



DIFFERENTIAL GPS (DGPS) SITE OPERATIONAL ASSESSMENT

NDGPS Site: Card Sound, FL DGPS Site (808)
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REFERENCES

- (1) Broadcast Standard for the USCG DGPS Navigation Service, CIM 16577.1 (APR 1993).
- (2) Radio Technical Commission for Maritime Services (RTCM) Recommended Standards for Differential Global Navigation Satellite System (GNSS) Service, Version 2.3.
- (3) Differential Global Positioning System (DGPS) Concept of Operations, COMDTINST 16577.2 (AUG 1995).
- (4) 2014 Federal Radio Navigation Plan.

PURPOSE

- Validate advertised DGPS coverage of the Card Sound DGPS site.
- Validate required RTCM message scheduling and delivery.
- Test differential correction accuracy versus a predetermined survey monument.

EQUIPMENT

Trimble SPS461 Receiver
Trimble GA 530 Antenna
Dell Latitude E3620 Laptop

CARD SOUND DGPS SITE PARAMETERS

Frequency	314 KHz
Forward Output Power	900 W
Transmission Rate	200 baud
Field Strength/Range	100 μ V/m (37.5 dB μ V/m) at 261 km

SUMMARY

The Operational Assessment of the Card Sound Differential Global Positioning System (DGPS) site revealed that the provided coverage is consistent with the advertised range. The signal strength measurements, within the advertised range were satisfactory. The northern far-field signal strength reading was within the required signal strength. Additionally, a review of the output/reflected power and near-field signal strength levels was conducted and found to be satisfactory. All RTCM messages were verified, evaluated and are consistent with the requirements set forth by Reference (1) and (2). Finally, accuracy measurements and analysis proved that at a distance of approximately 268 km from the broadcast site, the horizontal accuracy is sub-meter and within the 10 meter accuracy requirement as set forth by Reference (3) and (4).

RESULTS

Signal Strength

A verification of the DGPS coverage area was conducted from Panama City, FL, around the Florida peninsula, and ending in Jacksonville FL. The advertised signal strength range is 261 km. Figure 1 below displays adequate signal strength beyond the advertised range of 261 km from the site and throughout the predicted coverage area. Green points represent areas of signal strength above 40 dB μ V/m, whereas areas between 40 and 37.5 dB μ V/m are represented with orange points. Areas where a DGPS fix was unable to be obtained are represented in red. As seen in Table 1, far-field signal strength readings were taken at a northwestern point of the advertised range from the site. The reading was above the required 40 dB μ V/m signal strength on both sides.

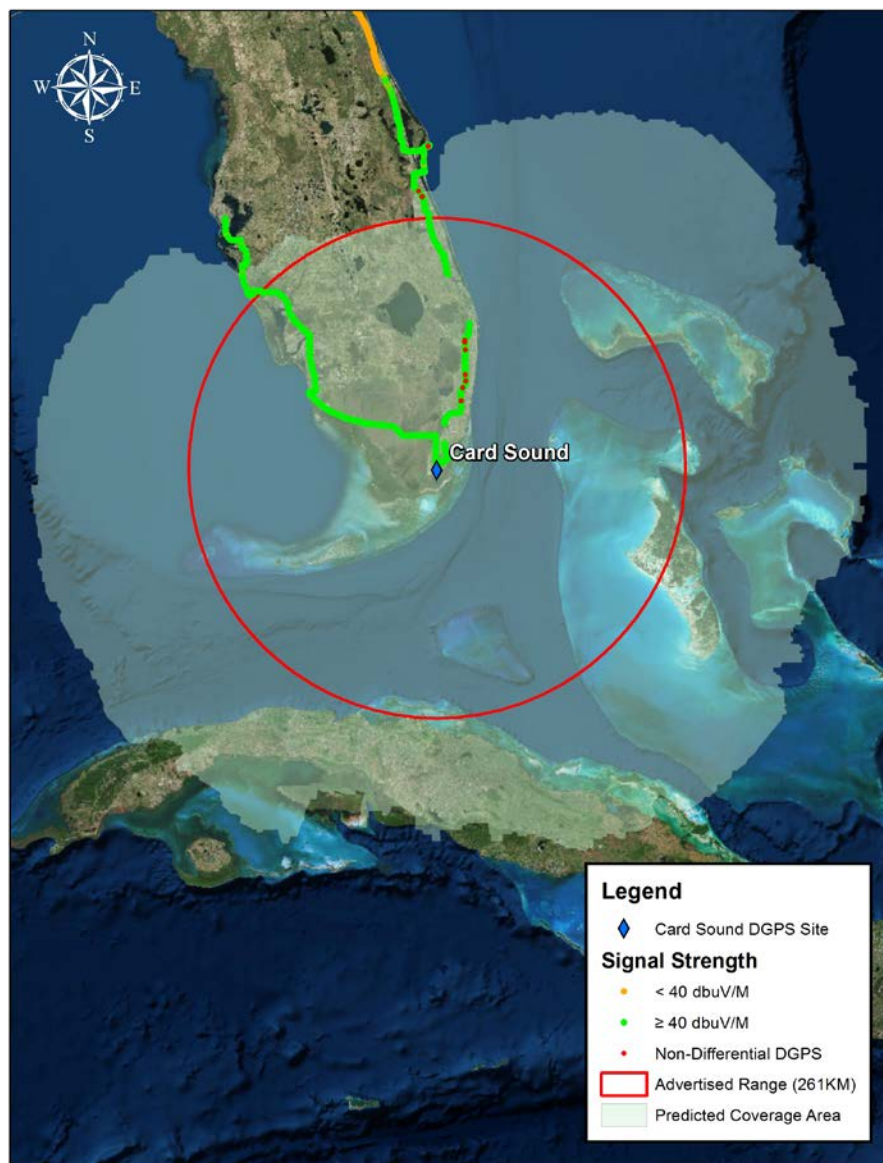


Figure 1: Signal Strength Results

Side	Signal Strength	Signal to Noise ratio	Position
A	43 dB μ V/m	13dB μ V/m	27° 4' 41.35745"N, 082° 25' 50.56693"W
B	43 dB μ V/m	13 dB μ V/m	

Table 1: North West-Field Signal Strength Reading

Accuracy Validation

Positional data was collected for 10 minutes per side using the Trimble SPS461. The data was then post processed and compared to a National Geodetic Survey (NGS) marker to verify the horizontal accuracy of the broadcast correction (Table 4 and 5). Side A was 0.07146 meters, bearing 134.478611° from the monument while Side B was .9430 meters, bearing 134.302778° from the monument. As per reference (3) and (4), both respective distances were within advertised accuracy requirements. A comparison between the GPS satellites in view at the Card Sound DGPS site and at the NGS monument location was conducted (Table 6) to identify any differences in the GPS satellite geometry used at the respective locations; any differences in geometry could lead to accuracy discrepancies. In this case, the satellites being tracked by the Reference Station and Integrity Monitor GPS receivers at the site were identical to those tracked at the NGS monument location. A two dimension radial review of the same time period was completed for the integrity monitors. Side A's average deviation was 0.09584 meters; Side B's average deviation was 0.08509 meters. Both findings were consistent with the findings observed in the field and are within system parameters.

NGS Monument ID:	BBFB84
Monument LAT:	27° 4' 41.35745" N
Monument LON:	082° 25' 50.56693" W
Distance from DGPS Site	268.1 km

Table 3: NGS Monument ID

Averaged LAT:	27° 04' 41.355845" N
Averaged LON:	082° 25' 50.565083" W
Distance from Monument:	0.07098 m (0.232874 ft)
Bearing from Monument:	134.302778°

Table 4: Side A Accuracy Check Results

Averaged LAT:	27° 04' 41.376446" N
Averaged LON:	082° 25' 50.593771" W
Distance from Monument:	0.9430 m (3.093826 ft)
Bearing from Monument:	308.479444°

Table 5: Side B Accuracy Check Results

<i>Antenna Location</i>	<i>GPS Satellites Tracked (PRN)</i>										
Reference Station A	2	5	6	9	12	17	19	24	25	28	
Integrity Monitor A	2	5	6	9	12	17	19	24	25	28	
Reference Station B	2	5	6	9	12	17	19	24	25	28	
Integrity Monitor B	2	5	6	9	12	17	19	24	25	28	
NGS Monument Location, Side A	2	5	6	9	12	17	19	24	25	28	
NGS Monument Location, Side B	2	5	6	9	12	17	19	24	25	28	

Table 6: GPS Satellite Comparison

RECOMMENDATION

No changes recommended

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