

COASTLINE DESIGN, P.C.



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FLAG POND LIVING SHORELINE PROJECT

PERMIT REPORT

May 15, 2018

1.0 Introduction

Flag Ponds Nature Park (Flag Ponds), is located at 1525 Flag Ponds Parkway, Lusby, Maryland and fronts Chesapeake Bay. The shoreline has undergone extensive erosions due to wind-driven waves and a rising sea level. A Maryland Department of Natural Resources (DNR) assessment determined significant erosion is occurring and possible remedies could include a variety of shoreline restoration and stabilization efforts. The Shoreline Conservation Section of DNR proposed a conceptual plan for a segmented breakwaters with beach sand replenishment on about 500 feet of coast that lies at the northern end of Flag Pond Nature Park. Any design developed for this proposal is expected to have a functional and economic minimum life expectancy of 15-years against the 25 year storm event. The proposed project has been design to accommodate these elements

2.0 Site Setting

Flag Ponds Nature Park is located on Chesapeake Bay in Calvert County, Maryland (Figure 1). The project shoreline resides along the northwest corner of Flag Ponds Nature Park and extends about 500 feet southward from the boundary with Long Beach residential community. This boundary is defined by a “terminal” groin and will be used as a reference to shoreline change. The project shore occurs within a larger shoreline reach from Flag Harbor and what we’ll call Flag



Figure 1. Location of Flag Ponds Nature Park.

Pond Spit. This reach of shoreline has had significant changes over the years.

In 1848, Flag Pond Spit was about 2,000 feet southeast of the present day Long Beach terminal groin (Figure 2), and the shoreline about 840 feet offshore of the present day project shoreline at Flag Pond Park. Flag Harbor and the Long Beach community had not been established at that time, but the geomorphic nature of Flag Pond Spit indicated a net alongshore direction of sediment transport to be southeastward or down Bay. In 1848, boat sheets (maps) show a massive shoal off Flag Pond with a sand barrier and wetlands with isolated ponds, similar as today's shore scape but extending further offshore. Long term bluff erosion up Bay of the Flag Pond Spit was the source of sand material to the littoral system. Long Beach community was established on the up Bay side of the spit in the 1940s.

By 1942, Flag Pond Spit had migrated southeastward 3,400 beyond the Long Beach terminal groin (Figure 2), about 1,400 feet past the 1848 position, an accretion rate of about 15 ft per year. The shoreline off the project coast had receded about 530 feet, an erosion rate of about 5.6 ft/yr. Flag Harbor, north of present day Long Beach, had not been created at that time, but some elements of development may have begun along the Long Beach water front. Flag Harbor jetties and dredging were constructed in 1947 (Clark *et al.*, 2002). This was and still is a significant littoral barrier which entrapped sand on the north, updrift side creating a wide beach. This wide beach offered shore protection to the base of the eroding bluffs north of Flag Harbor and they eventually began to stabilize. However, this impacted the downdrift coast by "starving" the area of sand. In response, the Long Beach community had to install revetments and groins to protect their shoreline from erosion over time.

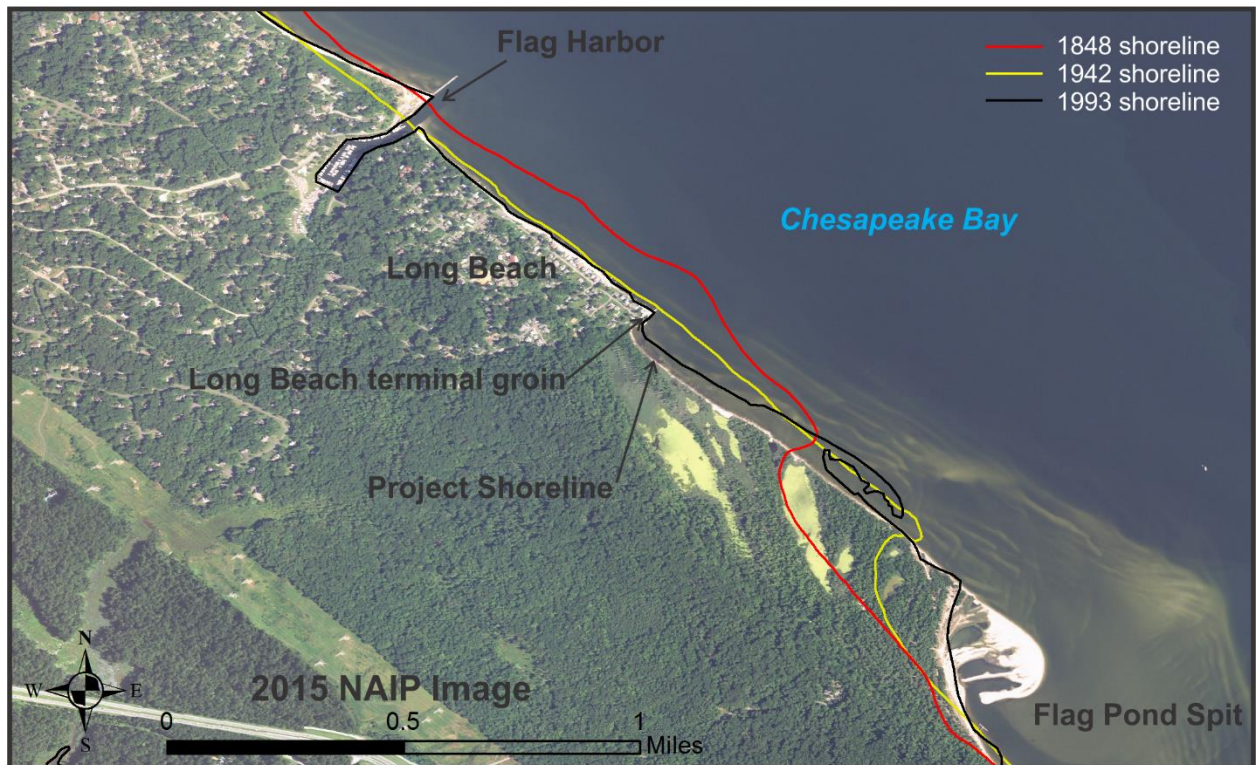


Figure 2. Shore change through time at Flag Ponds Nature Park. Shoreline data obtained from Maryland GIS Data Catalog.

The 1993 shoreline positions for the reach illustrates these impacts (Figure 2). The Flag Pond Spit had “stalled” 550 ft beyond the 1942 position, but another spit had formed just updrift of the 1942 spit. This feature is separated from the main shoreline and shows that as the spits grow and re-attach, ponds form on the lee (landward) side. The shoreline at the project shoreline had eroded another 310 ft between 1942 and 1993 at a rate of 6.1 ft/yr and became bounded on the northwest by the Long Beach terminal groin.

Today, 2015 imagery, the project coast has eroded another 120 feet since 1993 (Figure 2), and the Flag Pond spit has grown another 2,000 feet from the 1993 feature which had attached to the coast by then and added to today’s spit growth. The project shoreline today occurs as an erosional, low, wooded upland with numerous trees fallen alongshore (Figure 3). The condition continues down bay for another 3,500 feet before reaching the updrift end of the present day Flag Pond Spit. The old ponds that formed behind previous spit positions are being breached and infilling with sand. The swampy lowlands that formed behind the Flag Pond spit feature over are composed of fine grained material, easily eroded.

3.0 Flag Ponds Nature Park: Hydrodynamic Setting

The project shoreline is oriented approximately NW-SE with long fetch exposures to the N, NE, E and SE of 37, 13, 8, and 30 miles, respectively. Although partially protected from the north by the Long Beach terminal groin, wave diffraction around the end of the groin can still significantly impact the project shoreline. The local wind/wave climate is a function of fetch exposure and nearshore bathymetric gradient. The extensive shallow offshore also will attenuate incoming storm waves and reduce deep water wave heights and approaching wave lengths.



Figure 3. Present condition of Flag Ponds Nature Park shoreline (2017).

Seasonally the local wind wave climate is illustrated by wind data from Patuxent Naval Air Station (Figure 4). The northeast storms will impact the project shoreline with strong northeast and north winds (two highest frequency directions) on top of the associated storm surge. Storm surge frequencies are shown in Table 1. The storm berm elevation is between 3.5 and 4.0 ft MLW. This about the 25 year storm event, which is probably the minimum beach fill elevation at the upland bank interface.

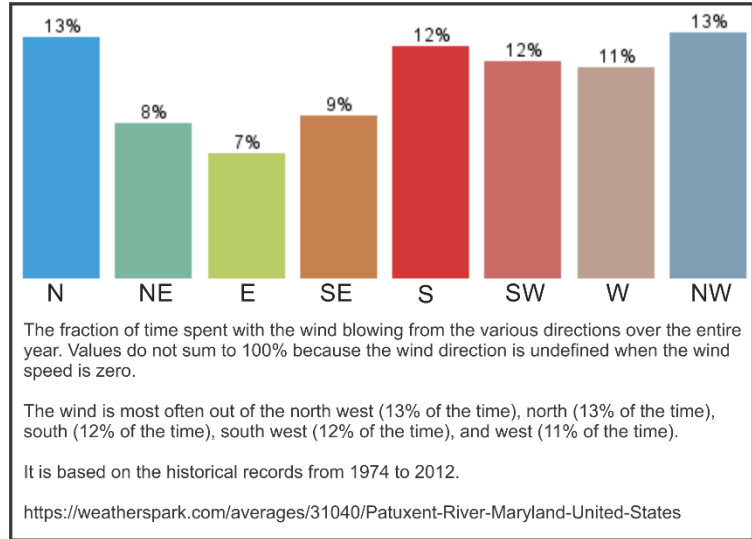


Figure 4. Analysis of wind direction between 1974 and 2012 by Weatherspark.com.

Table 1. Storm surge frequency (FEMA, 2014) as well as tide range and sea level trend (NOAA, 2017).

10-year	3.9 ft MLW
25-year	4.2 ft MLW
50-year	4.5 ft MLW
100-year	4.7 ft MLW
Mean Tide Range	1.0 ft
Sea Level Trend	3.68 mm/yr

4.0 Design Elements

The project design is a stable beach system that consists of 3 headland breakwaters, beach fill and high marsh plantings. The northernmost breakwater will be attached to the existing revetment and might be termed a spur. The project transitions southward from a wider beach area, in order to accommodate the spiral embayment, down to the minimum beach width needed for shore protection and for the allowance of continued erosion downdrift. Future plans are for more breakwaters to be built heading downbay.

Construction access is across the land side from the end of Long Beach Road. Turbidity curtain will be used as needed as the clean sand fill is installed. Fallen and dead trees will be removed. Rock structures will be installed and the beach fill reshaped into the proposed shore planform. At least a month will be allowed before planting the high marsh and dune plants. There are about 25,700 s.f. of plantings proposed. Some low marsh will be planted on the flanks of the tombolos behind each breakwater. However, trying to establish low marsh open bay coasts is a challenge.