



Region 1: Test results for Concord, MA

Summary

In FEMA-Region 1 the Concord area encompasses 305 square miles. A LiDAR data acquisition was ordered for a 2' equivalent contour accuracy, which equals the highest specification level. The area was flown and post-processed by Photo Science. CompassData performed the quality control of the collected and processed LiDAR data with a fundamental vertical accuracy (FVA) and a consolidated vertical accuracy (CVA) assessment, respectively. The planning, data collection, data processing, and data testing were successfully accomplished by the STARR members.

Index

- Final Test Results
- FVA Test
- CVA Test
- Distribution of Testing Points
- FVA Test Details
- CVA Test Details

Final Test Results

The vertical accuracy requirements based on flood risk and terrain slope are met with 17.8 cm and 18.9 cm for both FVA and CVA testing. The mandatory requirements for the highest specification for vertical accuracy, 95% confidence level are for FVA < 24.5 cm and CVA < 36.3 cm.

FVA Test

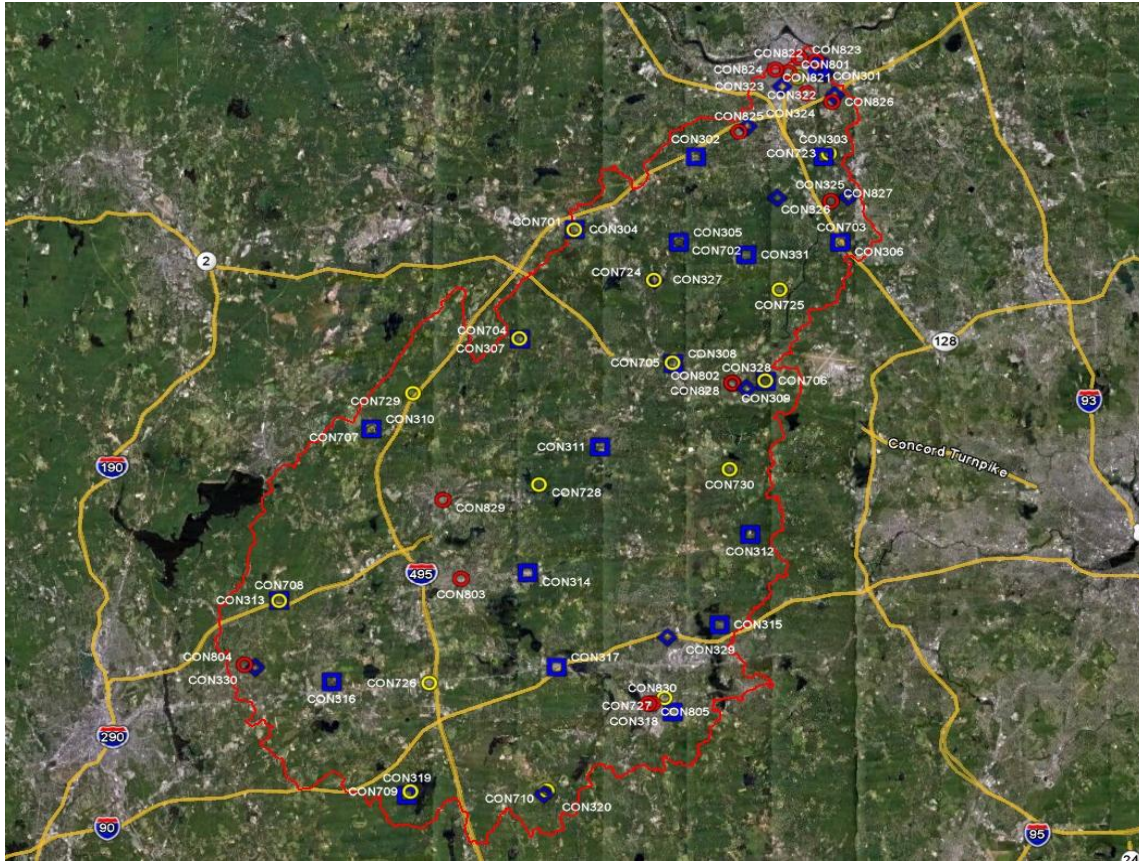
Tested 17.8 cm fundamental vertical accuracy at 95% confidence level in open terrain using $RMSE(z) \times 1.9600$. The Root Mean Square Error for the elevation differences between GPS control points and LiDAR points is 9.1 cm calculated with 31 FVA points.

CVA Test

Tested 18.9 cm consolidated vertical accuracy at 95th percentile in: open terrain, forest terrain, and urban terrain. The Root Mean Square Error for the elevation differences between GPS control points and LiDAR points is 9.7 cm calculated with 10 FVA points and 35 supplemental vertical accuracy points (SVA).








Distribution of Testing Points



Region 1, Concord, MA

Legend:

-  FVA points in open terrain on hard surface
-  FVA points in open terrain used as well in CVA test
-  SVA points in open terrain
-  SVA points in urban terrain
-  SVA points in forest terrain

According to the area to be tested the 31 FVA points are evenly distributed. Additional 35 SVA points are distributed in respect to the available major land classes.



FVA Test Details

FVA	Date	Northing (GPS)	Easting (GPS)	MSL (GPS)	LiDAR (GPS)	ΔZ	ΔZ^2
CON301	12/5/2010	4722880.327	311760.329	47.476	47.56	-0.084	0.007
CON302	12/5/2010	4717448.972	304469.987	65.702	65.72	-0.018	0.000
CON303	12/5/2010	4717225.189	311883.551	38.357	38.36	-0.003	0.000
CON304	12/5/2010	4713088.414	297302.843	84.297	84.12	0.177	0.031
CON305	12/5/2010	4712119.312	303325.851	63.98	64.06	-0.080	0.006
CON306	12/5/2010	4711838.012	312704.491	59.246	59.28	-0.034	0.001
CON307	12/4/2010	4706323.465	293910.548	74.506	74.46	0.046	0.002
CON308	12/4/2010	4704539.669	302784.363	38.953	39.05	-0.097	0.009
CON309	12/4/2010	4703269.312	308135.704	38.153	38.13	0.023	0.001
CON310	12/4/2010	4700964.088	285128.41	118.927	118.99	-0.063	0.004
CON311	12/4/2010	4699441.094	298366.902	63.825	63.57	0.255	0.065
CON312	12/4/2010	4693720.429	306933.122	52.985	52.88	0.105	0.011
CON313	12/3/2010	4690394.41	279467.307	130.096	130.10	-0.004	0.000
CON314	12/3/2010	4691710.522	293941.465	90.712	90.67	0.042	0.002
CON315	12/3/2010	4688120.317	304984.792	52.332	52.40	-0.068	0.005
CON316	12/3/2010	4685206.937	282351.688	88.296	88.35	-0.054	0.003
CON317	12/3/2010	4685756.842	295445.01	74.664	74.59	0.074	0.005
CON318	12/3/2010	4682744.242	302110.771	50.309	50.40	-0.091	0.008
CON319	12/3/2010	4677980.449	286526.811	111.696	111.74	-0.044	0.002
CON320	12/3/2010	4677814.133	294487.43	94.574	94.50	0.074	0.005
CON321	3/28/2011	4722433.070	312153.470	56.070	56.06	0.010	0.000
CON322	3/28/2011	4721057.180	312670.650	38.640	38.65	-0.010	0.000
CON323	3/28/2011	4721695.010	309622.930	32.100	32.19	-0.090	0.008
CON324	3/28/2011	4719251.670	307544.580	36.560	36.38	0.180	0.032
CON325	3/29/2011	4714726.430	309135.330	67.100	67.14	-0.040	0.002
CON326	3/28/2011	4714670.760	313267.180	60.490	60.49	0.000	0.000
CON327	3/29/2011	4709813.900	301870.440	55.920	55.90	0.020	0.000
CON328	3/29/2011	4702858.860	306998.260	39.070	39.06	0.010	0.000
CON329	3/28/2011	4687426.240	301952.070	52.900	52.87	0.030	0.001
CON330	3/29/2011	4686251.310	277967.520	140.300	140.32	-0.020	0.000
CON331	3/29/2011	4711218.820	307228.580	58.460	58.25	0.210	0.044

Z Mean	0.07	RMSE:	0.091
Z Min:	-0.10	*1.9600	0.178
Z Max:	0.26		



Note:

The FVA points (open terrain) passed the test. All, but one of the points are within the 24.5 cm confidence level. Point CON311 exceeds slightly with 25.5 cm.

The FVA test is passed.

Land Class Types: O = Open, F = Forest, U = Urban

UTM Zone 19 North, NAD83, NAVD88

MSL = NAVD88/Geoid09

All units in meters

CVA Test Details

CVA	Date	Northing (GPS)	Easting (GPS)	MSL (GPS)	LiDAR (GPS)	ΔZ	ΔZ^2
CON320	12/3/2010	4677814.133	294487.430	94.574	94.50	0.07	0.01
CON321	3/28/2011	4722433.070	312153.470	56.070	56.06	0.01	0.00
CON322	3/28/2011	4721057.180	312670.650	38.640	38.65	-0.01	0.00
CON323	3/28/2011	4721695.010	309622.930	32.100	32.19	-0.09	0.01
CON324	3/28/2011	4719251.670	307544.580	36.560	36.38	0.18	0.03
CON325	3/29/2011	4714726.430	309135.330	67.100	67.14	-0.04	0.00
CON326	3/28/2011	4714670.760	313267.180	60.490	60.49	0.00	0.00
CON327	3/29/2011	4709813.900	301870.440	55.920	55.90	0.02	0.00
CON328	3/29/2011	4702858.860	306998.260	39.070	39.06	0.01	0.00
CON329	3/28/2011	4687426.240	301952.070	52.900	52.87	0.03	0.00
CON330	3/29/2011	4686251.310	277967.520	140.300	140.32	-0.02	0.00
CON701	12/6/2010	4713062.398	297275.860	83.414	83.23	0.18	0.03
CON702	12/6/2010	4712079.235	303352.358	65.936	66.26	-0.32	0.10
CON703	12/6/2010	4711795.048	312776.487	58.129	58.27	-0.14	0.02
CON704	12/6/2010	4706358.640	293890.294	73.725	73.67	0.05	0.00
CON705	12/6/2010	4704575.234	302743.564	42.413	42.47	-0.06	0.00
CON706	12/6/2010	4703301.093	308098.308	38.565	38.72	-0.16	0.02
CON707	12/6/2010	4700913.786	285144.891	117.965	117.95	0.02	0.00
CON708	12/6/2010	4690359.257	279462.000	127.826	127.82	0.01	0.00
CON709	12/6/2010	4678205.531	286737.181	110.623	110.76	-0.14	0.02
CON710	12/6/2010	4678024.868	294647.562	92.088	91.93	0.16	0.02
CON721	3/29/2011	4722405.640	312182.390	51.630	51.73	-0.10	0.01



CON722	3/29/2011	4722232.450	310541.400	32.980	33.08	-0.10	0.01
CON723	3/29/2011	4717414.060	312208.980	38.840	38.99	-0.15	0.02
CON724	3/29/2011	4709786.420	301810.330	58.330	58.47	-0.14	0.02
CON725	3/29/2011	4708971.480	309089.400	46.900	47.02	-0.12	0.01
CON726	3/29/2011	4684957.770	288031.030	142.870	142.84	0.03	0.00
CON727	3/31/2011	4683626.060	301661.550	48.490	48.63	-0.14	0.02
CON728	3/29/2011	4697180.130	294766.590	63.140	63.17	-0.03	0.00
CON729	3/29/2011	4703112.220	287612.530	104.130	104.18	-0.05	0.00
CON730	3/29/2011	4697819.260	305859.120	56.710	56.86	-0.15	0.02
CON801	12/5/2010	4722554.013	310019.586	33.013	33.00	0.01	0.00
CON802	12/4/2010	4703169.676	306204.497	40.487	40.44	0.05	0.00
CON803	12/3/2010	4691421.606	290067.585	115.890	115.88	0.01	0.00
CON804	12/3/2010	4686420.940	277353.713	153.615	153.55	0.06	0.00
CON805	12/3/2010	4683282.004	300688.224	50.387	50.40	-0.01	0.00
CON821	3/30/2011	4721222.090	311048.810	39.350	39.29	0.06	0.00
CON822	3/28/2011	4723216.000	311643.810	36.860	36.88	-0.02	0.00
CON823	3/28/2011	4723452.800	310678.040	29.840	29.82	0.02	0.00
CON824	3/30/2011	4722753.280	309263.810	45.370	45.36	0.01	0.00
CON825	3/28/2011	4718923.730	307031.740	39.280	39.20	0.08	0.01
CON826	3/30/2011	4720635.910	312489.280	40.670	40.65	0.02	0.00
CON827	3/29/2011	4714419.250	312236.580	40.580	40.58	0.00	0.00
CON828	3/29/2011	4703214.480	306174.830	40.430	40.42	0.01	0.00
CON829	3/30/2011	4696381.140	289170.830	65.480	65.49	-0.01	0.00
CON830	3/30/2011	4683293.370	300939.400	49.960	50.03	-0.07	0.00

Z Mean	0.069	RMSE:	0.097
Z Min:	-0.324	*1.9600	0.189
Z Max:	0.184		

UTM Zone 16 North, NAD83, NAVD88

MSL = NAVD88/Geoid09

All units in meters

Note:

All 45 of the SVA points (open, forest, and urban terrain) passed. 100% of the points are within the 36.3 cm confidence level. The CVA test is passed.