Reuse of Sand from Sovereign Harbour Maintenance Dredging - 2017

1 Resolution of PBSC concerns

Following discussions with Pevensey Bay Sailing Club (PBSC) in July 2016 it was agreed that works undertaken in 2016 would be revised in 2017 in such a way that placed sand would not interfere with the club's normal sailing patterns.

The starting point for revised working was the list of proposals agreed in July 2016 meeting;

- to include in discussions with MMO/Premier Marinas an alternative location for the existing corridor, keeping it northeast of the launch/recovery zone, but would consider a "horseshoe" shaped zone centred on the launch/recovery zone
- to instruct the dredger skipper to spread delivery points for each load over the entire width of the area as allowed by the license. This should minimise any rise in seabed levels
- to monitor the location of each delivery
- to keep all deliveries below low water spring tides. This should minimise formation of inshore sand bars that could hinder sailing close to low water and prevent any small quantities of silt appearing on the foreshore
- that any solution put in place for 2017 would not be final and could be reviewed at any time, within the constraints of licenses granted by the MMO or The Crown Estate
- once discussions with the MMO and Premier Marinas start, PCDL will keep PBSC informed as to how they progress

Copies of two Fugro/EMU reports were subsequently supplied to the Club as they became available;

- "Pevensey Bay Hydrodynamic Study, ADP Investigation Report, August 2016", and
- "Trial Deployment of Nortek Signature, Pevensey Bay, 2016", 8th November 2016 covering a 90 day period when inshore wave heights were monitored.

All but one item discussed with PBSC refers to methods of working and is therefore with PCDL's gift to change. Moving the existing placement corridor to the northeast, was not and would require a variation to the FEPA license.

1.1 Revised delivery corridor

Several considerations were taken into account when identifying a suitable site for sand placement;

- The substrate of the location matched the material being delivered
- Access for the dredger at varying states of the tide
- Because overall sediment movement is to the northeast, maximum benefit is gained when placed closest to the harbour. Equally, it is more likely to be brought inshore and be of benefit to the defences the closer it placed to the beach in the first place
- Cost. The further sediment has to be taken from the marina, the greater the cost

1.1.1 Matching substrate

In this again the Channel Coastal Observatory proved immeasurably helpful. A multi-beam bathymetric survey completed in September 2013 identified a variety of substrates within the area of Sovereign Harbour. The dredge area immediately outside the marina is classified as Muddy Sand, as is the area to the northeast for about 1.5km. The placement area therefore had to be in this zone.

1.1.2 Dredger access

Dredging work in and around the marina is only carried between mid and high tide, so allowing for the vessel's draft is only required to around the -7mOD contour. Originally perpendicular to the coast the revised location is at an angle to reflect the direction from which the dredger will approach. Similarly,

with no sediment to be placed above low water spring tide, the revised corridor does not go so far inshore. By broadening the area between -4m and -6mOD, it will be much easier to spread delivery locations and hence reduce temporary rises in sea bed level.

1.1.3 Sediment Placement

Ideally sediment would be placed above low water and as close to the marina as possible to make it most beneficial. However, these parameters do not suit everybody. Premier do not want sand placed too close to the harbour in case it increases the speed at which sand bars reform. PBSC understandably do not want seabed levels unnaturally elevated so they interfere with sailing activities.

1.1.4 Cost

Whilst beneficial reuse of dredged materials is becoming increasingly important as a sustainability goal, there is currently no requirement for Premier Marinas as dredging client to actively seek out a beneficial use. To date all reuse solutions have been designed to be cost neutral, but the further along the coast away from the harbour the dredger has to go, the more likely increased costs will result. Although the disposal site is 2.5km away it is in deep water, allowing the dredger to sail much faster. Inshore sites are closer but depth limited, so sailing speeds have to be lower, potentially negating all benefit of being closer.

2 Revision of FEPA license L/2013/00110/8

After due consideration, the revised corridor shown in Figure 4 below was suggested;

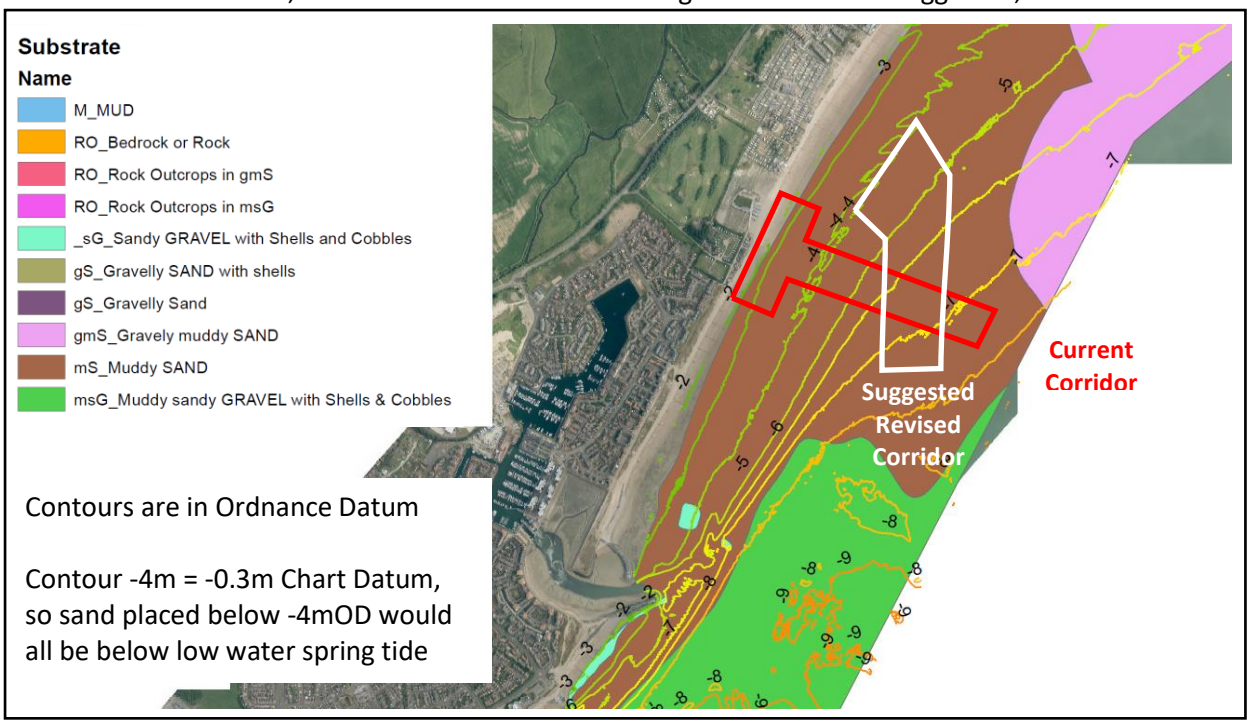

Figure 1: Suggested revised corridor for 2017

This image was emailed to PBSC Commodore Mark Doughty-Keen and President Gordon Bishop on 13th July and their response on 29th July 2016 confirmed the points in Section 1.3 above and that they had no objection to the proposed alternative.

This proposal was discussed with other stakeholders and consultees before precise coordinates were generated for a revised corridor and a request for a formal variation of PCDL's FEPA license being initiated.

Unaware that PBSC held its annual AGM in late November/early December, PCDL started the process of revising the corridor position with the MMO. However, on 15th December 2016, new Commodore

Adrian Peckham contacted PCDL to announce he had replaced Mark Doughty-Keen, and provided a formal letter from the Club asking that the corridor be moved as far east as possible within the prevailing "Muddy SAND" seabed type.

Consequently, a fourth version was hurriedly proposed, moving the eastern and northeastern corridor extremities to within 100m of where the seabed sediment changed to "Gravely muddy SAND", essentially moving as far northeast as possible.

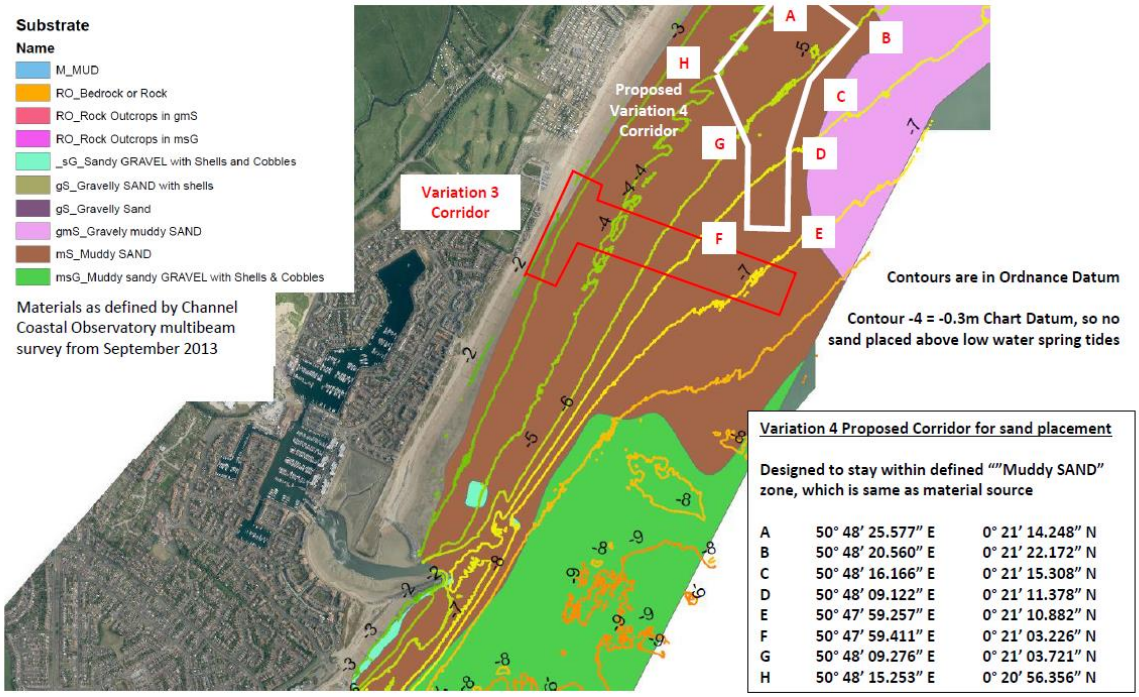

Figure 2: Fourth version of revised corridor to be used in 2017

A variation to PCDL's FEPA license 34001/080403/7 was issued on 5th May 2017.

3 Sand Placement Works

Initially receipt of the revised FEPA license was very close to the proposed start date for this year's works, but dredger Sospan Dau was then held at Dover, then suffered a mechanical problem, which led to a two week delay. Work finally started overnight on Friday 26th May with the final delivery being completed on Sunday 4th June.

The amount of dredging required each year is dependent on the weather experienced the previous winter, which affects how much sediment is driven into the marina's entrance channel. Experience suggests that the two types of material involved behave differently. Everything dredged from between the breakwaters and the lock gates is silt, and this seems to fill up by about the same amount every year. Sediment outside the breakwaters is sand formed into bars, the size of which vary, dependent on the intensity of winter storms. The yield of sand this year was 15,000m^3 compared to last year's 32,000m^3.

3.1 Bathymetric Surveys

Shoreline Surveys again undertook surveys of sand deposition areas both before and after dredging works. With a new area east of PBSC, three surveys were required; Pre and post surveys of the new area plus one of the old PBSC site. As the PBSC site was not being used this year, it was not important whether the survey was done before or after the new site. As it happens, it was included in Pre works survey and completed on Monday 8th May 2017. Although dredging works were completed during the

first week of June, it was not until Wednesday 12th July that a completion survey of the deposition site near 'The Sandcastle' could be completed.

3.2 Seabed Changes at PBSC

The placement site at PBSC has been used on and off since 2006, but was only used in earnest from spring 2015, when the placement site was extended seaward. It was then only used twice, in May 2015 and May 2016, before an alternative site 500m to the northeast was licensed. In that time around 50,000m^3 of sand was added to the seabed close to PBSC.

In order to ascertain changes through this period, base data from the Channel Coastal Observatory survey of autumn 2013 is compared to the July 2017 survey undertaken by Shoreline Surveys. Contour plots (0.1m interval) for both these surveys are shown, right, along with a comparison of height changes.

Monthly beach surveys taken over LW spring tides have always shown sand levels changing down to -3.5m at all times of the year. The 2013 survey shows a broad sand bar at -4.0m. Whilst the SW end of this doesn't seem to have changed much, the NE end shows an overall fall in seabed levels despite sand being added.

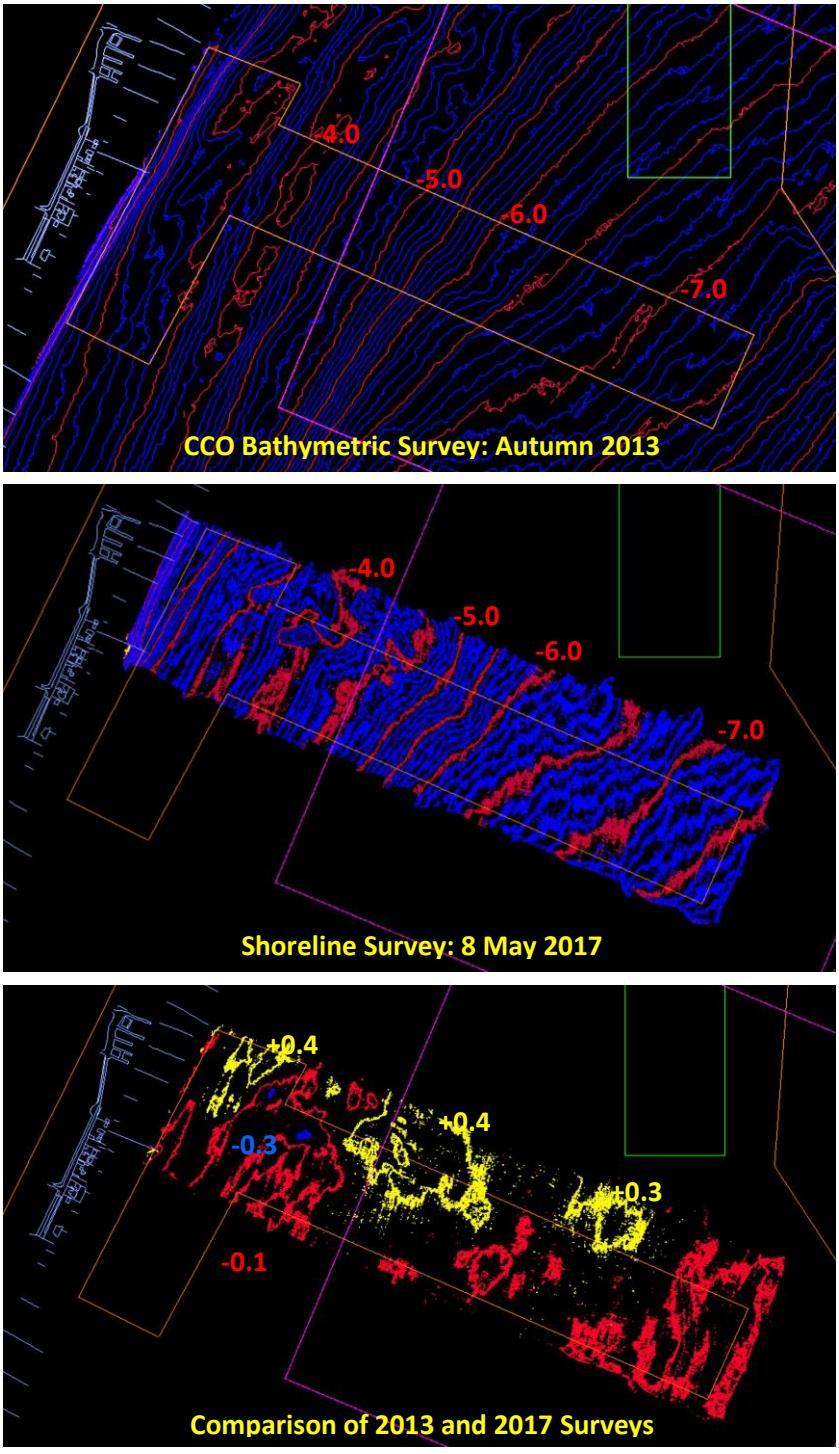

Figure 3: PBSC seabed surveys comparison 2013 - 2017

Landward of this, the intertidal sand bars will have formed, moved on and reformed many times during the intervening three years. A comparison of 2016 and 2017 surveys shows that the peaks formed as a result of 2016 sand placement had been smoothed by a year's worth of tides, with the highest points up to 0.7m lower than they were In summer 2016. In many cases the extent of this movement seems to have been relatively small. The level increase of +0.4m close to the -5.0m contour depth seems to suggest a northeasterly movement of only 100-200m. Perhaps more surprising is the +0.3m increase at the -6.5m contour

3.3 Seabed Changes at 'The Sandcastle'

Sand generated this year was half what it had been in 2016, and coupled with operational changes introduced to maximise the spread of material on the seabed, level changes were far lower than seen twelve months ago.

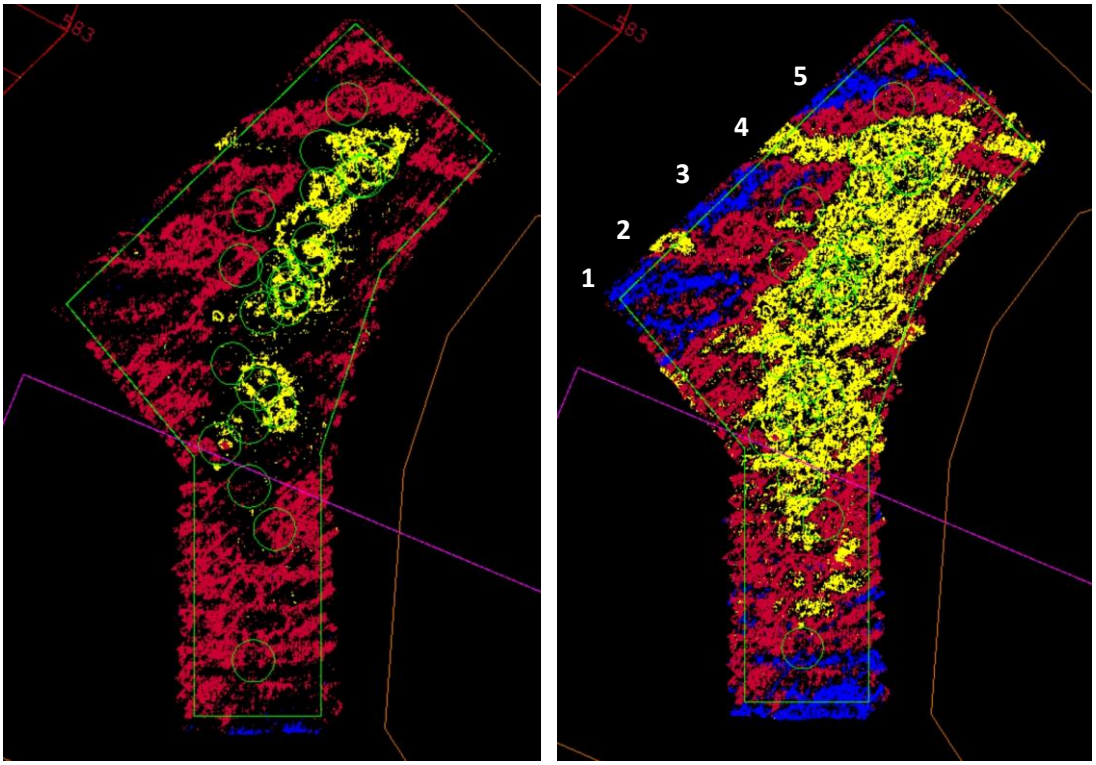

Figure 4: Comparison of Pre and Post sand placement at 'The Sandcastle' 2017

The two images above are of 'The Sandcastle' placement site, and both are comparative changes showing the difference between surveys before and after sand has been added. On the left the contour interval is 0.2m, whilst on the right it is 0.1m. Contour colours are similar to those used to illustrate sediment movement at PBSC, with blue showing a fall; red, no change; and yellow a rise in seabed levels.

Using a 0.2m contour interval provides sufficient information to indicate that a shallow ridge around 500m long was formed, but with data being sufficiently sparse for the location of individual loads to be visible, each plotted as a green circle. The maximum increase measured was just under 0.4m.

However, by using a 0.1m contour interval, there appears to be evidence of sand movement independent of any material added. In this instance it may be that sand bars are forming east west across the area and slowly migrating north (or possibly south). Because sand has been added between times, any natural pattern is unlikely to be completely clear, but points 1, 3 & 5 seem to represent troughs (i.e. sand has moved away between surveys), whilst points 2 & 4 represent ridges. It is

particularly interesting that the ridge at 4 seems to continue east up to and beyond the ridge of added material.

It also seems possible that this pattern is only visible because of the 10 weeks between surveys. Generally sand movement is relatively small, so it is only after an extended period that any movement is sufficient to be recognisable between surveys. On the other hand, leaving too long a gap between surveys could mean several series of movements have been and gone between times. It is therefore a delicate balance to judge at what interval surveys could be useful, particularly when having to factor in the occurrence of storms, when we know sediment movement in shallow water is increased.

3.4 Conclusion

Although this is the first time that sand has been placed at 'The Sandcastle' site there is little evidence that the works have had any impact on the local seabed. There seem to be three reasons for this;

- sand has been targeted further seaward than before (nothing placed above lowest lower water)
- sand quantities were half those seen in 2016
- sand was spread over a larger distance

With sand now placed some 500m east from where it was previously added, it will be interesting to see if topographical beach surveys at low tide are able to discern any long or medium term changes in sand terrace levels and volumes. Unfortunately, the further east one goes from PBSC, the greater the incidence of silt building up as mud holes on the foreshore in calm weather. This unstable ground makes physical remote surveys more difficult to complete accurately. Equally, medium and long term changes will not be identified overnight. As surveying technology either improves or becomes more cost effective, then increased quality and quantity of data becomes more possible.