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Design of underwater embankment of soft soil

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7.1 Overview

The present chapter illustrates the design of the underwater sand embankment on soft soil (dredged material). The water depth to the sediments level is about 20m. As detailed in the previous chapter, the soil profile at the site consists of an upper soft layer overlying sand and a deep tertiary clay layer.

Several alternatives have been evaluated. More details one these alternatives can be found elsewhere (Verástegui, 2001). Figure 7.1 illustrates a scheme of each of the options already studied:

- Alternative A: The embankment implements full improvement at the toe of the slope on the open river side while no improvement is specified for the toe at the dry dock side.
- Alternative B: The embankment comprises full improvement at the open river side and partial improvement at the dry dock side.
- Alternative C: In this configuration, the geometry slightly changes, partial improvement of the soft material is considered on both toes.
- Alternative D: The embankment has the same configuration as Alternative C except for the absence of improvement at the toe on the dry dock side.
- Alternative E: All the soft material is removed and the sand embankment is directly founded on the Boom clay (figure 7.1). Technically this could be qualified as a good solution, however, one must take into account that the removal and new disposal of huge volumes of dredged material may be a serious environmental issue.

The characteristics of the problem and the conditions of the foundation soil demanded improvement of the foundation (by deep mixing techniques) soil on the one hand and construction in stages on the other hand in order to prevent early instability. Moreover, restrictions imposed on the total time of construction led to adopt extra reinforcement elements such as geotextiles in the embankment body.
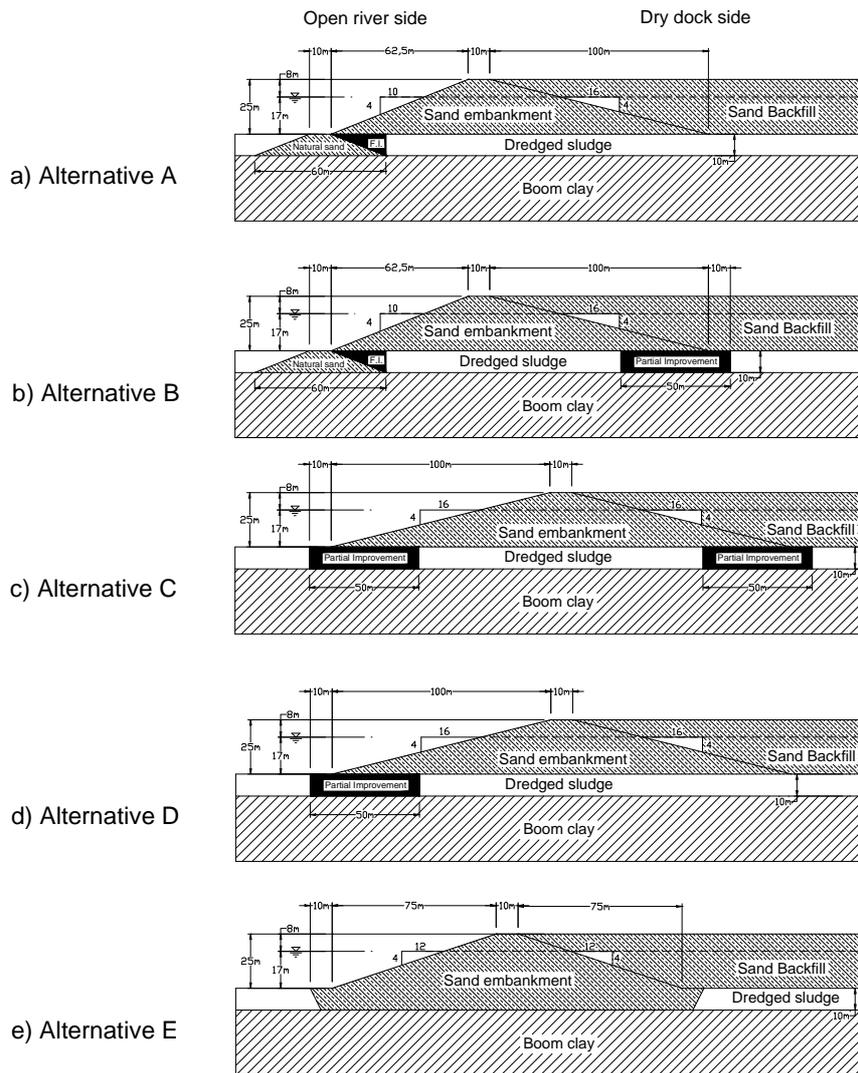
Fig. 7.1. Previously studied design options