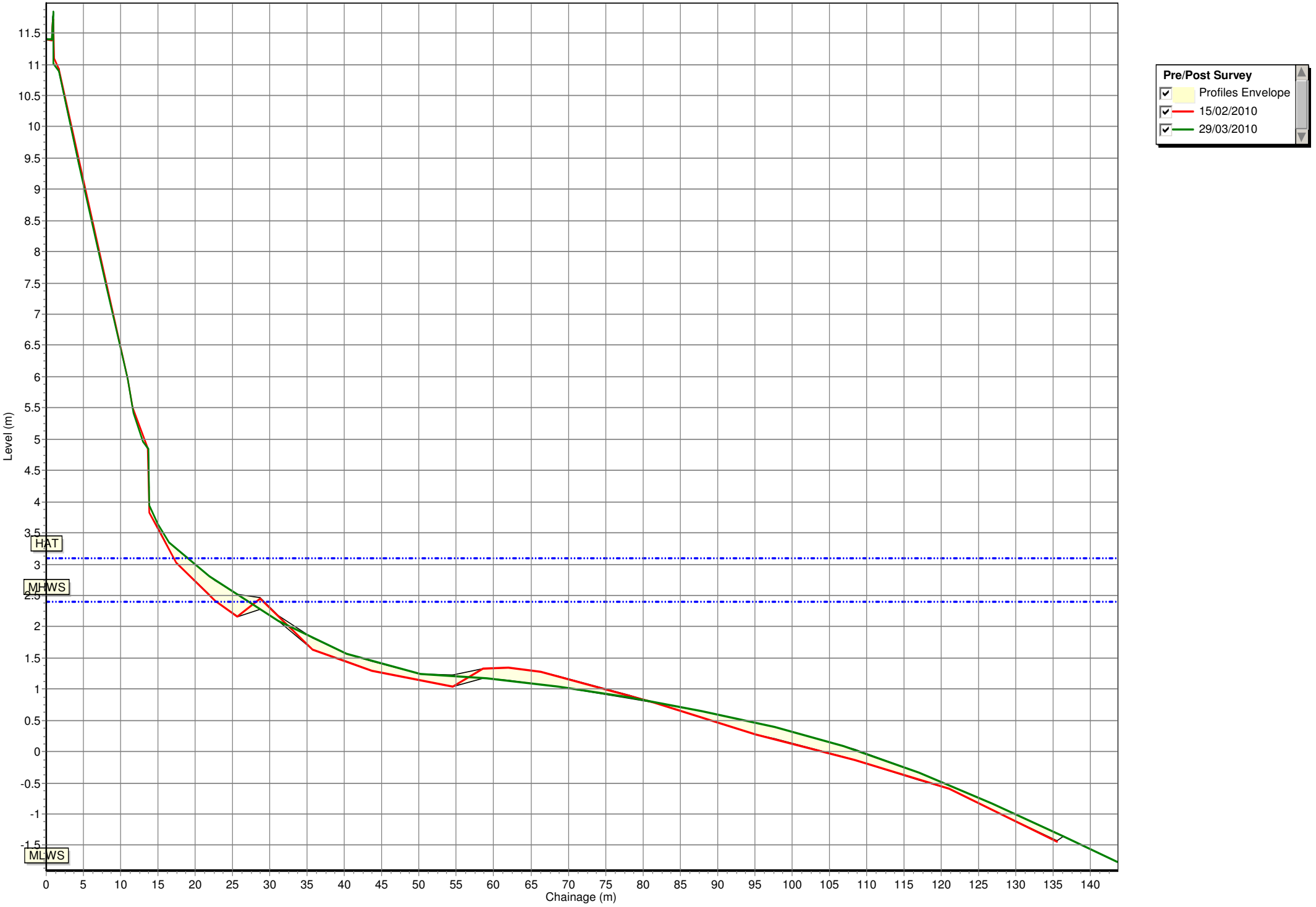
Chainage	Level	Code
0.000	11.405	
0.016	11.405	ZZ
0.721	11.392	ZZ
0.909	11.841	ZZ
0.981	11.818	ZZ
0.998	11.004	ZZ
1.687	10.887	GR
4.396	9.413	GR
8.089	7.437	GR
10.942	5.964	SD
11.671	5.427	SD
12.973	4.962	SD
13.726	4.840	SD
13.778	3.949	SD
14.969	3.634	G
16.448	3.353	G
21.890	2.798	S
31.160	2.089	S
40.268	1.559	S
50.148	1.245	S
59.134	1.181	S
68.651	1.040	S
78.098	0.865	S
87.856	0.642	S
97.725	0.389	S
106.888	0.086	S
117.054	-0.334	S
126.820	-0.831	S
136.397	-1.355	S
143.596	-1.760	S



Beach Profiles: 1aNTDC04

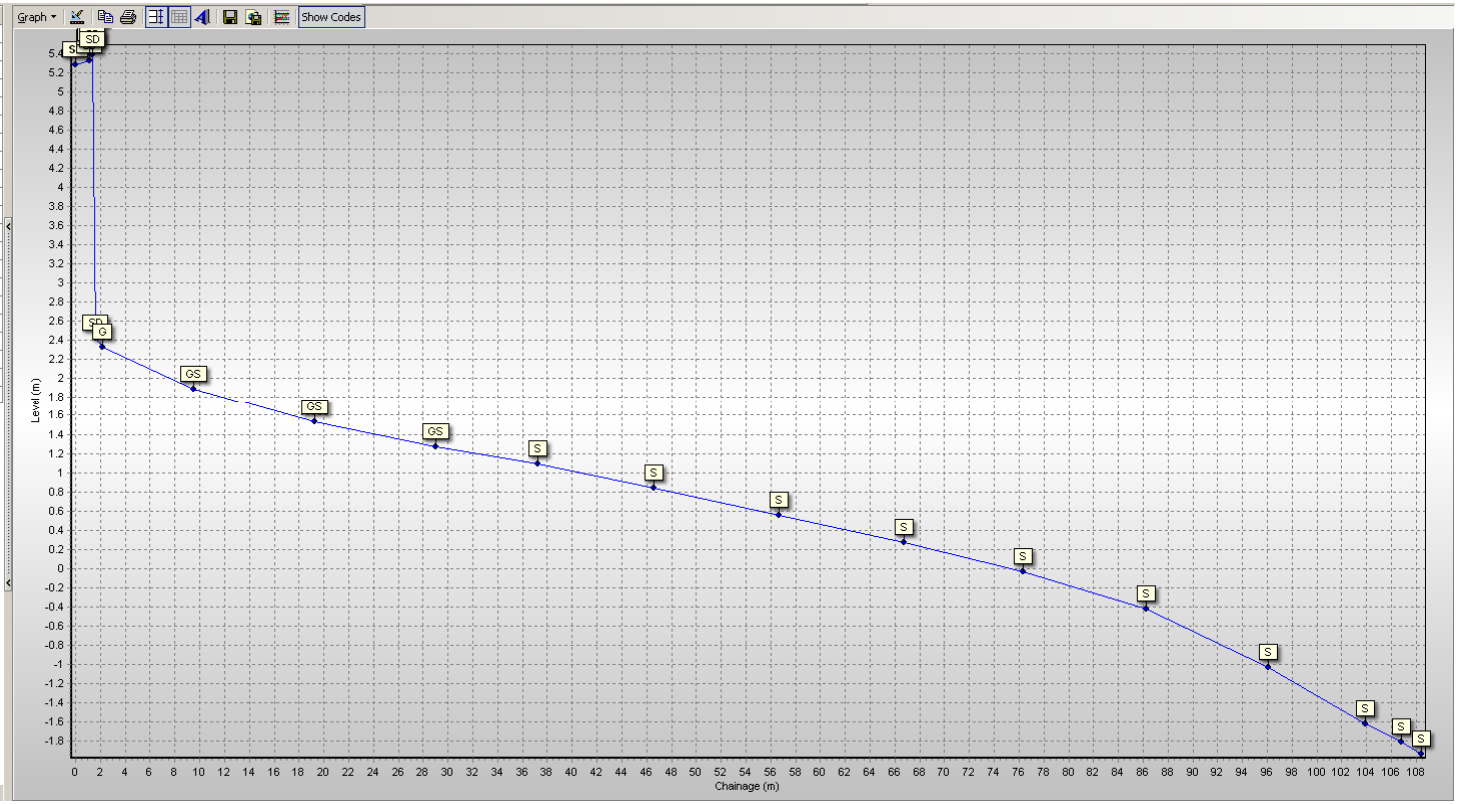


Beach Profiles: 1aNTDC04

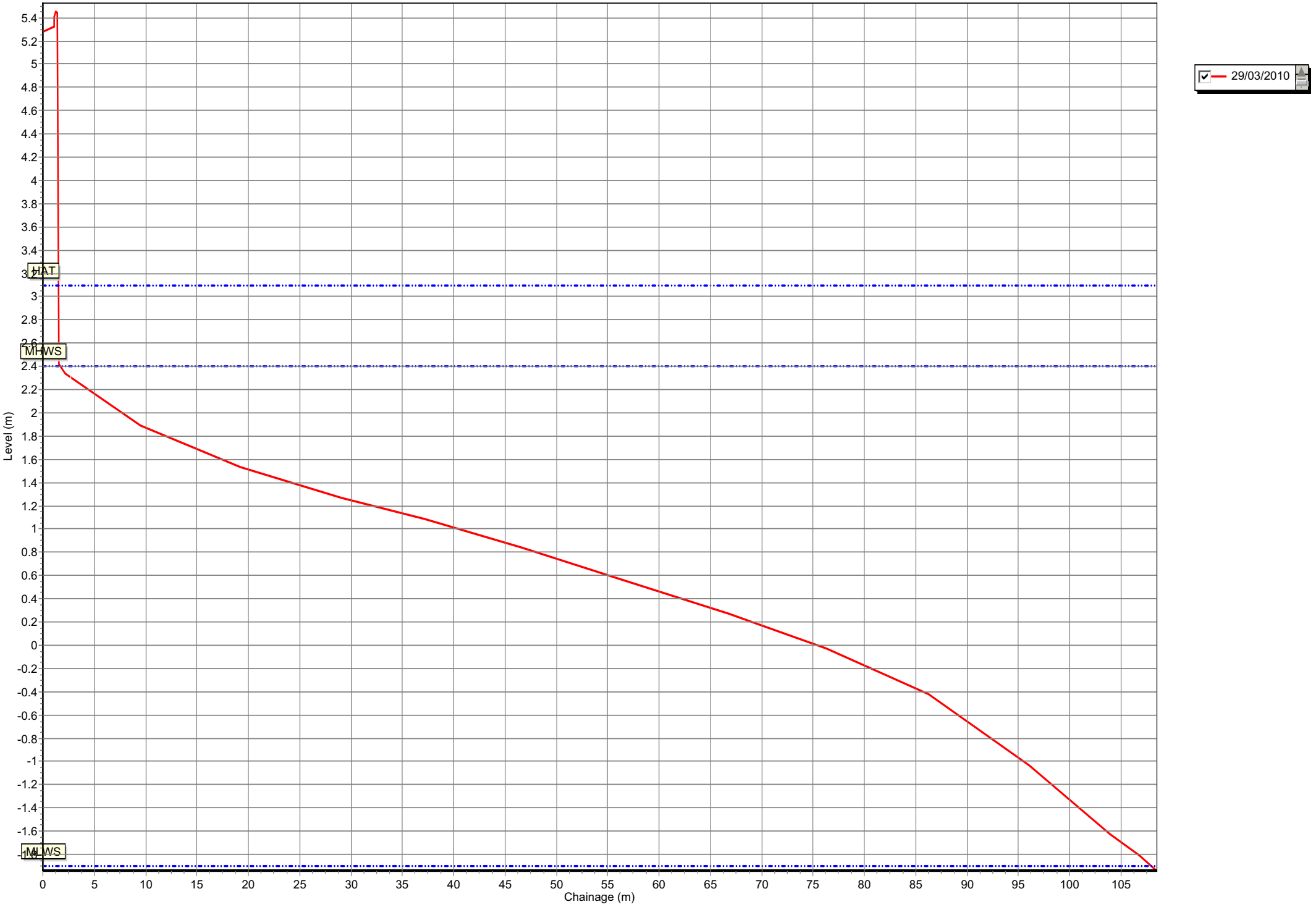


1aNTDC04A - 29/03/2010

Chainage	Level	Code
0.000	5.280	SD
1.096	5.324	SD
1.101	5.405	SD
1.206	5.452	SD
1.356	5.444	SD
1.408	5.385	SD
1.577	2.420	SD
2.198	2.334	G
9.517	1.887	GS
19.234	1.536	GS
29.027	1.269	GS
37.205	1.085	S
46.624	0.842	S
56.667	0.555	S
66.734	0.273	S
76.298	-0.031	S
86.234	-0.425	S
96.039	-1.036	S
103.931	-1.623	S
106.779	-1.810	S
108.409	-1.937	S

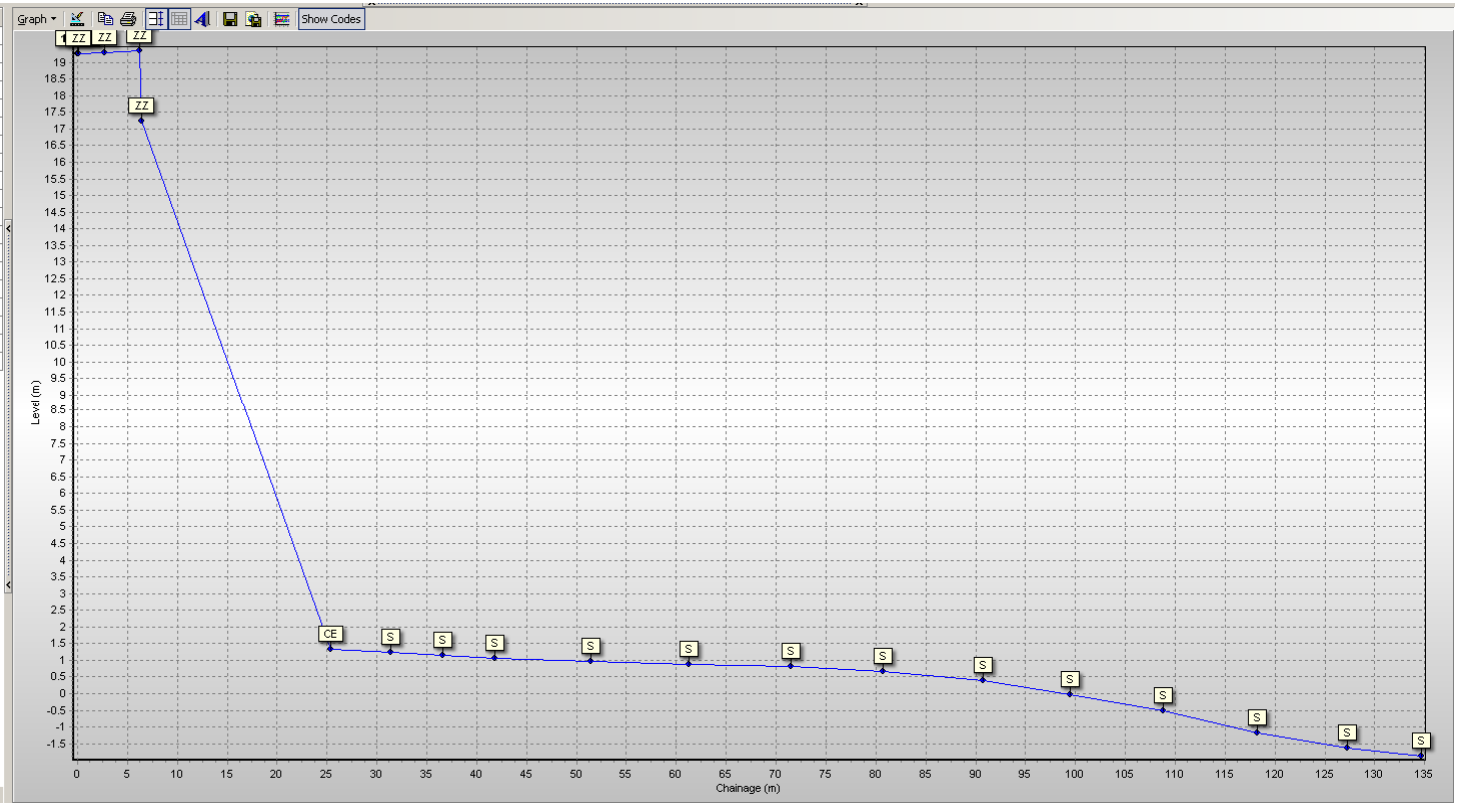


Beach Profiles: 1aNTDC04A



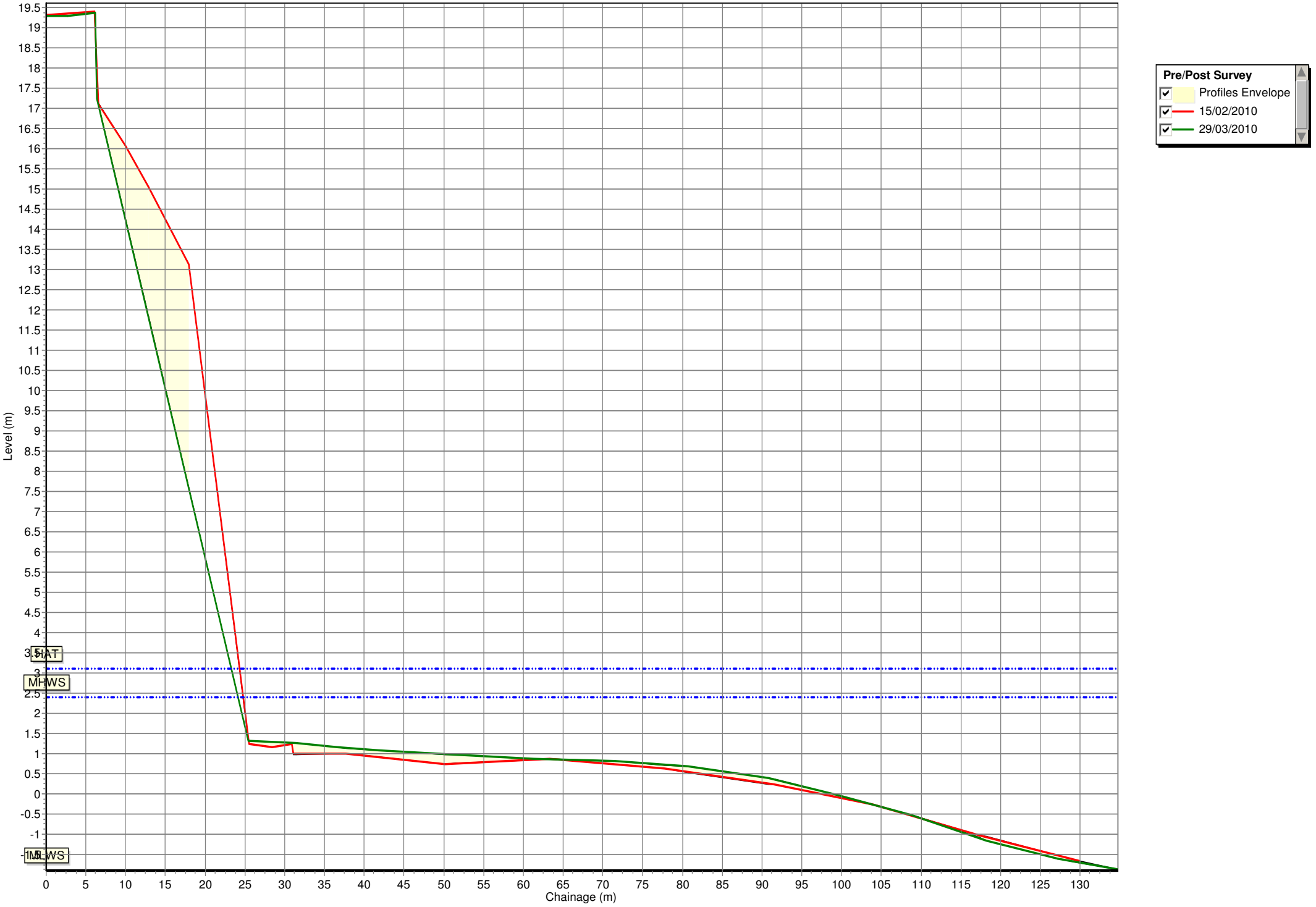
1aNTDC05 - 29/03/2010

Chainage	Level	Code
0.000	19.271	
0.109	19.271	ZZ
2.697	19.288	ZZ
6.219	19.350	ZZ
6.415	17.223	ZZ
25.415	1.315	CE
31.373	1.250	S
36.617	1.140	S
41.807	1.068	S
51.395	0.963	S
61.279	0.869	S
71.501	0.809	S
80.698	0.671	S
90.779	0.380	S
99.503	-0.021	S
108.835	-0.522	S
118.248	-1.165	S
127.206	-1.615	S
134.671	-1.870	S



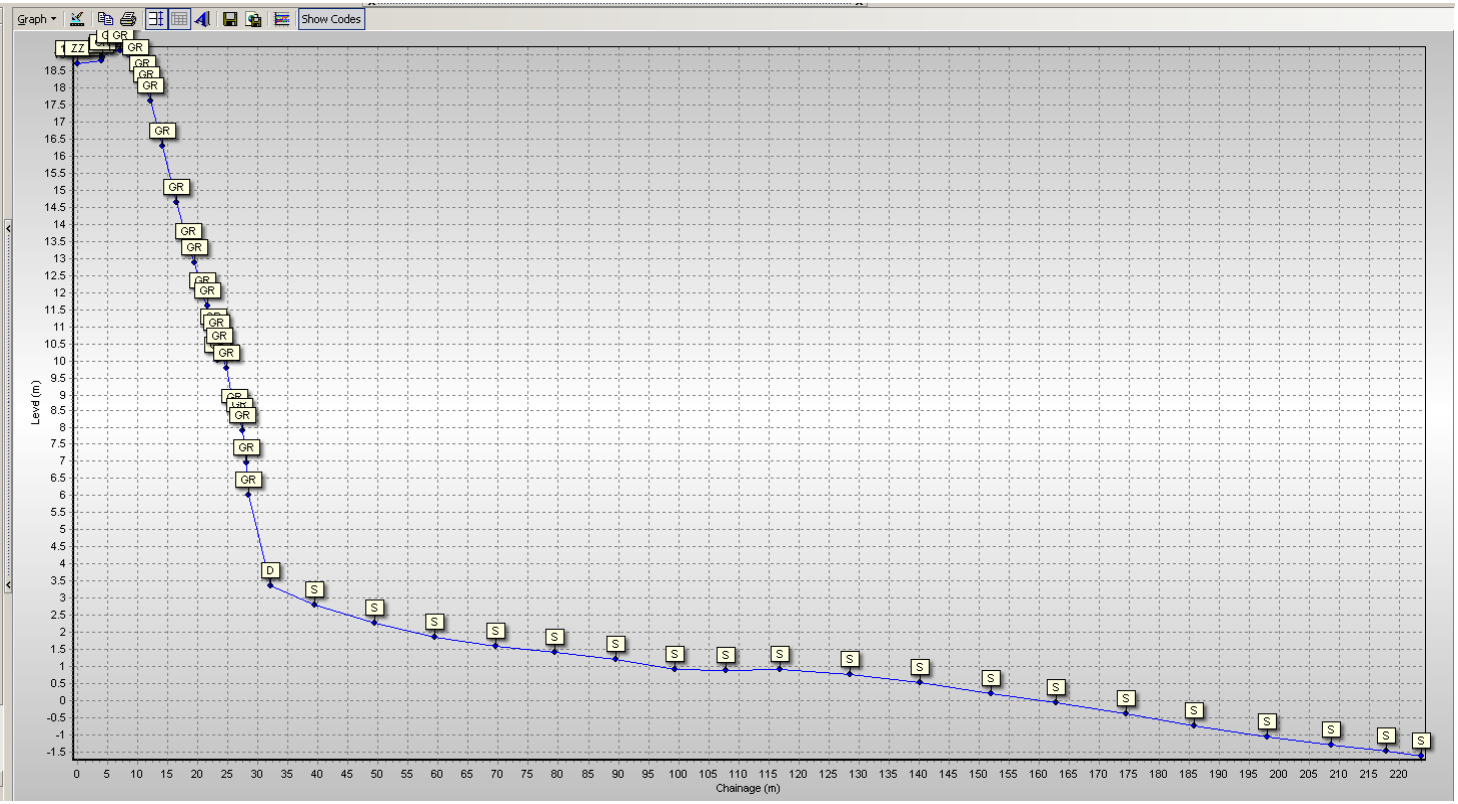
Beach Profiles: 1aNTDC05

Beach Profiles: 1aNTDC05

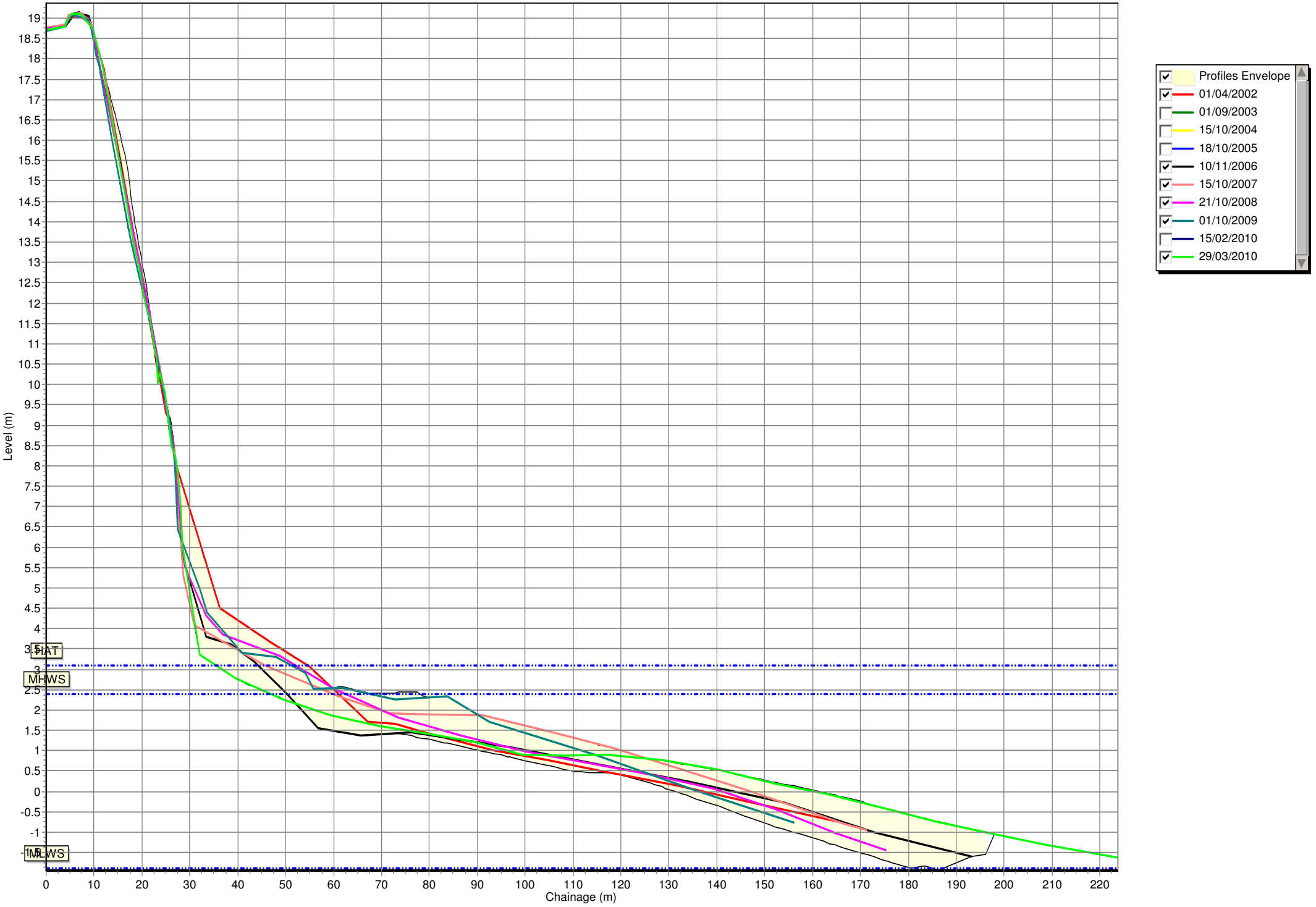


1aNTDC06 - 29/03/2010

Chainage	Level	Code
0.000	18.723	
0.038	18.723	ZZ
4.051	18.795	ZZ
4.145	18.897	GR
5.323	19.097	GR
7.194	19.104	GR
9.716	18.753	GR
10.838	18.270	GR
11.554	17.941	GR
12.164	17.624	GR
14.106	16.292	GR
16.537	14.655	GR
18.400	13.351	GR
19.399	12.896	GR
20.837	11.917	GR
21.679	11.601	GR
22.675	10.835	GR
23.073	10.683	GR
23.358	10.025	GR
23.608	10.287	GR
24.791	9.798	GR
26.186	8.498	GR
26.988	8.218	GR
27.497	7.886	GR
28.141	6.965	GR
28.486	6.021	GR
32.068	3.350	D
39.488	2.787	S
49.446	2.267	S
59.405	1.860	S
69.584	1.595	S
79.384	1.416	S
89.621	1.214	S
99.383	0.910	S
107.886	0.883	S
116.821	0.894	S
128.612	0.765	S
140.146	0.532	S
152.021	0.201	S
162.794	-0.067	S
174.412	-0.404	S
185.754	-0.732	S



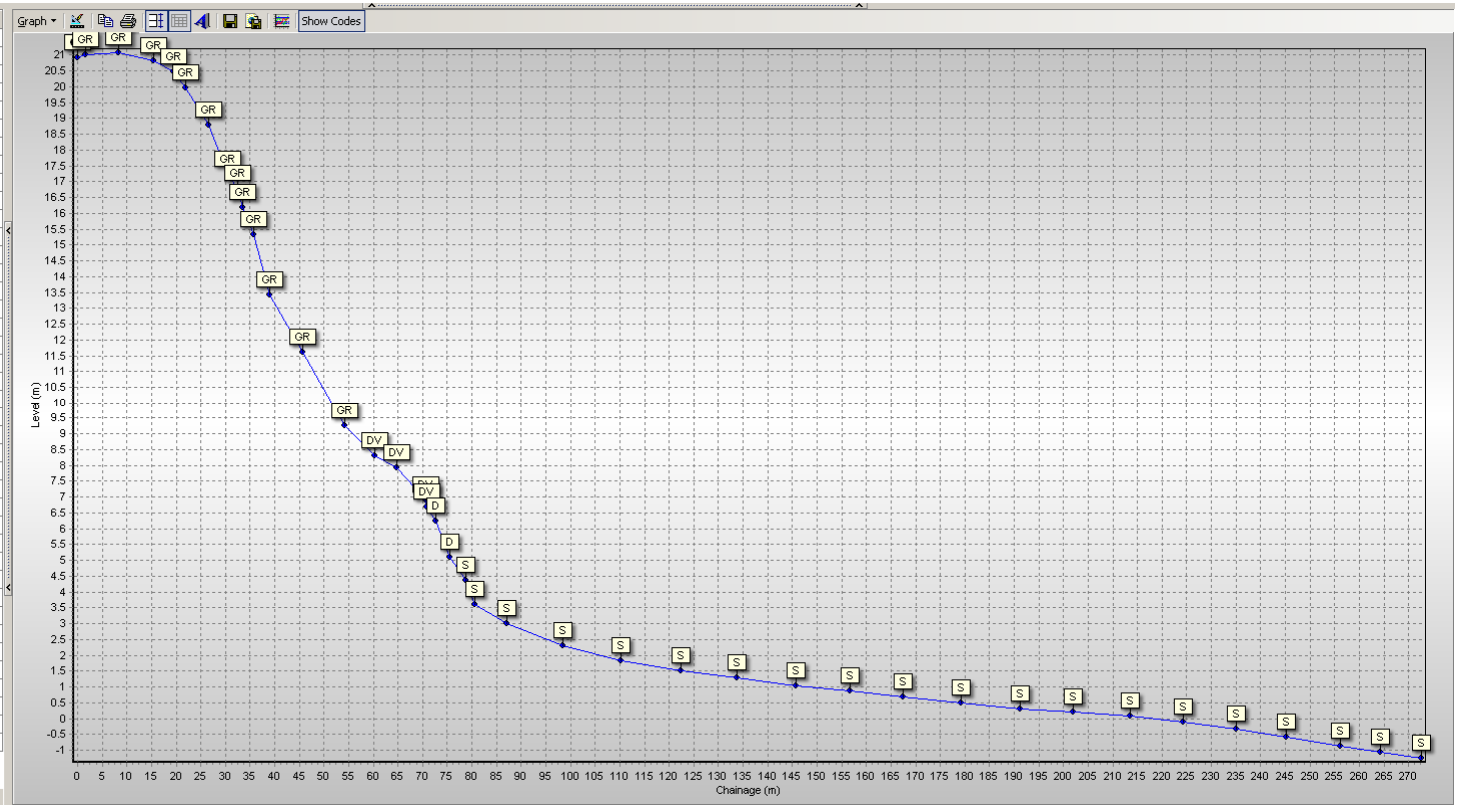
Beach Profiles: 1aNTDC06



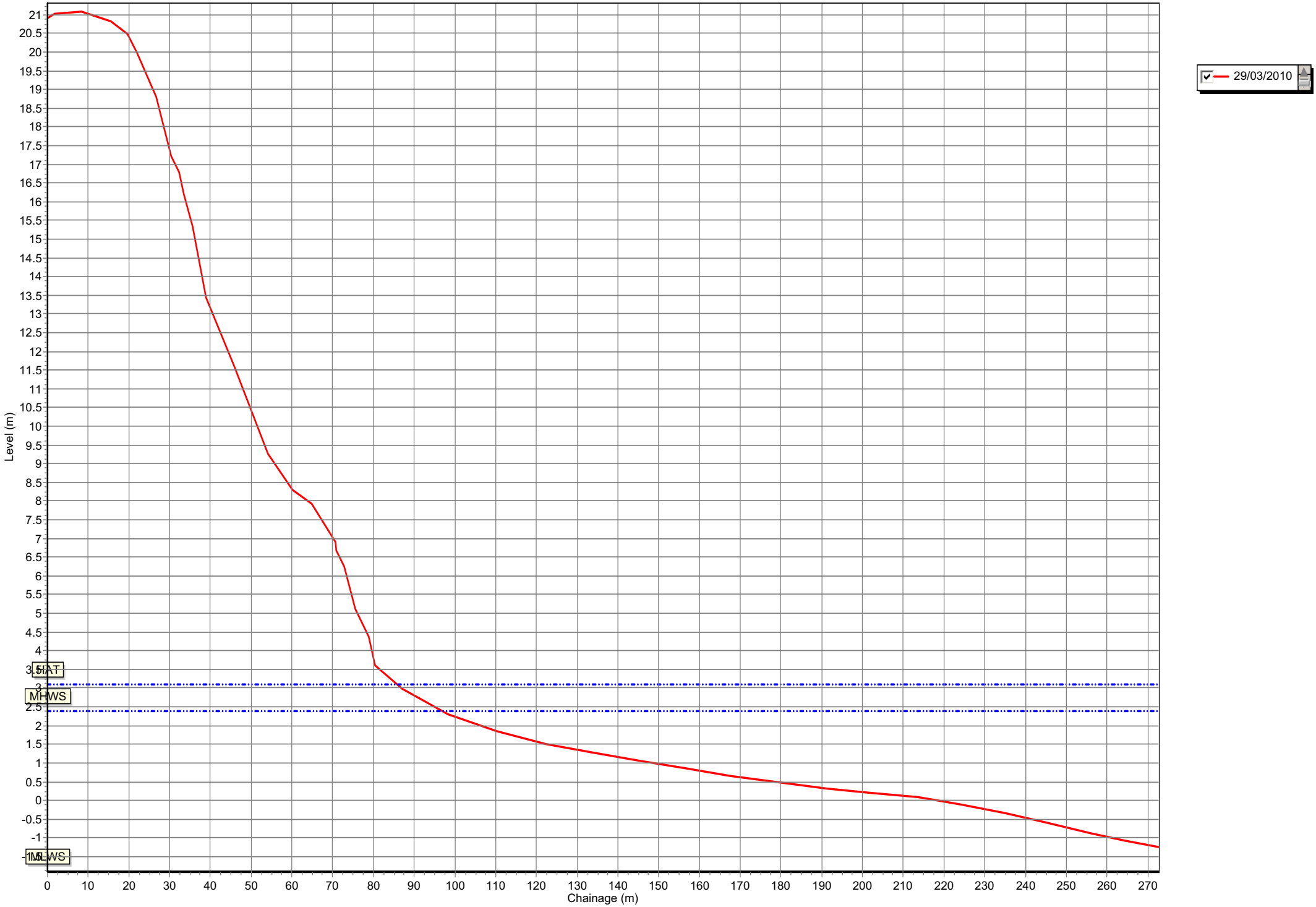
Beach Profiles: 1aNTDC06

1aNTDC06A - 29/03/2010

Chainage	Level	Code
0.000	20.910	GR
1.719	21.027	GR
8.364	21.079	GR
15.502	20.816	GR
19.576	20.473	GR
21.907	19.971	GR
26.628	18.798	GR
30.374	17.223	GR
32.397	16.776	GR
33.460	16.183	GR
35.678	15.343	GR
39.021	13.425	GR
45.711	11.622	GR
54.157	9.254	GR
60.247	8.309	DV
64.842	7.940	DV
70.626	6.909	DV
70.875	6.683	DV
72.764	6.249	D
75.595	5.111	D
78.811	4.367	S
80.496	3.603	S
87.025	2.996	S
98.347	2.302	S
110.216	1.842	S
122.344	1.519	S
133.758	1.273	S
145.717	1.047	S
156.763	0.863	S
167.521	0.670	S
179.311	0.478	S
191.276	0.303	S
202.035	0.203	S
213.506	0.094	S
224.256	-0.110	S
234.956	-0.339	S
245.144	-0.583	S
256.065	-0.867	S
264.370	-1.065	S
272.601	-1.254	S

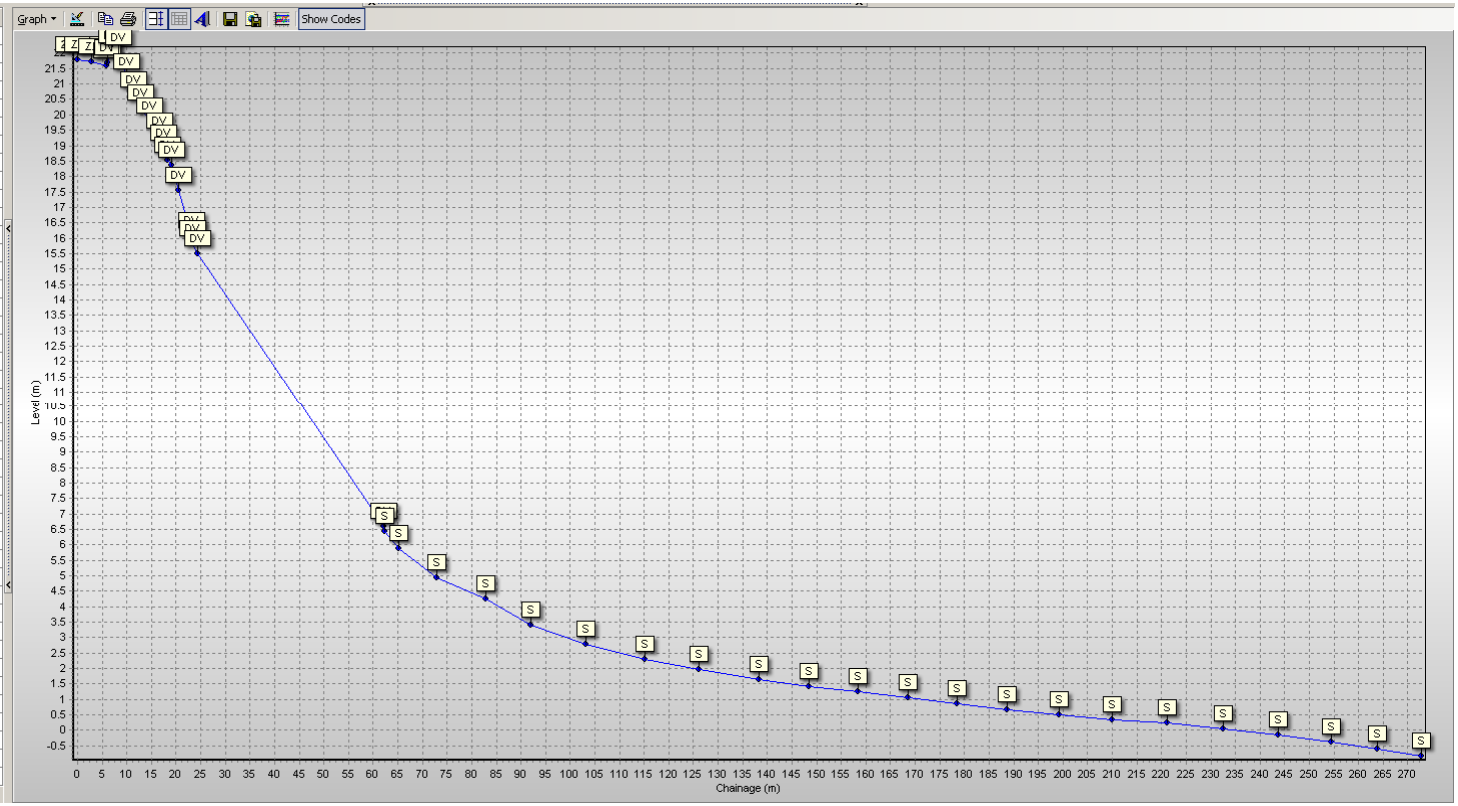


Beach Profiles: 1aNTDC06A

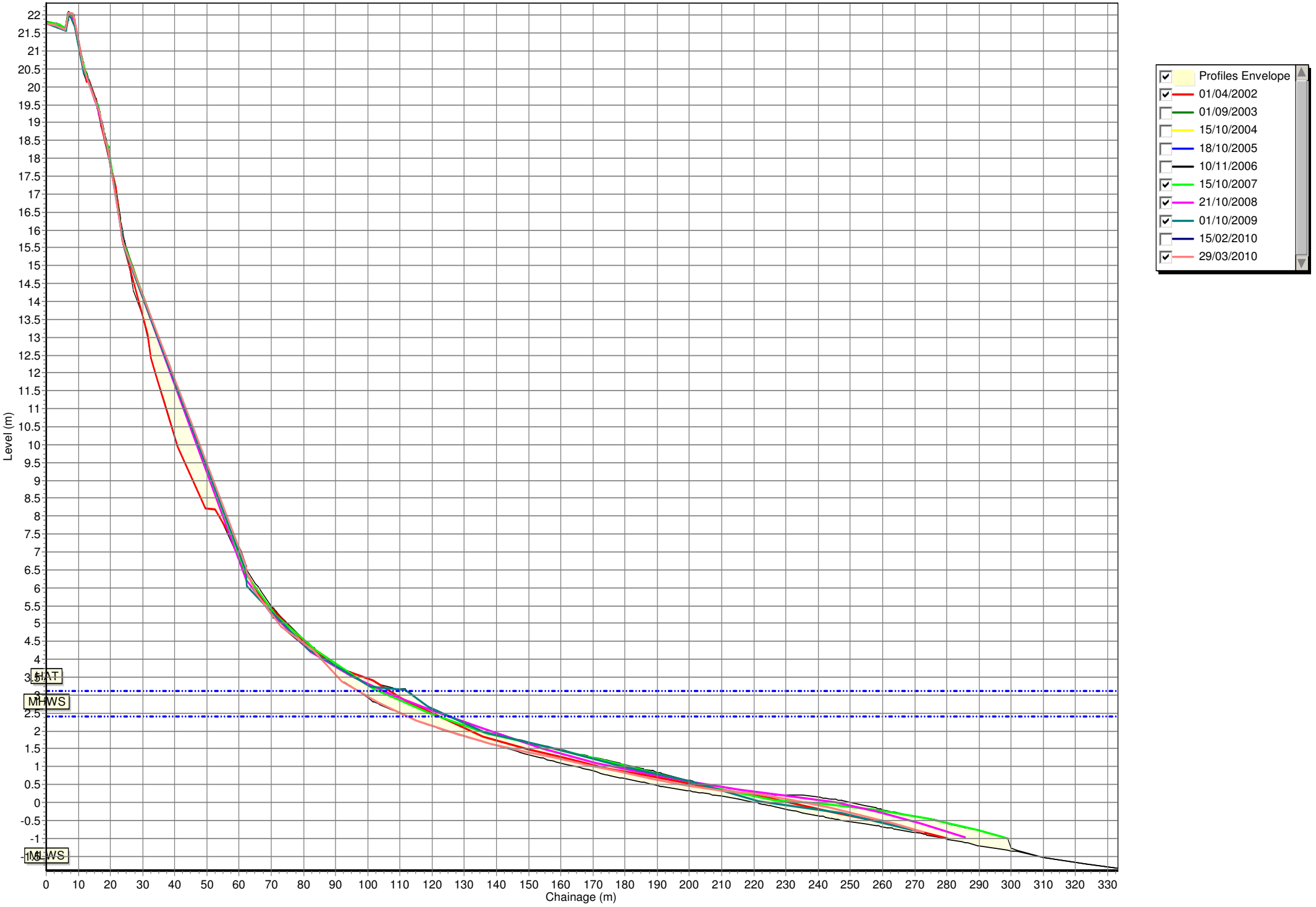


1aNTDC07 - 29/03/2010

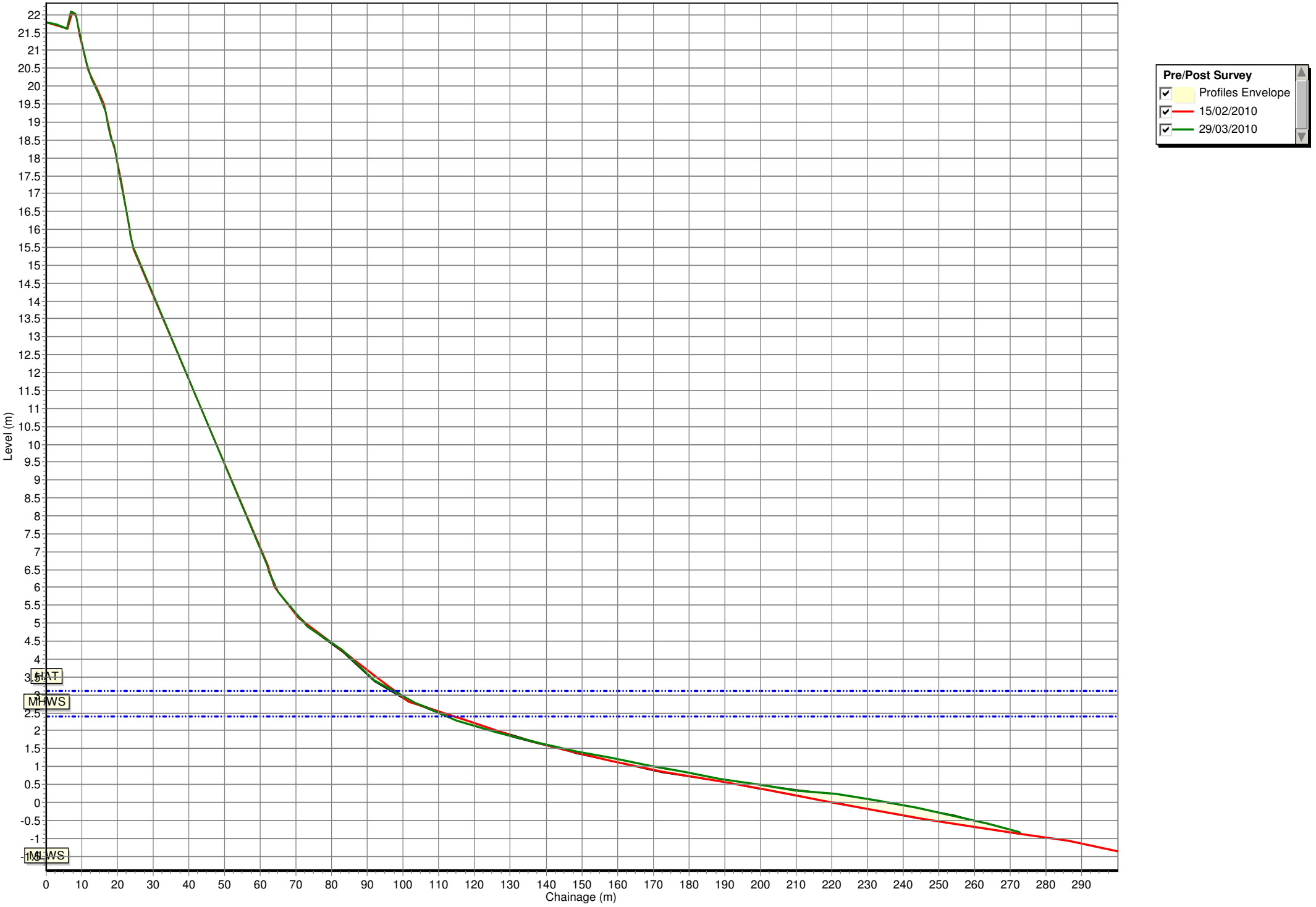
Chainage	Level	Code
0.000	21.785	
0.024	21.785	ZZ
2.916	21.728	ZZ
5.875	21.603	DV
6.053	21.696	DV
6.990	22.081	DV
8.272	22.030	DV
10.004	21.225	DV
11.322	20.644	DV
12.710	20.213	DV
14.615	19.787	DV
16.607	19.306	DV
17.415	18.916	DV
18.263	18.533	DV
19.060	18.349	DV
20.475	17.562	DV
23.237	16.074	DV
23.439	15.827	DV
24.430	15.503	DV
62.058	6.609	DV
62.395	6.426	S
65.150	5.863	S
72.990	4.926	S
82.867	4.258	S
91.973	3.394	S
103.206	2.782	S
115.116	2.283	S
126.206	1.954	S
138.214	1.645	S
148.555	1.427	S
158.371	1.238	S
168.629	1.043	S
178.506	0.852	S
188.642	0.661	S
199.219	0.488	S
209.971	0.337	S
221.086	0.222	S
232.480	0.051	S
243.802	-0.149	S
254.443	-0.374	S
263.787	-0.607	S
272.750	-0.838	S



Beach Profiles: 1aNTDC07

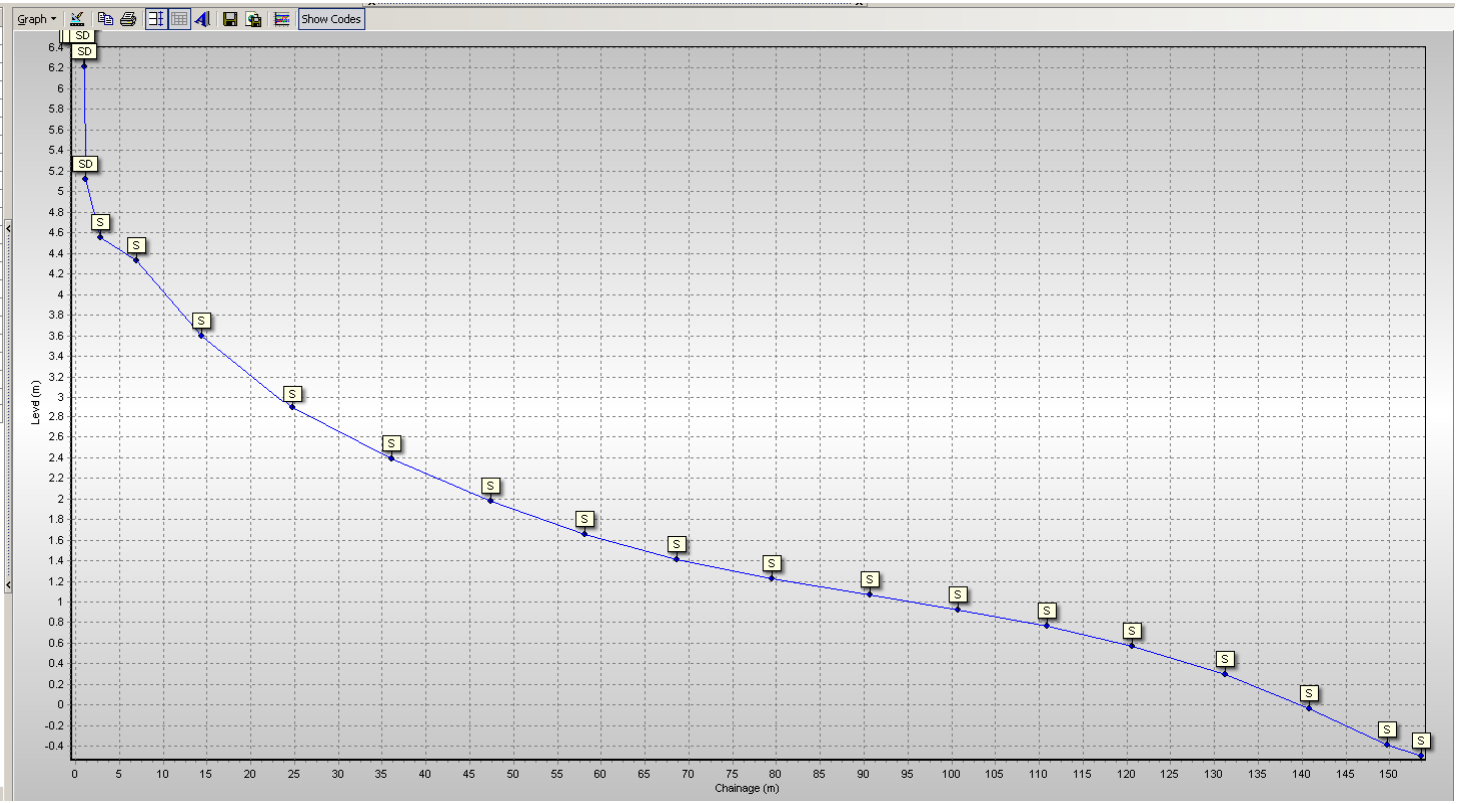


Beach Profiles: 1aNTDC07

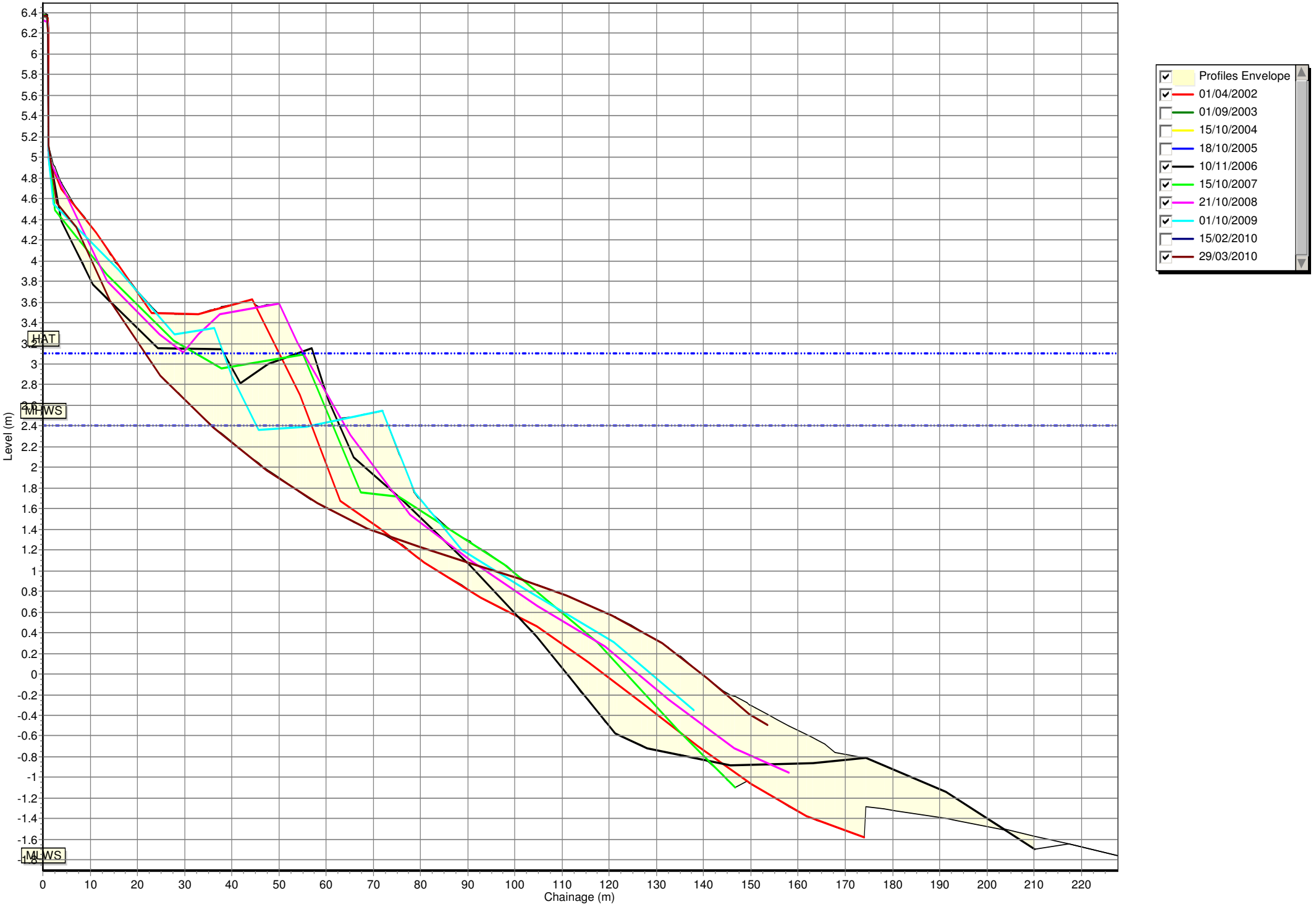


1aNTDC08 - 29/03/2010

Chainage	Level	Code
0.000	6.370	
0.015	6.370	SD
0.852	6.370	SD
1.010	6.218	SD
1.176	5.120	SD
2.818	4.558	S
6.996	4.329	S
14.335	3.601	S
24.821	2.886	S
36.078	2.387	S
47.390	1.975	S
58.130	1.654	S
68.653	1.410	S
79.543	1.229	S
90.669	1.069	S
100.735	0.924	S
110.937	0.764	S
120.607	0.569	S
131.233	0.296	S
140.777	-0.036	S
149.728	-0.385	S
153.621	-0.494	S



Beach Profiles: 1aNTDC08



Beach Profiles: 1aNTDC08