Proposed Dredging at Bravo Jetty, Shellhaven, River Thames

September 2002

HR Wallingford

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INTRODUCTION

It is proposed to carry out, as part of the on-going long-term dredging commitment programme, a Water Injection Dredging campaign at Bravo Jetty (Figure 1), which is located on the north side of the Thames Estuary at Shellhaven, Essex. The dredging will be contained within the existing established berth box.

This assessment examines the historical changes that have taken place in the vicinity of Bravo Jetty since 1970. Using this information an evaluation of the potential impact of the proposed dredging programme on the morphology of the bed in the vicinity of the proposed dredging works has been carried out. The report also includes a brief review of the morphological development of the entrance to Holehaven Creek, over the same period of time

BACKGROUND

Starting at the western end of Sea Reach Bravo Jetty is the second of more than twenty riverside facilities that service, or have serviced, the oil related industrial complexes located on the north side of the river (Figure 1). Most of the jetties have required periodic maintenance dredging, the frequency and extent of the campaigns being a function of location and depth required. For the whole of the period covered by this assessment Bravo Jetty has provided the deepest water berth of the five Shellhaven Jetties. Bed depths have been maintained below –12m CD and on occasions, probably for a short period following a dredging campaign, below –14m CD (Figure 2). These depths compare to the average navigation channel depth in the area of between –10m and –12m CD. In common with other berths in the vicinity of the Bravo Jetty, the berth has been regularly dredged throughout the period reviewed. For more than the last ten years this has been done primarily by Water Injection Dredging (WID). Since the introduction of WID trailer suction hopper dredging is only used when the material primarily comprises the coarse fraction (the fines having been washed out by previous WID campaigns) and/or when the material is more consolidated. It is understood that dredging campaigns are carried out during ebb tides.

Bed depths generally at and for some distance from the berth have not been subject any large-scale change since 1970. In some cases depths have been maintained by maintenance dredging. There is an exception to this. Parts of the creek system that feeds from and to Holehaven Creek, the entrance of which is situated about 4.5 kilometres seaward of Bravo Jetty, is presently accreting (pers. comm. EA Anglian Region). This accretion has been particularly noticeable over the last twenty years in the upper creeks, a period that started with the construction of the flood protection barriers in Easthaven and Benfleet Creeks, coupled with the cessation of barge activity in Holehaven Creek. Because of the sedimentation that has occurred, especially in the creeks upestuary of Fobbing Barrier, control sluices have become buried and areas of saltmarsh within parts of the creek system have converted to grassland. The actual sedimentation processes are not understood but it has been suggested (pers. comm. EA Anglian Region) that the sediment source is from the Thames Estuary, with sediment entering the creeks on the flood tide, falling out of suspension at high water slack, and then not all of this sediment being eroded on the following ebb tide. Whilst this is a possibility it should be noted that increasing use of the upestuary barrier(s) as part of the management of the tidal flood control, and changes to land drainage strategies will have undoubtedly have influenced the movement of sediments within the creek system, especially in the landward creeks.

Accretion has also occurred at the entrance to Holehaven Creek. In the last ten years or so there has been a considerable build-up of sediment in the sub-tidal waters, which in turn has led to the encroachment of the creek's low water mark into the main body of the Thames Estausry. The processes by which this accretion has occurred have not been determined.

Recent work carried out as part of the London Gateway project has demonstrated that the berths along the river frontage between Mucking Flats and Canvey Island are subject to the deposition of suspended sediments (and bedload) moving along the river from west to east with deposition occurring at low water slack.

REVIEW OF PLA BATHYMETRIC DATA (1970-2002)

A PLA survey dated 1970 (presented on Figure 2) shows that bed depths at Bravo Jetty were between –12m and –14m CD and that there was a "ridge " between the Jetty and the deeper waters in the navigation channel where bed depths were in places less than –10m CD. By 1980 the "ridge" was no longer present, Figure 3 clearly showing the area where greater water depth was available. It is believed that the ridge was removed as part of a general deepening of bed depths in the vicinity of Bravo Jetty and the adjacent navigation channel. It is also noticeable that bed depths on the intertidal foreshore to the west of the Shellhaven jetty complex had risen by more than 1m between 1970 and 1980 and that there had been a loss of bed depth behind Bravo Jetty of more than 2m. In the years 1980 to 1998 there was generally little overall change to bed depths in the area examined – loss of bed depth being offset by increase to bed depth (Figures 2 and 3). At Bravo Jetty bed depths fronting the structure were in excess of –14m CD possibly following a dredging campaign. By 2002 whilst there had been a loss of bed depth at the upstream Alpha Jetty bed depth was maintained at Bravo Jetty (Figure 4). Offshore bed depths had changed by +/-2.0m primarily due to areas of deep water being distributed slightly differently. The overall bed depth was similar to those present in 1998. Further accretion had occurred on the adjacent upstream intertidal area and more notably in the upstream subtidal waters.

ASSESSMENT OF THE IMPACT OF DREDGING

It is evident from the review of the bathymetric information that bed depths in the vicinity of Bravo Jetty and generally in Upper Sea Reach have varied considerably almost everywhere. Dredging campaigns carried out over the years at both the Shellhaven Jetties and in the navigation channel off Lower Hope Point will have contributed to the changes. Whilst no long-term change can be identified it can reasonably be concluded that without dredging bed depths at Bravo Jetty and the jetties adjacent to it would not be as deep as they are at present.

Overall

The impact of the proposed dredging campaign will have little impact on the hydrodynamic, morphodynamic or sediment regimes in the vicinity of the proposed works. The required dredged depth at Bravo Jetty is the same or very similar to that that achieved during previous campaigns.

THE IMPACT OF THE WORKS ON HOLEHAVEN CREEK

In the subtidal waters fronting, and in the intertidal areas at the entrance, to Holehaven Creek accretion has been ongoing for more than twenty years. Analysis of the information presented in Figure 5 shows that the areas considered for comparison of bed depths above 0.0m CD are similar, between 1970 and 1998 (6% increase). The volume of bed sediments above a 0.0m CD plane cannot be similarly described, the volume during the same period having increased from 317,654m^3 to 487,207m^3 (an increase of 53%). This corresponds to an overall bed level rise of 0.7m (0.023m/year). Data obtained in 2001, although not directly comparable provide evidence to suggest that this process is continuing.

It is not anticipated that this accretion process will be changed as a consequence of the proposed dredging works. The risk of any consequential slumping of the seabed in this area is therefore minimal. The integrity of the processes acting on the seabed in the vicinity of the entrance to Holehaven Creek will be unaffected.

The proposed dredging works will have any impact upon the reported bathymetric change that is occurring at the landward end of Holehaven Creek or within the creeks that flow into Holehaven Creek. A separate study would be required to identify the present and projected future bathymetry of Holehaven Creek, it's confluence with the River Thames and it's network of associated channels.

CONCLUSIONS

It is reasonable to conclude from the information presented and assessed that there is neither evidence of maintenance dredging at the Bravo Jetty causing detrimental erosion of bed sediments in or at the entrance to Holehaven Creek, nor an obvious mechanism by which a pattern of widespread erosion could occur.

It is not anticipated that the proposed works will have any impact upon the reported bathymetric change that is occurring at the landward end of Holehaven Creek or the creeks that flow into Holehaven Creek. There is no expectation, therefore, that there would be any widespread 'slumping' affecting the seaward end of Holehaven Creek as a consequence of the proposed WID maintenance dredging at Bravo Jetty.

HR Wallingford
18 September 2002

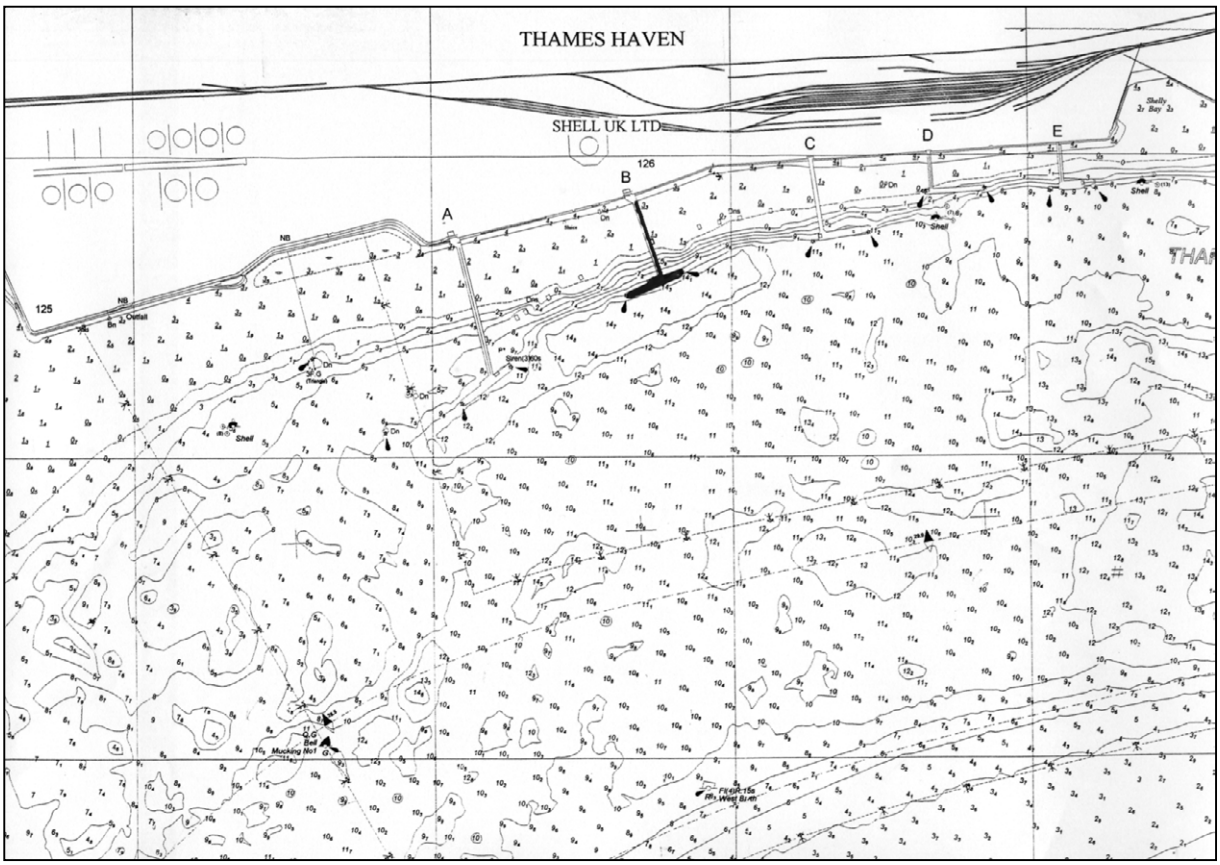

Figure 1 Location of Bravo Jetty

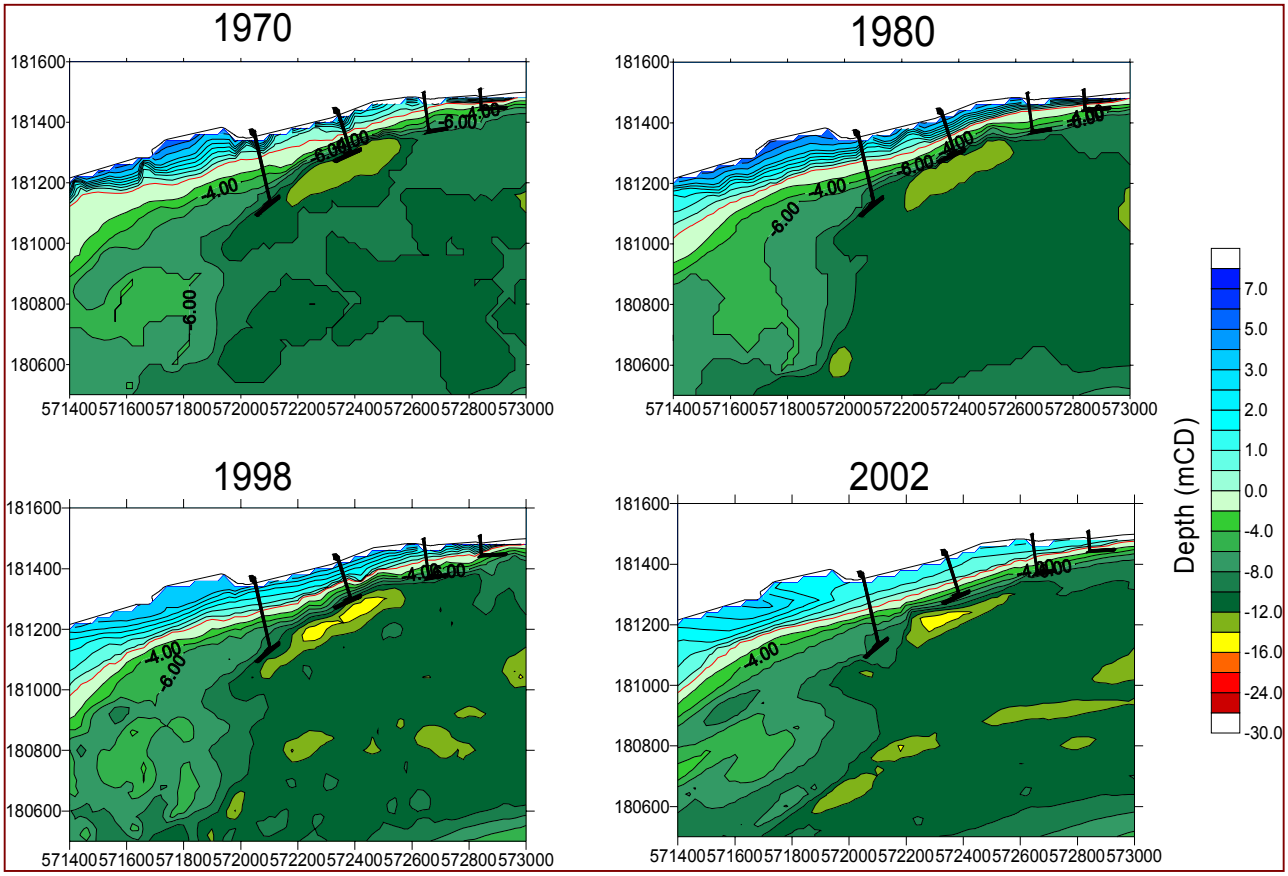

Figure 2 **Bathymetry from PLA Chart 340**

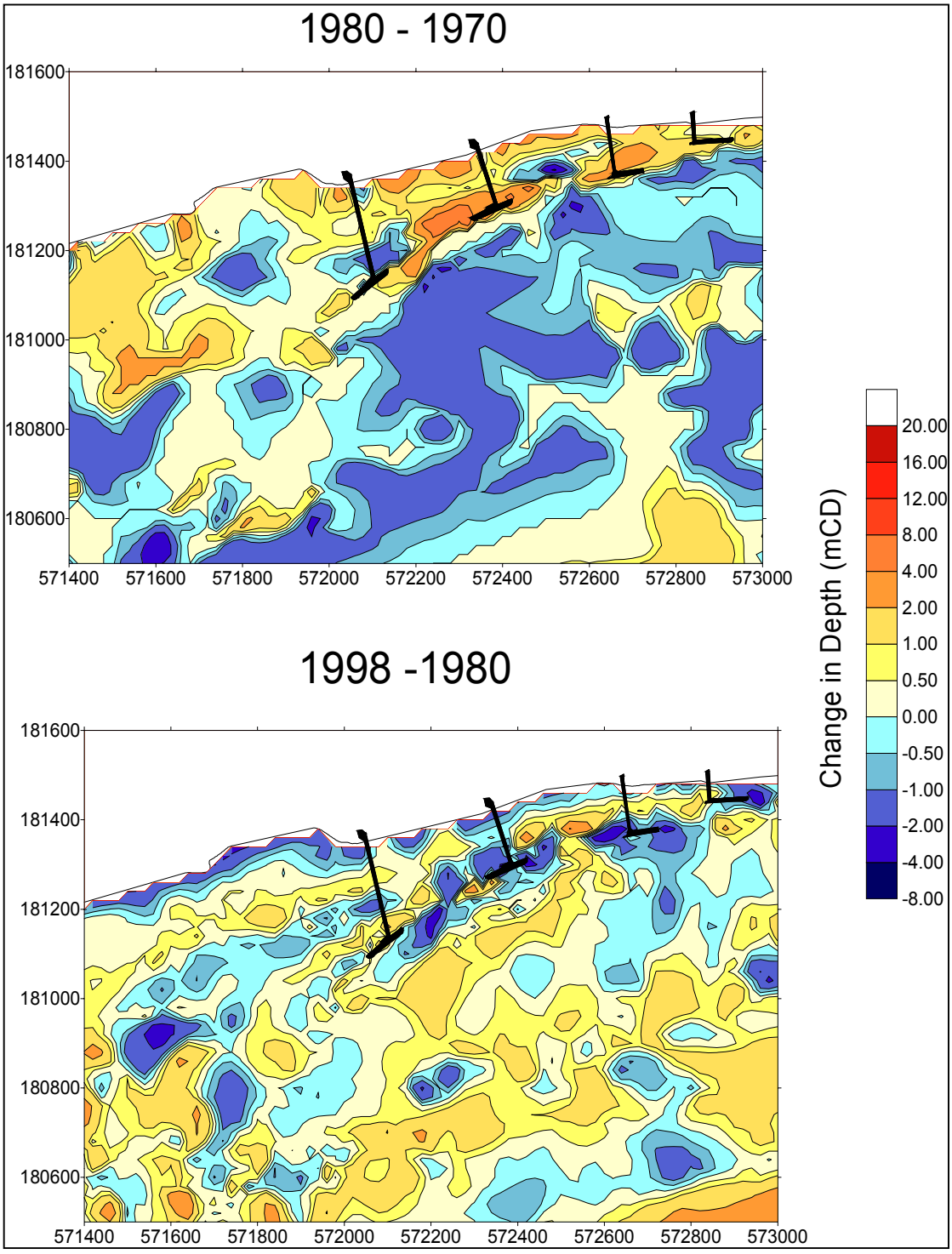

Figure 3 **Changes to bed levels (data source PLA Chart 340)**

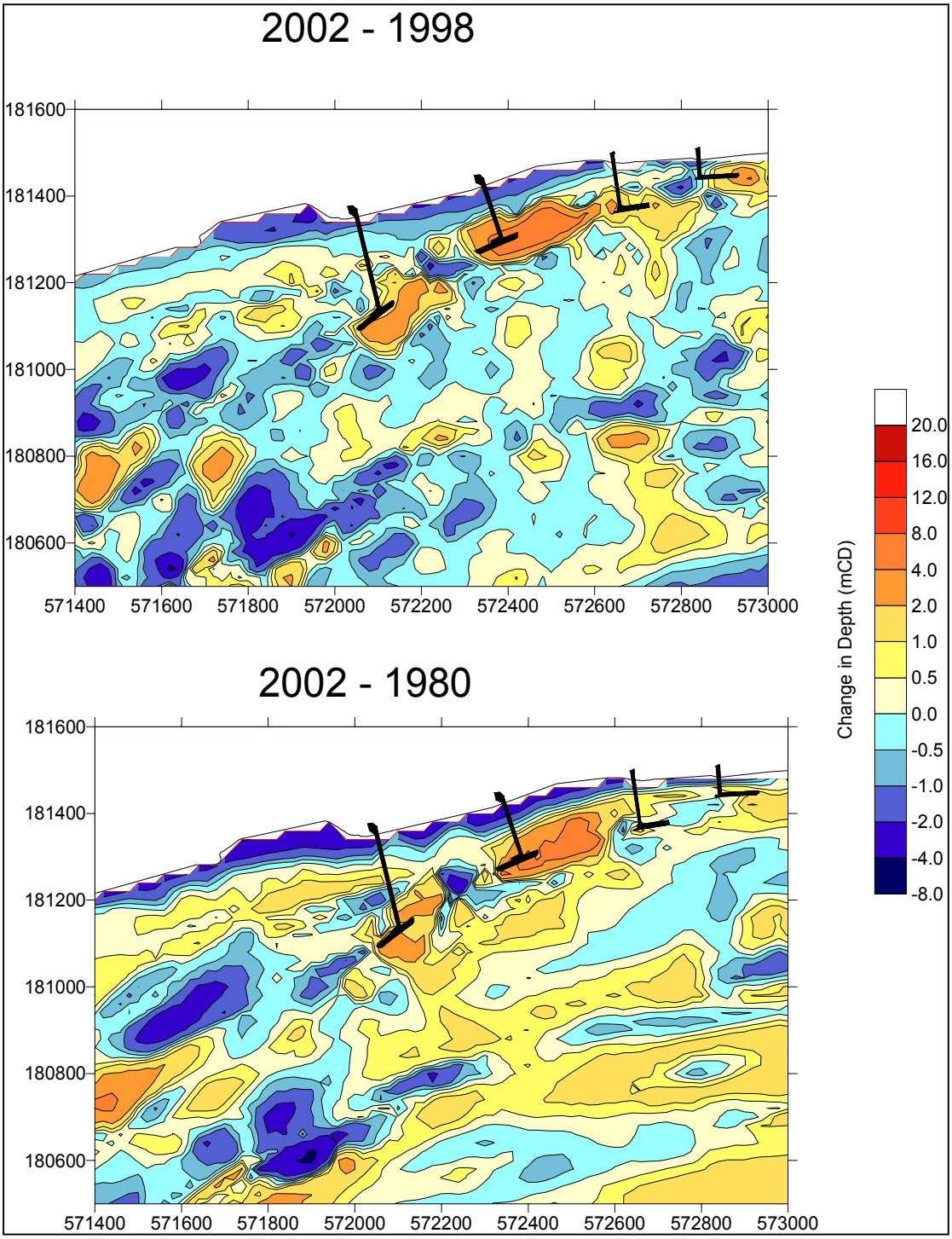

Figure 4 **Changes to bed levels (data source PLA Chart 340)**

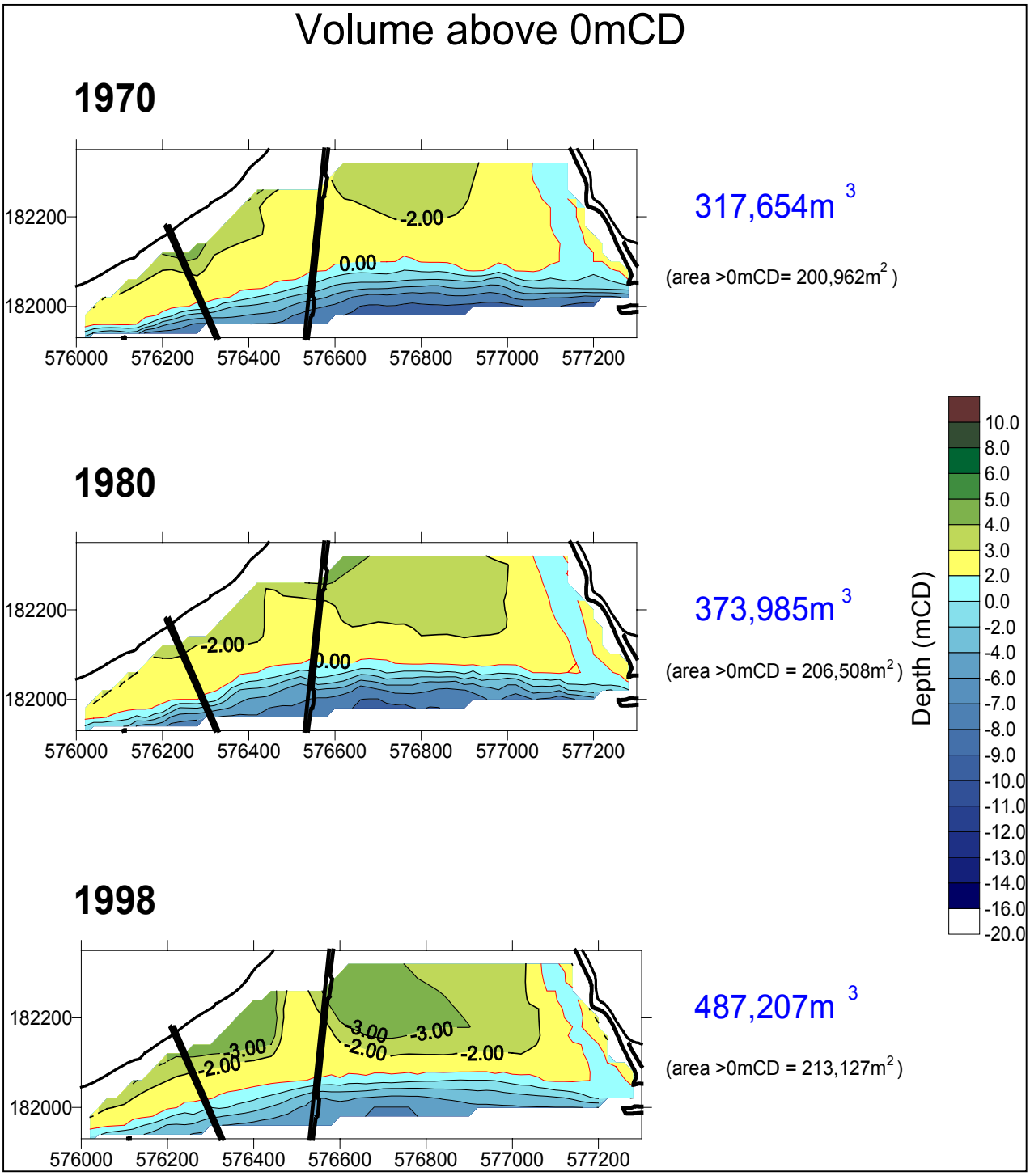

Figure 5 Volume and are change in entrance to Holehaven Creek 1970 - 1998