

GEOLOGIC FRAMEWORK AND HARD MINERAL RESOURCES OF PETIT BOIS PASS AND ADJACENT INNER SHELF, MISSISSIPPI-ALABAMA

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ABSTRACT

Approximately 200 line-km of high-resolution seismic profile data, 24 vibracores, and several C¹⁴ samples form the database to delineate the geologic framework and potential hard mineral resources of the Petit Bois Pass area. Petit Bois Pass is a natural tidal inlet system located between Petit Bois and Dauphin Islands at the Mississippi-Alabama state line. The inlet is 8.2 km wide with the main inlet channel located to the east adjacent to Dauphin Island. The inlet throat depth is 6.7 m below mean low water (MLW). The morphology of the main tidal channel is mixed energy, which is reflected by the absence of a flood-tidal delta and a moderately developed ebb-tidal delta. The largest percentage of sediment occurs directly between Dauphin and Petit Bois Islands. More recently, however, a secondary tidal channel and associated ebb-tidal delta are developing to the west of the main tidal inlet channel. On the adjacent inner continental shelf, several shoreface sand ridges occur and are oriented at about 40° in relation to the barrier shoreline; axes of the sand ridges have azimuths of about 120°. The origin of these ridges may be related to the evolution of Petit Bois Pass and other inlets in the area.

Tidal inlets are naturally occurring, concentrated sinks of sediment captured from longshore transport. In transgressive barrier island settings, available mechanisms for concentrating sediment are restricted almost exclusively to tidal inlet systems. However, the preservation potential of the tidal inlet system during transgression is limited except for the lower part of the tidal inlet channel and the ebb-tidal delta. The remainder of the inlet system eventually is removed by shoreface erosion as the coastal system translates landward. Therefore, tidal inlets and the adjacent transgressed shelf areas are primarily locations for potential hard mineral resources. In the study area, primary hard mineral resource targets include tidal inlet channels, flood-tidal deltas, ebb-tidal deltas, shoreface sand ridges, and fluvial channels.

Petit Bois Pass appears to be located in an antecedent topographic depression that is cut into underlying pre-Holocene deposits. Pre-Holocene deposits form the eastern core of Dauphin Island where they are subaerially exposed. The pre-Holocene surface dips to the west, providing a platform for the narrow, elongated Holocene spit of Dauphin Island, and crops out on the shoreface at the western end of Dauphin Island to -8 to -9 m below MLW. Farther to the west, core data from the main inlet channel of Petit Bois Pass indicate only Holocene sediments occur suggesting that the pre-Holocene surface is > 11 m below MLW. This > 11 m trend continues under western Petit Bois Pass. It appears that Petit Bois Pass may occupy the eastern side of an antecedent Pascagoula River valley.

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