



Fugro

Collection Report / USGS_USA_VA_SouthamptonHenricoWMBG_2019_B19

Version 01 Contract: 4400010335 1 / June 22, 2020

Version 01

Prepared for: USGS

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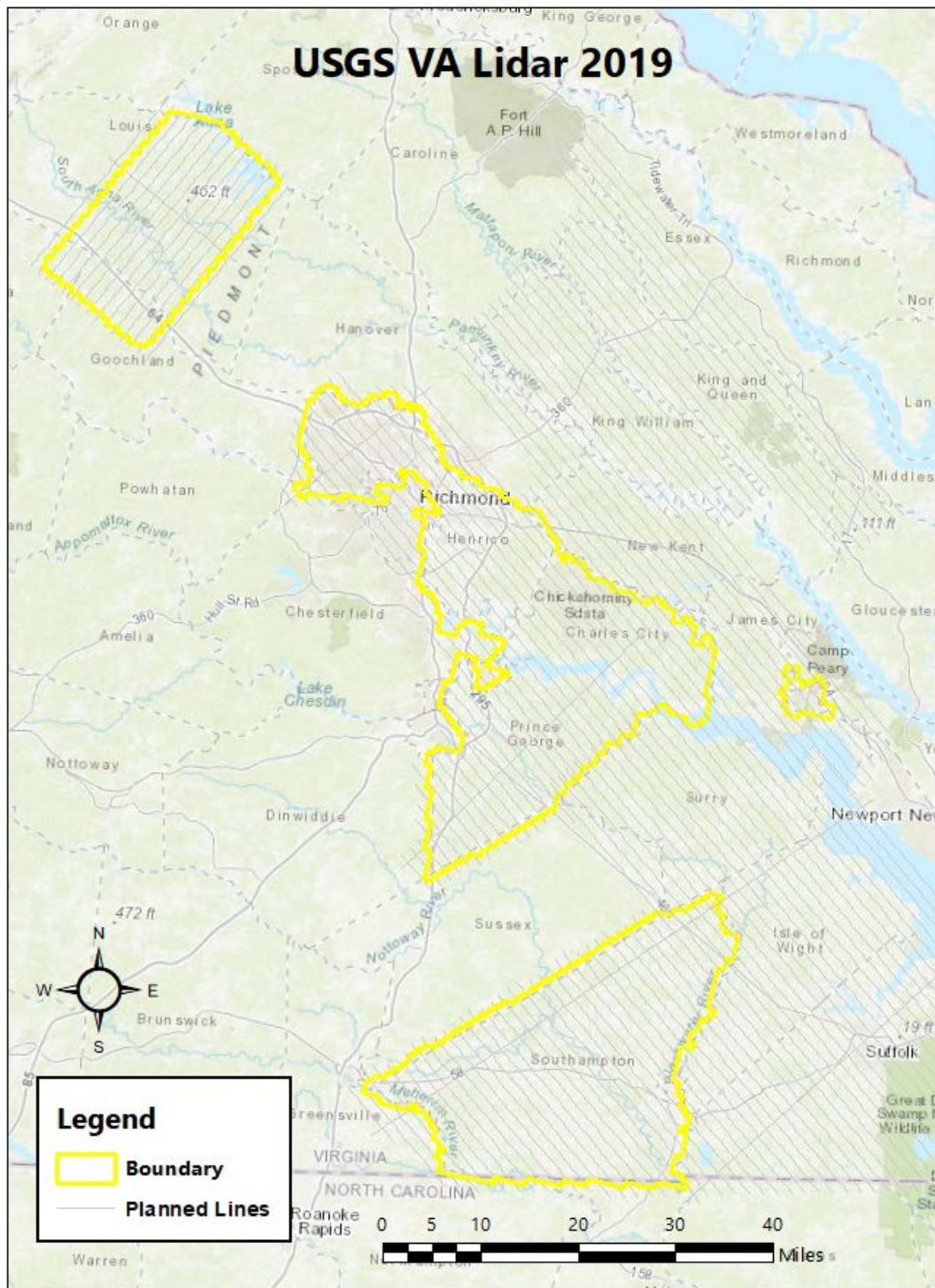
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Abbreviations

GSD	Ground Sample Distance
PPSM	Points per square meter
AMT	Above Mean Terrain
ASL	Above Sea Level
GNSS	Global Navigation Satellite System
IMU	Inertial Measurement Unit

1. General Project Information

Project Name	USGS_USA_VA_SouthamptonHenricoWMBG_2019_B19
Project Tracks	86; additionally 12 (3378088 VA_1A); 16 (3378088 VA_2A)
Lidar Point Density	2 ppsm
Collection AMT(s)	7900 ft
Sensor Type	Leica ALS 80
Sensor Serial #s	118, 130
# of Collections	14
Collection Date(s)	Dec 8, 2019 - Jan 2, 2020



2. Collection Details

Listed below are the Acquisition Logs and GNSS processing plots for each Collection.

Collection ID: 191208_118_33780191_01

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file:	17994
No processed position:	2
Missing Fwd or Rev:	12
With bad C/A code:	0
With bad L1 Phase:	0

Measurement RMS Values:

L1 Phase:	0.0165 (m)
C/A Code:	1.78 (m)
L1 Doppler:	0.022 (m/s)

Fwd/Rev Separation RMS Values:

East:	0.005 (m)
North:	0.005 (m)
Height:	0.017 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (17980 occurrences):

East:	0.005 (m)
North:	0.005 (m)
Height:	0.017 (m)

Quality Number Percentages:

Q 1:	99.8 %
Q 2:	0.2 %
Q 3:	0.0 %
Q 4:	0.0 %
Q 5:	0.0 %
Q 6:	0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m:	100.0 %
0.10 - 0.30 m:	0.0 %
0.30 - 1.00 m:	0.0 %
1.00 - 5.00 m:	0.0 %
5.00 m + over:	0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol:	0.0 %
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Baseline Distances:

Maximum:	99.159 (km)
Minimum:	0.146 (km)
Average:	60.140 (km)

First Epoch: 0.155 (km)
 Last Epoch: 0.159 (km)

Collection ID: 191212_118_33780191_02

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file: 38225
 No processed position: 3
 Missing Fwd or Rev: 6
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0190 (m)
 C/A Code: 2.15 (m)
 L1 Doppler: 0.027 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.021 (m)
 North: 0.007 (m)
 Height: 0.029 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (38215 occurrences):

East: 0.021 (m)
 North: 0.007 (m)
 Height: 0.029 (m)

Quality Number Percentages:

Q 1: 99.9 %
 Q 2: 0.1 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 87.730 (km)
 Minimum: 0.106 (km)
 Average: 45.519 (km)
 First Epoch: 0.148 (km)
 Last Epoch: 0.106 (km)

Collection ID: 191215_118_33780191_03**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file:	14806
No processed position:	3
Missing Fwd or Rev:	2
With bad C/A code:	0
With bad L1 Phase:	0

Measurement RMS Values:

L1 Phase:	0.0166 (m)
C/A Code:	1.92 (m)
L1 Doppler:	0.024 (m/s)

Fwd/Rev Separation RMS Values:

East:	0.009 (m)
North:	0.007 (m)
Height:	0.024 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (14801 occurrences):

East:	0.009 (m)
North:	0.007 (m)
Height:	0.024 (m)

Quality Number Percentages:

Q 1:	99.9 %
Q 2:	0.1 %
Q 3:	0.0 %
Q 4:	0.0 %
Q 5:	0.0 %
Q 6:	0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m:	100.0 %
0.10 - 0.30 m:	0.0 %
0.30 - 1.00 m:	0.0 %
1.00 - 5.00 m:	0.0 %
5.00 m + over:	0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol:	0.0 %
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Baseline Distances:

Maximum:	67.317 (km)
Minimum:	0.116 (km)
Average:	35.461 (km)
First Epoch:	0.411 (km)
Last Epoch:	0.116 (km)

Collection ID: 191218_118_33780191_04**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file:	22312
No processed position:	14
Missing Fwd or Rev:	4
With bad C/A code:	0
With bad L1 Phase:	0

Measurement RMS Values:

L1 Phase:	0.0173 (m)
C/A Code:	1.69 (m)
L1 Doppler:	0.222 (m/s)

Fwd/Rev Separation RMS Values:

East:	0.023 (m)
North:	0.021 (m)
Height:	0.027 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (22293 occurrences):

East:	0.023 (m)
North:	0.021 (m)
Height:	0.027 (m)

Quality Number Percentages:

Q 1:	99.9 %
Q 2:	0.1 %
Q 3:	0.0 %
Q 4:	0.0 %
Q 5:	0.0 %
Q 6:	0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m:	100.0 %
0.10 - 0.30 m:	0.0 %
0.30 - 1.00 m:	0.0 %
1.00 - 5.00 m:	0.0 %
5.00 m + over:	0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol:	0.0 %
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Baseline Distances:

Maximum:	61.304 (km)
Minimum:	0.082 (km)
Average:	30.783 (km)
First Epoch:	0.102 (km)
Last Epoch:	0.100 (km)

Collection ID: 191219_118_33780191_05**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file:	26504
No processed position:	3

Missing Fwd or Rev: 5
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0180 (m)
 C/A Code: 1.94 (m)
 L1 Doppler: 0.023 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.009 (m)
 North: 0.006 (m)
 Height: 0.021 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (26494 occurrences):

East: 0.009 (m)
 North: 0.006 (m)
 Height: 0.021 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 52.261 (km)
 Minimum: 0.098 (km)
 Average: 23.603 (km)
 First Epoch: 0.157 (km)
 Last Epoch: 0.098 (km)

Collection ID: 191219_130_33780088_01**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file: 38864
 No processed position: 2
 Missing Fwd or Rev: 17
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0195 (m)
 C/A Code: 1.93 (m)
 L1 Doppler: 0.023 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.015 (m)
 North: 0.013 (m)
 Height: 0.041 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (38845 occurrences):

East: 0.015 (m)
 North: 0.013 (m)
 Height: 0.041 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 123.612 (km)
 Minimum: 0.084 (km)
 Average: 72.791 (km)
 First Epoch: 0.099 (km)
 Last Epoch: 0.113 (km)

Collection ID: 191220_118_33780191_06**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file: 24926
 No processed position: 2
 Missing Fwd or Rev: 2
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0157 (m)

C/A Code: 1.60 (m)
 L1 Doppler: 0.021 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.008 (m)
 North: 0.006 (m)
 Height: 0.013 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (24922 occurrences):

East: 0.008 (m)
 North: 0.006 (m)
 Height: 0.013 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 77.498 (km)
 Minimum: 0.115 (km)
 Average: 37.331 (km)
 First Epoch: 0.157 (km)
 Last Epoch: 0.115 (km)

Collection ID: 191220_130_33780088_02**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file: 33344
 No processed position: 4
 Missing Fwd or Rev: 6
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0182 (m)
 C/A Code: 2.13 (m)
 L1 Doppler: 0.022 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.014 (m)
 North: 0.012 (m)
 Height: 0.031 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (33333 occurrences):

East: 0.014 (m)
 North: 0.012 (m)
 Height: 0.031 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 137.972 (km)
 Minimum: 0.078 (km)
 Average: 72.587 (km)
 First Epoch: 0.106 (km)
 Last Epoch: 0.098 (km)

Collection ID: 191220_130_33780088_03**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file: 27355
 No processed position: 2
 Missing Fwd or Rev: 2
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0170 (m)
 C/A Code: 1.84 (m)
 L1 Doppler: 0.020 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.014 (m)

North: 0.009 (m)
 Height: 0.016 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (27351 occurrences):

East: 0.014 (m)
 North: 0.009 (m)
 Height: 0.016 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 145.410 (km)
 Minimum: 0.081 (km)
 Average: 76.783 (km)
 First Epoch: 0.098 (km)
 Last Epoch: 0.104 (km)

Collection ID: 191221_130_33780191_01

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file: 30962
 No processed position: 2
 Missing Fwd or Rev: 9
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0172 (m)
 C/A Code: 2.17 (m)
 L1 Doppler: 0.020 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.014 (m)
 North: 0.010 (m)
 Height: 0.028 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (30951 occurrences):

East: 0.014 (m)
 North: 0.010 (m)
 Height: 0.028 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 134.700 (km)
 Minimum: 0.087 (km)
 Average: 83.202 (km)
 First Epoch: 0.101 (km)
 Last Epoch: 0.096 (km)

Collection ID: 191221_130_33780191_02

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file: 32210
 No processed position: 2
 Missing Fwd or Rev: 2
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0184 (m)
 C/A Code: 1.70 (m)
 L1 Doppler: 0.020 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.011 (m)
 North: 0.006 (m)
 Height: 0.023 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (32206 occurrences):

East: 0.011 (m)

North: 0.006 (m)
 Height: 0.023 (m)

Quality Number Percentages:

Q 1: 100.0 %
 Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 118.698 (km)
 Minimum: 0.103 (km)
 Average: 80.241 (km)
 First Epoch: 0.123 (km)
 Last Epoch: 0.103 (km)

Collection ID: 191221_118_33780088_04

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file: 24557
 No processed position: 2
 Missing Fwd or Rev: 2
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0159 (m)
 C/A Code: 1.78 (m)
 L1 Doppler: 0.028 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.007 (m)
 North: 0.011 (m)
 Height: 0.013 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (24553 occurrences):

East: 0.007 (m)
 North: 0.011 (m)
 Height: 0.013 (m)

Quality Number Percentages:

Q 1: 99.9 %
 Q 2: 0.1 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 89.665 (km)
 Minimum: 0.085 (km)
 Average: 45.800 (km)
 First Epoch: 0.116 (km)
 Last Epoch: 0.110 (km)

Collection ID: 191228_130_33780191_04**GNSS-IMU Summary Log:**

Number of Epochs:

Total in GPB file: 32478
 No processed position: 2
 Missing Fwd or Rev: 2
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0176 (m)
 C/A Code: 1.70 (m)
 L1 Doppler: 0.023 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.020 (m)
 North: 0.009 (m)
 Height: 0.022 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (32474 occurrences):

East: 0.020 (m)
 North: 0.009 (m)
 Height: 0.022 (m)

Quality Number Percentages:

Q 1: 100.0 %

Q 2: 0.0 %
 Q 3: 0.0 %
 Q 4: 0.0 %
 Q 5: 0.0 %
 Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
 0.10 - 0.30 m: 0.0 %
 0.30 - 1.00 m: 0.0 %
 1.00 - 5.00 m: 0.0 %
 5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 123.891 (km)
 Minimum: 0.099 (km)
 Average: 75.977 (km)
 First Epoch: 0.149 (km)
 Last Epoch: 0.099 (km)

Collection ID: 200102_130_33780088_05

GNSS-IMU Summary Log:

Number of Epochs:

Total in GPB file: 34332
 No processed position: 2
 Missing Fwd or Rev: 3
 With bad C/A code: 0
 With bad L1 Phase: 0

Measurement RMS Values:

L1 Phase: 0.0225 (m)
 C/A Code: 1.70 (m)
 L1 Doppler: 0.026 (m/s)

Fwd/Rev Separation RMS Values:

East: 0.041 (m)
 North: 0.014 (m)
 Height: 0.054 (m)

Fwd/Rev Sep. RMS for dual FWD/REV fixes (34327 occurrences):

East: 0.041 (m)
 North: 0.014 (m)
 Height: 0.054 (m)

Quality Number Percentages:

Q 1: 99.9 %
 Q 2: 0.1 %
 Q 3: 0.0 %

Q 4: 0.0 %
Q 5: 0.0 %
Q 6: 0.0 %

Position Standard Deviation Percentages:

0.00 - 0.10 m: 100.0 %
0.10 - 0.30 m: 0.0 %
0.30 - 1.00 m: 0.0 %
1.00 - 5.00 m: 0.0 %
5.00 m + over: 0.0 %

Percentages of epochs with DD_DOP over 10.00:

DOP over Tol: 0.0 %

Baseline Distances:

Maximum: 83.183 (km)
Minimum: 0.083 (km)
Average: 34.452 (km)
First Epoch: 0.106 (km)
Last Epoch: 0.102 (km)