# Criteria for the Depths of Dredged Navigational Channels

Marine Board
Commission on Engineering and Technical Systems
National Research Council

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Panel on Criteria for Dredged Depths of Navigational Channels

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somewhat sinuous, it is more difficult to navigate than a channel with longer tangents. Commercial or recreational needs often indicate the desirability of extending a channel into the upper limits of the estuary, or into coves, tributary streams, or interior basins, but it often happens that such channels shoal much more rapidly than the existing downstream channel.

*Channel depth.* The construction of a channel that is appreciably deeper than the natural depths along the course of the thalweg, or the deepening of an existing channel, may engender a difficult maintenance problem. After the depth required for safe navigation of the design vessel has been determined, it may be found that such a channel cannot be justified. Consideration will then be given to channels of lesser depths that would be suitable for the design vessel when advantage is taken of the tide. The governing considerations frequently are the natural depths of the thalweg, the depths beyond the limits of the proposed channel, the magnitudes of the changes in the cross sections of the estuary if the proposed channel is constructed, and the kinds of material available in the waterway beyond the limits of the channel for transport into the channel by density flows and by the tidal currents. For example, the shoaling rate of a channel of a given width and 40-foot depth located in a relatively very wide waterway may not be appreciably greater than that of a channel of the same width but 37 feet deep. The resulting cross sectional areas created by the two channels may not be significantly different. On the other hand, if the range of tide is large it may be possible to serve the design vessel reasonably well with a channel depth of 30 feet instead of the optimum of 40 feet. In this case, the resulting cross sectional area may be sufficiently closer to the natural or pre-improvement cross sectional area to effect a considerable saving of maintenance costs. Similarly, if the natural depths along the thalweg are 10 feet and a channel of 40-foot depth is the optimum, it is unlikely that there would be much difference in maintenance costs between a 40- and a 37-foot channel, other factors being equal, but the difference could be appreciably between 40- and 30-foot channels.

Channel depth sometimes has a profound effect on the distribution of shoaling as well as the rate of shoaling. For example, a channel 40 feet in depth may cause the bulk of the shoaling to occur in a place where there are no disposal areas, while a channel depth of 35 feet may shift the location of the heaviest shoaling to a location downstream, where disposal areas are plentiful, or the effects of the two depths could be reversed from those discussed here. Distance of the disposal area from the bulk of the shoaling is, of course, a factor in the cost of maintenance. Channel depth helps determine the location where the upstream predominance of bottom currents over downstream bottom currents occurs. References 8 and 15 should be consulted for additional information on this matter.

*Channel width.* While channel width and channel depth are factors of equal significance insofar as cross sectional area is concerned, it appears that inadequate depths are much more hazardous than inadequate widths, and they cause greater delay to vessels. On the other hand, a choice between the provision of a channel of width adequate to permit two-way traffic and inadequate depths at low tide, as compared with a channel suitable for one-way traffic of design vessels and of adequate depth even at low tide, must take cognizance of the possibility that the greater depth may cause a shift in the location of the bulk of the shoaling.

*Channel alignment.* Channels should be located as closely to the alignment of the thalweg as is practicable, keeping in mind that the larger vessels cannot navigate the sharp bends that sometimes are characteristic of the alignment of the thalweg. In cases where there are two deep areas of approximately equal depth, the relative merits of each should be considered before selecting one of them for improvement. When it is found that the alignment of a channel located on the thalweg would be too sinuous to serve the design vessel reasonably, consideration will be given to the use of training works having for their pur-