



February 24, 2017

Linda Tucker
City Administrator
City of Isle of Palms
PO Box 508
Isle of Palms, SC 29451

RE: Hurricanes *Matthew* and *Joaquin* — Revised Beach Damage Assessment [CSE 2453]

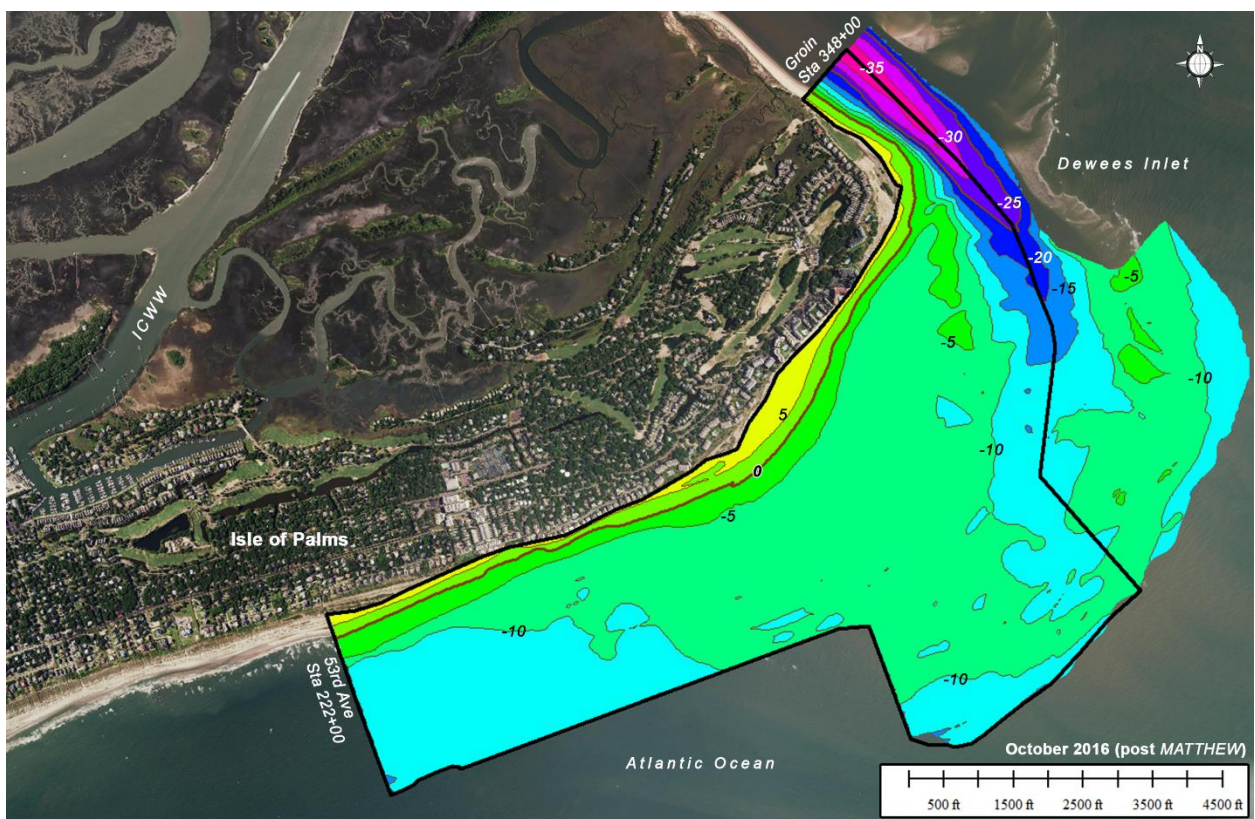
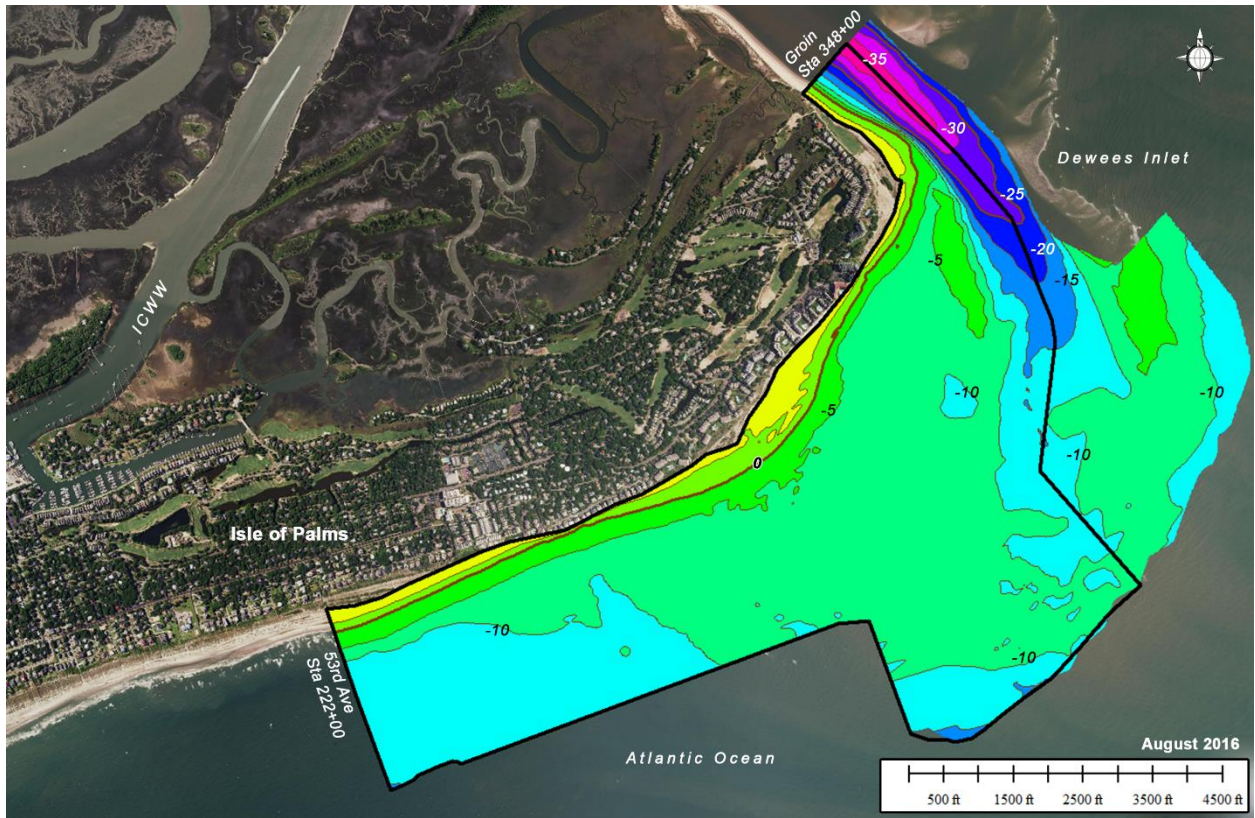
Dear Linda,

Following discussions with FEMA on the method of volume change calculations used in determining storm losses, CSE has recalculated the storm losses associated with Hurricanes *Joaquin* and *Matthew*. The limits of the volume calculations were modified to include the entire 2008 permitted project area between stations 222 and 348 (between 53rd Avenue and the groin at the 17th hole) and did not distinguish between accretional and erosional areas within the project area. Also, the seaward limits of the calculations were extended further seaward to capture more of the changes occurring to the depth of closure.

CSE developed digital elevation models from each before and after storm survey. A boundary was developed for each storm within the limits of comparable data. Total sand volume above the -15 foot (ft) NAVD contour was calculated within each boundary.

For Hurricane *Joaquin*, the post-storm survey coverage was more limited than the *Matthew* survey with survey data ending closer to the beach and not extending out to the limits of the delta. The computed volume change using these new limits showed no net loss of sand resulting from the storm. Losses occurring on the upper beach were offset by gains occurring in the underwater zone. **Due to the lack of measurable sand losses using the adjusted calculation limits, CSE recommends that the City cancel the request for FEMA Category G assistance funds for storm losses to the beach associated with Hurricane Joaquin.**

For Hurricane *Matthew*, CSE calculated the volume change for the entire offshore zone within the project area within the limits of the post-storm survey coverage. The net volume change showed a loss of ~385,000 cubic yards (cy), which included all the sand volume above -15 ft NAVD in the delta. The limits of the data coverage are shown as the colored areas in Figure 1 (upper graphic, next page). CSE met with FEMA at our office to discuss the methodology and limits used for this determination. FEMA representatives indicated that extending the coverage seaward to the depth of closure was more in line with the policy; however, that this area is a unique situation and that including all of the delta may not be reasonable for determining impacts of the storm on the system.





FEMA suggested establishing a volume calculation boundary that terminated along the centerline of the pre-storm channel. This would eliminate shoal and delta sand on the Dewees Island side of the Dewees Inlet channel from the volume calculations. CSE believes this to be a reasonable boundary for measuring storm-related impacts to the Isle of Palms’ beach. The boundary is shown as the black outline on Figures 1 and 2 (previous page).

The eligible storm-induced volume change for Hurricane *Matthew* within the boundary suggested by FEMA was a loss of 260,270 cy. The revised volume losses for both storms requires that the project funding formulation be recomputed. CSE is updating the cost opinions based on recent bid prices for a project at Edisto Beach, SC (opened November 2016). Bid prices for that project were higher than anticipated, including unit costs and mobilization. Unit prices for the base quantity were bid from \$9.30 to \$10.09 per cubic yard and mobilization from \$2.68 million to \$4.26 million. CSE believes it is justified to increase the estimated mobilization price for the IOP project to \$3 million. The City presently has identified funding sources sufficient to implement an ~1,000,000 cy project if all requested funding is approved. If the *Matthew* losses are added to this volume, the FEMA portion of the project represents 20.65 percent of the total 1,260,270 cy project. This percentage is applied to the project tasks in Table 2. **The total FEMA share for the project is \$3,803,347.**

Table 1. Beach volumes for the pre-storm and post-storm beach condition.

Hurricane <i>Matthew</i> Pre- and Post-Storm Beach Volumes	
	Volume (cy) Above -15 ft NAVD
August 2016 (Pre-storm)	11,901,480
October 2016 (Post-storm)	11,641,210
Storm-Induced Change	-260,270

Table 2. Opinion of probable construction costs for beach restoration, including FEMA reimbursement for Hurricane *Matthew*.

Opinion of Probable Construction Cost	Unit Cost	FEMA Quantity - <i>Matthew</i> (cy)	City Quantity (cy)	Total Quantity (cy)	Total Cost (\$)	FEMA <i>Matthew</i> Pro Rata Share (20.65%)
Mobilization	\$ 3,000,000			1	3,000,000	619,500
Nourishment (cy)	\$ 10.00	260,270	1,000,000	1,260,270	12,602,700	2,602,700
Environmental Monitoring	\$ 40,000			1	40,000	8,260
Post-Project Monitoring	\$ 200,000			1	200,000	41,300
Engineering and Miscellaneous	\$ 900,000			1	900,000	185,850
Contingency	10%			1	1,674,270	345,737
Total					18,416,970	3,803,347



The above analyses and revised cost opinions were developed following consultation with FEMA beach specialists in consideration of the unique physical setting where the beach interacts with a large ebb-dominant inlet. A new set of pre- and post-Hurricane *Matthew* profiles are included as Attachment 1, although this set does not include all the data necessary to determine the volume change in the delta setting. Additional data were collected between some of the profiles and within the inlet delta and incorporated into the elevation models. The elevation models are the most appropriate method for determining overall sand volume changes in the system as sand moves from the beach and into the shoals of the delta.

Please let me know if you have any questions or need additional information.

Sincerely,

Coastal Science & Engineering (CSE)

A handwritten signature in black ink, appearing to read 'S. Traynum', with a long horizontal flourish extending to the right.

Steven B Traynum
Coastal Scientist / Project Manager

Enclosures: Attachment 1