

Analysis of storm Brendan and following high energy period (11/01/2020 – 17/01/2020) along with the impact on Mounts Bay: 6eSU10-1 to 6eSU10-2

1. Introduction

This report briefly identifies the impact of storm Brendan and the following high energy on survey units 6eSU10-1 (Marazion) and 6eSU10-2 (Mounts Bay), with reference to the area of interest shown in figure 2. Storm Brendan was named by the Irish meteorological society, and brought wind speeds of up to 80 mph to the SW coast of England, lasting a total of 4 days between the 12th till the 15th of January.

Data obtained for this report includes the spring interim topographic profile data obtained on the 11/01/2020 and a post storm survey obtained on the 17/01/2020. Analysis is only undertaken on the profiles which were captured in the post-storm survey for consistency.

2. Hydrodynamics

Between the two surveys undertaken either side of Storm Brendan, the significant wave height (H_s) averaged 1.88 m, with an average maximum wave height (H_{Max}) of 2.9 m (Table 1). When comparing to the January average, the period under analysis recorded a doubling in H_s with a more south-westerly average wave direction (Table 1). There were three distinct peaks throughout the period under analysis whereby the storm threshold (2.98 m) was exceeded by the H_s (Table 1), the most distinctive being storm peak 2, which lasted for a duration of 15 hours, coinciding with the spring high tide on the 14/01 at 19:53 (5.3 m, recorded from Penzance Harbour) as demonstrated in figure 1.

Table 1- Hydrodynamic statistics recorded from the Penzance directional wave rider

	H_s (m)	T_p (s)	T_z (s)	$Dir.$ (°)
Storm Brendan Average (12/01 - 18/01)	1.88	9.45	5.78	192.08
January Average (2007 - 2019)	0.94	9.9	4.9	184
Storm Peak 1 (13/01 10:00–16:00)	3.25	9.53	6.40	185.69
Storm Peak 2 (14-15/01 11:30 – 02:30)	3.31	10.97	7.72	191.16
Storm Peak 3 (16/01 13:00-17:00)	3.20	8.62	6.13	189.22

The seven day period under analysis recorded a maximum wave height of 6.8 m and a maximum H_s of 3.8 m (Fig.1). The spring interim survey and post-storm survey sufficiently capture either side of storm Brendan which has been the most energetic period of the 2019/20 winter season so far.

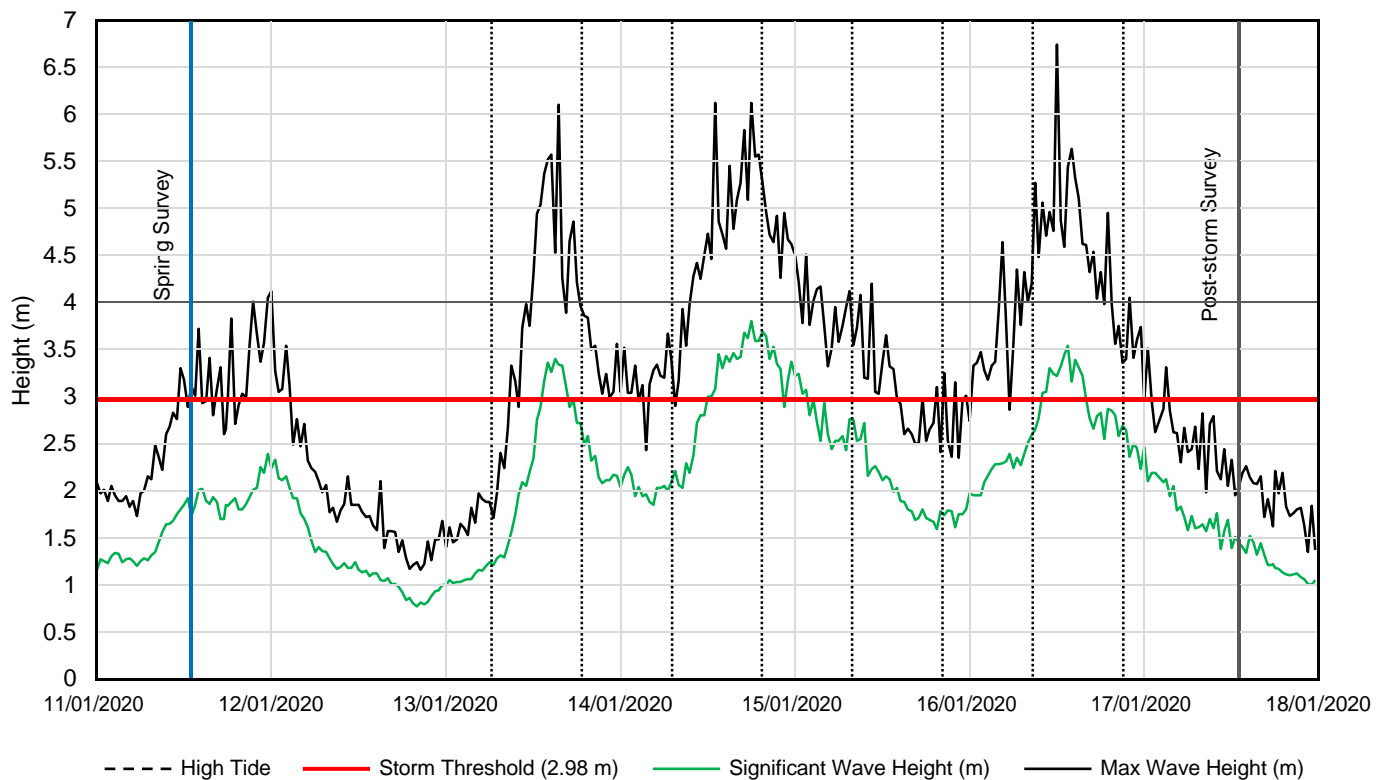


Figure 1 - Plot showing the significant wave height (H_s) and Maximum wave height (H_{Max}) over the study period. High tide times which coincide above the storm threshold are indicated with a dashed vertical black line. Data obtained from Penzance DWR.

3. Beach Morphology Change

The post-storm survey consisted of eleven survey lines (Fig.2) which are here directly compared against the spring interim survey. It should be noted that the difference modelling was undertaken by interpolating between survey lines to create a volumetric surface.

When comparing beach volume change between the 11/01 (Spring Interim) and the 17/01 (Post-storm survey), the area of interest displayed a loss of 25,176 m³ equivalent to a 1% loss in total beach volume. The primary area of erosion was identified to the west of Marazion dunes (Fig.2), primarily along the low tide terrace, with profiles 6e00764 and 6e00756 showing the highest level of change (see Appendix 1).

When comparing the cross-sectional area of the highlighted profiles identified in figure 2, 6e00756, 6e00764 and 6e00772 showed a clear loss of material from the low tide terrace, with a respective gain in the upper beach face. In appose to this, profiles 6e00780, 6e00788 and 6e00797 showed a more expected change of material with a loss from the beach face and minor gains along the low tide terrace. Overall, profiles 6e00756, 6e00764, 6e00788, 6e00805 and 6e00814 saw an overall loss in material between the interim and post-storm survey ranging from -14 to -2 m² whereas profiles 6e00739, 6e00747, 6e00772, 6e00797 and 6e00822 saw an overall gain ranging from 2 to 11 m² (see Appendix 1).

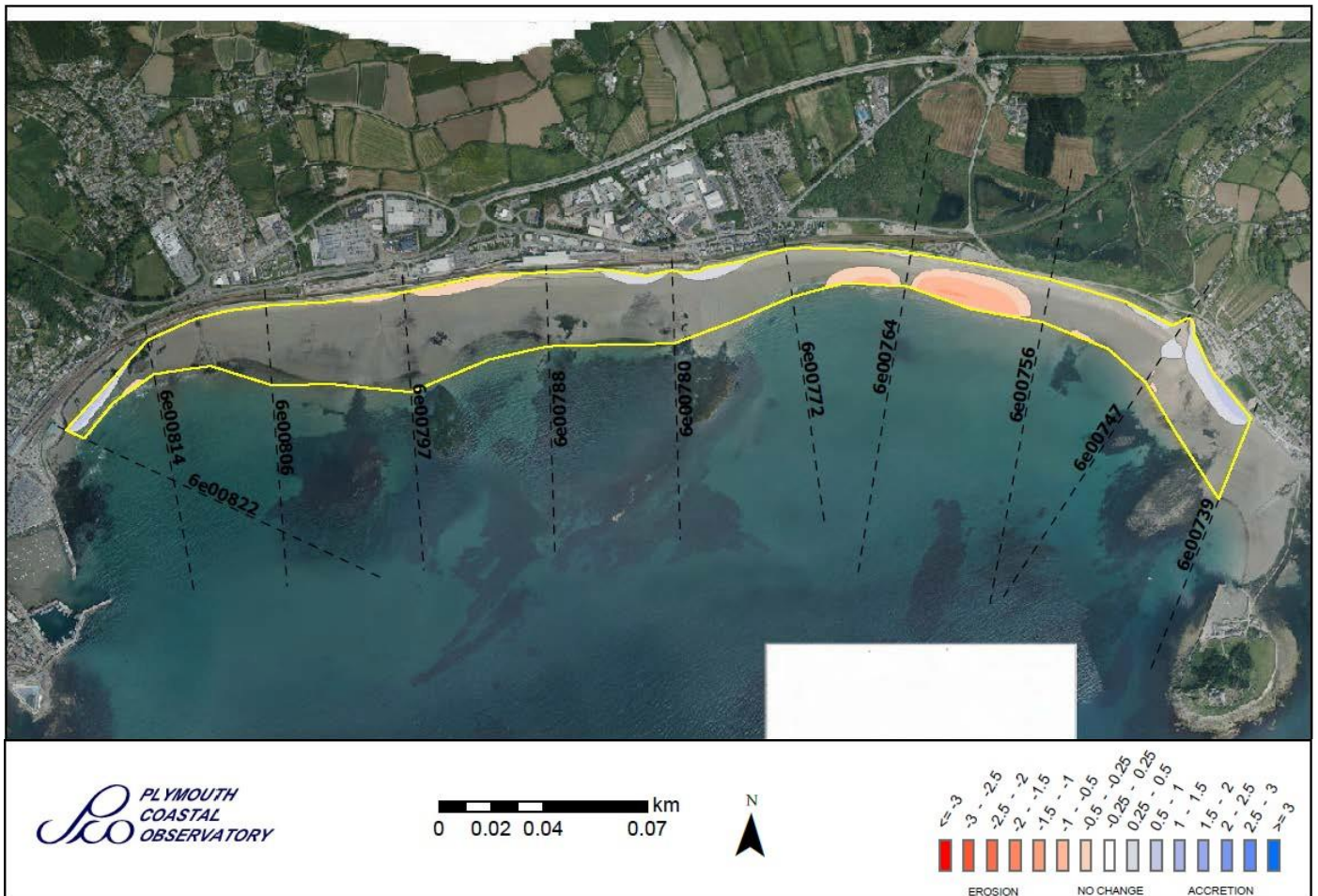


Figure 2 – Difference model displaying areas of erosion and accretion for the area of interest highlighted by the yellow outline, comparing the spring interim to that of the post-storm survey. The post-storm survey lines are shown as dashed black lines. N.B. Data was interpolated between the displayed survey lines and volumetric calculations were undertaken from within the highlighted yellow area.

Appendix 1 – Cross-sectional area change plots

Each profile highlighted in figure 2 is shown below, comparing the interim and post-storm survey cross-sectional areas. Each plot has an accompanying profile change plot, displaying green as accretion and red as erosion for ease of visualisation.

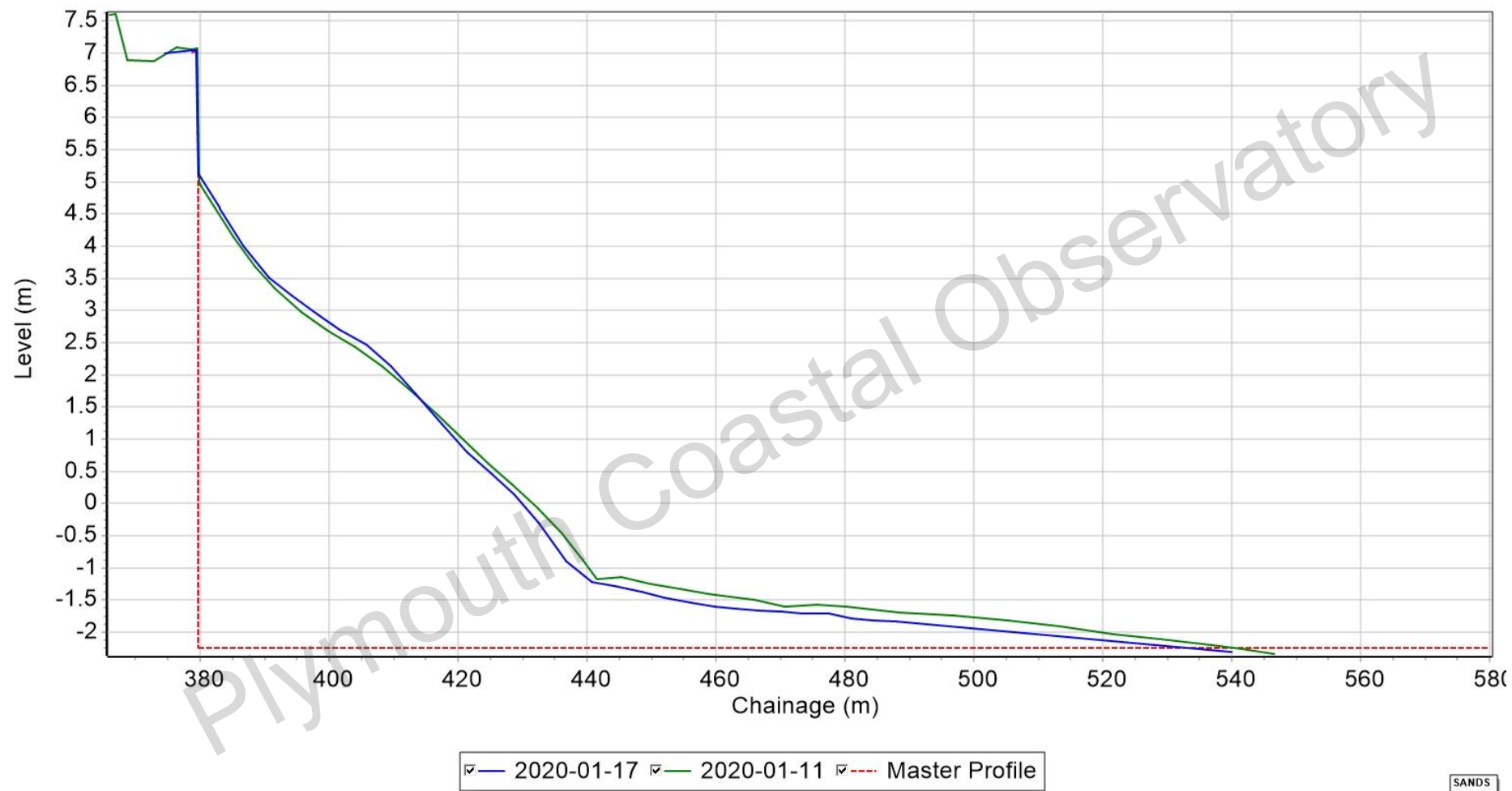




Profiles: 6e00756



Profiles: 6e00764



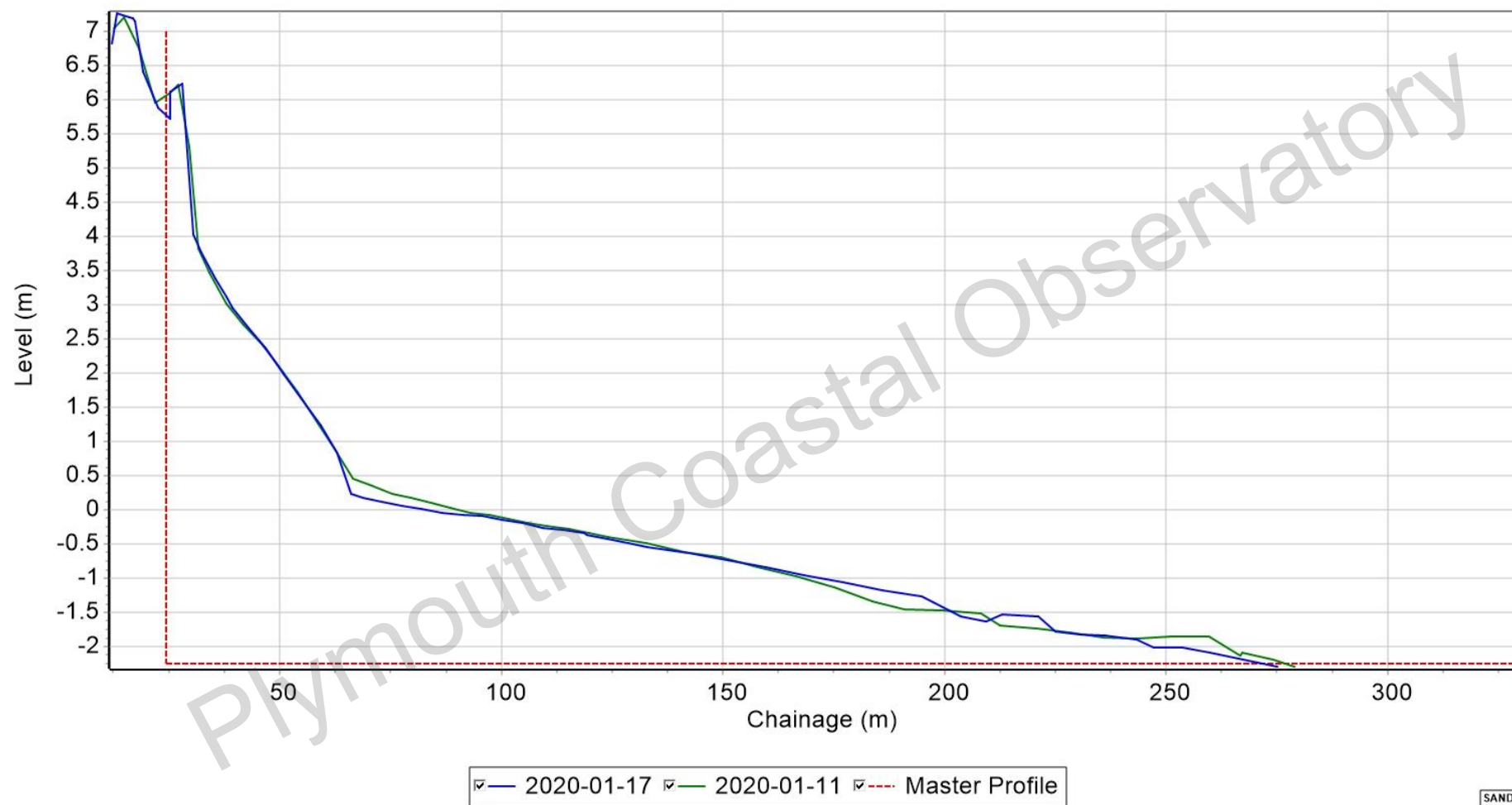
Profiles: 6e00772



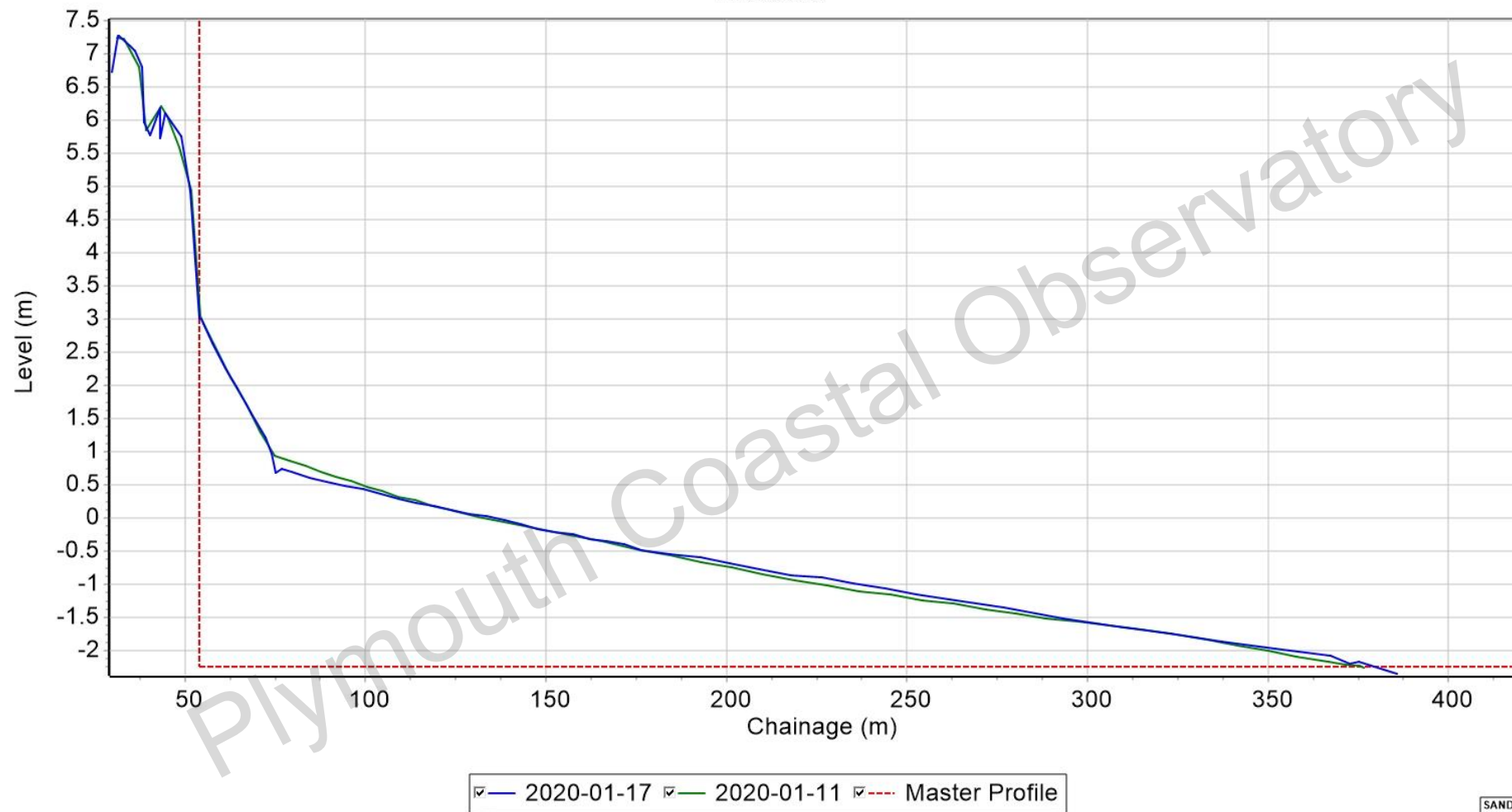
Profiles: 6e00780



Profiles: 6e00788



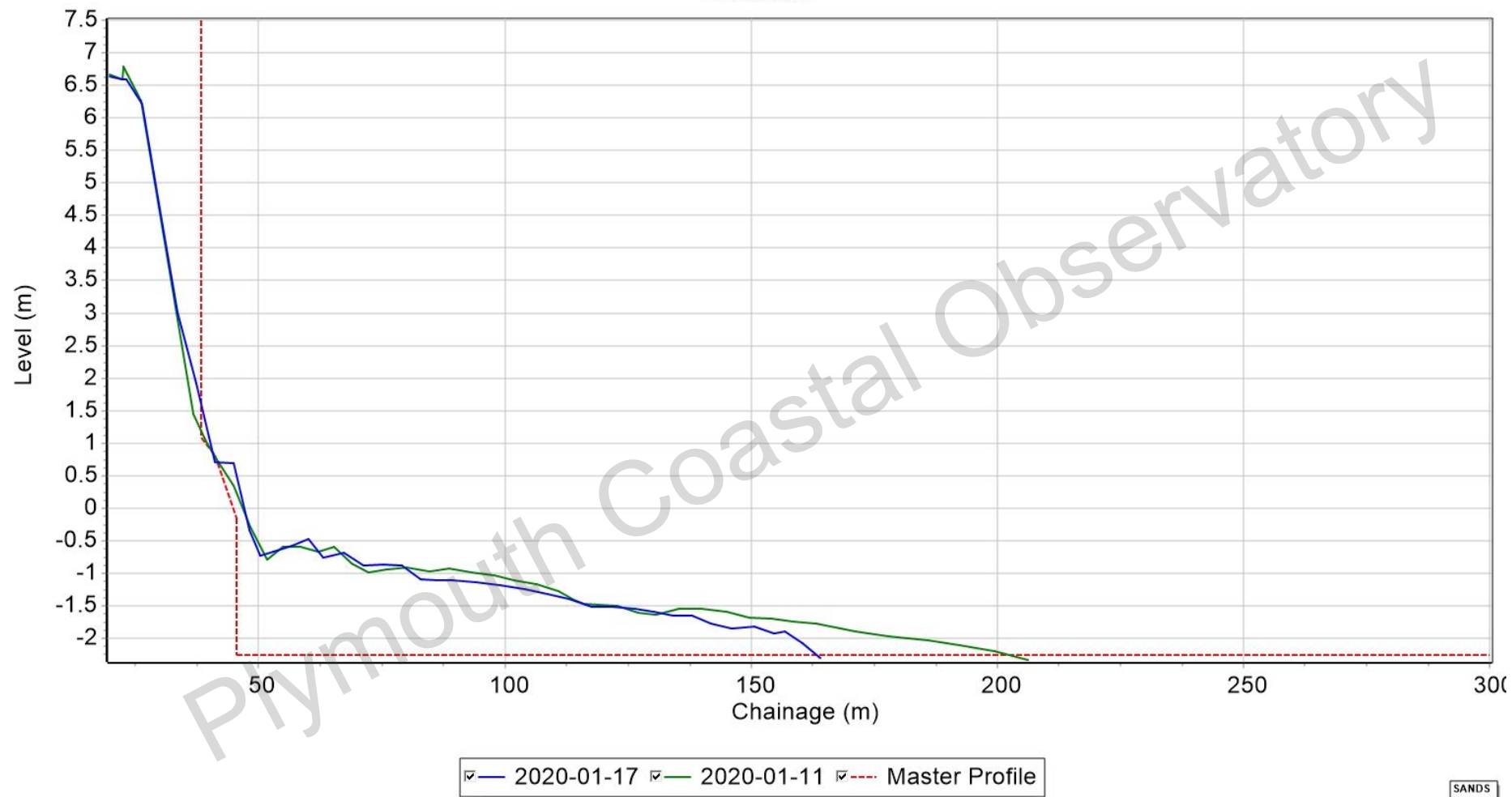
Profiles: 6e00797



Profiles: 6e00806



Profiles: 6e00814



Profiles: 6e00822

