



## DGPS SITE OPERATIONAL ASSESSMENT

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<b>NDGPS Site:</b>	<i>Louisville DGPS Site</i>
<b>Inspector(s):</b>	LT Christian Hernaez, CWO3 William Iozzino
<b>Date:</b>	07NOV11

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### PURPOSE:

- Validate advertised DGPS coverage of the Louisville 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	290 KHz
Forward Output Power	900W
Transmission Rate	200 baud
Field Strength/Range	100 $\mu$ V/m (40 dB $\mu$ V/m) at 241 km

### SITE PHOTO: (24SEP200)



## RESULTS

### Signal Strength:

A verification of the Louisville Differential GPS (DGPS) coverage area was conducted from the western most point through the city of Louisville to the eastern most point of the coverage area. Far-field signal strength readings taken from the western region exceeded system specifications while the eastern regions results were unsatisfactory by approximately 40km. Figure 1, below is a pictorial representation of the readings taken during daylight hours. The outer purple ring represents the published coverage area of the Louisville site, 100 uV/m (40dBuV/m) at 241 km. The Green points indicate satisfactory signal strength and the red points are unsatisfactory.

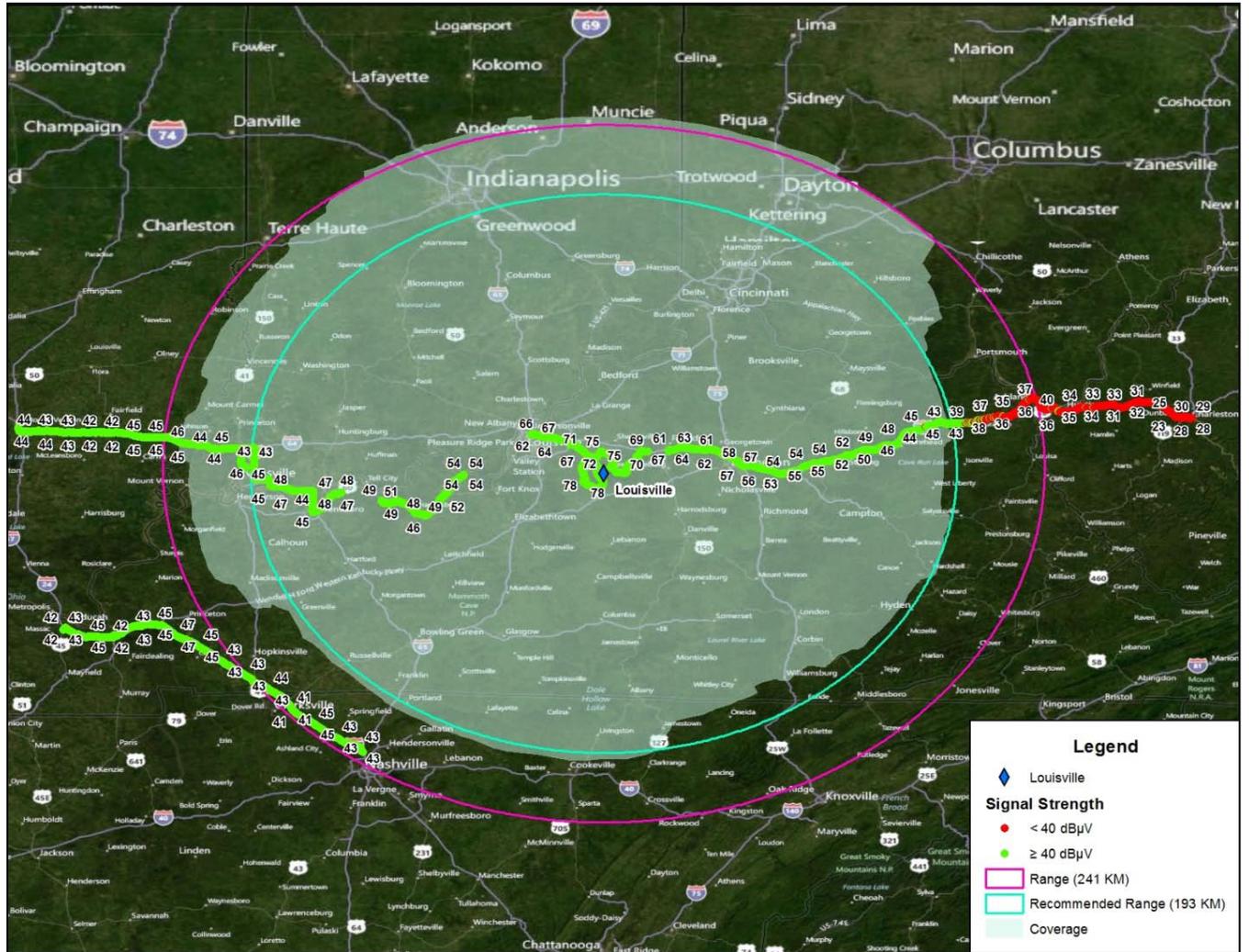


Figure 1.

Far-Field Signal Strength Reading 1:

Receiver:	STARLINK DNAV-212
Antenna:	Trimble MBA-2
Position	38° 14.32310N, 088° 00.10170W
Side A Signal Strength	43 dB $\mu$ V/m
Side B Signal Strength	43 dB $\mu$ V/m

Far-Field Signal Strength Reading 2:

Receiver:	STARLINK DNAV-212
Antenna:	Trimble MBA-2
Position	38° 28.865955"N 082° 38.260246"W
Side A Signal Strength	33 dB $\mu$ V/m
Side B Signal Strength	33 dB $\mu$ 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 the Commandant Instruction Manual 16577.1 DGPS Broadcast Standard schedule for RTCM messages. Type 5 messages were received from Side A but discontinued by the DGPS watchstander upon request. Chart 1 below displays the message verification results:

Side A

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

Side B

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

Chart 1

**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 was 0.62 meters, at a bearing of 245.46 °, from the monument while Side B was 0.75 meters, at bearing of 274.93° from the monument. In both cases the differences in position were well within the advertised accuracy requirements. Additionally, a two dimension radial review for the same time period was completed for integrity monitors. Side A’s average deviation was 0.17429 meters and Side B’s average deviation was 0.08124 meters. Both findings were consistent with the finding observed in the field and well within system parameters.

<b>NGS Monument ID:</b>	<b>BBCD66</b>
Monument LAT:	38° 00.304774’ N
Monument LON:	086° 10.153707’ W

Side A

<b>Averaged LAT:</b>	38° 00.304635121’ N
<b>Averaged LON:</b>	086° 10.15405608’ W
<b>Distance from DGPS Site:</b>	76.22 km
<b>Distance from Monument:</b>	0.62 m (2.03’)
<b>Bearing from Monument:</b>	245.46°

Side B

<b>Averaged LAT:</b>	38° 00.304808764’ N
<b>Averaged LON:</b>	086° 10.1541691’ W
<b>Distance from DGPS Site:</b>	76.22 km
<b>Distance from Monument:</b>	0.75m (2.46’)
<b>Bearing from Monument:</b>	274.93°

**OPERATIONAL RECOMMENDATION:** Analysis of the Louisville coverage area reveals that the actual coverage is consistent with the predicted coverage plot but does not meet the required specifications of the current OP ORDER on the eastern side of the specified coverage area. NAVCEN DGPS System Support recommendation is to reduce the advertised range to 193km as shown in Figure 1.