SOUTH WEST COASTAL MONITORING

making space for sand



Making Space for Sand – Mexico Towans Beach Report

Topographic and LiDAR Data Analysis

SWCM | TBR18 | 15/05/2024

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Summary

This report utilises Light Detection and Ranging (LiDAR, topography and aerial imagery data collected by the South West Coastal Monitoring (SWCM) Programme to analyse beach and dune volume at Mexico Towans. The aim is to highlight coastal change at Mexico Towans using SWCM data since 2007, focusing on beach and dune areas categorised into four zones: Beach, Mobile, Fixed, and Developed. Mexico Towans Beach is a large, sandy cresent shaped beach orientated to the northwest and backed by an extensive dune system. Topographic data collected bi-annually along fixed cross-shore profile lines are presented to indicate change of the intertidal beach area over time. LiDAR data is compared from each available flight to show difference models of the intertidal area, to compare volumetric data over time and to show change in Mean Seal Level and Dune Toe contours over time.

Since 2007, 19 topographic surveys were conducted at Mexico Towans, including 4 baselines and 15 interim surveys. No post storm surveys have been conducted. Analysis of topographic data suggests the survey unit has remained stable between 2007 and 2024. Notable fluctuations were observed in survey results, with the beach being heavily impacted after the 2013/14 storms, recording the lowest CPA on record. Despite this, the beach appears to have shown strong signs of beach volume recovery, depicting pre-storm beach volumes.

Beach volume was extracted from the Beach and Mobile Zones from 10 LiDAR flights between 2008 and 2023. The Mobile Zone saw a 2% gain in volume between 2008 and 2012, followed by a 6% loss in volume following the 2013/14 winter. Since, the Mobile Zone has recovered to pre-2013 levels, recording the highest volume to date during the most recent LiDAR survey in January 2023. The Beach Zone follows a similar trend to the Mobile Zone, with an overall trend for accretion, despite an 8% loss in volume between 2012 and 2016 following the 2013-14 winter period. The Beach Zone has since recovered to pre-2013 volumes. Despite this overall trend for accretion within the LiDAR data, the Dune Toe contour has retreated by up to 7 m since 2007 along the majority of the dune face.

Overall Mexico Towans has seen a gradual accretion according to LiDAR data analysis, and remained stable according to topographic data analysis, with both indicating a significant erosive period following the 2013/14 winter period.

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1.0 Introduction

The aim of this report is to highlight beach and dune change at Mexico Towans using data collected as part of the South West Coastal Monitoring (SWCM) Programme since 2007. Four zones have been identified to define the beach/dune area and are defined as:

- **Beach Zone** – The wet beach area has been defined using Mean Low Water Spring (MLWS) and Mean High Water Spring (MHWS) contours extracted from all LiDAR data captured by SWCM. The Beach Zone will therefore encompass the area between the MHWS and MLWS contours, with volumes for this area extracted from each LiDAR surface.
- **Mobile Zone** – This area is defined as the active dune face and embryo dune[1] from MHWS +1 m to the back of the mobile area, often distinguished by vegetation depth or urban development. The Mobile Zone has been defined using aerial imagery from 2007 to 2021 and historic OS maps and has been verified through site visits.
- **Fixed Zone** – This area is defined by permanent dune vegetation that may also include scrub or invasive species, effectively denoting vegetation atop sandy soil.
- **Developed Zone** – This is defined as urban development areas (i.e., car parks, unnatural grassy areas, roads, houses etc.) which have been built atop previously present dune systems.

1.1 Study Site

Mexico Towans is a large, sandy cresent shaped beach orientated to the northwest, backed by an extensive perched dune system; one of the largest dune systems in Cornwall (Fig.1). A large caravan site is also located in the middle section of the dune system. The beach has a cross-shore section of ~400 m and longshore distance of ~2.9 km with an average spring tidal range of 5.8 m.

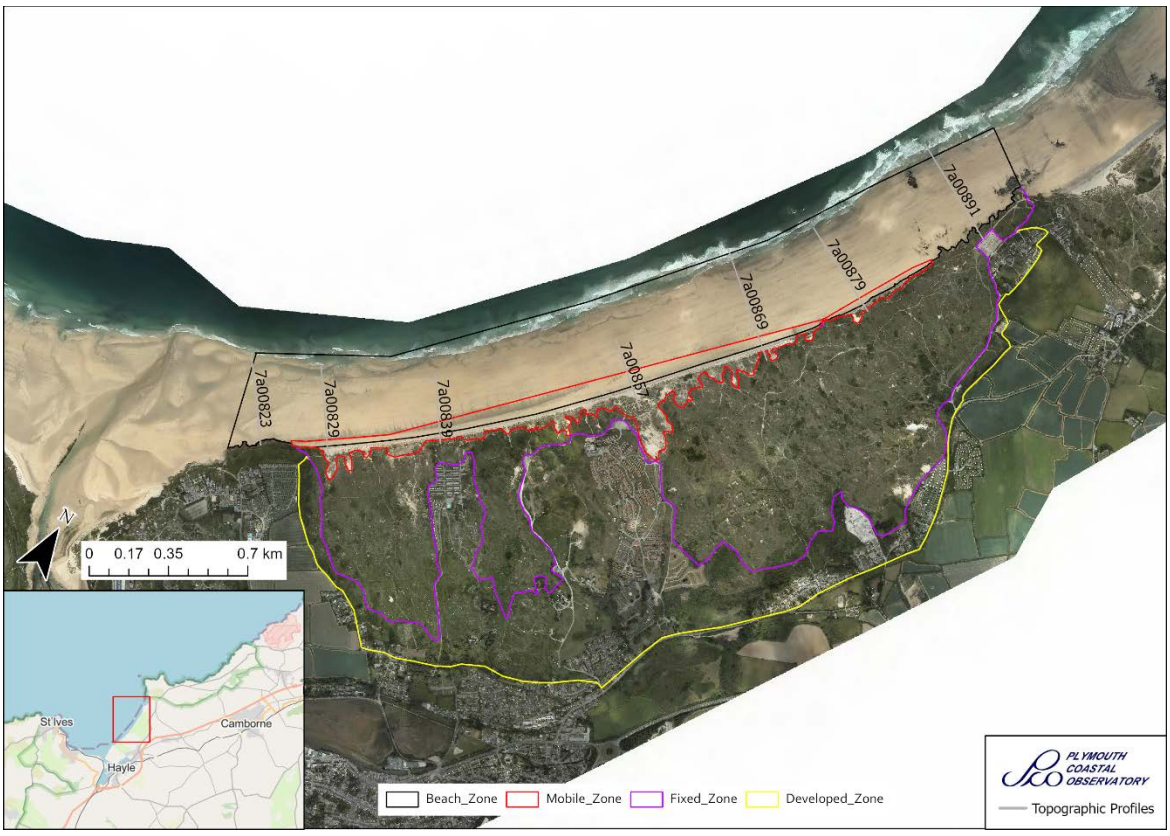


Figure 1 - Location Map of Mexico Towans Beach and Dune System, indicating the four defined zones outlined in section 1.0. Interim topographic profiles are also overlain to show their location, as detailed in section 2.1

[1] An embryo dune, or yellow dune, is the earliest stage of dune growth, usually found along the seaward extent of a dune system or newly formed dune.

2.0 Methods

Data utilised in this report was collected by SWCM between 2007 and 2024. Information on topographic and LiDAR data collection and specifications can be found on the Website for the National Network of Coastal Monitoring Programmes.

2.1 Topographic Data

SWCM have undertaken routine topographic beach surveys at 34 of the 40 MS4S sites since 2006. All surveys are conducted from the MLWS contour to the backshore. On average, each surveyed beach receives two interim surveys a year and one full coverage survey every 5 years:

- Interim - Conducted twice a year in the spring (conducted between January and April), and autumn (conducted between September and December). An interim survey consists of collecting data points at 5m intervals along pre-defined profiles; these are outlined in Figure 1.
- Full coverage – Conducted once per phase (6 years), or annually at more vulnerable sites (conducted between May and September). Full coverage surveys include a full profile survey at 50 m intervals and continuous spot height data collected across a 5 m grid covering the whole beach.

Analysis of the Cross-Sectional Area (CSA) change is conducted for each individual profile between each separate survey. Changes in CSA are measured relative to the fixed master profile which is defined by a pre-determined stable landward position and the MLWS level in reference to Ordnance Datum.

2.1.1 Topographic Data Analysis

Topographic data is presented as the following, where applicable:

Trend Analysis Plot - The combined profile trend in CSA is presented for each survey unit (example shown in Fig.2). The sum of all interim profile CSA is combined for each survey conducted to date to provide a survey unit with a single 'beach area' value, known hence-forth as the Combined Profile Area (CPA). CPA is compared using linear trend analysis over a temporal scale (Fig.2).

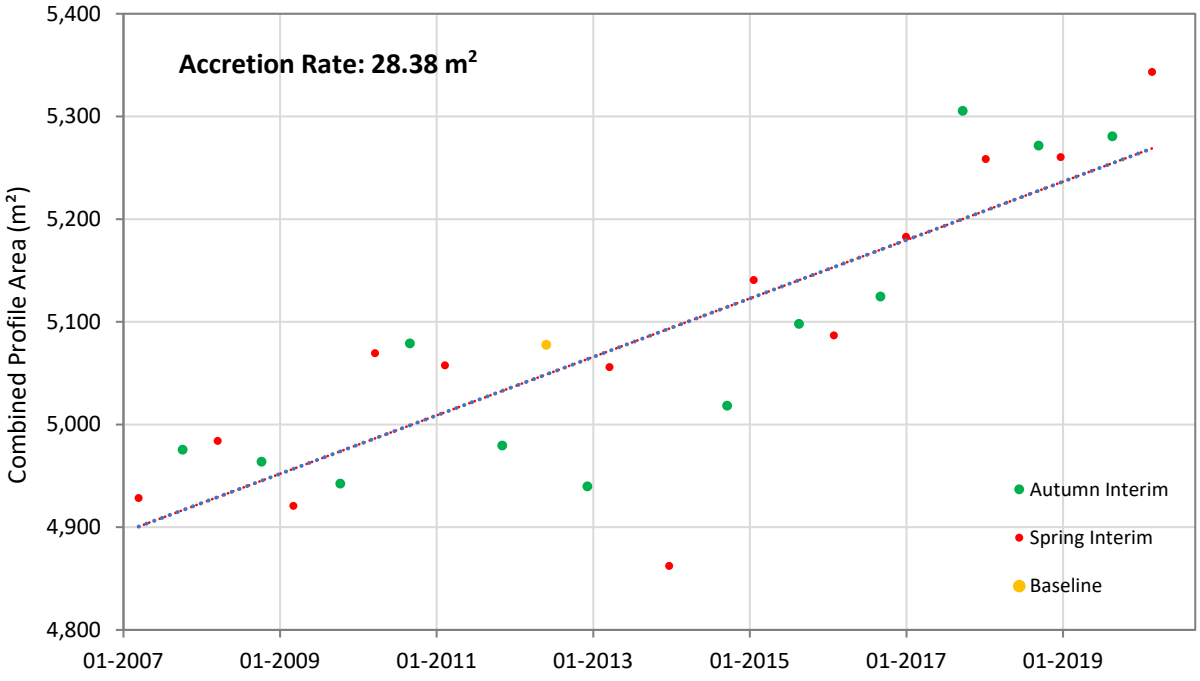


Figure 2 - Example of trend analysis for CPA for each survey with a linear trend rate highlighted at 28.4 m^2 y^{-1} equating to the increase of 0.56% of the average CPA per year.

If a profile has been omitted from a particular survey, for reasons of obstruction or similar, the average CSA of that profile from all available surveys is taken to ensure a consistent 'beach area'; if fewer than 75% of surveys have been conducted for a particular profile, the profile is omitted.

Profile Extremes Analysis - This plot displays the range of CSA values recorded throughout the duration of data collection (2006-2024) for each individual interim profile; the most recent survey is represented as a green dot. An example is given in figure 3. This plot provides the reader with information on how the CSA for each interim profile from the most recent survey corresponds to the entire dataset range.

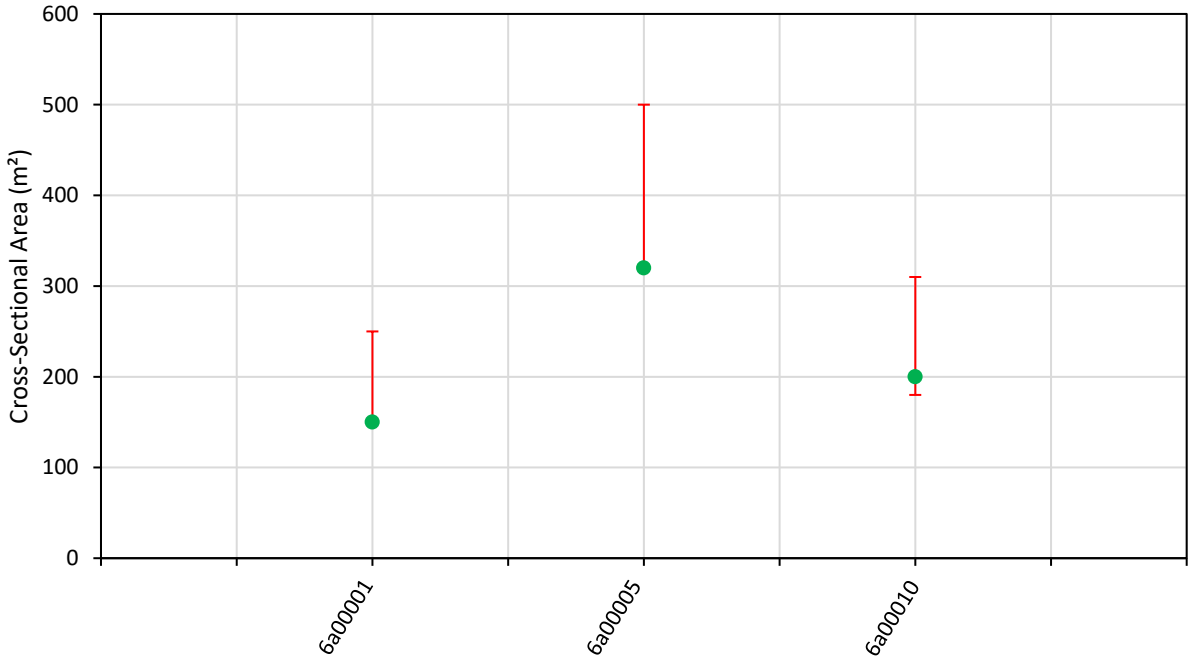


Figure 3 - Example plot showing the most recent CSA value recorded for three separate profile lines (green dots). The error bars represent the range of CSA recorded by each profile throughout the topographic dataset.

CSA Time Series Plot - CSA measurements for each interim profile are displayed on a separate plot representing values from each interim and full coverage survey conducted to date (example shown in Fig.4). This provides the reader with information on each interim profile's CSA evolution through time.

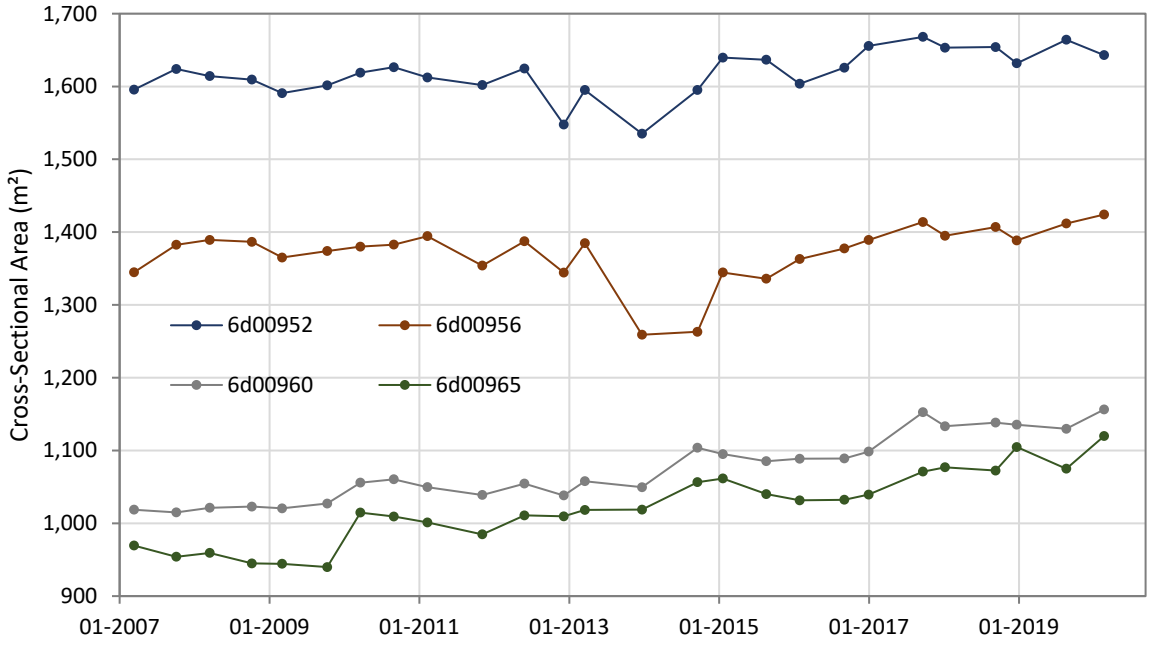


Figure 4 - Example of a cross-sectional area plot showing each of the interim profiles recorded for every survey since the 2007 baseline.

Individual Profile Charts - Each interim profile is portrayed as a cross-sectional profile comparing the most recent spring interim (blue), the previous spring interim (green) and the original full coverage survey (red). Profiles are displayed against the master profile (dotted red line) and are presented in the Appendices.

The 2013/2014 Storms – The winter period between September 2013 and April 2014 was, for many beaches in Cornwall, the most destructive period since SWCM records began in 2007. An abnormal number of significant storms, occurring in quick succession, heavily impacted many beaches, causing the loss of sediment from the intertidal area and dune face. This period is extensively discussed throughout this report and will hereinafter be referred to as the 2013/2014 winter period.

2.2 LiDAR Data

Airborne Light Detection and Ranging (LiDAR) data have been captured as part of the SWCM since 2007. Products include a point clouds, from which filtered and unfiltered 1 m^2 gridded surface models are derived:

- Unfiltered (Digital Elevation Model) representing the earth's surface including natural and artificial features such as trees and buildings.
- Filtered (Digital Terrain Model) representing the bare earth surface, with trees, buildings, cars etc. removed.

LiDAR is captured between September and March to minimise vegetation capture. Data is captured between MLWS and up to approximately 500 m inland. This report utilises "filtered" LiDAR data.

2.2.1 LiDAR Data Analysis

LiDAR data analysis is presented as the following:

Difference Modelling – Separate LiDAR surfaces are compared to produce a difference model of change based on gridded spot height elevations. The raw spot height data is processed into a gridded digital terrain model (DTM) and successive models are subtracted from one another to produce a difference model for the survey unit. Change in elevation is shown for values +/- 0.25 m and is represented by a colour scale bar.

Volume Extraction - Net sediment volume (m^3) is extracted for each LiDAR surface from the Beach Zone above MLWS and Mobile Zone above MHWS for trend comparison over time.

Contour Analysis – Contours are mapped from four LiDAR epochs spanning from 2007 to 2023, representing Mean Sea Level (MSL) and dune toe (calculated using the Stockdon equation by UoP, 2023[2]).

2.3 Accuracy Statement

Topographic Data – All survey points recorded along profiles have a measurement accuracy of +/- 0.03 m RMSE[3] in the horizontal and +/-0.03 m RMSE in the vertical.

LiDAR Data – Each LiDAR point cloud dataset has an average point density of 1.5 points per square metre. The digital terrain surfaces provide a minimum accuracy in elevation data of +/- 0.10 m RMSE with a minimum horizontal standard deviation as < 0.05 m. Please note that while every endeavour has been made to capture LiDAR as far seaward as MLWS, tidal and weather restrictions may in some instances have precluded this and coverage may be slightly reduced.

[2] Please refer to the following for Dune Toe elevation calculation: UoP, 2023. MS4S: Contemporary Dune Evolution and Future Predictions, Report, University of Plymouth, 33 pp.

[3] RMSE – Root-Mean-Square Error

3.0 Results

3.1 Topographic Data Analysis

There has been a total of 19 topographic surveys at Mexico Towans since 2007; 4 of which are full coverage surveys and 15 are interim surveys. There have been no post storm surveys completed. Exact dates of each survey for Mexico Towans are available to view on our survey record. Analysis of the CPA indicates the survey unit has been accreting at 7.6 m^2 y^{-1} equating to 0.12% of the average beach area per year (Fig.5). The lowest recorded combined area was during the 2014 spring interim (5,975 m^2), following the highly energetic winter period, however the beach began recovering to a pre-storm state by 2017. The highest recorded combined area was during the 2011 spring interim (6,871 m^2).

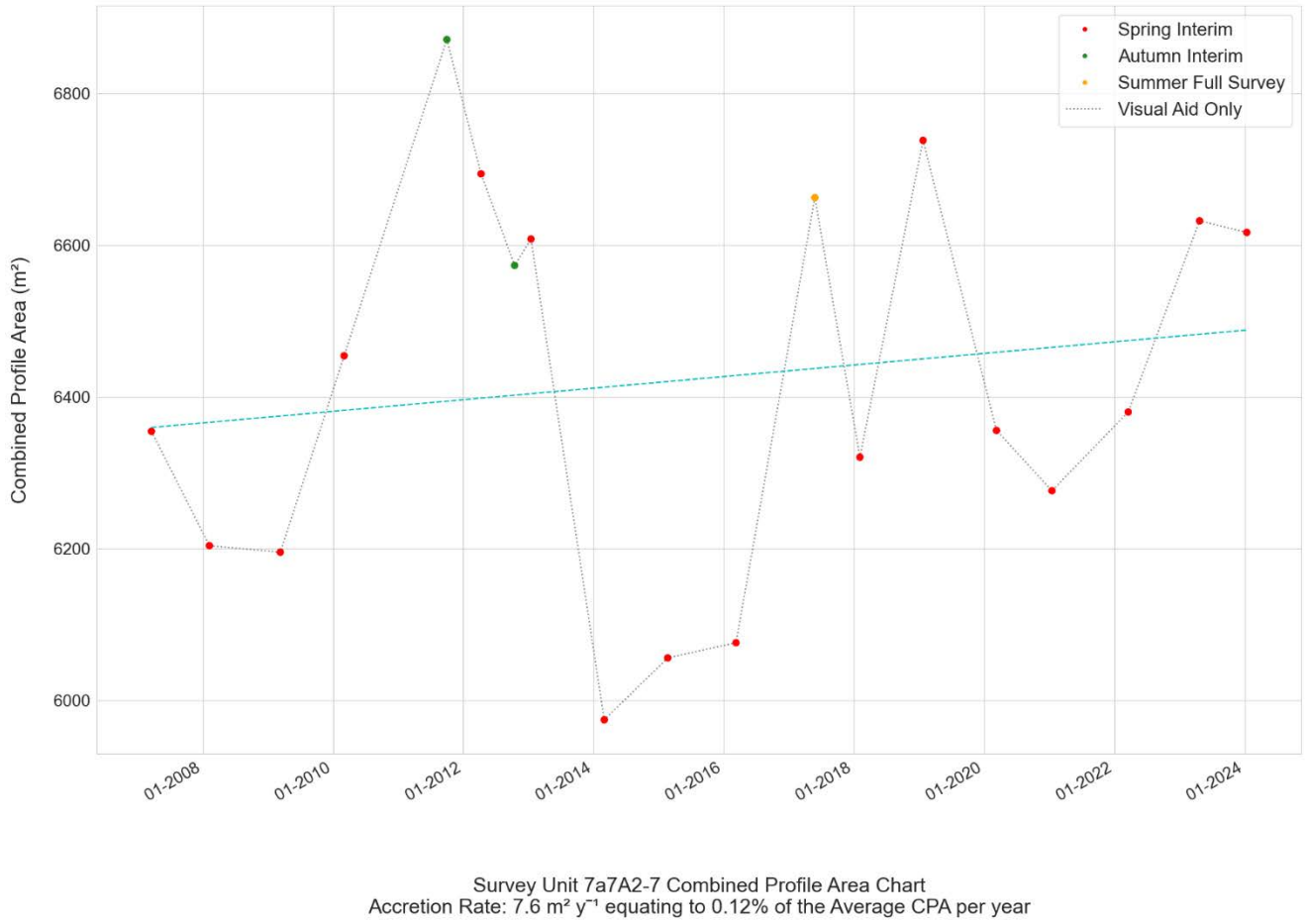


Figure 5 - The Combined Profile Area (CPA) for Mexico Towans, including every spring (red), summer (yellow) and autumn (green) survey completed between 2007 and 2024.

When comparing to the entire dataset (Fig.6), during the 2024 spring interim all but one of Mexico Towans profiles were very healthy, displaying an above average cross-sectional area to date. Profile 7a00857 has experienced the highest CSA to date. However, profile 7a00829 displayed the lowest CSA on record.

When comparing profile cross-sectional areas to the entire time series (Fig.7), all profiles again have displayed a real erosive impact from the 2013/14 winter season. The lasted survey showed a distinct accretive effect, with profile 7a00857 displaying the highest area on record.

Profile Charts for Mexico Towans can be found in Appendix 1, these display the cross-sections of each profile for the initial baseline survey conducted in 2007 along with the two most recent interim surveys. Profiles 7a00829 and 7a00869 have seen a retreat of the dune face, whereas profiles 7a00839, 7a00849 and 7a00857 have experienced an advance of the dune face, since 2007.

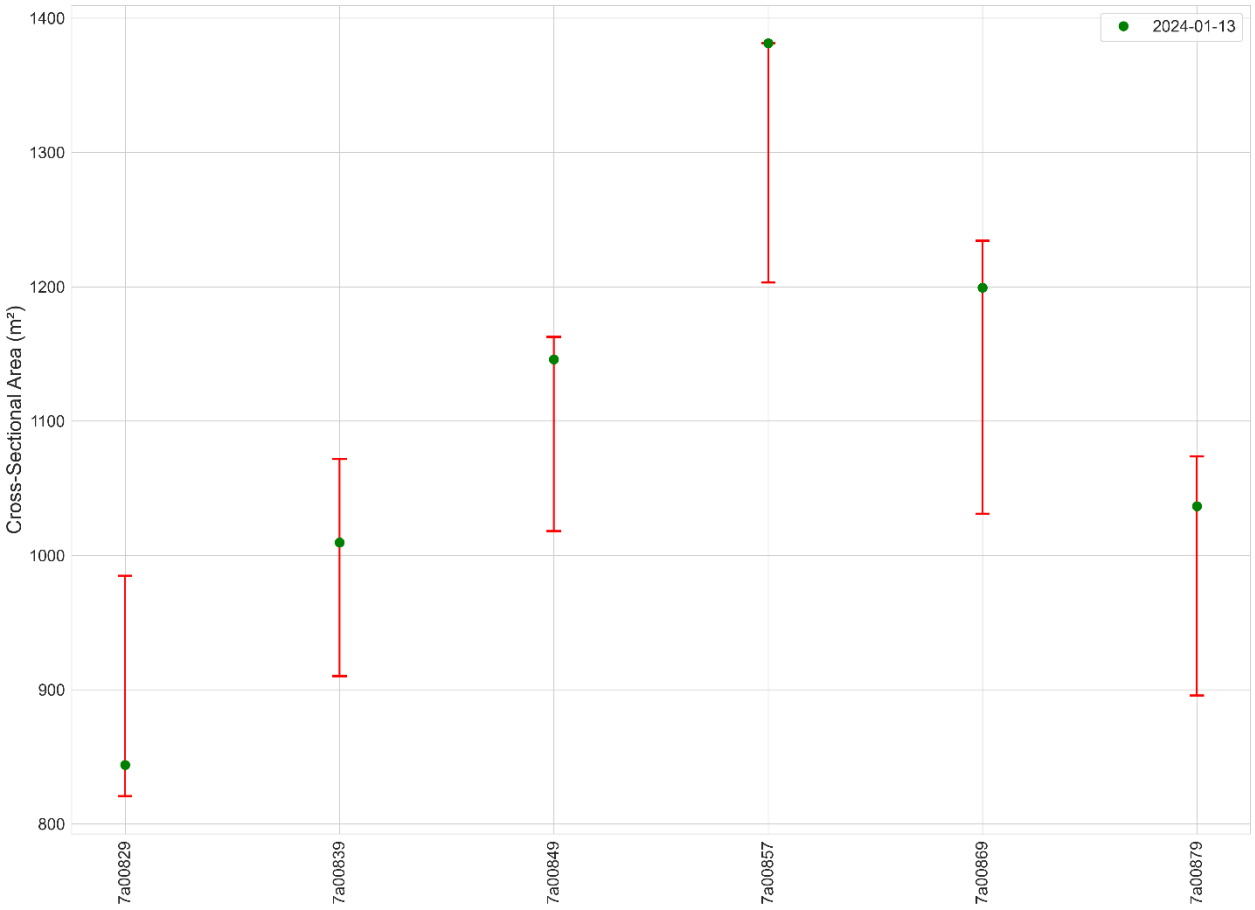


Figure 6 - Cross-sectional area of each interim profile, comparing the current area of the profile (green dot), with the maximum and minimum values (red error bar) recorded between 2007 and 2024.

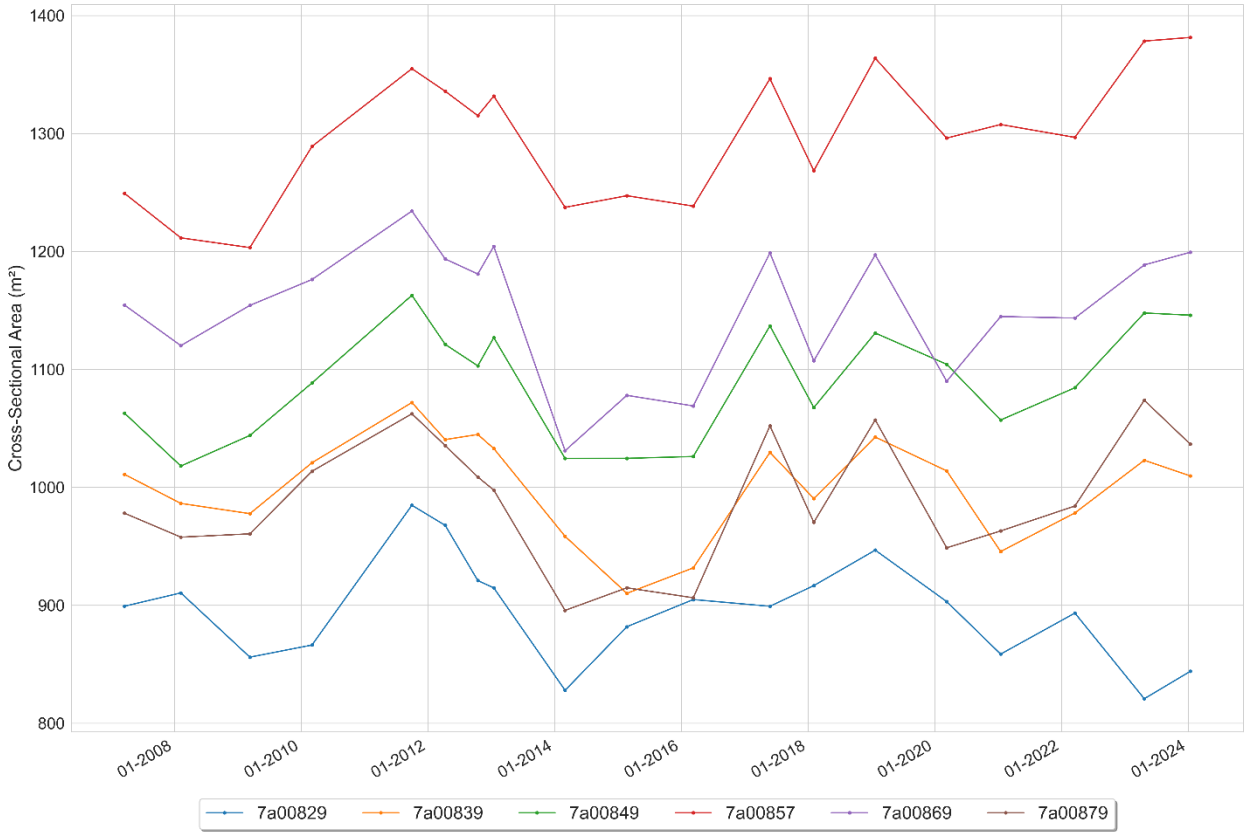


Figure 7 - Cross-sectional area of each interim profile, comparing the values recorded during each interim and baseline survey between 2007 and 2024.

3.2 LiDAR Data Analysis

There has been a total of 10 LiDAR flights captured at Mexico Towans, since 2007, by the SWCM Programme.

3.2.1 Difference Models

Difference models between each epoch of LiDAR data are presented here. Accretion and erosion values observed behind the dune system can be attributable to noise in the filtered LiDAR data or man-made changes in elevation and should be dismissed as such.

Figure 8 shows the difference in elevation between the first filtered LiDAR data from March 2008 compared to the most recent, captured in January 2023. Considerable accretion (>3 m) can be seen along the dune and beach face, towards the middle of the unit, where a substantial dune blowout has formed. Areas of acute erosion can be seen along the beach face towards the western end of the beach particularly where multiple dune blowouts have formed. Similarly, acute erosion is observed along the eastern half of the dune/beach face followed by low-level accretion across the upper beach. Patches of accretion can be seen to have built up towards the seaward extent.

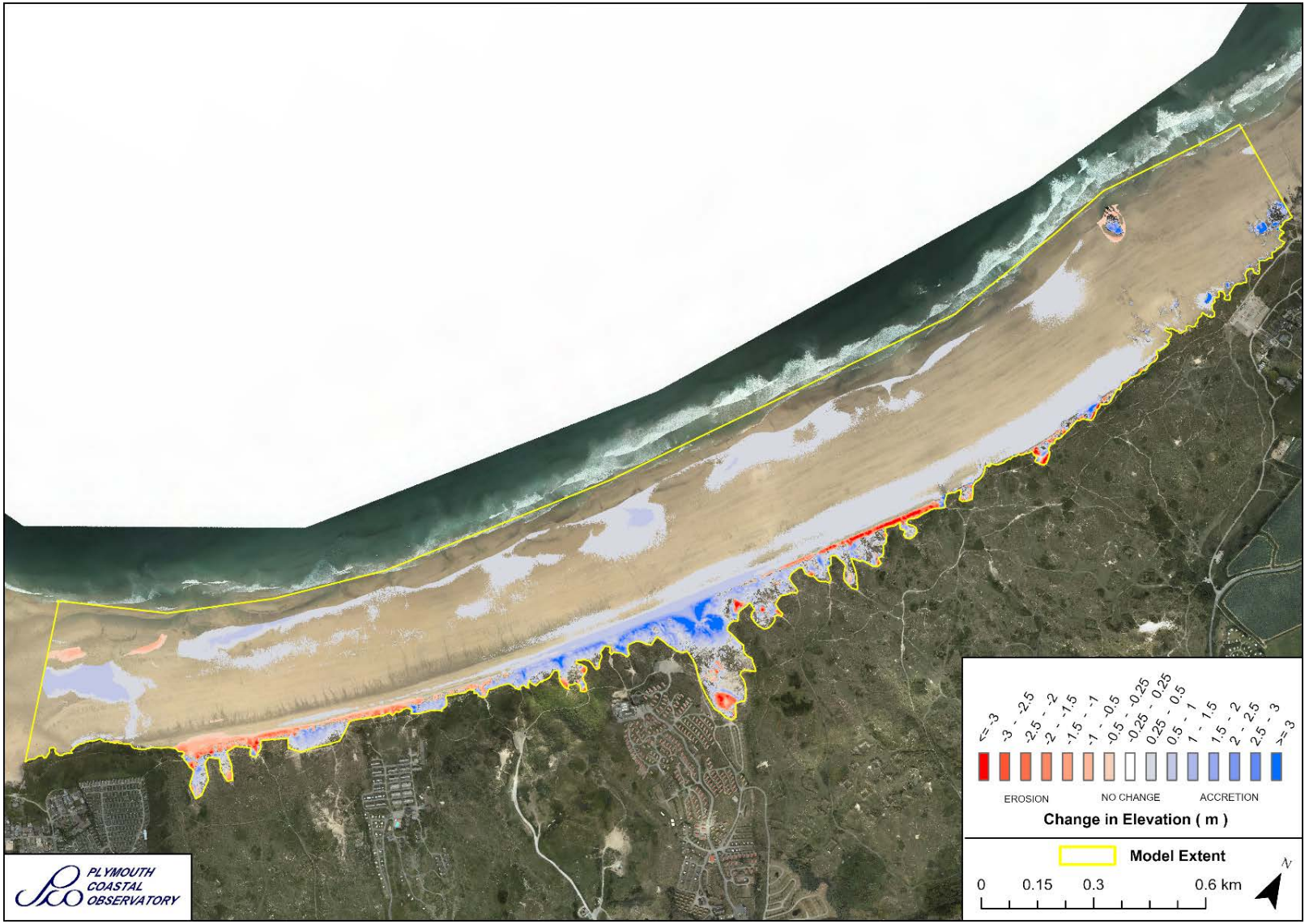


Figure 8 – Difference model indicating the changes in elevation observed between the March 2008 and January 2023 filtered LiDAR datasets within the yellow model extent.

Figure 9 shows differences in elevation between filtered LiDAR data from March 2008 compared to March 2009. There is minimal change observed across the intertidal zone. The beach and dune face has seen some acute erosion to the middle of the unit and low-level erosion to the west. The large dune blowout has seen minimal accretion along the lower half but has remained stable towards the top.

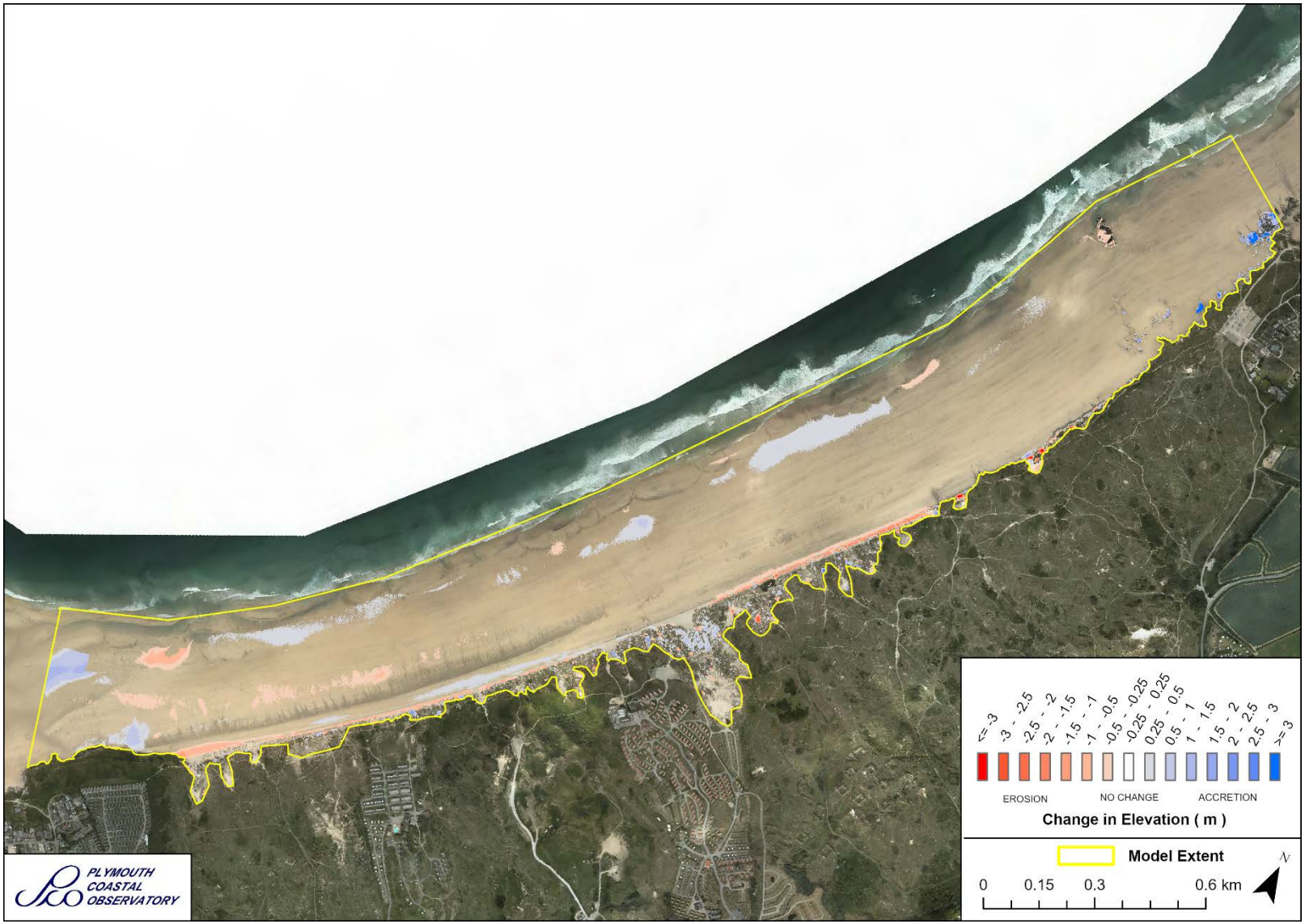


Figure 9 - Difference model indicating the changes in elevation observed between the March 2008 and March 2009 filtered LiDAR datasets within the yellow model extent.

Figure 10 shows differences in elevation between filtered LiDAR data from March 2009 compared to March 2011. Widespread accretion can be seen in this epoch, measuring up to 1.5 m in elevation. The dune face across the beach has experienced low-level accretion, whilst towards the west, erosion is measured along the beach face. A small area of erosion can be seen at the top of the large dune blowout.

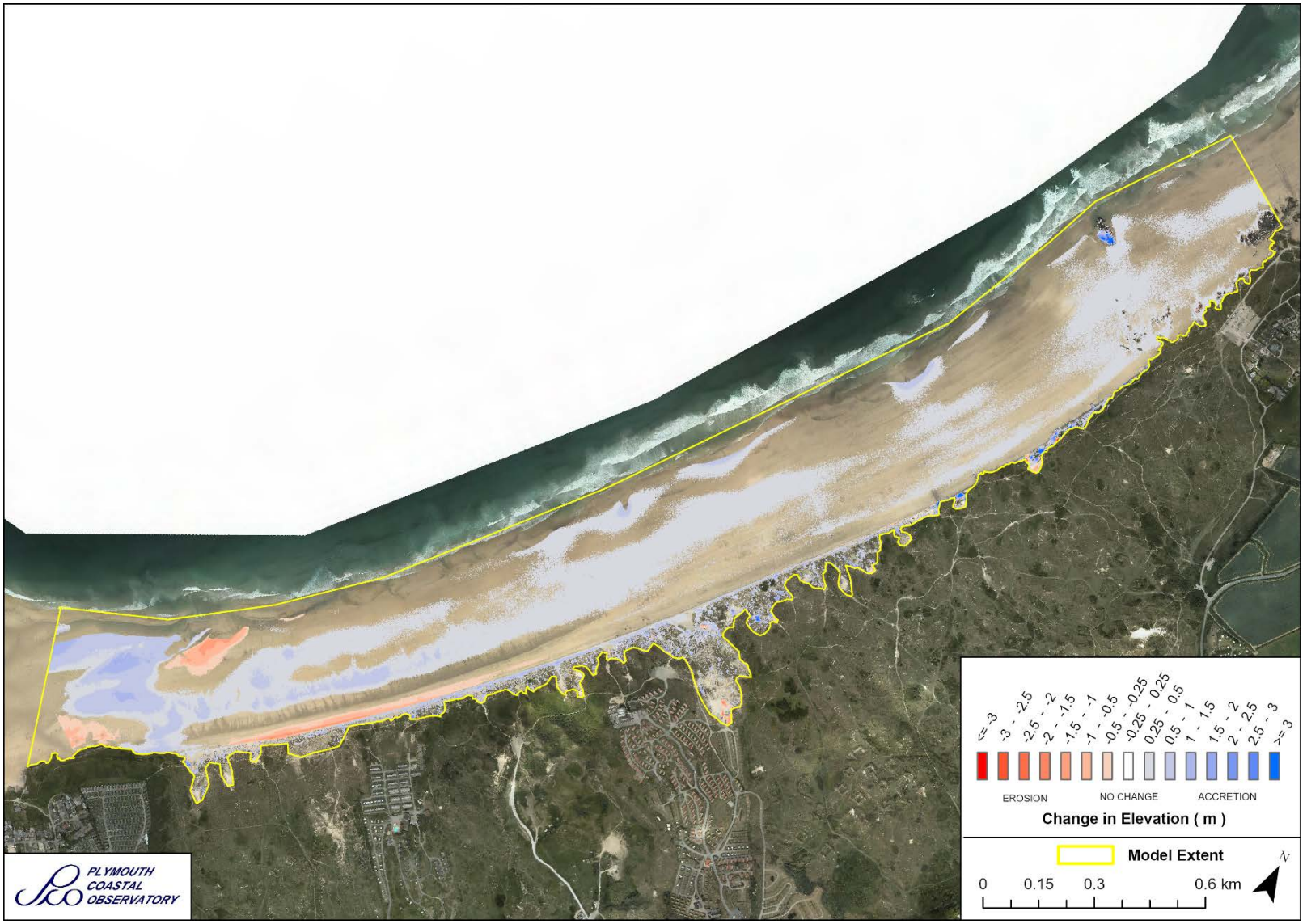


Figure 10 - Difference model indicating the changes in elevation observed between the March 2009 and March 2011 filtered LiDAR datasets within the yellow model extent.

Figure 11 shows differences in elevation between filtered LiDAR data from March 2011 compared to April 2012. Oppositely to that observed in Figure 10, there is minimal change across the intertidal zone. A band of accretion is measured along the beach face along the length of the beach. Patches of low-level erosion can be seen to the west, as well as the seaward extent of the unit.

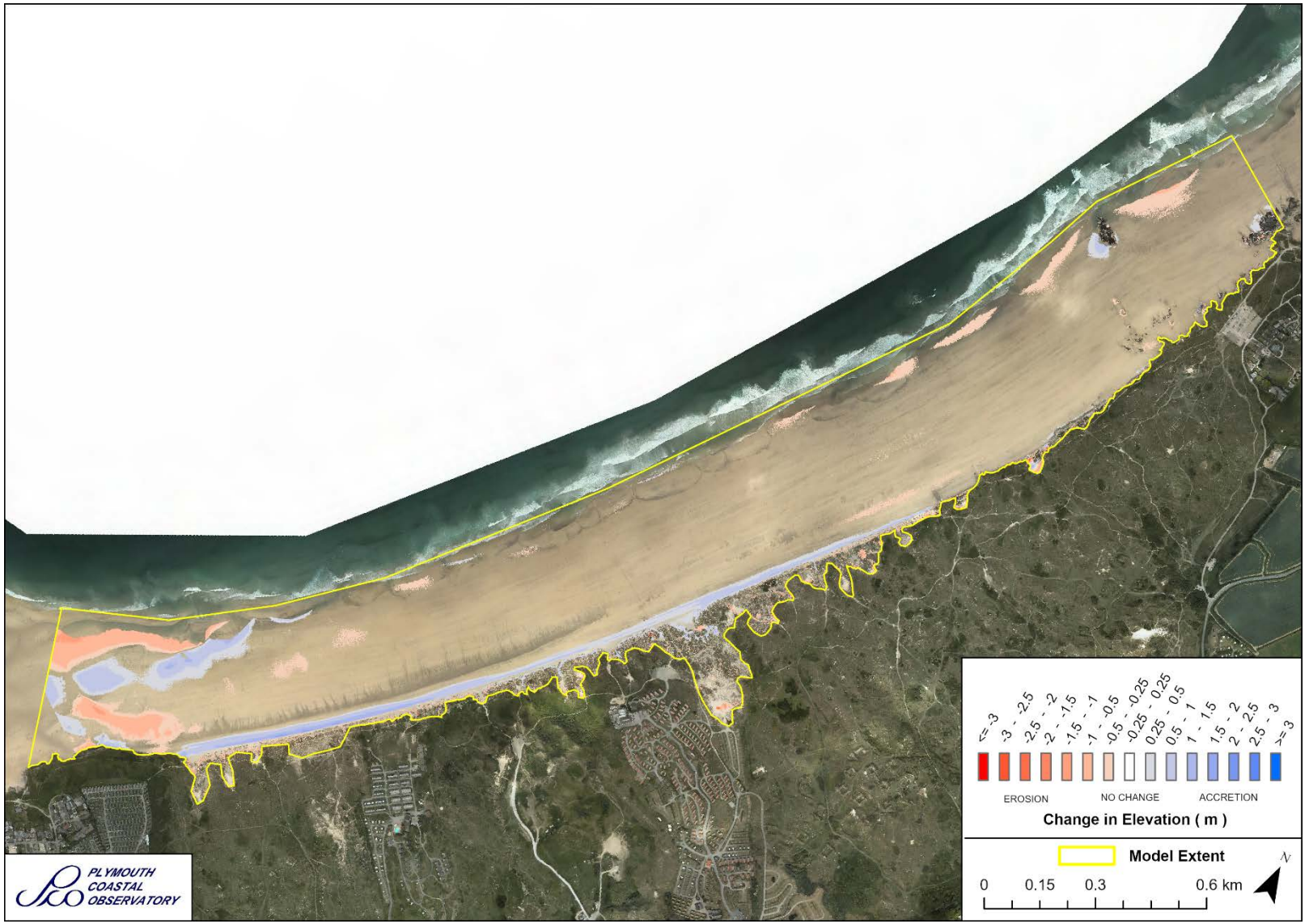


Figure 11 – Difference model indicating the changes in elevation observed between the March 2011 and April 2012 filtered LiDAR datasets within the yellow model extent.

Figure 12 shows differences in elevation between filtered LiDAR data from April 2012 compared to April 2014. This epoch indicates large areas of change, with erosion, of up to 3 m, observed along the dune face across the whole unit. Low-level erosion is measured to the east of the unit as well as erosive pockets to the west. Accretion can be seen on the dune system and dune blowouts as well as accretive pockets to the west of the unit.

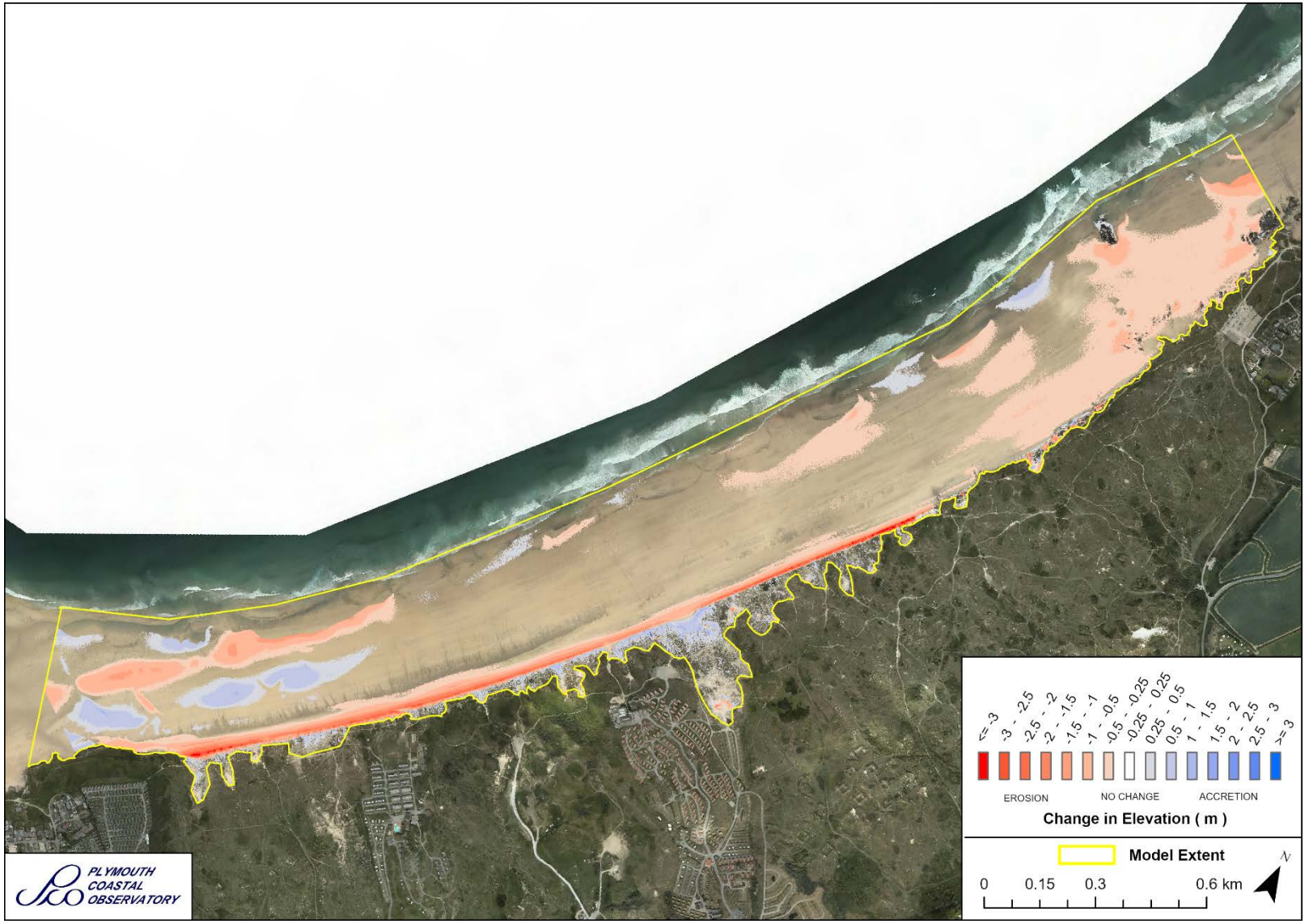


Figure 12 - Difference model indicating the changes in elevation observed between the April 2012 and April 2014 filtered LiDAR datasets within the yellow model extent.

Figure 13 shows differences in elevation between filtered LiDAR data from April 2014 compared to March 2016. Despite having the 2013/14 storms, the beach and dune face have experienced moderate accretion. The dune crest, to the south, has seen some erosion, as well as a large patch of erosion in the intertidal zone. An intertidal bar can however be suggested towards the southern end of the unit, whereas the northern end of the unit has seen very little change.

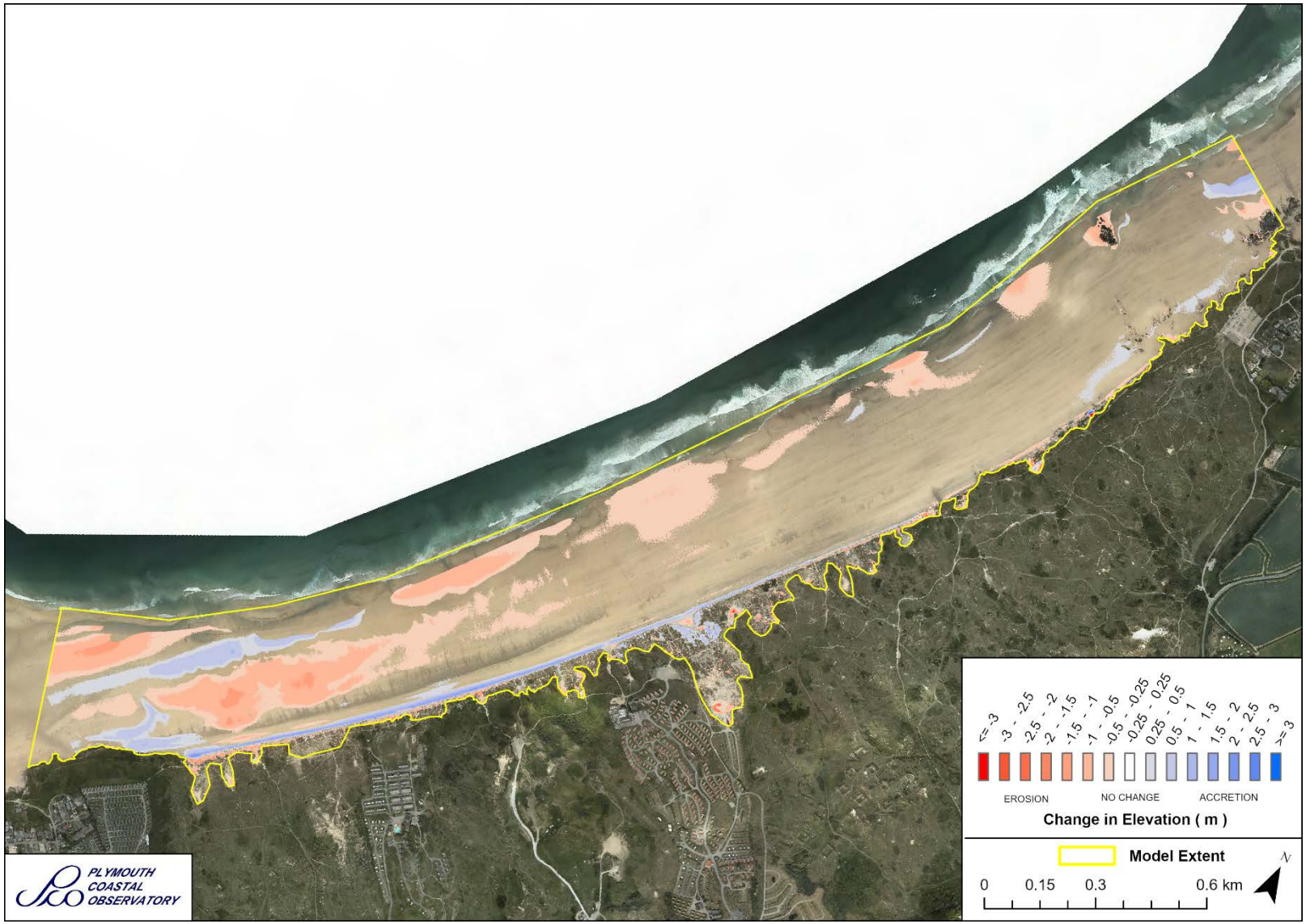


Figure 13 - Difference model indicating the changes in elevation observed between the April 2014 and March 2016 filtered LiDAR datasets within the yellow model extent.

Figure 14 shows differences in elevation between filtered LiDAR data from March 2016 compared to April 2017. Widespread accretion is suggested across the unit, gaining up to 1.5 m in elevation. Similarly, a band of low-level accretion is observed along the dune face, but to the south the beach face has experienced some erosion but the dune face and crest has seen up to ~1 m of accretion.

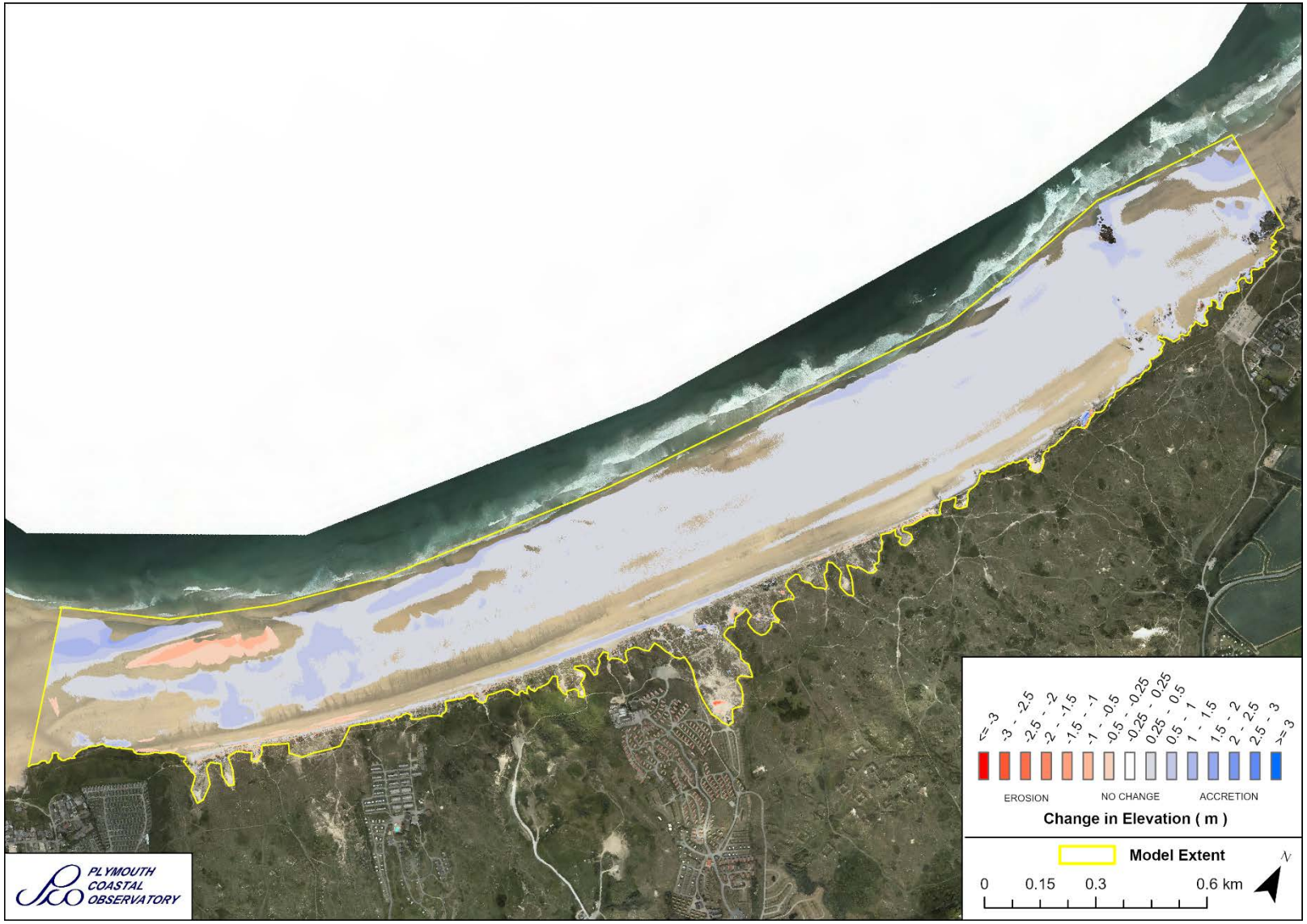


Figure 14 - Difference model indicating the changes in elevation observed between the March 2016 and April 2017 filtered LiDAR datasets within the yellow model extent.

Figure 15 shows differences in elevation between filtered LiDAR data from April 2017 compared to April 2019. Minimal change can be seen across the intertidal zone. However, ~ 1 m of erosion is observed along the beach face, whilst the dune face has experienced up to 1.5 m accretion in some areas. An intertidal bar can be seen to have evolved towards the southern end of the unit, followed by a trough of ~1 m.

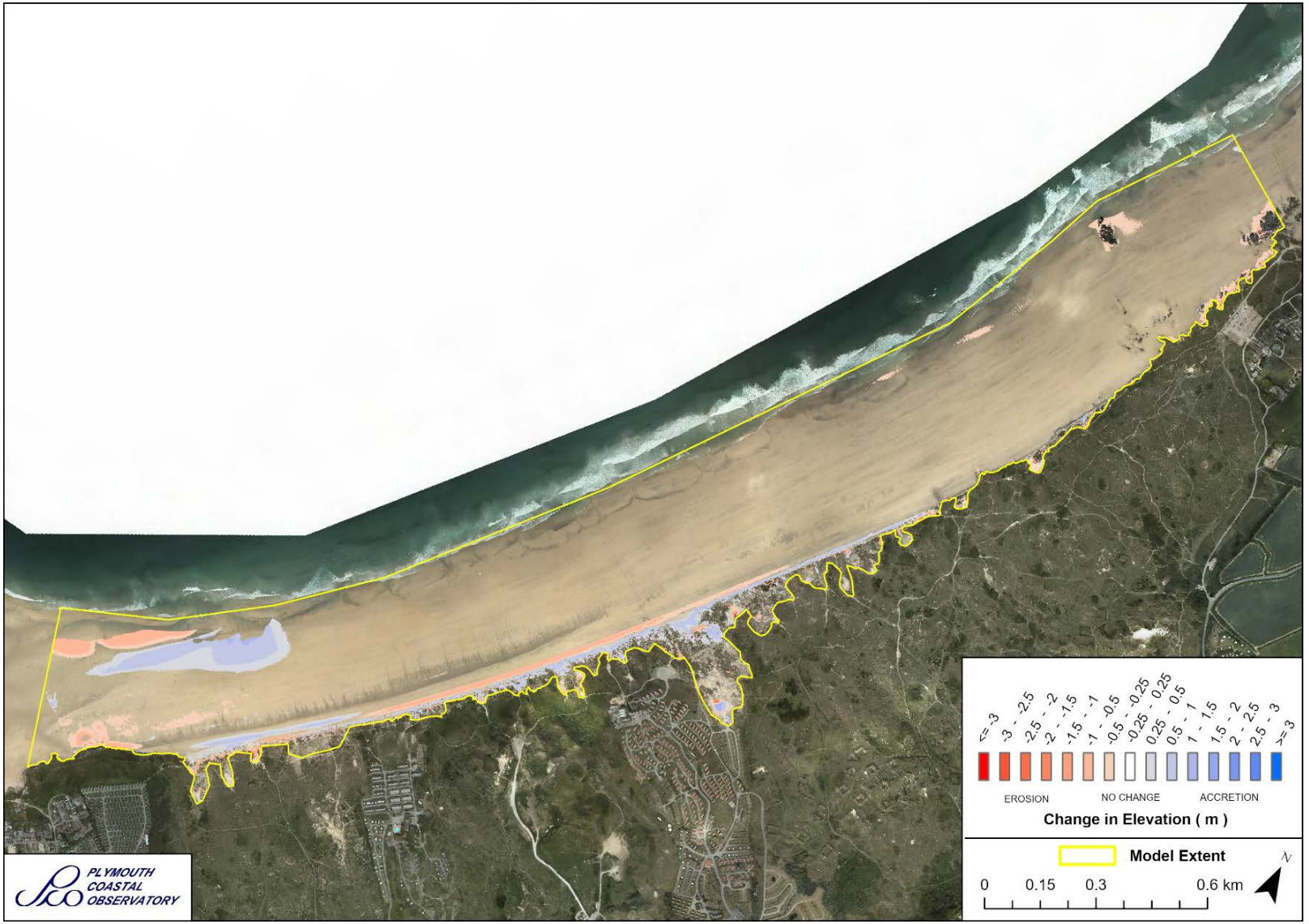


Figure 15 - Difference model indicating the changes in elevation observed between the April 2017 and April 2019 filtered LiDAR datasets within the yellow model extent.

Figure 16 shows differences in elevation between filtered LiDAR data from April 2019 compared to September 2020. Considerable change can be observed across the entire upper beach area, with a band of accretion suggested along the high-water mark, followed by a trough and an intertidal bar. Erosion can be seen along the dune face, loosing up to 2 m in elevation. However, low-level accretion can be seen to have built-up along the mobile dune and the dune blowouts. The majority of the intertidal zone has remained stable in this epoch.

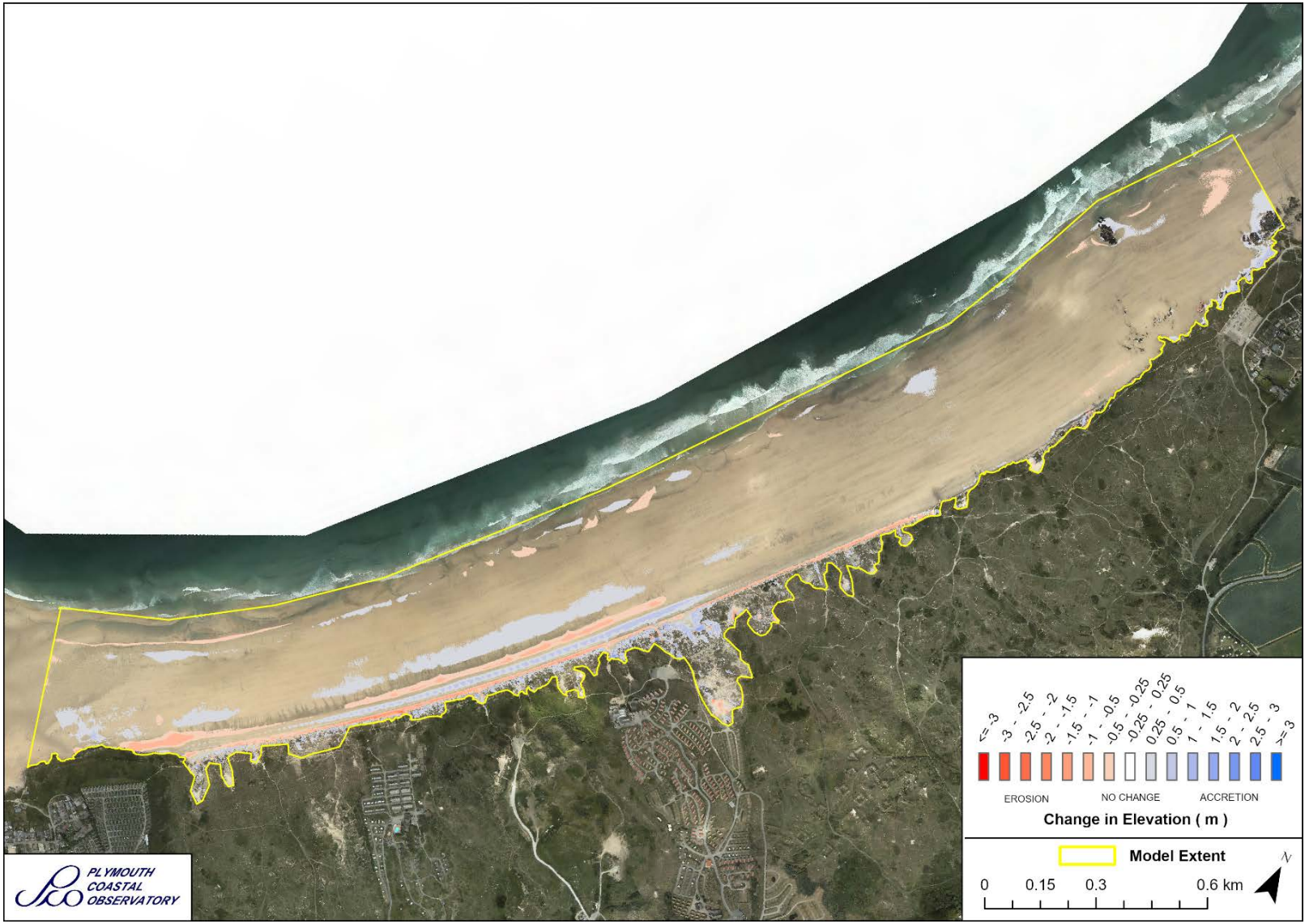


Figure 16 - Difference model indicating the changes in elevation observed between the April 2019 and September 2020 filtered LiDAR datasets within the yellow model extent.

Figure 17 shows differences in elevation between filtered LiDAR data from September 2020 compared to January 2023. Widespread erosion can be seen across the intertidal zone, around the MSL mark, loosing between 0.5 and 2 m in elevation. Whereas the upper beach has experienced a band of accretion, gaining up to 2 m of material along the length of the beach. Many of the dune blowouts, particularly those to the south, have experienced pockets of low-level erosion.

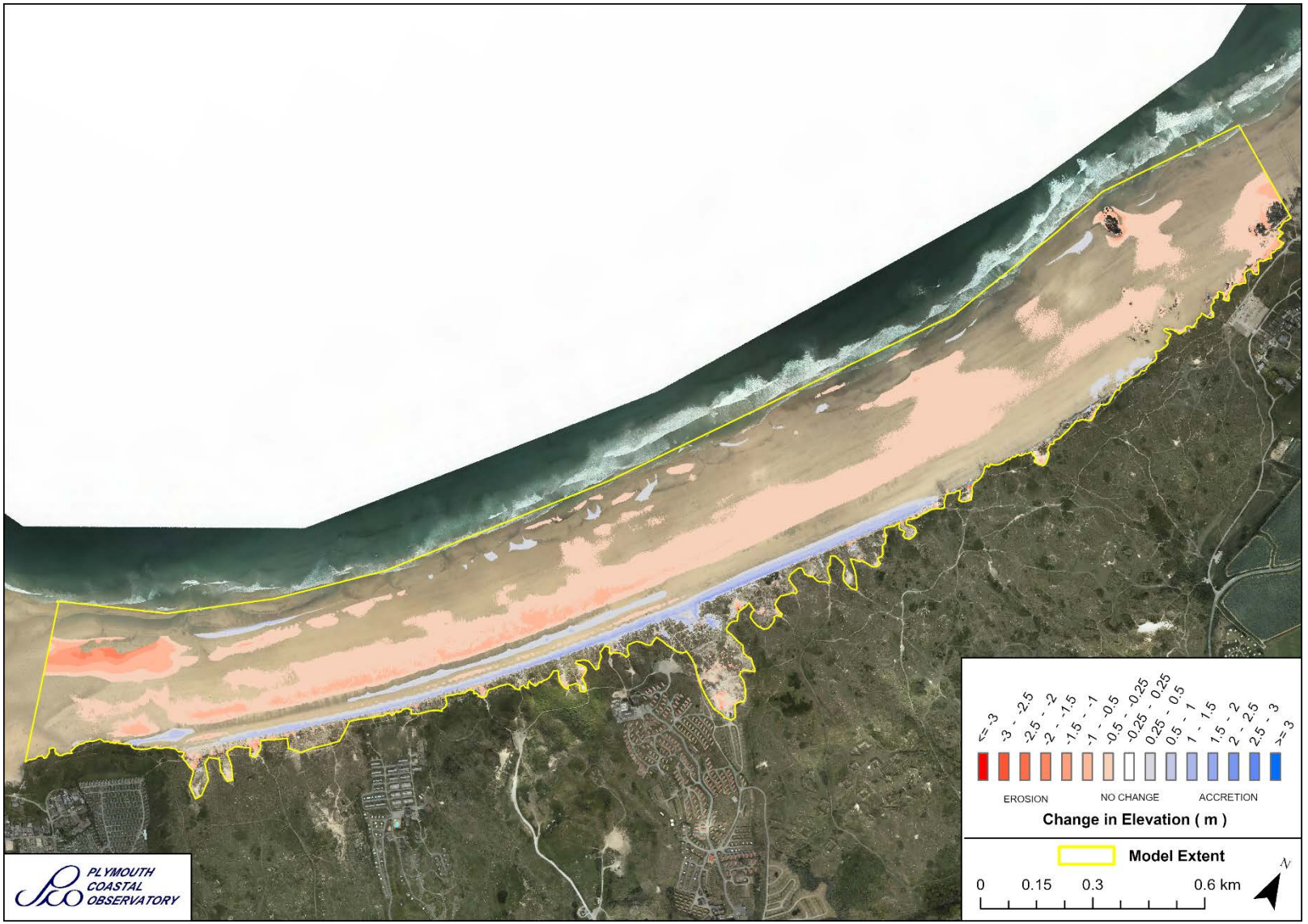


Figure 17 - Difference model indicating the changes in elevation observed between the September 2020 and January 2023 filtered LiDAR datasets within the yellow model extent.

3.2.2 Beach and Dune Volume Extraction

Surface volume extracted from each available LiDAR dataset from the Mobile Zone above the MHWS contour (3.20 m OD) are shown in Table 1 and Figure 18. Between 2008 and 2012 Mexico Towans rapidly increased but saw a sharp decline after the 2013/2014 storms, losing 6% of the Mobile Zone. Since then, the beach has seen a considerable amount of recovery, almost surpassing pre-2013 beach levels during the most recent survey in 2023, the highest on record. Despite experiencing a large impact in 2014, the overall trend for the Mobile Zone is for accretion.

Surface volume extracted from each LiDAR dataset from the Beach Zone above the MLWS contour (-2.60 m OD) are shown in Table 1 and Figure 19. Similarly to the Mobile Zone, the Beach Zone has seen an overall trend for accretion, being also eroded by the 2013/2014 winter period. The Beach Zone volume had since returned to pre-2013 levels, recording the highest volume on record during the September 2020 survey (Fig.19).

Table 1 – Surface volume values (m^3) extracted from all available filtered LiDAR datasets for the Mobile Zone above MHWS (3.20 m OD) and for the Beach Zone above MLWS (-2.60 m OD).

Date	Mobile Zone Volume (m^3)	Beach Zone Volume (m^3)
03/2008	2,378,787	2,593,763
03/2009	2,376,895	2,643,300
03/2011	2,408,742	2,905,089
04/2012	2,429,534	2,878,043
04/2014	2,372,430	2,718,318
02/2016	2,380,024	2,637,695
04/2017	2,399,329	2,958,351
04/2019	2,405,316	2,939,528
09/2020	2,422,329	3,002,758
01/2023	2,453,271	2,774,934

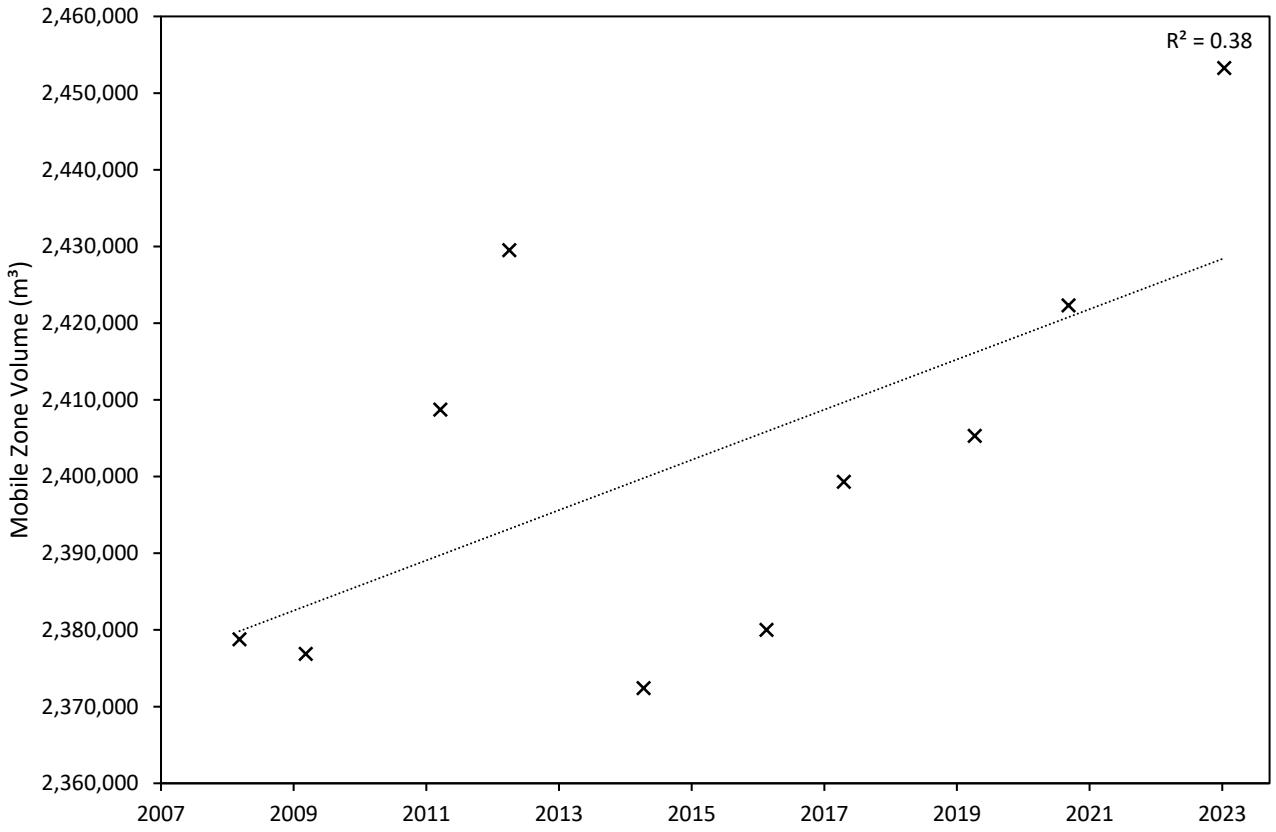


Figure 18 – Plot indicating beach volume (m^3) recorded in the Mobile Zone above MHWS (3.20 m OD) for each filtered LiDAR datasets between 2008 and 2023.

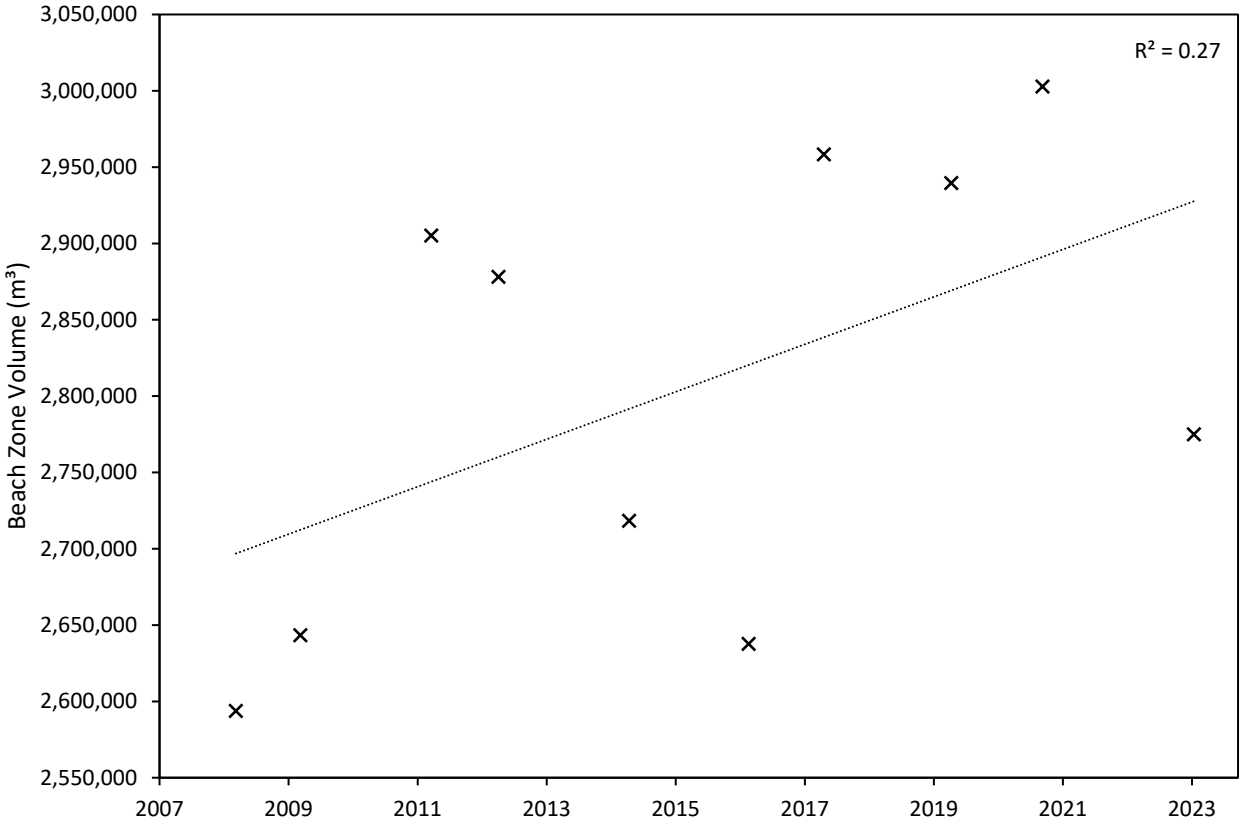


Figure 19 - Plot indicating beach volume (m^3) recorded in the Beach Zone above MLWS (-2.60 m OD) for each filtered LiDAR datasets between 2008 and 2023.

3.2.3 Contour Comparison

Figure 20 indicates the Mean Sea Level (MSL) and Dune Toe contours from the 2008, 2014, 2019 and 2023 LiDAR datasets. MSL contours indicate a widening of the beach in 2019, with an overall range of approximately 20-36 m between 2008 and 2023. Conversely, in the south of the unit, the beach widened in 2014 by ~40 m but saw minimal difference in the north. The Dune Toe contours have seen the dune face to retreat up to 7 m since 2007, along much of the dune face.

3.3 Historic Aerial Maps

Historic aerial photography captured in 1947 by the RAF, in 2001 by the Environment Agency and from 2006 onwards by the SWCM are presented here.



Figure 20 – Contour map indicating Mean Sea Level (solid line) and Dune Toe (dashed line) extracted from 2008, 2014, 2019 and 2023 LiDAR datasets.

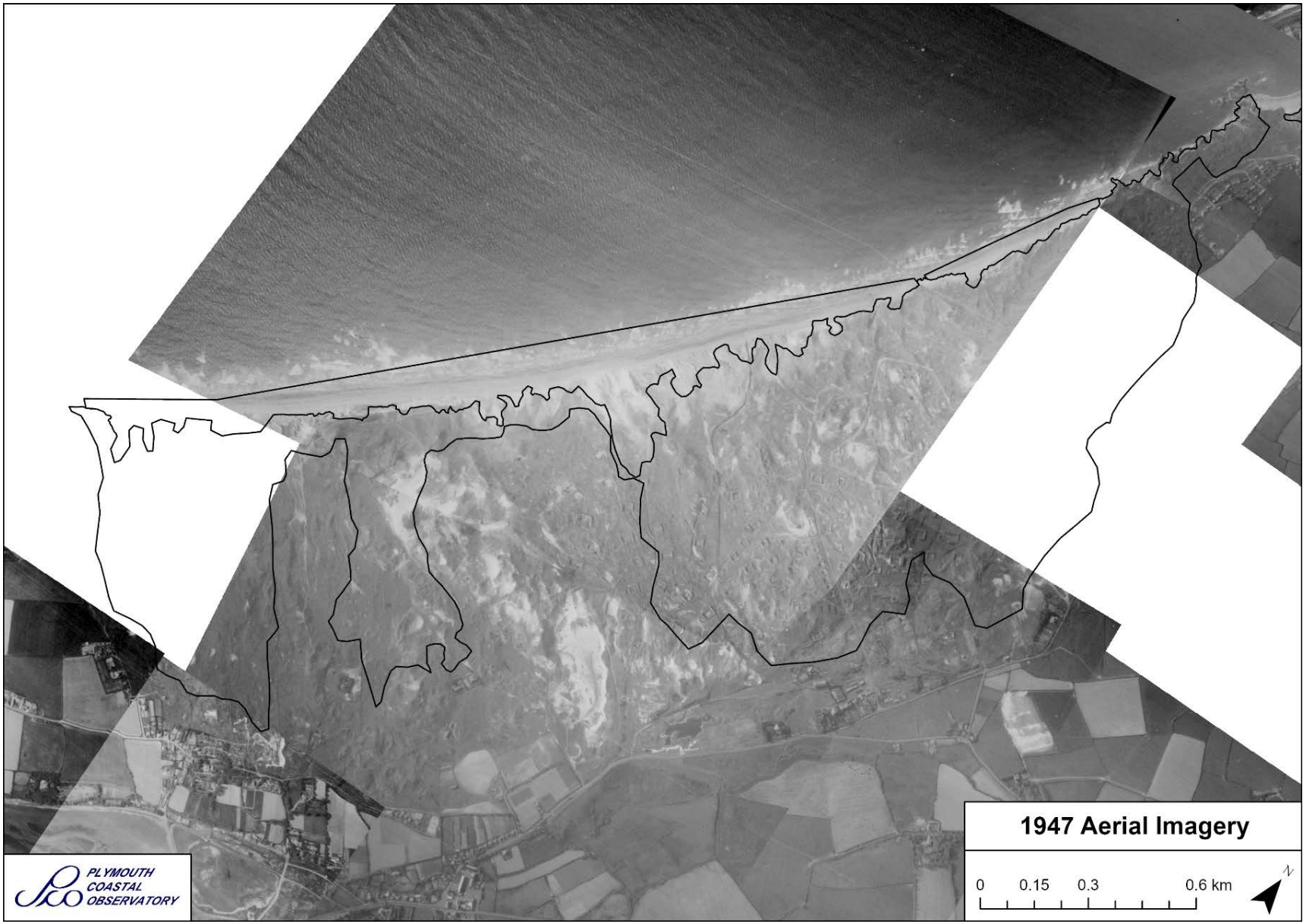


Figure 21 – Aerial imagery from 1947.



Figure 22 – Aerial imagery from 2001.



Figure 23 – Aerial imagery from 2008.

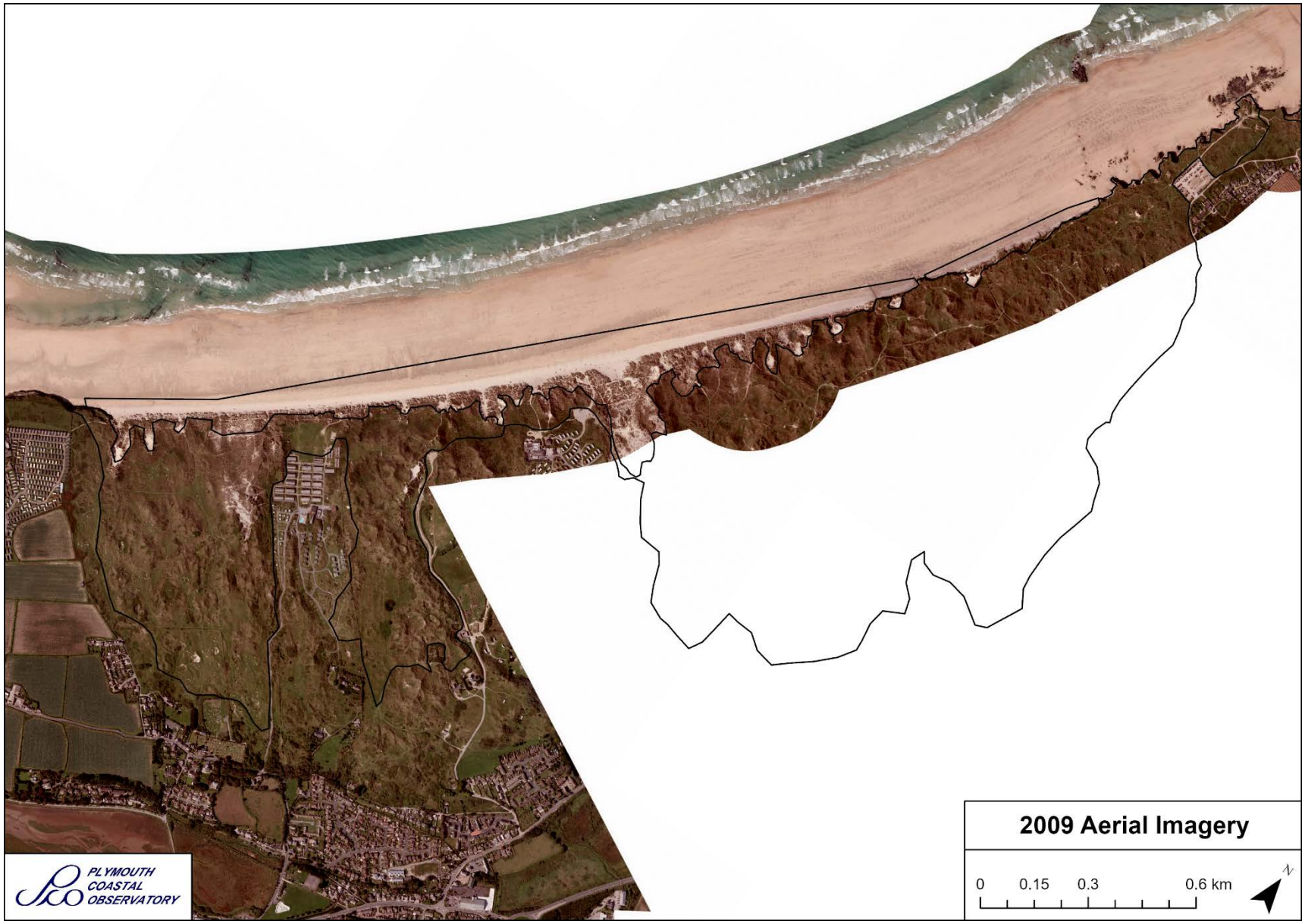


Figure 24 – Aerial imagery from 2009.



Figure 25 – Aerial imagery from 2014.



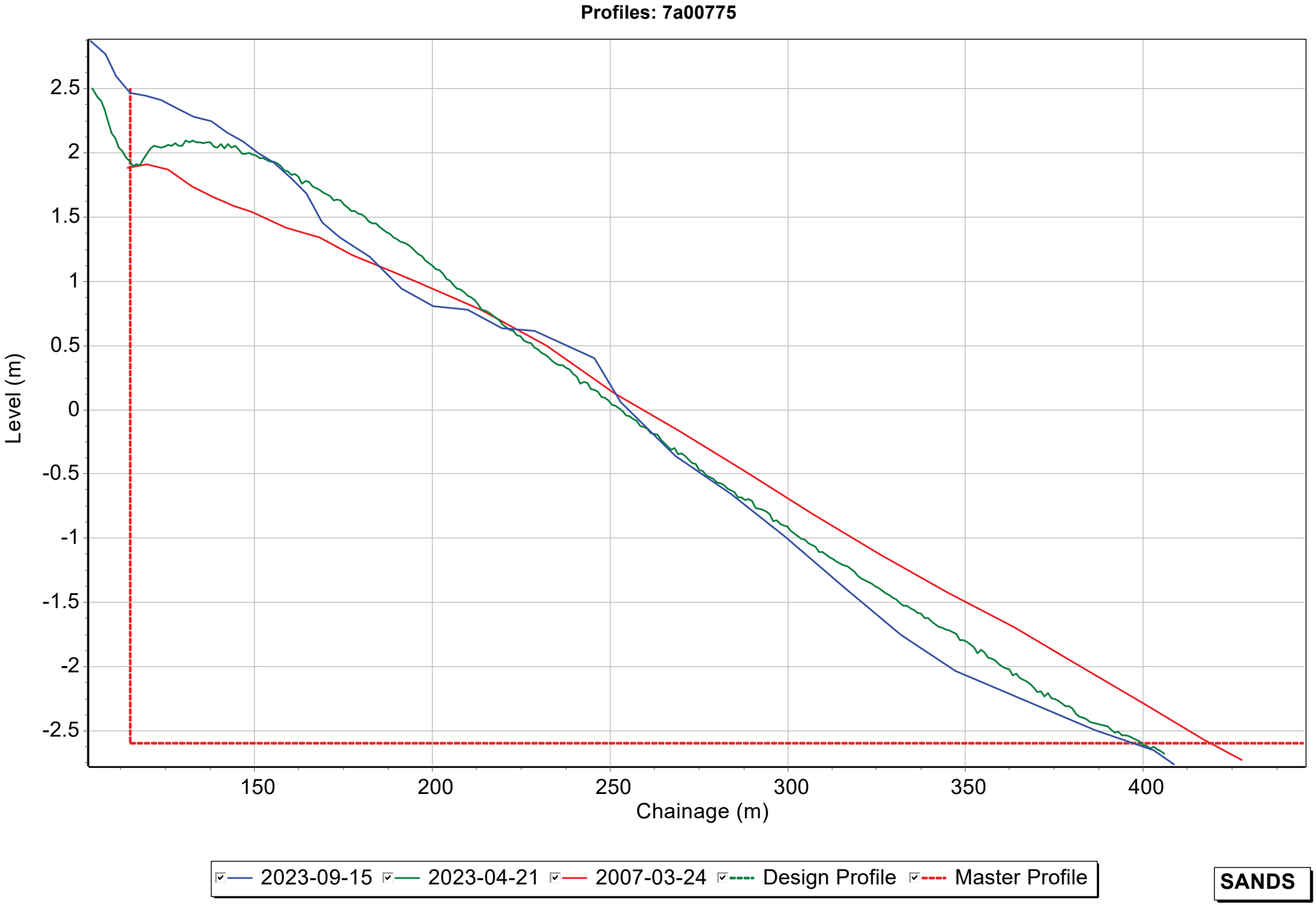
Figure 26 – Aerial imagery from 2018.

Glossary

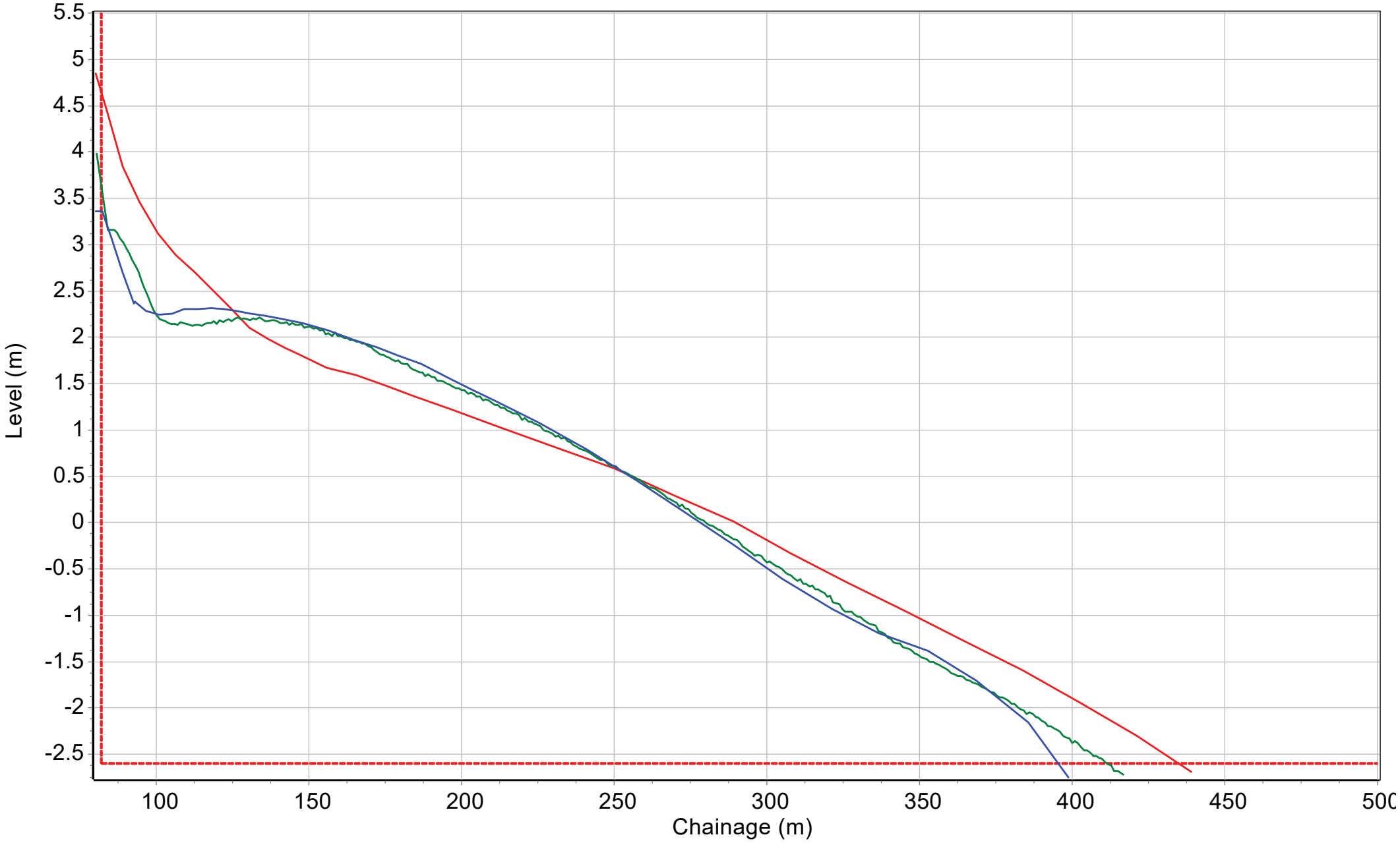
1. Accretion: The net accumulation of deposited sediment, deposited by waves, tides or current.
2. Coastal Morphodynamics: The study of changes in coastal landforms and landscapes over time.
3. Contour Analysis: Mapping of contours from LiDAR datasets to represent Mean Sea Level (MSL) and Dune Toe elevations.
4. Cross-Sectional Area (CSA): The area of a two-dimensional cross-section of a cross-shore beach profile, running between Mean Low Water Spring and the back of the beach.
5. Developed Zone: Areas of urban development built atop previously present dune systems.
6. Difference Modelling: Comparison of separate LiDAR surfaces to produce a difference model of change based on gridded spot height elevations.
7. Digital Elevation Model (DEM) and Digital Terrain Model (DTM): DEM represents the Earth's surface with all features, while DTM represents the bare earth surface, excluding vegetation and structures.
8. Embryo Dune: The earliest stage of dune growth, typically found along the seaward extent of a dune system or newly formed dune.
9. Erosion: The process by which local sea level rise, strong wave action, and coastal flooding wear down or carry away rocks, soils, and sands along the coast.
10. Fixed Zone: Area defined by permanent dune vegetation, including scrub or invasive species, denoting vegetation atop sandy soil.
11. Intertidal Bar: A ridge or mound of sand, gravel, or other sediment deposited in the intertidal zone along a shoreline.
12. LiDAR: Light Detection and Ranging, a remote sensing method that uses light in the form of a pulsed laser to measure variable distances to the Earth.
13. Mean High Water Spring (MHWS): The height of mean high-water springs is the average throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
14. Mean Low Water Spring (MLWS): The height of the mean low-water springs is the average height obtained by the two successive low waters during the same period.
15. Mobile Zone: The area including the active dune face and embryo dune that is in motion due to wind action or other factors.
16. Root-Mean-Square Error (RMSE): A measure of the differences between values predicted by a model and the observed values.
17. Tidal Range: The vertical difference between high tide and low tide during a tidal cycle.

Appendices

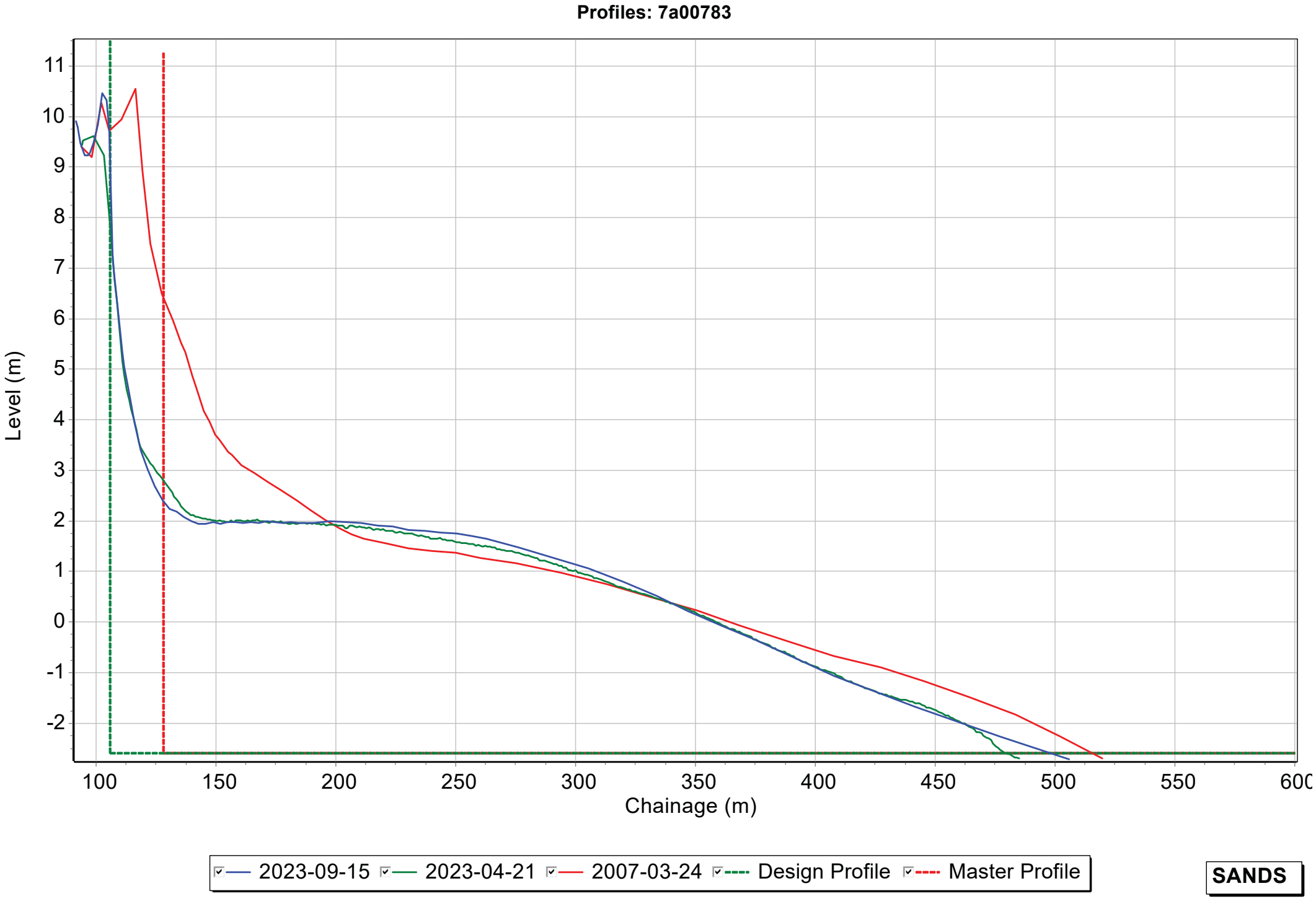
Appendix 1 – Profile charts showing the cross-shore area of each interim profile from the most recent survey (blue), second most recent survey (green) and first survey, also known as the baseline (red) at Mexico Towans are presented below.

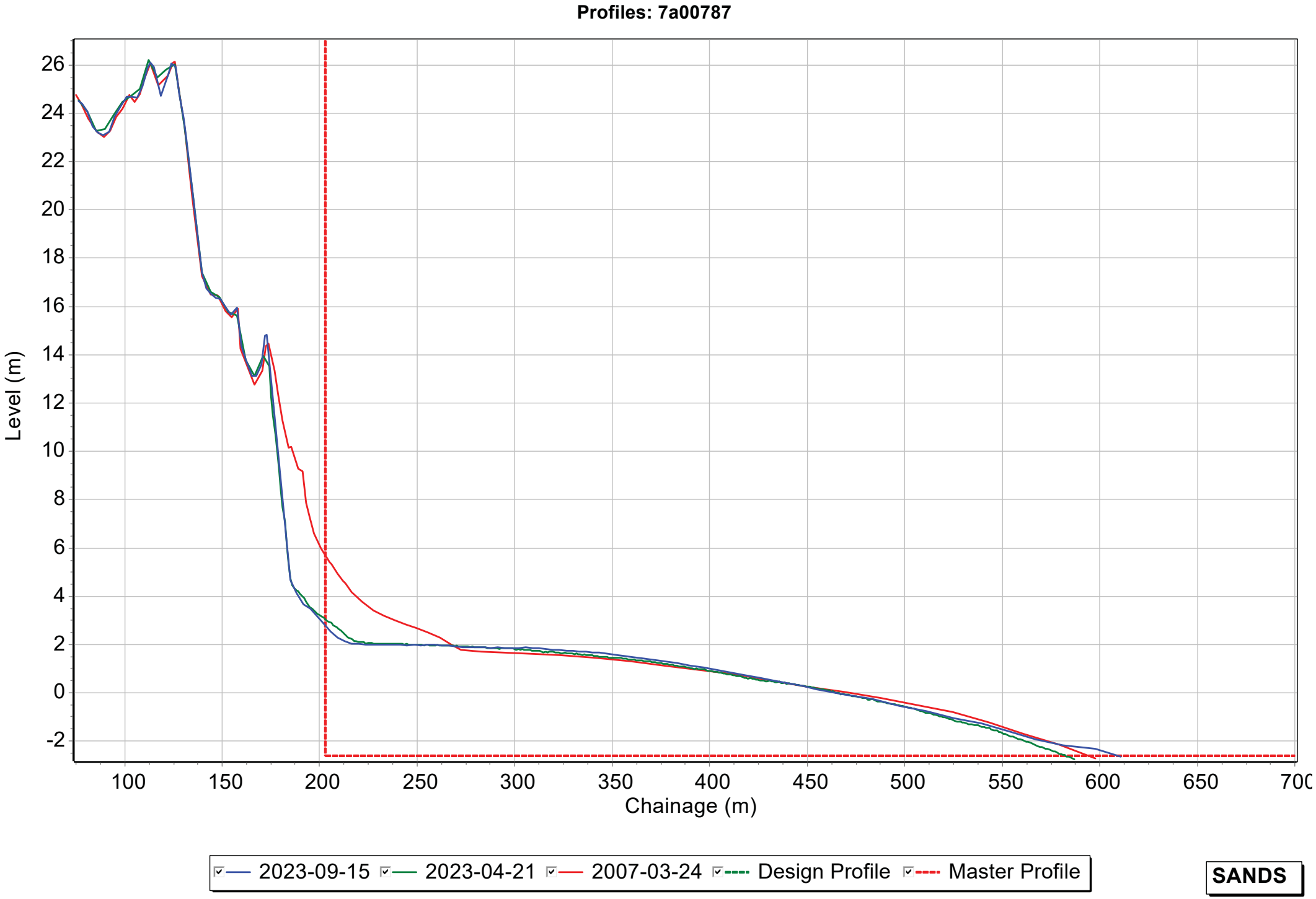

Profiles: 7a00775
Level (m)
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
150
200
250
300
350
400
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS

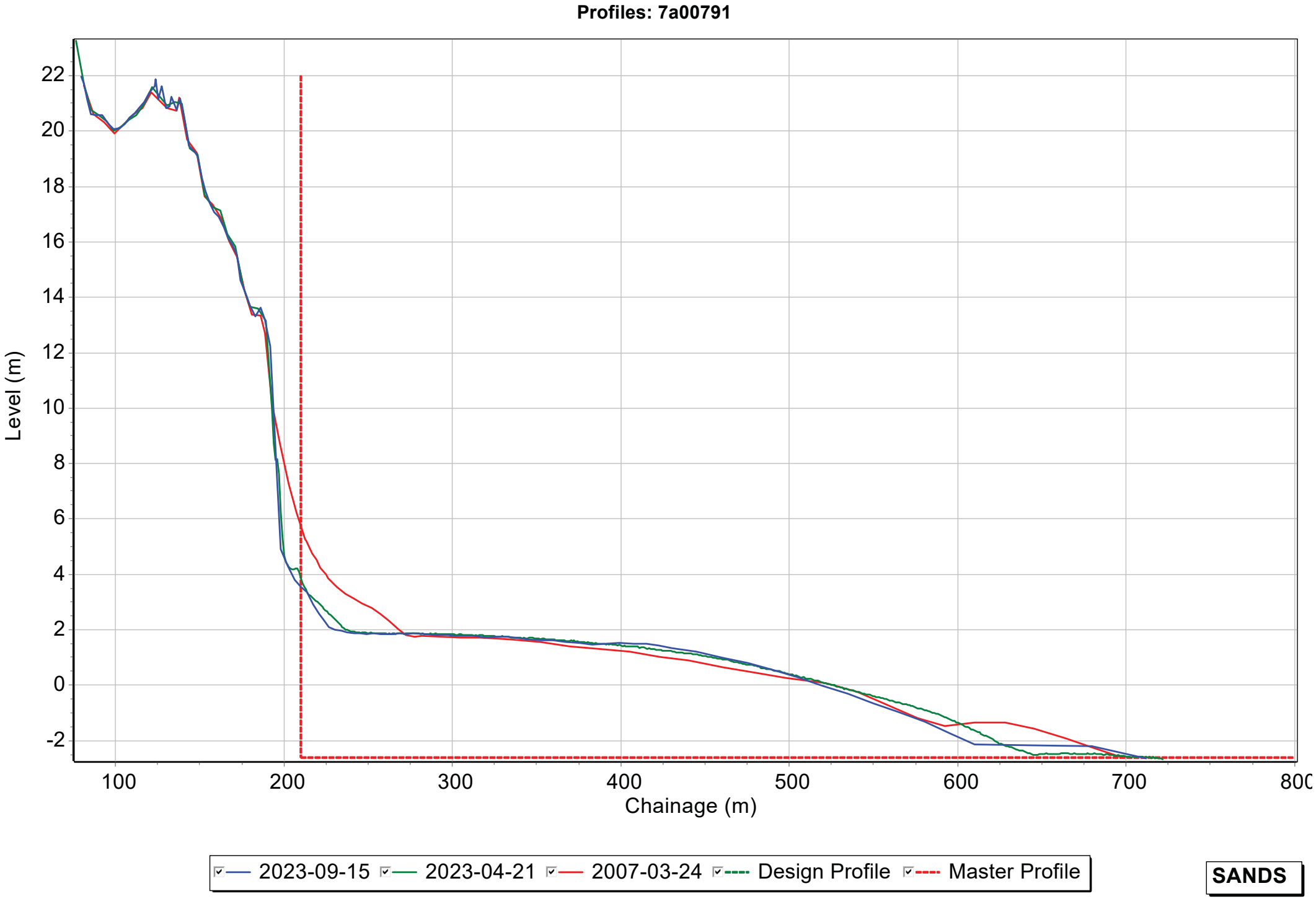
Profiles: 7a00779

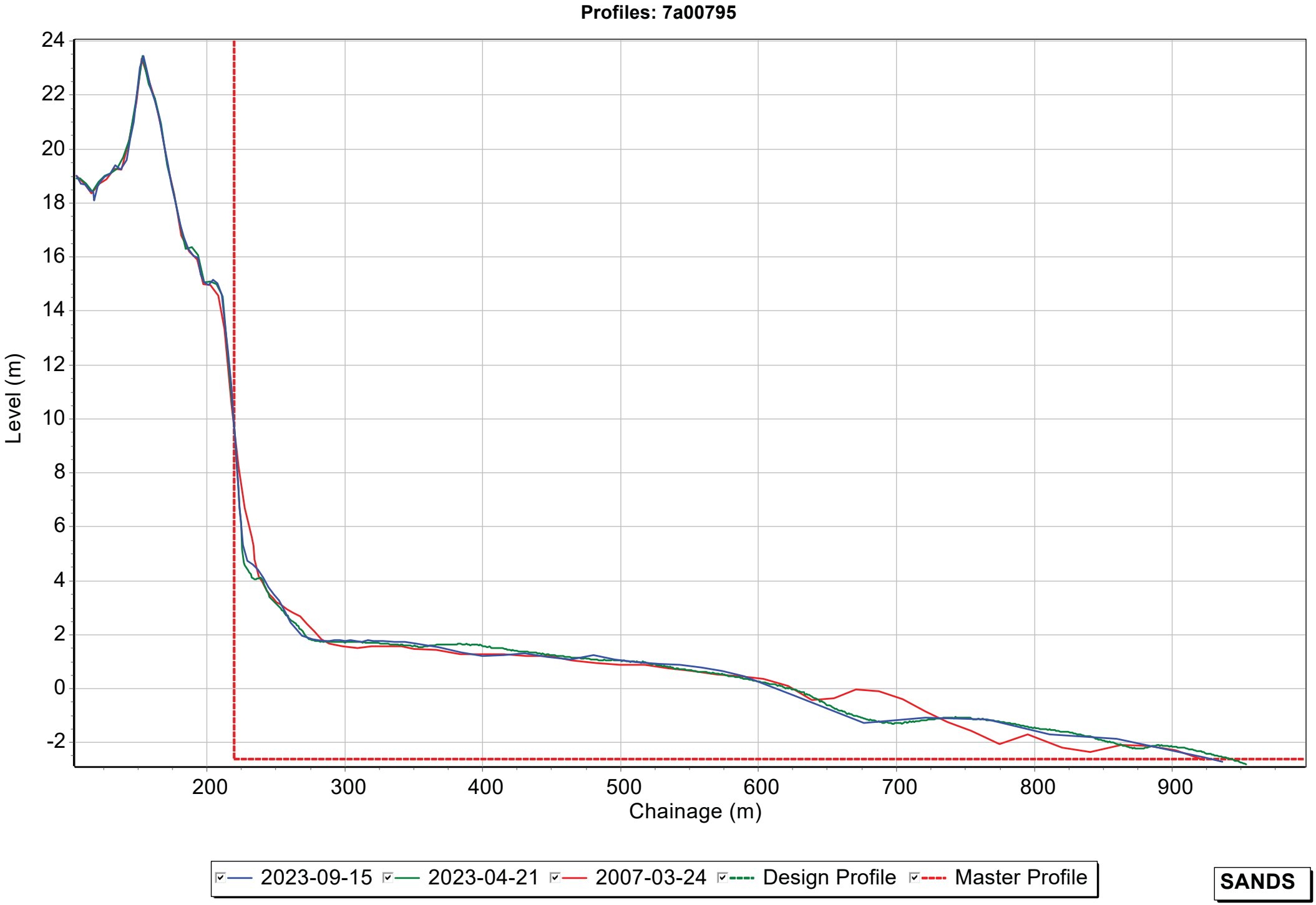


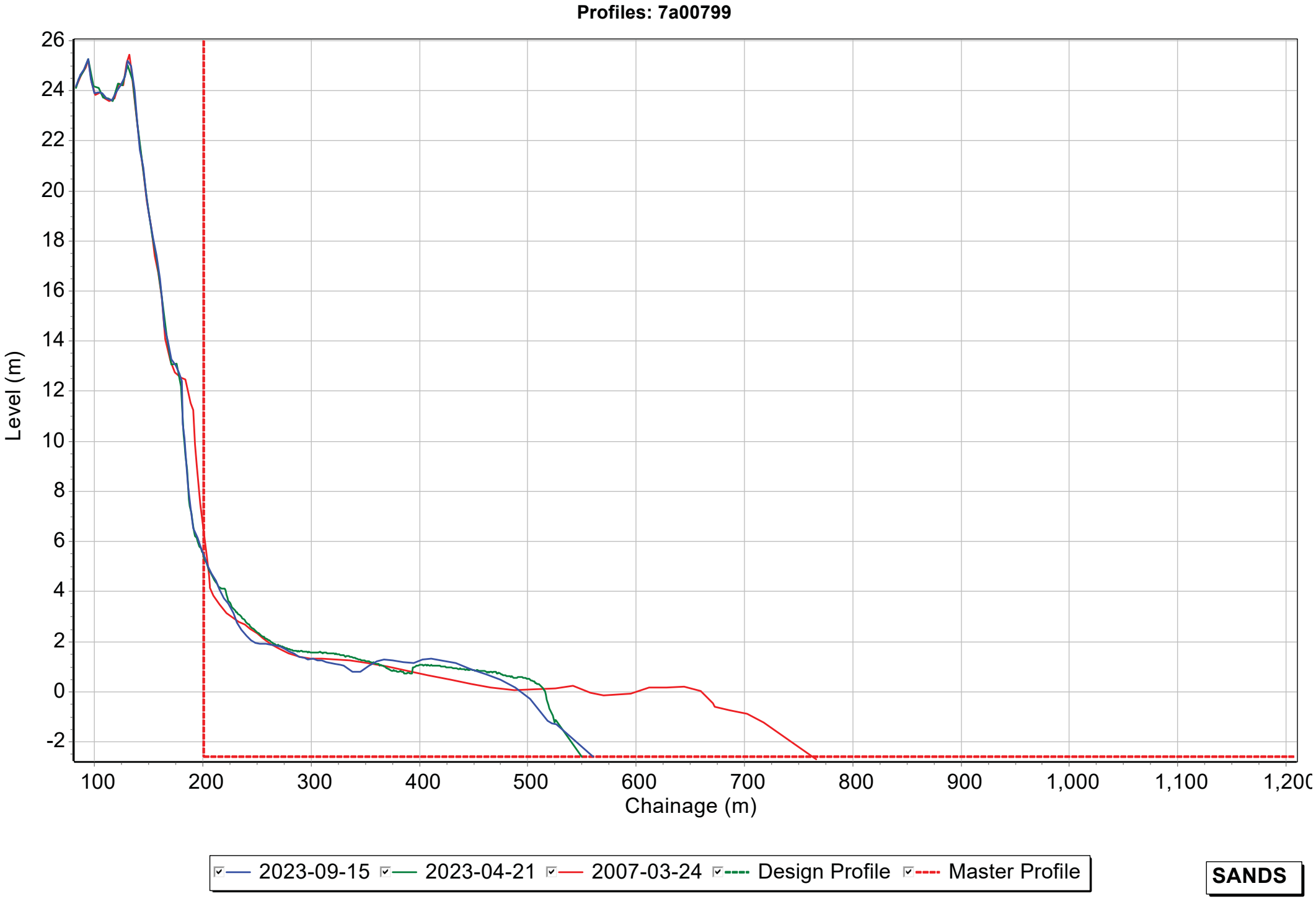
SANDS

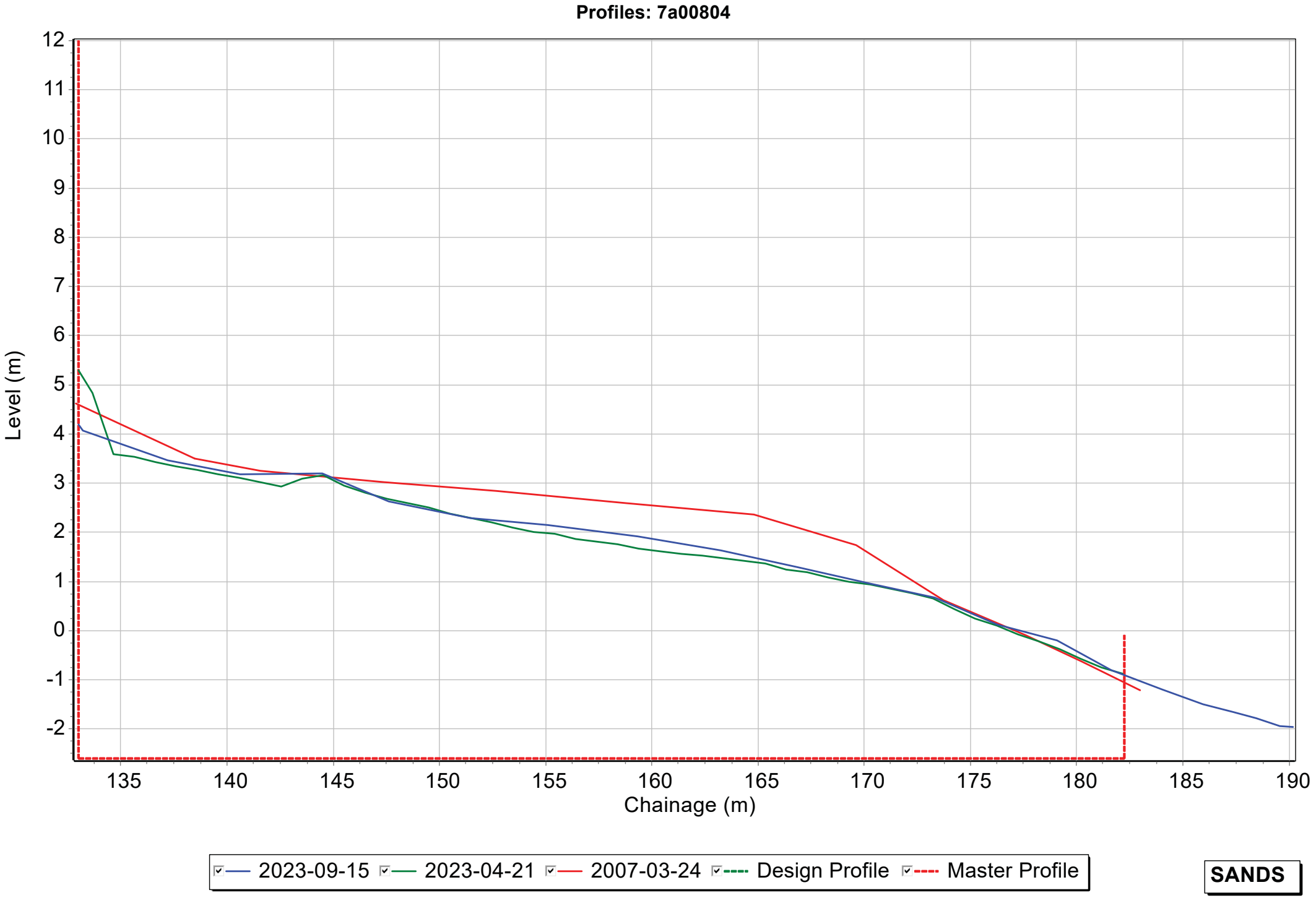

Profiles: 7a00783
Level (m)
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
100
150
200
250
300
350
400
450
500
550
600
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS


Profiles: 7a00787
Level (m)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
100
150
200
250
300
350
400
450
500
550
600
650
700
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS


Profiles: 7a00791
Level (m)
22
20
18
16
14
12
10
8
6
4
2
0
-2
100
200
300
400
500
600
700
800
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS


Profiles: 7a00795
Level (m)
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
200
300
400
500
600
700
800
900
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS


Profiles: 7a00799
Level (m)
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS


Profiles: 7a00804
Level (m)
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
-2
135
140
145
150
155
160
165
170
175
180
185
190
Chainage (m)
2023-09-15
2023-04-21
2007-03-24
Design Profile
Master Profile
SANDS