

## HIGH PRECISION VERTICAL CONTROL NETWORK MODEL:

### INTRODUCTION

The National Geodetic Survey (NGS) has published standards for achieving two- and five-cm Accuracies for GPS derived heights (see for more information)

[http://www.ngs.noaa.gov/PUBS\\_LIB/DRAFTGuidelinesforEstablishingGPSderivedOrthometricHeights.pdf](http://www.ngs.noaa.gov/PUBS_LIB/DRAFTGuidelinesforEstablishingGPSderivedOrthometricHeights.pdf)

It is the intent of the Department of Environmental Protection, Bureau of Beaches and Coastal Systems in cooperation with University of Florida to apply these standards to develop and implement a GPS-derived vertical control network with improved vertical accuracies along shore for all coastal permitting and project monitoring activities. As part of this effort, University of Florida researchers, in collaboration with the Bureau of Beaches and Coastal System (BBCS) staff members, collected and adjusted GPS L1/L2 observations for the four established Coastal Regions Southeast Atlantic Coast (Brevard, Indian River, Saint Lucie, Martin, Broward, Dade Counties), Northeast Atlantic Coast (Nassau, Duval, Saint John, Flagler, Volusia Counties), Northwest Gulf of Mexico Coast (Escambia, Santa Rosa, Okaloosa, Walton, Bay, Gulf, Franklin Counties), and the Southwest Gulf of Mexico Coast (Pinellas, Hillsborough, Manatee, Sarasota, Charlotte, Lee, Collier Counties). The four provided reports give the results of the GPS observations and adjustment results and provides a supplemental horizontal and vertical control network along Florida's coastline for use with Coastal Construction Control Line permitting and project monitoring activities.

### NETWORK DESIGN AND ADJUSTMENT STRATEGY

The strategy for the development of this high-accuracy elevations network along the coastline hinges on GPS Observations for two networks: Tier-1 aims for a 2 centimeter ellipsoid height accuracy and all Stations are tied directly to the CORS network. See for more information.

<http://www.ngs.noaa.gov/CORS/>

Tier-2 consists of a dense network of stations whose target is 5 centimeters of ellipsoid height accuracy, tied to the Tier-1 stations. Tier-1 stations are observed over multiple sessions of at least two hours each while Tier-2 stations are observed along shorter baselines using shorter sessions, forming many independent and redundant interconnections.

Positions of Tier-1 GPS network were processed using the Online User Positioning Service (OPUS), which is a web-based static GPS processing engine built around the PAGES software. See for more information.

<http://www.ngs.noaa.gov/OPUS/>

Tier-2 network observations were processed by FDEP using Ashtech Solutions Software, and then adjusted by a least-squares method using Ashtech GNSS software suite. Only NAD83 ellipsoid heights are adjusted, final orthometric heights referenced to NAVD88 are Computed using GEOID03 – the latest geoid model available from NOAA/NGS . See for more information

<http://www.ngs.noaa.gov/GEOID/GEOID03/>