



DGPS SITE OPERATIONAL ASSESSMENT

NDGPS Site:	<i>Hartsville DGPS Site</i>
Inspector(s):	LT Christian Hernaez, CWO3 William Iozzino
Date:	08NOV11

PURPOSE:

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

EQUIPMENT: STARLINK DNAV-212 DGPS Receiver
Raven INVICTA RPR 210 DGPS Receiver
Hemisphere R110 USB DGPS Receiver
Trimble MBA-2 Receive Antenna

PARAMETERS:

Frequency	317 KHz
Forward Output Power	600W
Transmission Rate	100 baud
Field Strength/Range	75 μ V/m (37.5 dB μ V/m) at 215 km

SITE PHOTO:



RESULTS

Signal Strength:

A verification of the Hartsville Differential GPS (DGPS) coverage area was conducted along the western and northern portions of the coverage area. Far-field signal strength readings were taken at western and northeastern points to validate the signal at the 215 km advertised range. Overall, the signal strength was satisfactory and exceeded the advertised coverage radius. Figure 1, below, shows the 215 km advertised range for the Hartsville DGPS site. Green points represent areas of satisfactory signal strength and SNR. Areas of unsatisfactory signal strength are represented as red points.

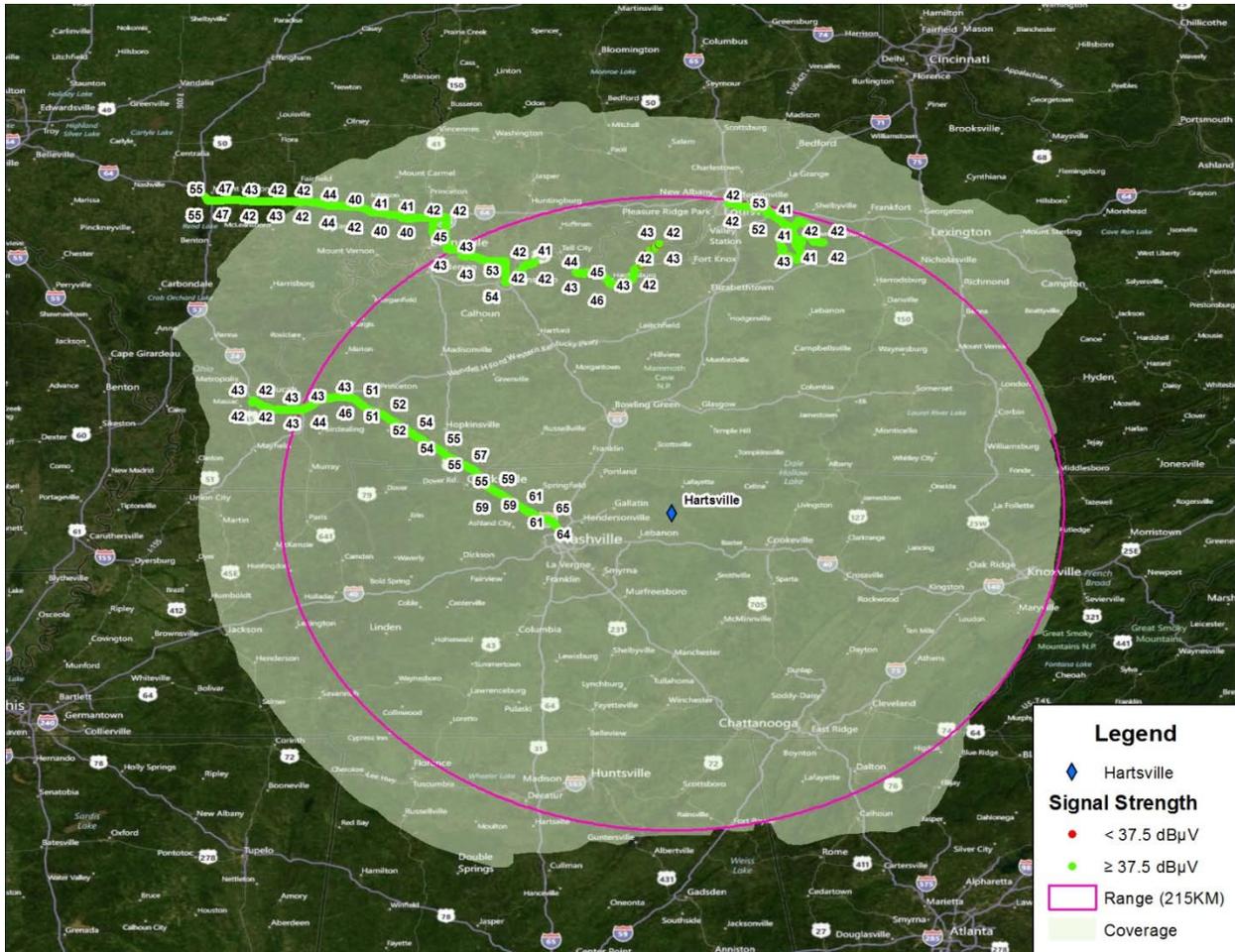


Figure 1.

Far-Field Signal Strength Reading 1:

Receiver:	STARLINK DNAV 212
Antenna:	Trimble MBA-2
Position	37° 00.29000'N 088° 20.63170'W
Side A Signal Strength	44 dB μ V/m
Side B Signal Strength	44 dB μ V/m

Far-Field Signal Strength Reading 2:

Receiver:	STARLINK DNAV 212
Antenna:	Trimble MBA-2
Position	38° 00.6249'N 085° 17.9358'W
Side A Signal Strength	53 dB μ V/m
Side B Signal Strength	52 dB μ V/m

RTCM Message Verification:

RTCM messages were collected for sixty minutes from each side of the DGPS site utilizing a RAVEN INVICTA DGPS Receiver. All messages were received in accordance with Commandant Instruction Manual 16577.1 DGPS Broadcast Standard schedule for RTCM messages; however the positional data within the Type 7 appeared to be inaccurate. The Type 7 positional data received is inconsistent with positional data obtained via C3CEN and NCS. Specifically, the longitude position for all sites included in the Type 7 message was incorrect (all other Type 7 message fields were accurate and validated). Further research will be conducted to determine the exact cause and corrective action required.

Side A

Message Type	Received	Scheduled	Content Verified
Type 3	Y	Y	Y
Type 5 (ensure message is not being transmitted)	N	N	N/A
Type 7	Y	Y	N
Type 9	Y	Y	Y
Type 16	Y	Y	Y

Side B

Message Type	Received	Scheduled	Content
Type 3	Y	Y	Y
Type 5 (ensure message is not being transmitted)	N	N	N/A
Type 7	Y	Y	N
Type 9	Y	Y	Y
Type 16	Y	Y	Y

Accuracy Validation:

Positional data was collected for 10 minutes per side using a Hemisphere RPR 210 DGPS receiver with a Trimble MBA-2 DGPS Receive antenna. The data was then post processed and compared to a National Geodetic Survey (NGS) marker to verify the horizontal accuracy of the broadcast correction. Side A presented with a 0.40m error bearing 311.36° from the monument while Side B presented a 0.59m error bearing 294.00° from the monument. In both cases the scale of error is well within advertised accuracy requirements. Additionally a two dimension radial review for the same time period was completed for the integrity monitors. Side A's average deviation was 0.20449 meters; Side B's average deviation was 0.21137 meters. Both findings are consistent with the finding observed in the field and well within system parameters.

NGS Monument ID:	BBCD66
Monument LAT:	38° 00.304774' N
Monument LON:	086° 10.153707' W

Side A

Averaged LAT:	38 00.304915688' N
Averaged LON:	086° 10.1538917' W
Distance from DGPS Site:	113.92 km
Distance from Monument:	0.40 m (1.30')
Bearing from Monument:	311.36°

Side B

Averaged LAT:	38° 00.304904435' N
Averaged LON:	086° 10.1540432' W
Distance from DGPS Site:	113.92 km
Distance from Monument:	0.59 m (1.95')
Bearing from Monument:	294.00°

Summary:

Analysis of the Hartsville coverage area reveals the measured coverage area is consistent with published specifications. Analysis of the differential position accuracy revealed the corrected positions were well within the required threshold. Analysis of the RTCM message broadcasts revealed a potential error with the RTCM Type 7 message (all other messages were validated and accurate). The positional longitude collected for the surrounding sites stated in the RTCM Type 7 messages did not match the positional longitude of any of the those sites, respectively. When compared to C3CEN and NCS data, the Type 7 data did not match. Further analysis will be conducted by NAVCEN System Support division.