

RAPID Collection of Water Level, Scour, and Structural Damage Data Due to Extreme Storm Surge for the Future Improvement of Structural Systems and Their Resistance to Natural Hazards

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Summary

The objective of the project is to compare the impacts of Hurricane Sandy in three New Jersey communities and to develop a better understanding of why each community was impacted to the extent that they were. The three communities selected for the analysis were Mantoloking, Bay Head, and Sea Girt. Less than ten miles separate the three communities; however the amount of observed damage varied significantly. The southernmost community, Mantoloking, was protected by a narrow beach and dune system and suffered the worst damage. The community of Bay Head which is located immediately to the north of Mantoloking was impacted to a much lesser degree, thanks in part to 1960's era seawall that protected three-quarters of the town. The third community, Sea Girt, only experienced minimal damage during Sandy due in part to a wide beach and dune system, and naturally higher elevations.



Figure 1: Site Location Map (Image: Google Earth)

Data Collection

Over the three month period between November 2012 and January 2013, faculty and students from Stevens Institute of Technology collected watermark elevations, scour depths, and structural damage surveys in each of the three communities. The data collected include Differential GPS (DGPS) latitude, longitude and elevation data of observed watermarks, topographic measurements of scour and sedimentation adjacent to structures, digital images of structures and topographic change, and a description of structural failure modes. DGPS data are recorded and stored on a handheld field datalogger. Digital images are captured by GPS georeferencing cameras. Structure damage assessments are recorded in the field using a derivative of the LSU post-storm analysis checklist developed by Freidland et.al. (2008).

Over 400 structure evaluations have been completed and entered into a Microsoft Access Database. Each evaluation has accompanying photographs. In addition, 150 watermarks have been identified, recorded and logged into the database with an accompanying photograph. Watermarks were measured as the elevation above a convenient reference frame, with the reference frame surveyed in with the DGPS system at a later date. Concurrently, scour depressions are being surveyed and documented with photographs. All of the damage assessments and photographs are being ported into a GIS environment.



Figure 2: Watermark Data Collection

Future Work

Once the NOAA Coastal Services Center releases the pre and post Sandy LIDAR data sets, that information will be added to the GIS data set. The ultimate goal is to be able to utilize the information gathered under the NSF Rapid funding to improve our understanding of the way the surge and waves propagate through communities and how that ultimately impacts structural stability. An associated goal is to understand the role each community's approach to coastal protection played in minimizing the damages during Sandy.

References

Friedland, C.J. 2008. "Residential Building Damage from Hurricane Storm Surge: Proposed Methodologies to Describe, Assess, and Model Building Damage. Louisiana State University, Department of Civil and Environmental Engineering, Doctoral Dissertation, pp 198.

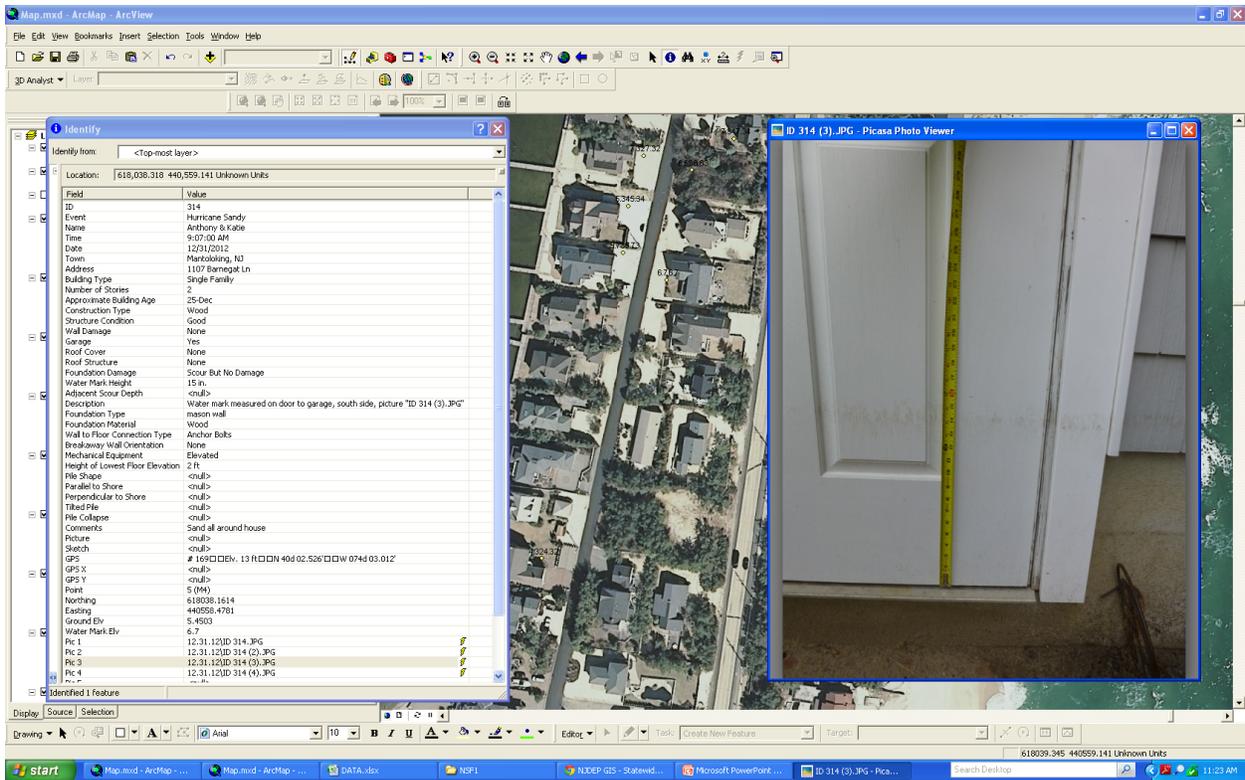


Figure 3: Results Presented in a GIS Environment.