

Technical note

Project:	Swansea Bay University Campus	To:	Darren Mace
Subject:	Coastal Monitoring and Mitigation Framework	From:	Robert Bull
Date:	31 Mar 2014	cc:	Andy Wareing

Appendix 5 – 2014 Topographic Survey Results

A topographic survey of the beach was carried out in January 2014 (the first annual survey) based on the survey methodology set out in the Coastal Monitoring and Mitigation Framework. All data has been sent electronically. Outputs from the survey are:

- Topographic survey in xyz format
- A contoured plan in CAD format – pdf version shown in Figure 8
- A plot showing the difference in the beach level between October 2012 and January 2014 – shown in Figure 9
- 53 cross sections in CAD format
- Survey report – appended to this note
- Sections 213 – 216 (surveyed December 2013) in xyz and CAD format

Topographic Beach Survey

The January 2014 topographic beach survey has been overlaid on the baseline survey carried out in October 2012 and the difference in beach volume calculated using AutoCAD Civils 3D.

As described in the Monitoring and Mitigation Scheme (2012), the beach has been subdivided into 5 areas (A-E) based on the location of sections 213 – 216 and the total extent of the two surveys (see Figure 1). The change in beach volume between the 2012 baseline survey and the first annual survey is shown in Table 1.

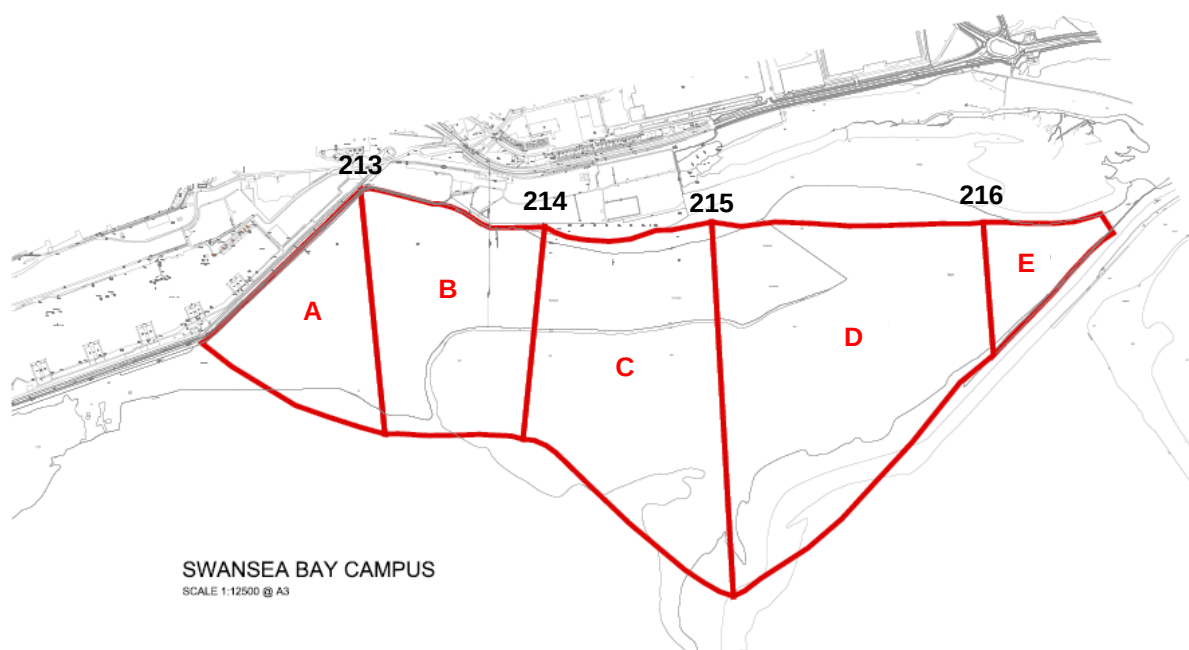


Figure 1 – Survey extent and beach areas for volume comparison calculations

Technical note

Table 1 – Beach volumes

	Area A		Area B		Area C		Area D		Area E	
Change	(m ³)	(%)	(m ³)	(%)	(m ³)	(%)	(m ³)	(%)	(m ³)	(%)
2012 - 2014	-66,206	-2.42%	71,004	1.36%	-71,934	-0.83%	22,232	0.18%	64,736	3.63%
Annualised 2012 - 2014	-52,533	-1.92%	56,340	1.08%	-57,078	-0.66%	17,640	0.15%	51,367	2.88%

Note: Beach volumes are defined between the surface (as surveyed) and -10mAOD within the plan areas shown in Figure 1.

The results show a variation in the trend across the beach with some areas accreting and some eroding. In total the beach has accreted by almost 20,000m³ (+0.07%) over the 1 year and 3 months since the baseline survey; this equates to a change in beach volume of approximately +15,700m³ (+0.05%) per year.

Two years of beach survey data is deemed to be insufficient to justify a review of the thresholds which are currently based on over 10 years of profile data. Therefore this data has not been used to update the thresholds for trigger points set out in the Monitoring and Mitigation Scheme at this stage. This should be reviewed on completion of the second annual topographic beach survey which is due to be carried out in Autumn 2014.

Sections 213 – 216

Sections 213 – 216 (as defined in Swansea Bay Shoreline Management Plan) have been regularly surveyed since 1998 and the beach profile data collected has been provided by Swansea and Carmarthen Bay Coastal Engineering Group (SCBCEG).

The latest survey (December 2013) of Sections 213 – 216 has been added to that previously collected and analysed in Appendix 4 of the Coastal Monitoring and Mitigation Scheme and results are presented and discussed below. This data has not been used to update the thresholds for trigger points set out in the Monitoring and Mitigation Scheme.

Table 2 – Maximum, minimum and average inter-survey change in beach cross section area at Profiles 213, 214, 215 and 216

	213		214		215		216	
Change	(m ³)	(%)	(m ³)	(%)	(m ³)	(%)	(m ³)	(%)
Minimum	-65	-12.38%	-60	-5.58%	-78	-4.63%	-146	-7.13%
Average	-4.28	-0.65%	-4.78	-0.41%	13.33	0.76%	-21.89	-1.00%
Maximum	58	10.62%	65	6.47%	442	29.43%	63	2.88%
1998 - 2008	-117	-17.65%	-149	-12.91%	-249	-14.22%	-418	-19.08%
1998 - 2012	-59	-8.90%	-84	-7.28%	193	11.02%	-393	-17.94%
2008 - 2012	58	10.62%	65	6.47%	442	29.43%	25	1.41%
Annualised 2008 - 2012		2.41%		1.58%		6.67%		0.35%
2012 - 2013	-18	-2.98%	-2	-0.19%	47	2.42%	-1	-0.06%

The colour coding in the final row of Table 2 indicates how the changes between 2012 and 2013 relate to the agreed thresholds to trigger actions, as set out in the Monitoring and Mitigation Scheme. As can be seen, all profiles are within the 'green' threshold, as based on historic changes in beach profiles, indicating that observed the change is within that previously recorded (over the previous 10 years' of collected profile data).

Following exceedence of the red threshold at Profile 215 in 2012 (indicating possible requirement for additional survey), the latest change in cross section area is within the green threshold parameters indicating that variation across the profile has returned to within that previously observed. Therefore there is no need for any additional survey as a result of exceedence of the red threshold in 2012.

Technical note

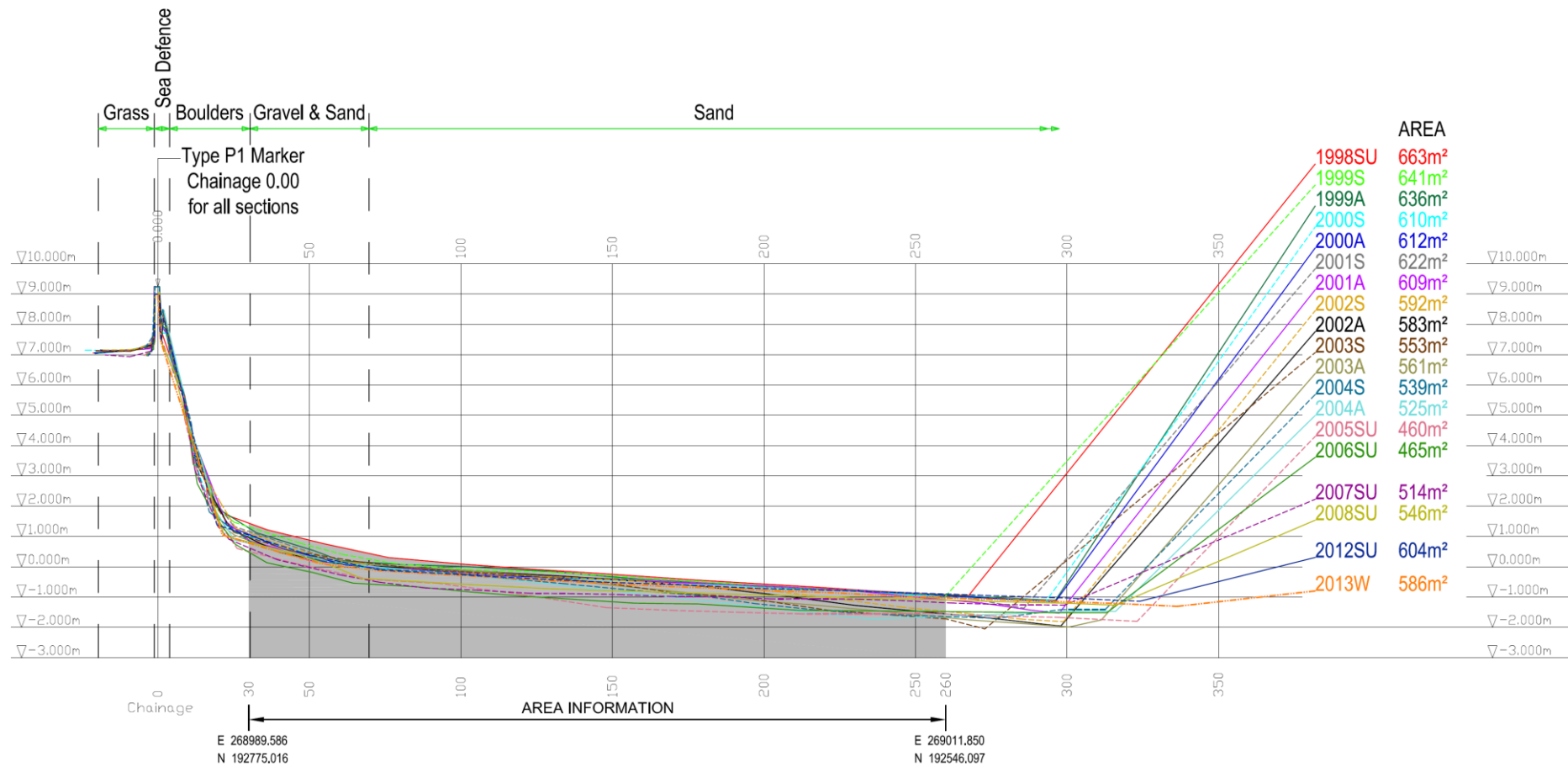
In 2013 the cross section area has decreased across three of the four profiles, the largest change being at Profile 213 (-3%), whilst there has been an increase at Profile 215 of just over 2%. The totals indicate net accretion across the four profiles, a continuation of the 2008-2012 trends.

The recent increases have reduced the overall losses since 1998 at three of the profiles and shown an increase of 14% at Profile 215. Overall there has been a negligible increase of approximately 0.5% more sediment on the beach in 2013 than in 2012. Overall losses between 1998 and 2013 are approximately 5.5% whilst losses between 1998 and 2008 were 16%.

The cause or source of the increased beach volume is not clear, however, it is thought these changes could be accounted for by likely on-offshore movement of sediment between the beach and the nearshore sand bars. Figure 9 shows a difference map which highlights general accretion across the beach from 2012-13 and on-offshore movement of the nearshore bars.

The results of the 2013 survey do not highlight a need for any additional survey work at this stage. The second annual topographic survey is due to be carried out in Autumn 2014. The next bathymetric survey is due to be carried out 5 years after the first (Autumn 2017), unless the results of annual topographic surveys require additional survey work, as set out in the Monitoring and Mitigation Scheme.

Technical note

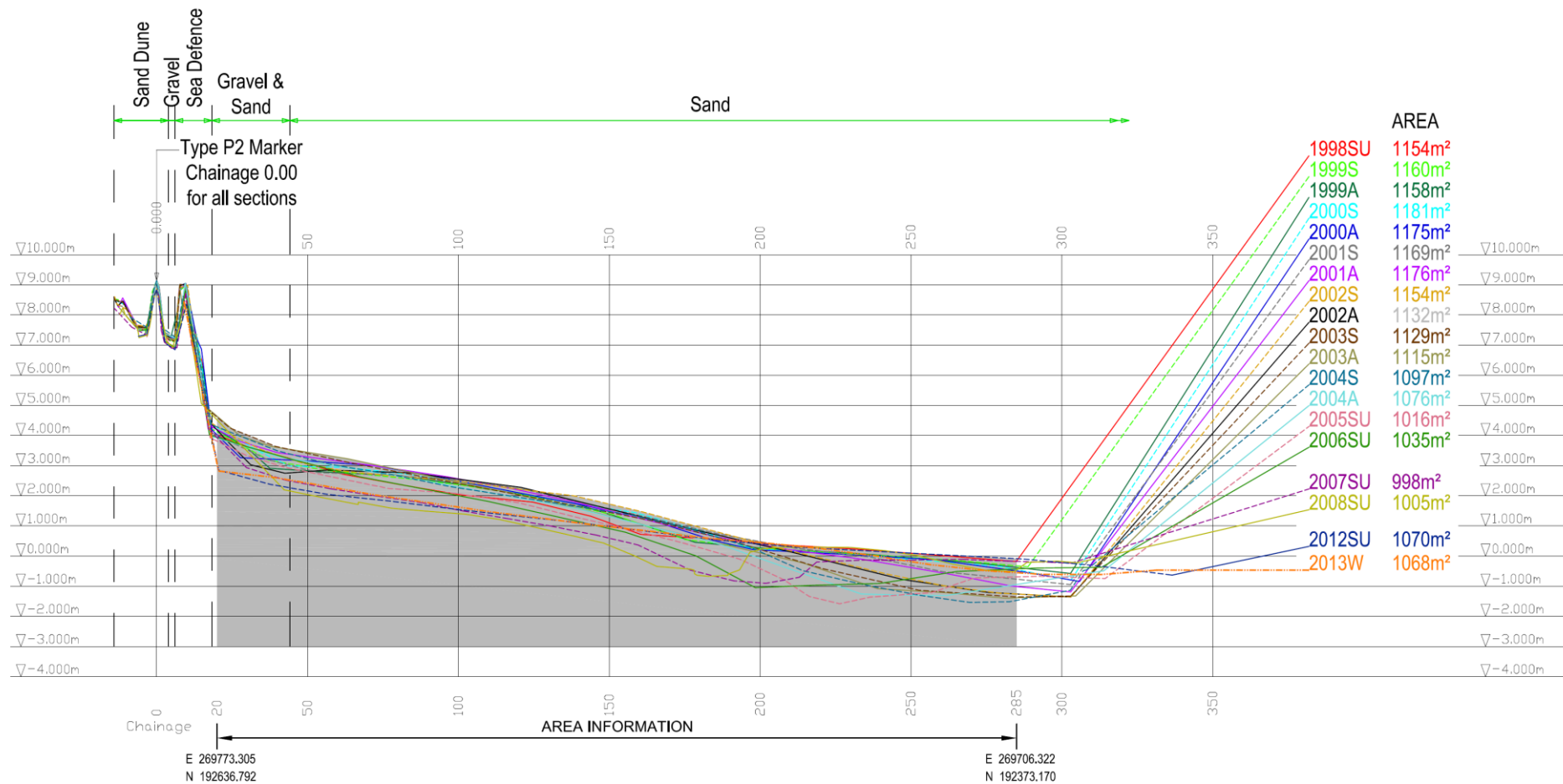


SECTIONS 213 OF 1998 - 2014

SCALE Hz - 1:1250 V - 1:125 @ A3

Figure 2 – Profile 213 (1998 – 2013)

Technical note



SECTIONS 214 OF 1998 - 2014

SCALE Hz - 1:1250 V - 1:125 @ A3

Figure 3 – Profile 214 (1998 – 2013)

Technical note

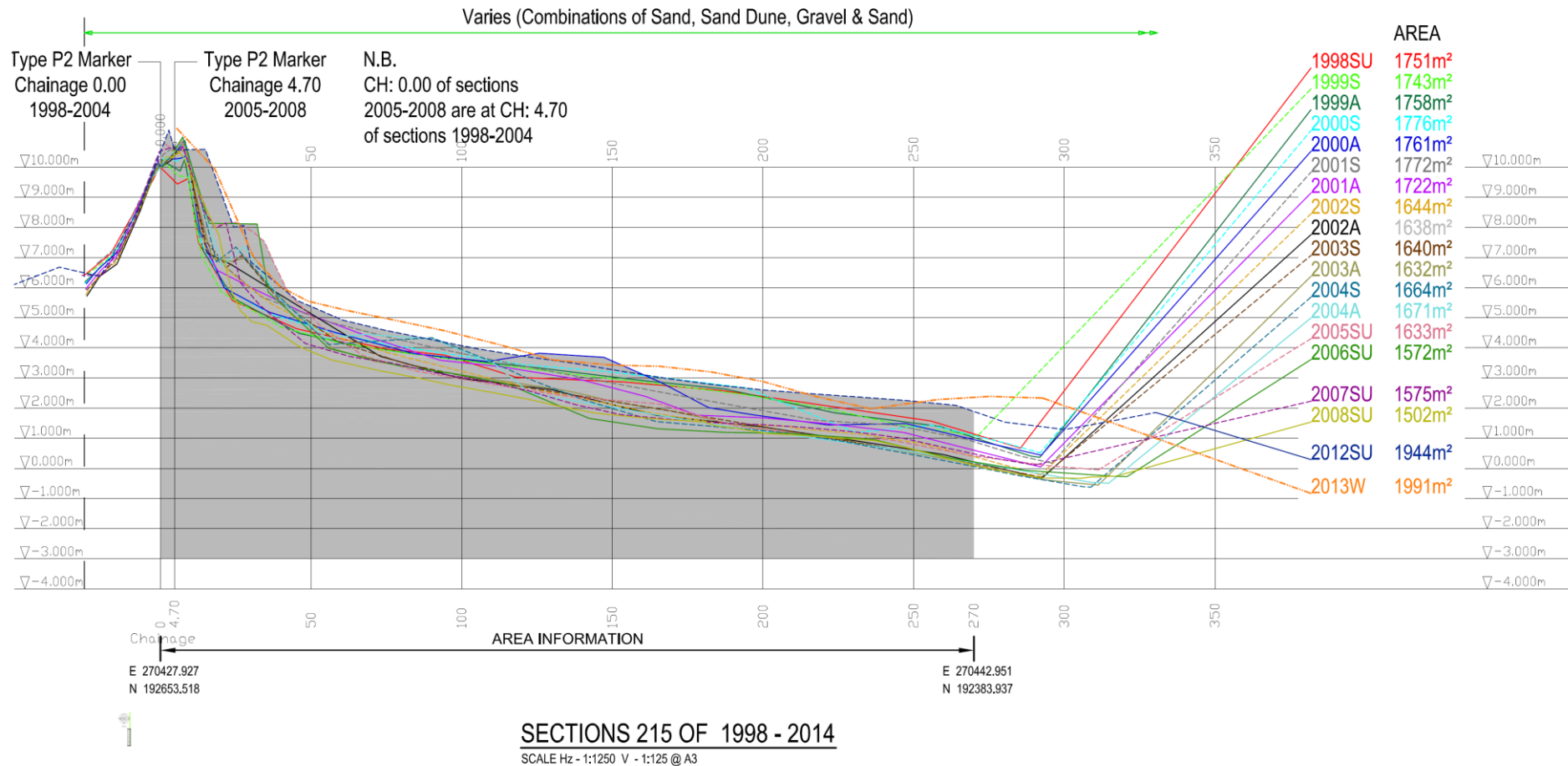


Figure 4 – Profile 215 (1998 – 2013)

Technical note

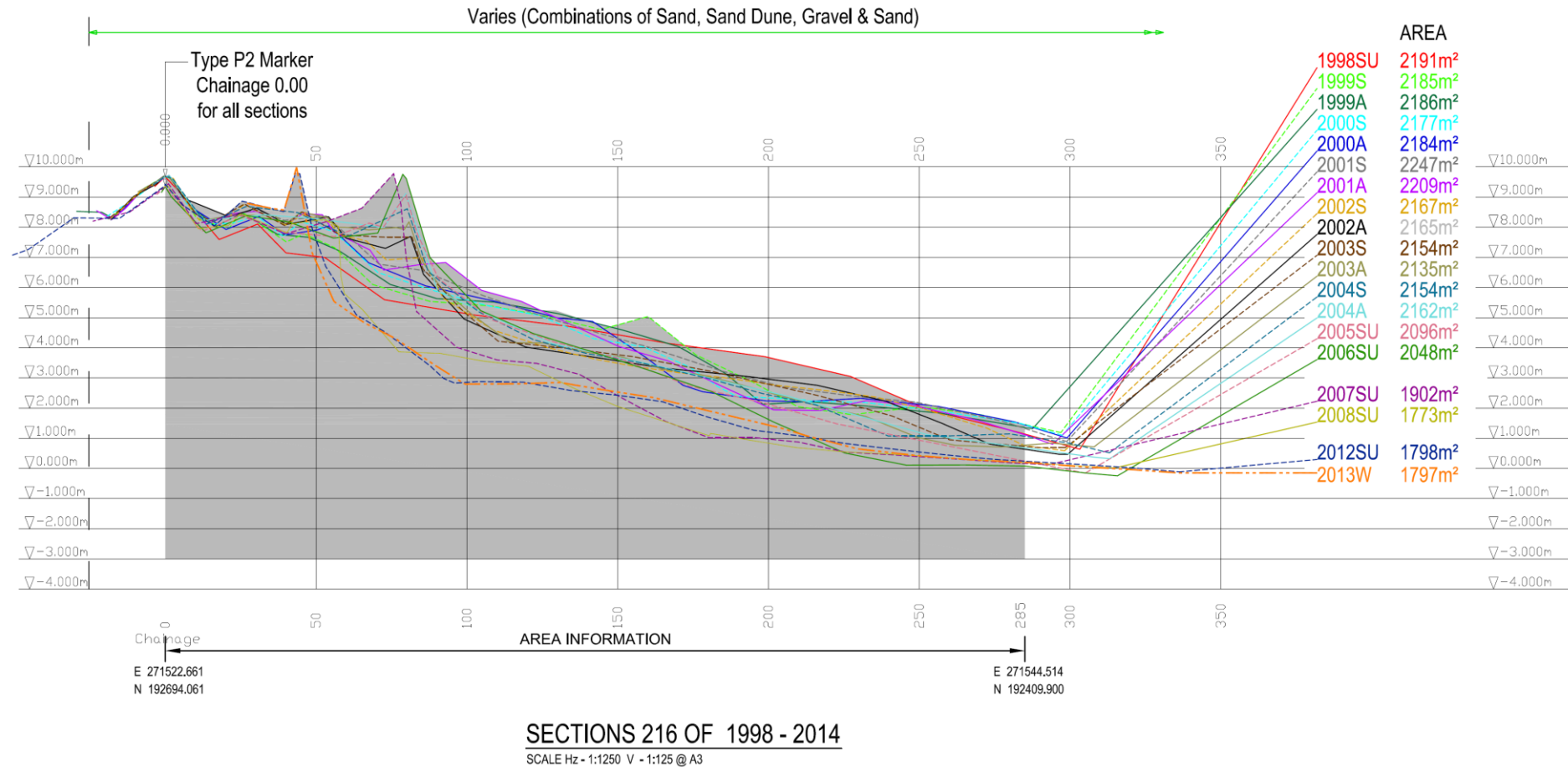


Figure 5 – Profile 216 (1998 – 2013)

Technical note

Table 3 – Inter-survey change in beach cross section area at Profiles 213, 214, 215 and 216 (1998 – 2013)

	213			214			215			216		
Date	Area (m ²)	Change (m ²)	% increase	Area (m ²)	Change (m ²)	% increase	Area (m ²)	Change (m ²)	% increase	Area (m ²)	Change (m ²)	% increase
1998 - summer	663	-	-	1,154	-	-	1,751	-	-	2,191	-	-
1999 – spring	641	-22	-3.32%	1,160	6	0.52%	1,743	-8	-0.46%	2,185	-6	-0.27%
1999 – autumn	636	-5	-0.78%	1,158	-2	-0.17%	1,758	15	0.86%	2,186	1	0.05%
2000 – spring	610	-26	-4.09%	1,181	23	1.99%	1,776	18	1.02%	2,177	-9	-0.41%
2000 – autumn	612	2	0.33%	1,175	-6	-0.51%	1,761	-15	-0.84%	2,184	7	0.32%
2001 – spring	622	10	1.63%	1,169	-6	-0.51%	1,772	11	0.62%	2,247	63	2.88%
2001 – autumn	609	-13	-2.09%	1,176	7	0.60%	1,722	-50	-2.82%	2,209	-38	-1.69%
2002 – spring	592	-17	-2.79%	1,154	-22	-1.87%	1,644	-78	-4.53%	2,167	-42	-1.90%
2002 – autumn	583	-9	-1.52%	1,132	-22	-1.91%	1,638	-6	-0.36%	2,165	-2	-0.09%
2003 – spring	553	-30	-5.15%	1,129	-3	-0.27%	1,640	2	0.12%	2,154	-11	-0.51%
2003 – autumn	561	8	1.45%	1,115	-14	-1.24%	1,632	-8	-0.49%	2,135	-19	-0.88%
2004 – spring	539	-22	-3.92%	1,097	-18	-1.61%	1,664	32	1.96%	2,154	19	0.89%
2004 – autumn	525	-14	-2.60%	1,076	-21	-1.91%	1,671	7	0.42%	2,162	8	0.37%
2005 – summer	460	-65	-12.38%	1,016	-60	-5.58%	1,633	-38	-2.27%	2,096	-66	-3.05%
2006 – summer	465	5	1.09%	1,035	19	1.87%	1,572	-61	-3.74%	2,048	-48	-2.29%
2007 - summer	514	49	10.54%	998	-37	-3.57%	1,575	3	0.19%	1,902	-146	-7.13%
2008 – summer	546	32	6.23%	1,005	7	0.70%	1,502	-73	-4.63%	1,773	-129	-6.78%
2009 – summer	-	-	-	-	-	-	-	-	-	-	-	-
2010 – summer	-	-	-	-	-	-	-	-	-	-	-	-
2011 – summer	-	-	-	-	-	-	-	-	-	-	-	-
2012 – summer	604	58	10.62%	1,070	65	6.47%	1,944	442	29.43%	1,798	25	1.41%
2013 – winter	586	-18	-2.98%	1,068	-2	-0.19%	1,991	47	2.42%	1,797	-1	-0.06%

Technical note

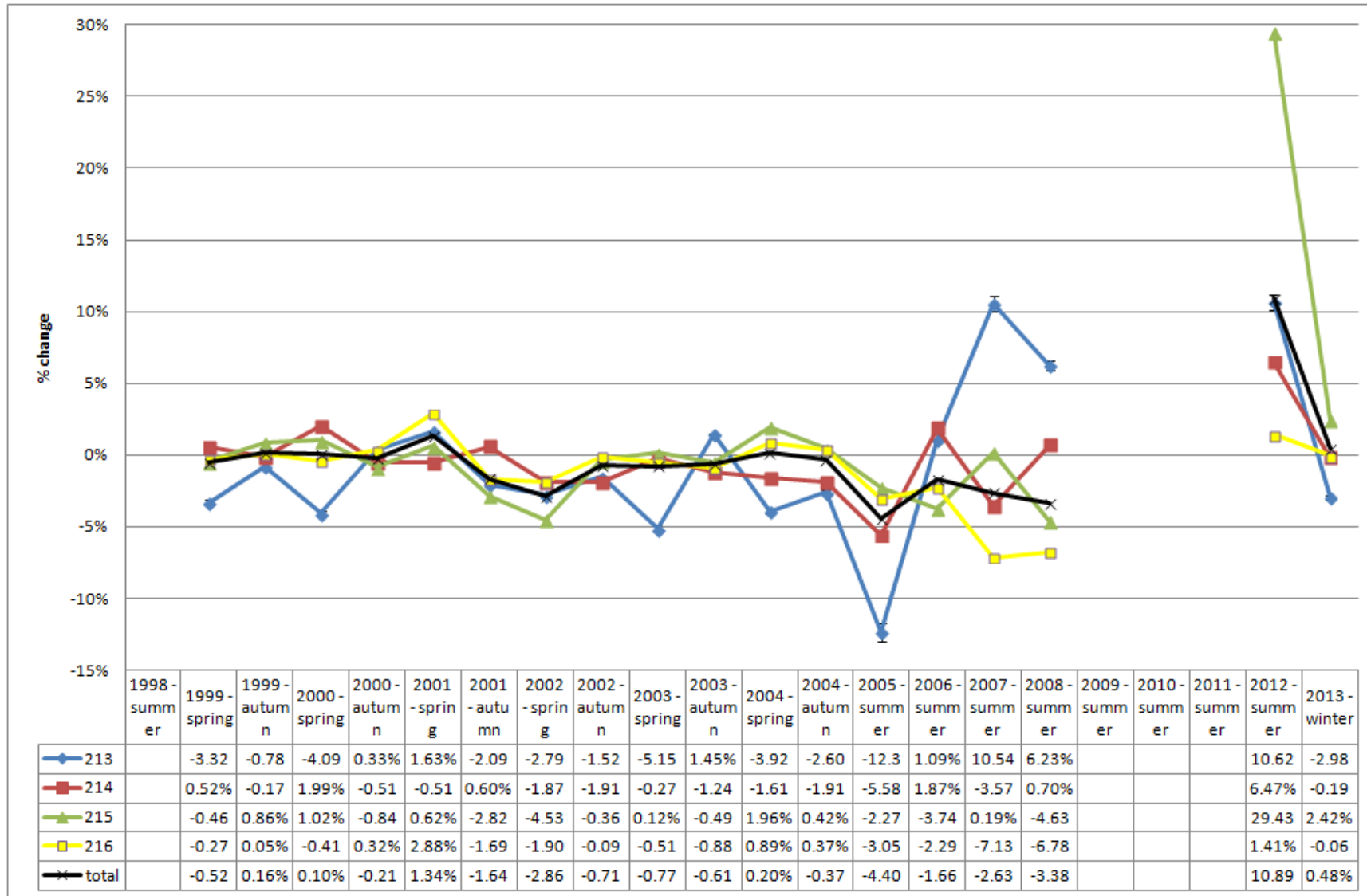


Figure 6 – Inter-survey % change in beach cross section area over time (1998 – 2013)

Technical note

Table 4 – Cumulative change in beach cross section area at Profiles 213, 214, 215 and 216 (1998 – 2013)

	213			214			215			216		
Date	Area (m ²)	Cumulative change (m ²)	% increase	Area (m ²)	Cumulative change (m ²)	% increase	Area (m ²)	Cumulative change (m ²)	% increase	Area (m ²)	Cumulative change (m ²)	% increase
1998 - summer	663	-	-	1,154	-	-	1,751	-	-	2,191	-	-
1999 - spring	641	-22	-3.32%	1,160	6	0.52%	1,743	-8	-0.46%	2,185	-6	-0.27%
1999 - autumn	636	-27	-4.07%	1,158	4	0.35%	1,758	7	0.40%	2,186	-5	-0.23%
2000 - spring	610	-53	-7.99%	1,181	27	2.34%	1,776	25	1.43%	2,177	-14	-0.64%
2000 - autumn	612	-51	-7.69%	1,175	21	1.82%	1,761	10	0.57%	2,184	-7	-0.32%
2001 - spring	622	-41	-6.18%	1,169	15	1.30%	1,772	21	1.20%	2,247	56	2.56%
2001 - autumn	609	-54	-8.14%	1,176	22	1.91%	1,722	-29	-1.66%	2,209	18	0.82%
2002 - spring	592	-71	-10.71%	1,154	-	0.00%	1,644	-107	-6.11%	2,167	-24	-1.10%
2002 - autumn	583	-80	-12.07%	1,132	-22	-1.91%	1,638	-113	-6.45%	2,165	-26	-1.19%
2003 - spring	553	-110	-16.59%	1,129	-25	-2.17%	1,640	-111	-6.34%	2,154	-37	-1.69%
2003 - autumn	561	-102	-15.38%	1,115	-39	-3.38%	1,632	-119	-6.80%	2,135	-56	-2.56%
2004 - spring	539	-124	-18.70%	1,097	-57	-4.94%	1,664	-87	-4.97%	2,154	-37	-1.69%
2004 - autumn	525	-138	-20.81%	1,076	-78	-6.76%	1,671	-80	-4.57%	2,162	-29	-1.32%
2005 - summer	460	-203	-30.62%	1,016	-138	-11.96%	1,633	-118	-6.74%	2,096	-95	-4.34%
2006 - summer	465	-198	-29.86%	1,035	-119	-10.31%	1,572	-179	-10.22%	2,048	-143	-6.53%
2007 - summer	514	-149	-22.47%	998	-156	-13.52%	1,575	-176	-10.05%	1,902	-289	-13.19%
2008 - summer	546	-117	-17.65%	1,005	-149	-12.91%	1,502	249	-14.22%	1,773	-418	-19.08%
2009 - summer	-			-			-			-		
2010 - summer	-			-			-			-		
2011 - summer	-			-			-			-		
2012 - summer	604	-59	-8.90%	1,070	-84	-7.28%	1,944	193	11.02%	1,798	-393	-17.94%
2013 - winter	586	-77	-11.61%	1,068	-86	-7.45%	1,991	240	13.71%	1,797	-394	-17.98%

Technical note

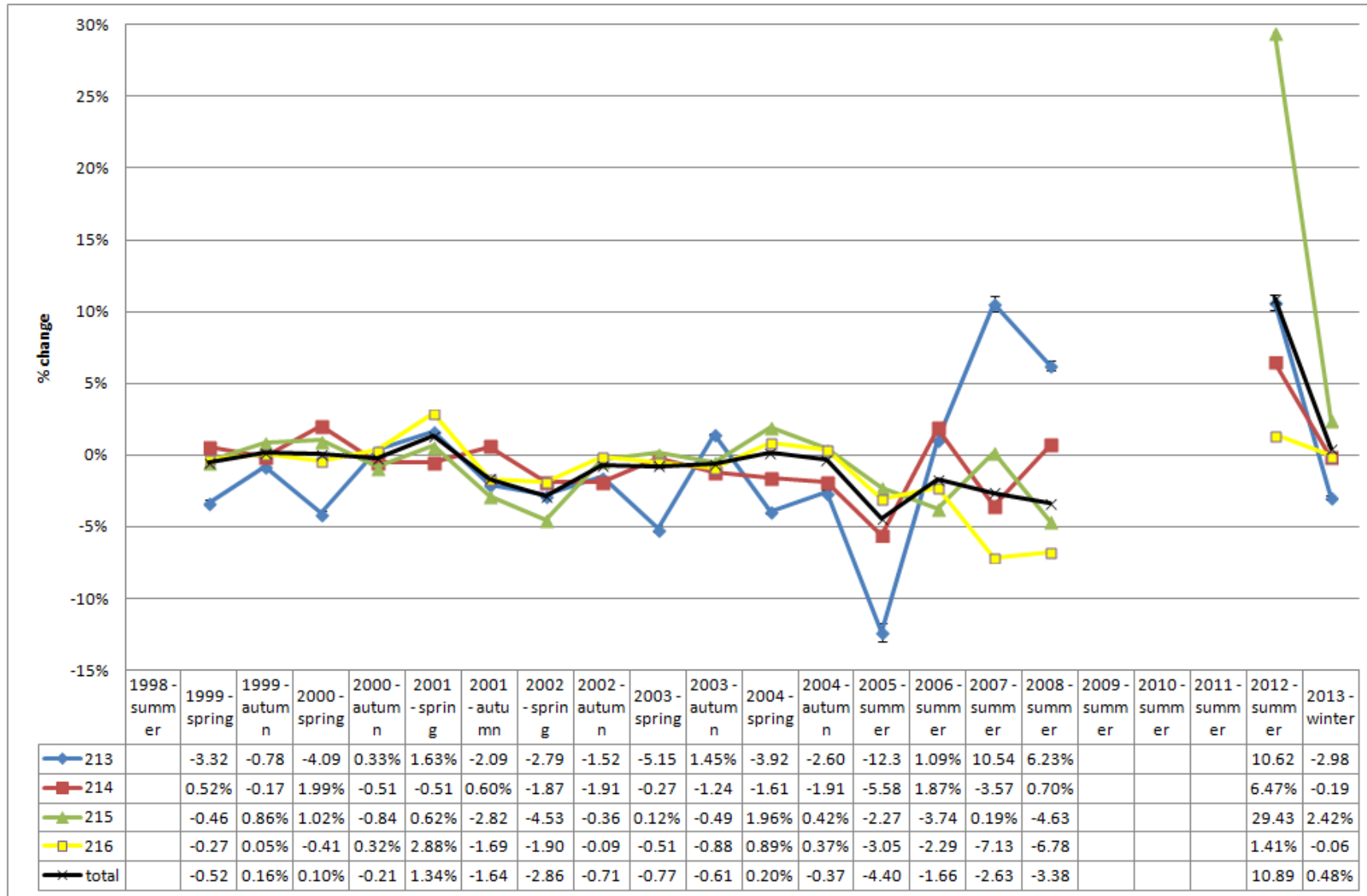


Figure 7 – Cumulative % change in beach cross section area over time (1998 – 2013)

Technical note

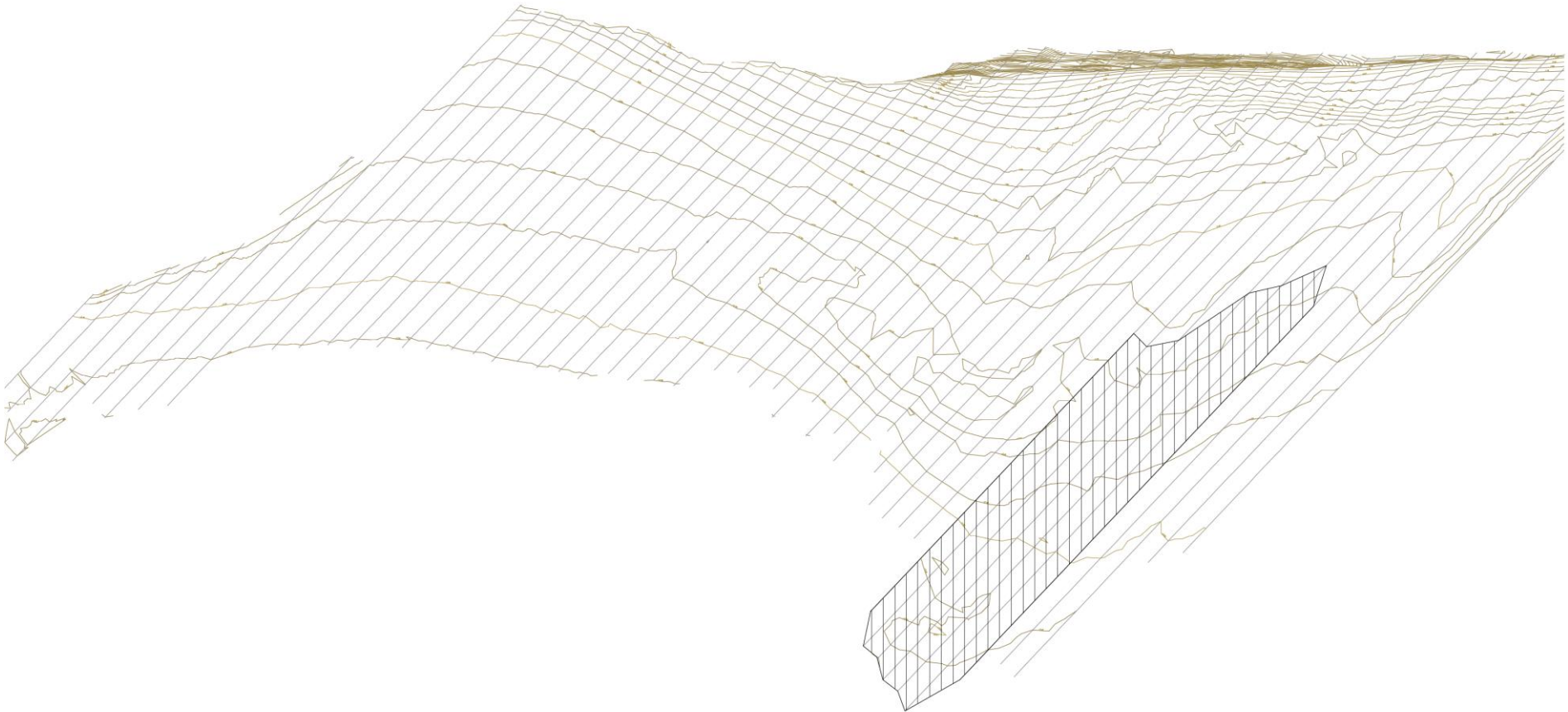


Figure 8 – Beach contour plan

Note: The hatched area denotes the area surveyed later (03/02/2014) due to the available tides.

Technical note

