

Breakwaters, Detached

Detached breakwaters, also referred to as offshore breakwaters or segmented breakwaters, are shore-parallel structures built in shallow nearshore environments. Located just offshore, these structures reduce erosion and protect beaches by reducing wave action. As the waves approach the shore, the breakwaters reduce the energy of the waves, creating a calm environment on the landward side of the structures. This environment is ideal for the deposition of sediment which in turn aids in retaining and enhancing beach width and thickness.

Detached breakwaters are well suited for shallow areas where sand is present in the nearshore. These structures also function well in areas where the cross-shore current, or shore-perpendicular transport of materials, is stronger as the structures will provide greater protection of original beach material while capturing new sediment entering the system.

Constructed out of armor stone or precast concrete block placed at a slope, detached breakwaters appear as short, usually shore-parallel structures just offshore of a beach or connected to the land via sediment build-up. When the sediment extends from the shore to the breakwater, the area of beach connecting the land and breakwater is referred to as a tombolo. When the sediment does not extend completely to the breakwater, the area of sand is referred to as a salient. While sand may naturally build up behind the breakwaters, pre-filling and periodic nourishment is beneficial typically required by regulatory agencies.

When constructing a detached breakwater or series of detached breakwaters, consideration must be given to the proper placement of the structure(s). If a breakwater is placed too close to shore, or if the series of breakwaters are constructed too close together, an excess of sand may be captured landward of the project. While this may seem ideal in creating a beach, the trapping of sand at the project site creates a loss of sand downdrift, potentially leading to increased erosion in the affected areas. To counter this, detached breakwater projects include the placement of sand, or pre-fill, during construction. The pre-fill volume of sand is equivalent to the amount that is estimated to be captured by the structure under average water levels.

A correctly designed breakwater system will result in the formation of a salient which allows littoral drift to flow downdrift between the breakwater and the sand beach. An incorrectly designed breakwater system will result in the formation of a tombolo. Tombolo formation will often impede the

flow of sand in the downdrift direction, resulting in an excess build up of sand on the updrift side and starving downdrift areas of sand. Alternatively, incorrectly designed breakwater systems could also prove ineffective in protecting a beach area if the resulting beach width is inadequate to provide erosion control.

Maintaining detached breakwaters requires monitoring of any movement of the armor units and re-positioning and/or replacement of armor units when necessary. Monitoring of the beach is also recommended and may be required by regulatory agencies. Occasionally, addition of sand between the structures and the shore may be required, or if an excess of sand is found in the beach area sand bypassing may be needed.

The design and construction of detached breakwaters requires the services of a professional engineer and contractor. The required beach nourishment or pre-fill will also be conducted by a contractor.

