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Bald Head Island, N.C. Beach Monitoring Program

Monitoring Report No. 15 (April 2016 to May 2017)

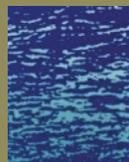
Prepared for:
Village of Bald Head Island

Prepared by:
Olsen Associates, Inc.
2618 Herschel Street
Jacksonville, FL 32204
(904) 387-6114
(Fax) 384-7368
olsen-associates.com
C-1468

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olsen
associates, inc.

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EXECUTIVE SUMMARY

The most recent Wilmington Harbor Inner Ocean Bar maintenance dredging of Bald Head Shoal Channel Reaches 1 and 2, as well as the Smith Island Channel segment occurred between January and April 2015. Approximately 1.33 Mcy of sand excavated during that operation were placed at Bald Head Island along South Beach. For this project, the Village of Bald Head Island was required to contribute \$945,000 in order to have disposal sand placed more westerly so as to benefit a terminal groin project scheduled to begin immediately following the completion of the federal contract.

Between November 2000 and April 2015, Bald Head Island had received about 7.0 Mcy, mol of sand from the initial widening/deepening and four (4) subsequent maintenance dredging operations for the Wilmington Harbor Navigation Project entrance channel. That work was performed in accordance with the original Wilmington Harbor Sand Management Plan. In addition, the Village was required to place at their expense approximately 1.85 Mcy of sand in the form of an “engineered beach” intended to offset the adverse consequences of a channel maintenance event contracted to occur with an Oak Island alternate disposal location. Prior to that, the Village constructed a 47,000 cy fill along West Beach. In 2012, the Village had constructed a Post-Irene emergency fill comprised of 138,000 cy of sand dredged from Bald Head Creek. Accordingly, in the net Bald Head Island has experienced a total estimated sand placement volume of approximately 9.1 Mcy since November 2000.

Conversely, the *gross* volumetric sediment *loss* over the November 2000 to May 2017 monitoring timeframe is conservatively computed at -6,449,600 cy, or approximately -390,900 cy per year – on “average”. The assignment of an *average annual* long-term rate of sand loss at Bald Head Island however, has *not* necessarily been a meaningful indicator of navigation project impact. Such an “average rate” is often temporally biased by periods of beach fill equilibration, groinfield effectiveness, major storm events (such as Hurricane Matthew), the occurrence of episodic destabilizing dredging events in close proximity to the island, as well as other physiographic phenomena temporally affecting annualized quantities of alongshore sediment transport – from Bald Head Island.

Even though the latest May 2017 monitoring survey documents some 2.633 Mcy of additional sand within the island’s littoral system since November 2000 (*after* fill placement of over 9 Mcy), historical surveys have routinely documented an area of S. Beach with large

net losses (nearest the inlet) and large *net gain* (eastward thereof). Hence, it would be neither accurate nor technically acceptable to conclude that Bald Head Island as a whole has experienced a net “improvement” since November 2000 when discrete sections of shorefront nearest the navigation channel have been shown to lie hundreds of ft landward of their location prior to the pre-harbor deepening project benchmark condition survey of November 2000.

Comprehensive beach monitoring over the past 17 years by the Village of Bald Head Island has resulted in the conclusion that sand placement alone has *not* served to successfully offset navigational channel impacts to the west end of South Beach resulting in chronic rates of erosion and consistent northerly recession and migration of the Point. The net result of these phenomena has been accelerating erosion and ensuing threat to public infrastructure, homes, protective dunes and wildlife habitat.

As a result, the Village was ultimately forced to “change the existing dynamic” by constructing a single terminal groin designed to complement the placement of beach fill at a documented South Beach erosional “hot spot”. The project was being performed in 2 Phases. The structure was intended to serve as a “template” for fill material placed eastward thereof on South Beach. The Phase 1 1,300 ft. long terminal groin (completed in Nov. 2015), was designed as a “leaky” structure (*i.e.* semi-permeable) so as to provide for some level of sand transport to West Beach and portions of the Point (located northward of the groin stem). It can reasonably be shown that the construction of such a structure should ultimately have some level of direct benefit to the abutting navigation channel. Additional monitoring data required by Permit will assist in the quantification of the terminal groin’s effects on littoral processes and resultant shoreline configurations – both updrift and downdrift. Such an evaluation will take a number of years and will necessitate multiple sand fill applications until some level of dynamic equilibrium of the post-structure shoreline can be defined.

Although not directly impacted by long-term navigation channel improvements and maintenance of the Cape Fear River entrance, the Village Council elected to initiate monitoring of the East Beach shorefront at Bald Head Island in November 2008. The limited nature of survey results at that location continues to preclude any meaningful long-term conclusions. However, it is observed at this juncture that East Beach principally undergoes strong seasonal variations of beach width and profile volume to a large degree dependent upon storm frequency and intensity as well as the ever-changing configuration of the Cape Fear spit. The current May 2017 survey data show a net shoreline accretion of approximately 42,700 cy (above elevation -16 ft NGVD) throughout the 6,000 ft East Beach shoreline lying northward of Cape Fear over the last 12 months.

Unfortunately, recent configurations of the Cape Fear spit deemed beneficial to East Beach have resulted in a high rate of erosion and duneline recession along the easternmost section of South Beach – directly seaward of the Shoals Club facility. For example, between 2000 and 2017, the average MHWL erosion rate at this general location has been about -13 ft/yr.

In 2017, the Village was required by Permit to perform the 7th year of monitoring for the Jay Bird Shoals borrow site utilized to construct the non-federal 1.85 Mcy beach fill constructed in 09/10. The computed change within the monitored survey area (excavated and unexcavated) was a *net* gain of approximately 611,600 cy over the 86 month monitoring period following project construction. The next scheduled survey will occur in 2019 and additional sand gain is expected.

The Bald Head Creek borrow area was dredged in 2017 for purposes of fill placement at Row Boat Row and West Beach. Prior to the excavation of some 55,000 cy, the borrow site had accreted by approximately 78,000 cy.

During the current monitoring period, the Village initiated construction of two (2) detached rock breakwaters located north of the marina entrance. The original project proposed four (4) structures. To receive permission to construct during the “moratorium”, the Village was required to reduce the project scope. It is anticipated that final acceptance of the project will occur in early August 2017.

In early 2017, the Village submitted permits and associated studies and environmental analyses necessary to develop a borrow site located within Frying Pan Shoals. The purpose of such a borrow site would be to ensure compliance with Permit conditions necessitating the maintenance of the updrift fillet associated with the 2015 terminal groin project. It is currently anticipated that the borrow site will be needed for limited sand placement along South Beach in 2018/19 between the terminal groin and Sta. 134+00. This conclusion results from the scheduled hiatus in the disposal of channel maintenance sand on Bald Head Island by the Wilmington District, USACOE. Pursuant to the existing tenets of the Wilmington Harbor Sand Management Plan, all beach quality channel maintenance material excavated in 2018 will be placed at Oak Island. Any future comprehensive “engineered beach” renourishment project by the Village along the South Beach shorefront may likewise need to consider ongoing erosional processes near the Cape Fear spit seaward of the Shoals Club facility.

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