Geodetic Control Survey Report

11103U North Area

Project Number: 2011-103U
Project: Hooper Island
Client: Dewberry & Davis LLC

Prepared by: Adrian Camungol
Date: 29 April 2011

Control Source: National Geodetic Survey
Horizontal Datum: NAD83
Vertical Datum: NAVD88
Units: Meters
Geoid: Geoid09

Published Control Station:

DG4545

Latitude: N38 41 25.59545
Longitude: W77 30 54.38036
Ellipsoid Height: 31.028m
Orthometric Height: 63.078m

HV5411

Latitude: N38 02 33.30691
Longitude: W77 04 10.63718
Ellipsoid Height: 16.170m
Orthometric Height: 49.51m

CORB

Latitude: N38 12 07.82819
Longitude: W77 22 24.57106
Ellipsoid Height: 37.252m
Orthometric Height: 69.792m

LOYB

Latitude: N38 43 42.02222
Longitude: W77 11 02.29856
Ellipsoid Height: -1.544m
Orthometric Height: 30.656m

LOY8

Latitude: N38 16 58.69170
Longitude: W77 27 09.46863
Ellipsoid Height: -4.887m
Orthometric Height: 27.623m

LWX

Latitude: N38 58 21.63405
Longitude: W077 29 18.96314
Ellipsoid Height: 62.046m
Orthometric Height: 94.026m

New Control Stations:

1110301

Latitude: N 38 43 34.05308
Longitude: W 77 31 24.33961
Ellipsoid Height: 23.6231m
Orthometric Height: 55.6556m

1110301_Backup

Latitude: N 38 43 34.96223
Longitude: W -77 31 25.21449
Ellipsoid Height: 24.1074m
Orthometric Height: 56.1400m

1110302

Latitude: N 38 17 51.99406
Longitude: W 77 18 55.26399
Ellipsoid Height: 29.0382m
Orthometric Height: 61.6319m

1110304

Latitude: N 37 51 41.39611
Longitude: W 76 53 55.13346
Ellipsoid Height: 5.1619m
Orthometric Height: 38.9165m

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Requirements for LiDAR Control Points

Final control used for flight data processing should:

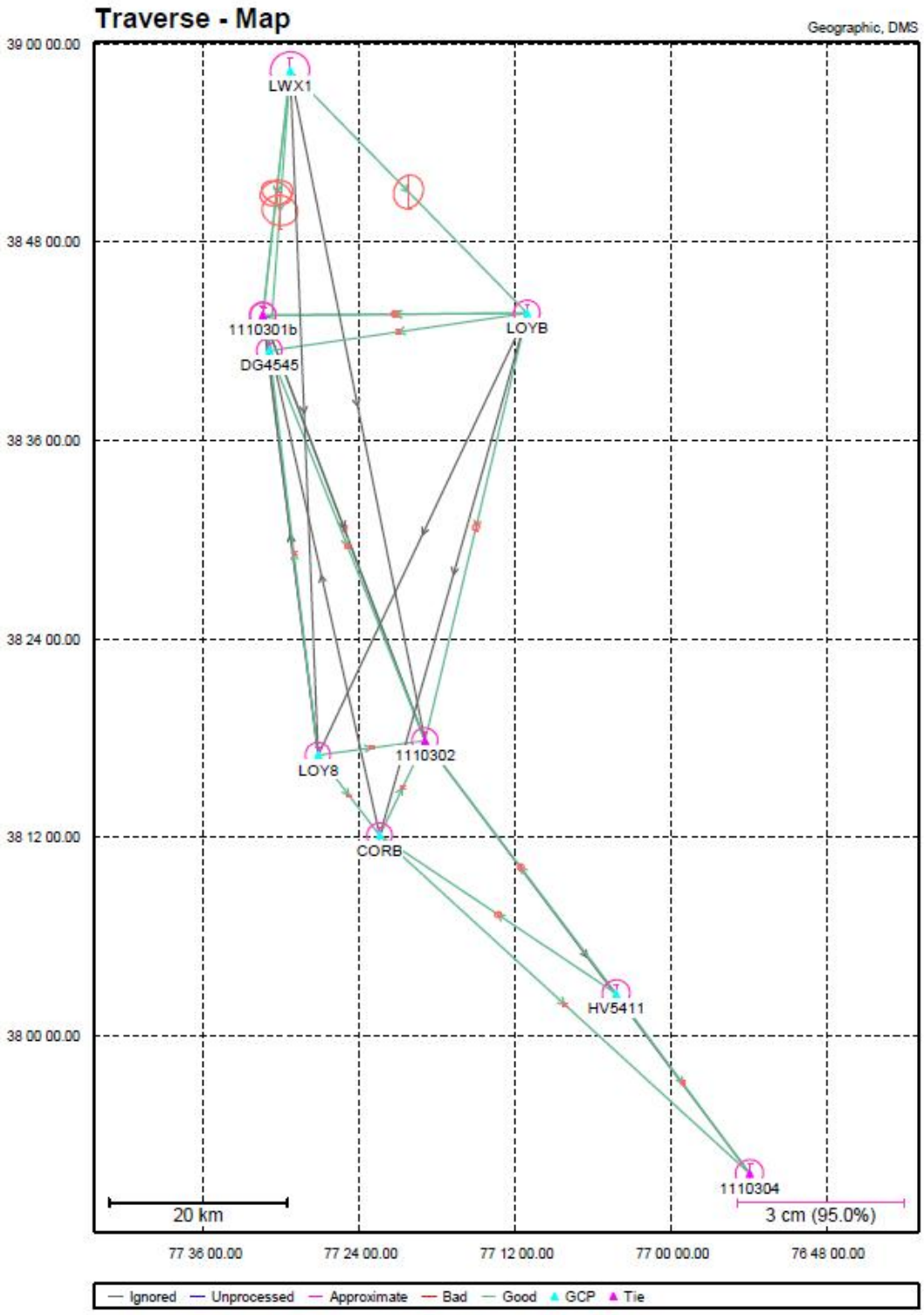
1) Be tied to geodetic control stations.
    a. Geodetic control stations should be first order or better (unless otherwise specified by client). Preference shall be given to nationally maintained control points before provincial/state level.
    b. All final flight & ground truthing control (published and/or new) should be tied to these geodetic points by two or more occupations (prove or disprove HI errors).
    c. All new points used in final flight & ground truthing control require a tie to two AGREEING 3-D geodetic control stations (alternatively any combination of horizontal and vertical control such that both are represented twice). If disagreement is found (i.e. exceeding the tolerance required to meet project specifications), sufficient additional control points must be included in the survey to clearly identify the erroneous monument.
    d. Final adjusted coordinates of published geodetic control stations should agree to +/- 1/3rd the required RMSE of the project or better. In cases where this is not achieved, additional control will be required to establish the error in the geodetic control point(s). When insufficient control can be found to agree to this standard, the issue must be taken to Operations Manager and the client.
2) Geodetic control stations may be used as final control for data processing if they meet the standards described in point 1d. In this case, the published coordinates shall be used unless special circumstances dictate otherwise.
3) Where projects use multiple control points for flight data processing, in addition to meeting the requirements of point 1, the flight control points must also be shown to tie to each other within the same specification (1d).

Note: Even if all control stations are published, they must still be tied in order to validate the coordinates.

Typical collection parameters are defined as 6 satellites, PDOP of less than 4 and low geomagnetic activity. Under these conditions, the formula of 20 minutes plus 3 minutes per baseline kilometre shall be set as the minimum for each observation. Additional time shall be observed where the collection requirements cannot be met and/or obstructions are present

Map of Control Network

Project: 11103U_North_Area_fully_constrained GrafNet v7.80.2517



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             ****************************************************
             * NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT        *
             *                                                  *
             * (c) Copyright NovAtel Inc., (2007)               *
             *                                                  *
             * Version: 7.80.2517                               *
             *                                                  *
             * FILE: C:\Documents and Settings\adrian.camungol\Desktop\2011_103U\2_Op
erations\4_Control\Grafnet Project\11103U_North_Area_fully_constrained.net
             ****************************************************

DATE(m/d/y): Sat.   4/30/11   TIME: 15:55:31



*********************************************************************

  DATUM:            'NAD83'
  GRID:             UTM, Zone 18
  SCALE_FACTOR:     36.2370
  CONFIDENCE LEVEL: 95.00 %   (Scale factor is 2.4479)


*********************************************************************
    INPUT CONTROL/CHECK POINTS
*********************************************************************

STA_ID     TYPE    -- LATITUDE --   -- LONGITUDE --  ELLHGT -   HZ-SD   V-SD
CORB       GCP-3D  38 12 07.82819  -77 22 24.57106     37.252 0.00500 0.00500
DG4545     GCP-3D  38 41 25.59545  -77 30 54.38036     31.028 0.00500 0.00500
HV5411     GCP-3D  38 02 33.30691  -77 04 10.63718     16.170 0.00500 0.00500
LOY8       GCP-3D  38 16 58.69170  -77 27 09.46863     -4.887 0.00500 0.00500
LOYB       GCP-3D  38 43 42.02222  -77 11 02.29856     -1.544 0.00500 0.00500
LWX1       GCP-3D  38 58 21.63405  -77 29 18.96314     62.046 0.00500 0.00500


*********************************************************************
    INPUT VECTORS
*********************************************************************

SESSION NAME           VECTOR(m)    ------ Covariance (m) [unscaled] ------
                        DX/DY/DZ           standard deviations in brackets
1110301 to 1110302 (1) 24162.2311  3.0027e-007 (0.0005)
                      -24948.4054  -1.9293e-007 8.2767e-007 (0.0009)
                      -37203.1198  1.3840e-007 -5.1627e-007 8.1772e-007 (0.0009)

CORB to 1110302 (1)    3524.8625  6.5872e-008 (0.0003)
                       7531.4800  -4.4868e-008 2.5941e-007 (0.0005)
                       8328.6622  2.3541e-008 -1.1784e-007 1.3464e-007 (0.0004)

CORB to 1110304 (1)   45823.3167  5.8833e-008 (0.0002)
                      -13406.2941  -4.1276e-008 2.0623e-007 (0.0005)
                      -29804.7211  2.8237e-008 -1.0206e-007 1.2740e-007 (0.0004)

DG4545 to 1110301b (1) -1267.6837  1.0032e-008 (0.0001)
                       2279.9920  -5.9245e-009 3.6169e-008 (0.0002)
                       3108.5892  3.5715e-009 -1.9565e-008 2.2601e-008 (0.0002)

DG4545 to 1110301 (4) -1243.3416  7.5477e-009 (0.0001)
                       2267.7967  -4.4153e-009 2.8047e-008 (0.0002)
                       3086.4135  3.0004e-009 -1.5048e-008 1.9793e-008 (0.0001)

DG4545 to 1110302 (1) 22918.8907  1.9815e-007 (0.0004)
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                      -22680.6039  -1.5991e-007 5.1350e-007 (0.0007)
                      -34116.7057  9.1889e-008 -2.8122e-007 4.0190e-007 (0.0006)

HV5411 to 1110302 (2) -24875.6711  2.9032e-007 (0.0005)
                      12286.8005  -6.8693e-008 9.4127e-007 (0.0010)
                      22277.4066  -2.7700e-008 -3.6349e-007 4.8920e-007 (0.0007)

HV5411 to 1110302 (1) -24875.6711  2.9032e-007 (0.0005)
                      12286.8005  -6.8693e-008 9.4127e-007 (0.0010)
                      22277.4066  -2.7700e-008 -3.6349e-007 4.8920e-007 (0.0007)

HV5411 to 1110304 (1) 17422.7878  1.4467e-007 (0.0004)
                      -8650.9654  -1.5157e-007 4.6861e-007 (0.0007)
                      -15855.9819  6.7406e-008 -2.2605e-007 2.7680e-007 (0.0005)

HV5411 to 1110304 (2) 17422.7853  1.3484e-007 (0.0004)
                      -8650.9654  -1.3362e-007 3.7822e-007 (0.0006)
                      -15855.9761  5.8303e-008 -1.7707e-007 2.1513e-007 (0.0005)

HV5411 to CORB (1)    -28400.5267  2.6145e-007 (0.0005)
                       4755.3291  -6.1610e-008 8.4441e-007 (0.0009)
                      13948.7349  -2.4847e-008 -3.2654e-007 4.4015e-007 (0.0007)

LOY8 to 1110302 (2)   11503.2978  4.4286e-008 (0.0002)
                       3590.9795  -2.6235e-008 1.6799e-007 (0.0004)
                       1310.9887  1.8677e-008 -8.8609e-008 1.0348e-007 (0.0003)

LOY8 to CORB (1)       7978.4382  6.9741e-009 (0.0001)
                      -3940.5060  -4.8590e-009 2.4939e-008 (0.0002)
                      -7017.6715  3.0130e-009 -1.3106e-008 1.7053e-008 (0.0001)

LOY8 to DG4545 (1)    -11415.5953  9.4031e-008 (0.0003)
                      26271.5735  -6.4180e-008 3.2327e-007 (0.0006)
                      35427.6980  3.7019e-008 -1.7289e-007 2.3376e-007 (0.0005)

LOYB to 1110301 (4)   -28764.3452  1.5868e-007 (0.0004)
                      -6631.6869  -1.5326e-007 4.4083e-007 (0.0007)
                       -175.9554  6.4772e-008 -2.0567e-007 2.5801e-007 (0.0005)

LOYB to 1110301b (2)  -28788.6755  2.6853e-007 (0.0005)
                      -6619.5043  -1.9228e-007 1.4143e-006 (0.0012)
                       -153.7874  -3.9893e-008 -3.4846e-007 3.1829e-007 (0.0006)

LOYB to 1110302 (1)   -4602.1043  4.9838e-007 (0.0007)
                      -31580.0876  -4.4557e-007 1.2555e-006 (0.0011)
                      -37379.0870  2.7340e-007 -7.2774e-007 9.6360e-007 (0.0010)

LOYB to DG4545 (1)    -27520.9991  5.8421e-008 (0.0002)
                      -8899.4839  -3.8810e-008 1.8368e-007 (0.0004)
                      -3262.3656  3.2429e-008 -1.1445e-007 1.6710e-007 (0.0004)

LOYB to DG4545 (3)    -27520.9991  5.8421e-008 (0.0002)
                      -8899.4839  -3.8810e-008 1.8368e-007 (0.0004)
                      -3262.3656  3.2429e-008 -1.1445e-007 1.6710e-007 (0.0004)

LWX1 to 1110301 (1)     756.0430  1.3657e-005 (0.0037)
                      -17387.0004  -8.8713e-006 1.8271e-005 (0.0043)
                      -21340.0583  5.3295e-006 -1.0904e-005 1.4152e-005 (0.0038)

LWX1 to 1110301 (2)     756.0399  4.9299e-006 (0.0022)
                      -17386.9964  -2.4347e-006 2.3562e-005 (0.0049)
                      -21340.0678  1.2899e-006 -1.0046e-005 1.0218e-005 (0.0032)

LWX1 to 1110301 (3)     756.0441  6.3562e-006 (0.0025)
                      -17386.9960  -4.1410e-006 1.8587e-005 (0.0043)
                      -21340.0707  6.1459e-007 -5.7728e-006 1.0585e-005 (0.0033)
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LWX1 to 1110301b (1)     731.6992  3.1008e-006 (0.0018)
                      -17374.8057  -1.7002e-006 1.6229e-005 (0.0040)
                      -21317.9079   6.9309e-007 -9.0968e-006 1.1850e-005 (0.0034)

LWX1 to 1110301b (2)     731.7020  7.8595e-006 (0.0028)
                      -17374.8290  -5.7544e-006 4.2104e-005 (0.0065)
                      -21317.8999  -1.1400e-006 -1.0300e-005 9.3191e-006 (0.0031)

LWX1 to 1110301b (3)     731.7041  5.1125e-006 (0.0023)
                      -17374.8243  -2.8317e-006 1.5732e-005 (0.0040)
                      -21317.8966   4.0868e-006 -7.2426e-006 1.3984e-005 (0.0037)

LWX1 to DG4545 (1)      1999.3806  7.0208e-006 (0.0026)
                      -19654.8000  -2.6862e-006 4.0447e-005 (0.0064)
                      -24426.4956   7.1703e-007 -1.6629e-005 1.7484e-005 (0.0042)

LWX1 to DG4545 (2)      1999.3797  1.8466e-006 (0.0014)
                      -19654.7946  -1.2069e-006 5.8509e-006 (0.0024)
                      -24426.4770   1.0147e-006 -3.6645e-006 5.3902e-006 (0.0023)

LWX1 to DG4545 (3)      1999.3806  7.0208e-006 (0.0026)
                      -19654.8000  -2.6862e-006 4.0447e-005 (0.0064)
                      -24426.4956   7.1703e-007 -1.6629e-005 1.7484e-005 (0.0042)

LWX1 to LOYB (1)       29520.3822  1.7145e-005 (0.0041)
                      -10755.3179  -1.5684e-005 3.7699e-005 (0.0061)
                      -21164.1081   8.2089e-006 -1.4812e-005 1.7540e-005 (0.0042)

LWX1 to LOYB (2)       29520.3846  1.4890e-005 (0.0039)
                      -10755.3146  -1.6924e-005 4.7657e-005 (0.0069)
                      -21164.1106   6.1962e-006 -2.4185e-005 1.9059e-005 (0.0044)

LWX1 to LOYB (3)       29520.3863  1.2013e-005 (0.0035)
                      -10755.3221  -8.5316e-006 2.3701e-005 (0.0049)
                      -21164.1024   5.6770e-006 -1.2537e-005 1.6118e-005 (0.0040)
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****

OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)

****

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST (km)	- STD - (m)
1110301 to 1110302 (1)	0.0044	0.0028	-0.0090	0.204	50.9	0.0090
CORB to 1110302 (1)	-0.0022	0.0004	-0.0012	0.217	11.8	0.0044
CORB to 1110304 (1)	0.0007	0.0029	-0.0055	0.111	56.3	0.0040
DG4545 to 1110301b (1)	0.0001	-0.0004	-0.0004	0.138	4.1	0.0017
DG4545 to 1110301 (4)	-0.0001	0.0001	-0.0002	0.052	4.0	0.0015
DG4545 to 1110302 (1)	0.0021	-0.0004	-0.0061	0.137	46.9	0.0068
HV5411 to 1110302 (2)	0.0027	-0.0026	0.0033	0.139	35.6	0.0084
HV5411 to 1110302 (1)	0.0027	-0.0026	0.0033	0.139	35.6	0.0084
HV5411 to 1110304 (1)	-0.0009	-0.0003	0.0076	0.306	25.1	0.0061
HV5411 to 1110304 (2)	0.0016	-0.0052	0.0045	0.282	25.1	0.0055
HV5411 to CORB (1)	-0.0037	0.0002	0.0157	0.505	32.0	0.0080
LOY8 to 1110302 (2)	-0.0007	-0.0015	0.0037	0.334	12.1	0.0036
LOY8 to CORB (1)	-0.0001	0.0002	-0.0011	0.098	11.3	0.0014
LOY8 to DG4545 (1)	0.0017	0.0018	0.0004	0.055	45.6	0.0052
LOYB to 1110301 (4)	0.0035	-0.0003	-0.0008	0.121	29.5	0.0059
LOYB to 1110301b (2)	-0.0051	0.0145	-0.0079	0.586	29.5	0.0091
LOYB to 1110302 (1)	-0.0027	0.0102	-0.0006	0.214	49.1	0.0106
LOYB to DG4545 (1)	-0.0008	-0.0022	-0.0037	0.151	29.1	0.0041
LOYB to DG4545 (3)	-0.0008	-0.0022	-0.0037	0.151	29.1	0.0041
LWX1 to 1110301 (1)	-0.0016	-0.0071	0.0022	0.275	27.5	0.0436
LWX1 to 1110301 (2)	0.0006	-0.0026	0.0117	0.435	27.5	0.0400
LWX1 to 1110301 (3)	-0.0036	0.0000	0.0131	0.493	27.5	0.0383

LWX1 to 1110301b (1)	0.0004	0.0122	0.0177	0.781	27.5	0.0359
LWX1 to 1110301b (2)	0.0027	0.0207	-0.0055	0.784	27.5	0.0494
LWX1 to 1110301b (3)	-0.0003	0.0155	-0.0044	0.585	27.5	0.0379
LWX1 to DG4545 (1)	0.0031	0.0126	0.0157	0.649	31.4	0.0518
LWX1 to DG4545 (2)	0.0028	-0.0053	0.0083	0.327	31.4	0.0232
LWX1 to DG4545 (3)	0.0031	0.0126	0.0157	0.649	31.4	0.0518
LWX1 to LOYB (1)	0.0018	-0.0009	0.0039	0.117	37.9	0.0546
LWX1 to LOYB (2)	-0.0013	-0.0006	0.0076	0.204	37.9	0.0580
LWX1 to LOYB (3)	-0.0013	-0.0022	-0.0035	0.114	37.9	0.0462
RMS	0.0023	0.0072	0.0079			

$ - This session is flagged as a 3-sigma outlier

****
CONTROL POINT RESIDUALS (ADJUSTMENT MADE)
****

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
CORB	0.0011	0.0077	-0.0046
DG4545	0.0074	0.0044	-0.0034
HV5411	-0.0015	-0.0291	0.0241
LOY8	-0.0077	0.0099	-0.0083
LOYB	-0.0014	0.0033	-0.0108
LWX1	0.0020	0.0040	0.0033
RMS	0.0045	0.0132	0.0116

****
OUTPUT STATION COORDINATES (LAT/LONG/HT)
****

STA_ID	-- LATITUDE --	-- LONGITUDE --	- ELLHGT -	ORTHOHGT
1110301	38 43 34.05308	-77 31 24.33961	23.6231	55.6556
1110301b	38 43 34.96223	-77 31 25.21449	24.1074	56.1400
1110302	38 17 51.99406	-77 18 55.26399	29.0382	61.6319
1110304	37 51 41.39611	-76 53 55.13346	5.1619	38.9165
CORB	38 12 07.82844	-77 22 24.57102	37.2473	69.7897
DG4545	38 41 25.59559	-77 30 54.38005	31.0245	63.0714
HV5411	38 02 33.30596	-77 04 10.63724	16.1940	49.5333
LOY8	38 16 58.69202	-77 27 09.46895	-4.8954	27.6142
LOYB	38 43 42.02232	-77 11 02.29862	-1.5549	30.6406
LWX1	38 58 21.63418	-77 29 18.96306	62.0492	94.0264

****
OUTPUT STATION COORDINATES (GRID)
****

STA_ID	- EASTING - (m)	- NORTHING - (m)	- ELLHGT - (m)	ORTHOHGT (m)
1110301	280636.5498	4289408.3079	23.6231	55.6556
1110301b	280616.1936	4289436.9199	24.1074	56.1400
1110302	297530.1861	4241390.8785	29.0382	61.6319
1110304	332983.1267	4192146.9986	5.1619	38.9165
CORB	292173.0326	4230910.1083	37.2473	69.7897
DG4545	281251.3107	4285428.0107	31.0245	63.0714
HV5411	318388.2985	4212561.7555	16.1940	49.5333
LOY8	285480.2968	4240057.4582	-4.8954	27.6142
LOYB	310154.9384	4288895.1007	-1.5549	30.6406
LWX1	284410.5249	4316690.1996	62.0492	94.0264

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*********************************************************************
    OUTPUT VARIANCE/COVARIANCE
*********************************************************************
                                                        2
STA_ID      SE/SN/SUP  --------- CX matrix (m )-----------
            (95.00 %)  (not scaled by confidence level)
               (m)           (ECEF, XYZ cartesian)
1110301        0.0056  5.3283e-006
               0.0057  -5.8958e-007 7.3266e-006
               0.0072  3.1504e-007 -1.4883e-006 6.5119e-006

1110301b       0.0056  5.4545e-006
               0.0057  -6.4007e-007 7.8618e-006
               0.0074  3.1584e-007 -1.7225e-006 6.6917e-006

1110302        0.0056  5.3619e-006
               0.0057  -6.0993e-007 7.4299e-006
               0.0072  3.1658e-007 -1.4999e-006 6.4288e-006

1110304        0.0060  6.3476e-006
               0.0062  -1.3243e-006 1.0314e-005
               0.0087  7.2678e-007 -2.7768e-006 8.2007e-006

CORB           0.0055  5.0623e-006
               0.0055  -3.6627e-007 6.2245e-006
               0.0064  1.7536e-007 -8.3150e-007 5.7137e-006

DG4545         0.0055  5.1116e-006
               0.0056  -4.4523e-007 6.5452e-006
               0.0067  2.2289e-007 -1.0629e-006 5.9604e-006

HV5411         0.0060  6.1344e-006
               0.0061  -7.3865e-007 8.8462e-006
               0.0078  2.0028e-007 -1.7130e-006 7.2846e-006

LOY8           0.0054  5.0280e-006
               0.0055  -3.4942e-007 6.1627e-006
               0.0064  1.6966e-007 -8.2032e-007 5.6760e-006

LOYB           0.0056  5.4841e-006
               0.0058  -6.4215e-007 7.3839e-006
               0.0072  3.2477e-007 -1.4465e-006 6.6206e-006

LWX1           0.0083  1.1878e-005
               0.0086  -1.5397e-006 1.7068e-005
               0.0108  4.4221e-007 -3.3262e-006 1.4507e-005



*********************************************************************
    VARIANCE FACTOR = 1.0090

    Note: Values < 1.0 indicate statistics are pessimistic, while
          values > 1.0 indicate optimistic statistics. Entering this
          value as the network adjustment scale factor will bring
          variance factor to one.
*********************************************************************
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```
*************************************************
* GrafNet - GRAPHIC GPS NETWORK PROCESSING      *
*           SOFTWARE PACKAGE                    *
*                                               *
* TRAVERSE SOLUTION:                            *
*                                               *
* Copyright NovAtel Inc. (2007)                 *
*                                               *
* Version: 7.80.2517                            *
*                                               *
* PROJECT: 11103U_North_Area_fully_constrained.gnt *
*************************************************
```

DATE: 4/30/2011 (m/d/y)
TIME: 16:06:56

DATUM: NAD83
GRID: UTM, Zone 18
UNITS: metres (see preferences to change)
GEOID: C:\Documents and Settings\adrian.camungol\Desktop\Operations_DVD\Software\Geoids\USA\Geoid09\Geoid09_CONUS.wpg

****
STATIONS (STATUS):
****

Station	Type	HgtStatus	Result	Coordinates derrived from...
1110301	Loop Tie	OK	Good	DG4545
1110301b	Loop Tie	OK	Good	LOYB
1110302	Loop Tie	OK	Good	DG4545
1110304	Loop Tie	OK	Good	CORB
CORB	Control-3D	OK	Pub(3D)	(-)
DG4545	Control-3D	OK	Pub(3D)	(-)
HV5411	Control-3D	OK	Pub(3D)	(-)
LOY8	Control-3D	OK	Pub(3D)	(-)
LOYB	Control-3D	OK	Pub(3D)	(-)
LWX1	Control-3D	OK	Pub(3D)	(-)

****
STATIONS (COORDINATES):
****

Station	Latitude (D M S)	Longitude (D M S)	Grid-E (m)	Grid-N (m)	EllHgt (m)	OrthoHgt (m)
1110301	38 43 34.05317	-77 31 24.33975	280636.547	4289408.311	23.623	55.655
1110301b	38 43 34.96202	-77 31 25.21403	280616.205	4289436.913	24.119	56.151
1110302	38 17 51.99415	-77 18 55.26443	297530.175	4241390.882	29.043	61.637
1110304	37 51 41.39576	-76 53 55.13353	332983.125	4192146.988	5.172	38.927
CORB	38 12 07.82819	-77 22 24.57106	292173.031	4230910.101	37.252	69.794
DG4545	38 41 25.59545	-77 30 54.38036	281251.303	4285428.007	31.028	63.075
HV5411	38 02 33.30691	-77 04 10.63718	318388.301	4212561.785	16.170	49.509
LOY8	38 16 58.69170	-77 27 09.46863	285480.304	4240057.448	-4.887	27.623
LOYB	38 43 42.02222	-77 11 02.29856	310154.940	4288895.098	-1.544	30.651

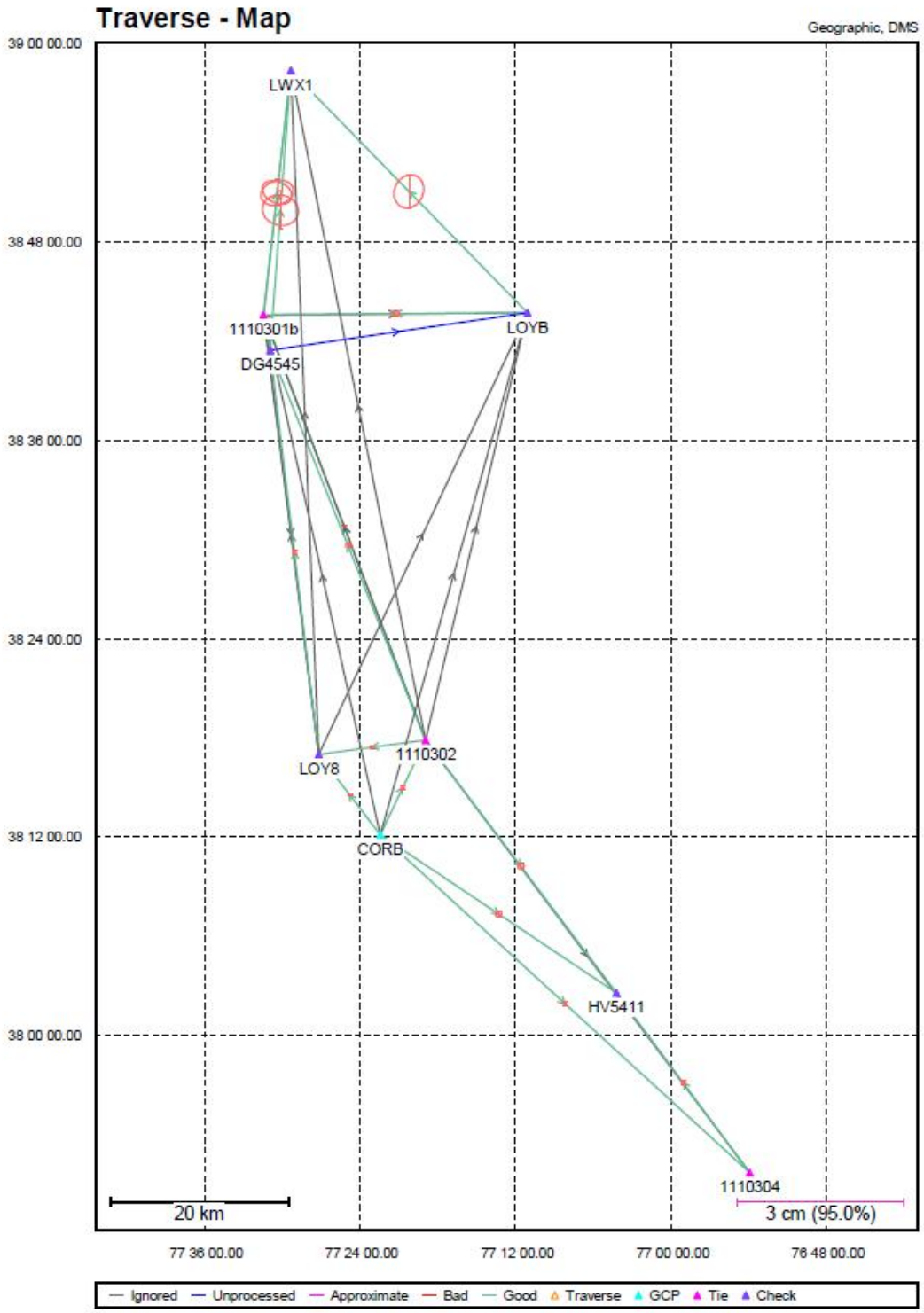
LWX1 38 58 21.63405 -77 29 18.96314 284410.523 4316690.196 62.046 94.0
23

****
LOOP, CHECK & DUPLICATE TIES:
****

Name/Session	Type	Result	DEast (m)	DNorth (m)	DHeight (m)
LOYB to 1110301	LoopTie	Good	-0.0053	-0.0016	-0.0080
LWX1 to 1110301 (1)	Duplicate	Good	-0.0068	-0.0076	0.0090
LWX1 to 1110301 (2)	Duplicate	Good	-0.0046	-0.0031	0.0185
LWX1 to 1110301	LoopTie	Good	-0.0088	-0.0005	0.0199
LWX1 to 1110301b	LoopTie	Good	0.0083	0.0017	0.0175
LWX1 to 1110301b (2)	Duplicate	Good	0.0113	0.0069	0.0163
LWX1 to 1110301b (1)	Duplicate	Good	0.0090	-0.0015	0.0395
DG4545 to 1110301b	LoopTie	Good	0.0141	-0.0138	0.0149
LOY8 to 1110302	LoopTie	Good	-0.0178	0.0045	0.0049
LOYB to 1110302	LoopTie	Good	-0.0136	0.0093	-0.0019
CORB to 1110302	LoopTie	Good	-0.0106	0.0042	0.0038
HV5411 to 1110302	LoopTie	Good	-0.0081	-0.0359	0.0367
HV5411 to 1110302 (2)	Duplicate	Good	-0.0081	-0.0359	0.0367
1110301 to 1110302	LoopTie	Good	0.0022	0.0032	-0.0031
HV5411 to 1110304	LoopTie	Good	-0.0043	-0.0400	0.0419
HV5411 to 1110304 (2)	Duplicate	Good	-0.0019	-0.0449	0.0388
RMS (tie points)			0.0094	0.0204	0.0240
RMS (check points)					

Minimally Constrained GPS Network

Project: 11103U_North_Area_minimally_constrained GrafNet v7.80.2517



```
              ***************************************************
              * NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT       *
              *                                                 *
              * (c) Copyright NovAtel Inc., (2007)              *
              *                                                 *
              * Version: 7.80.2517                              *
              *                                                 *
              * FILE: C:\Documents and Settings\adrian.camungol\Desktop\2011_103U\2_Op
erations\4_Control\Grafnet Project\11103U_North_Area_minimally_constrained.net
              ***************************************************

DATE(m/d/y): Sat.   4/30/11   TIME: 15:43:13



*********************************************************************

  DATUM:            'NAD83'
  GRID:             UTM, Zone 18
  SCALE_FACTOR:     32.7959
  CONFIDENCE LEVEL: 95.00 %   (Scale factor is 2.4479)


*********************************************************************
    INPUT CONTROL/CHECK POINTS
*********************************************************************

STA_ID     TYPE    -- LATITUDE --  -- LONGITUDE --  ELLHGT -   HZ-SD   V-SD
CORB       GCP-3D  38 12 07.82819  -77 22 24.57106     37.252 0.00500 0.00500
DG4545     CHK-3D  38 41 25.59545  -77 30 54.38036     31.028
HV5411     CHK-3D  38 02 33.30691  -77 04 10.63718     16.170
LOY8       CHK-3D  38 16 58.69170  -77 27 09.46863     -4.887
LWX1       CHK-3D  38 58 21.63405  -77 29 18.96314     62.046


*********************************************************************
    INPUT VECTORS
*********************************************************************

SESSION NAME           VECTOR(m)    ------ Covariance (m) [unscaled] ------
                        DX/DY/DZ           standard deviations in brackets
1110302 to 1110301 (1) -24162.2295  2.1458e-007 (0.0005)
                       24948.4092  -1.7542e-007 5.5423e-007 (0.0007)
                       37203.1165  1.0200e-007 -2.9996e-007 4.2860e-007 (0.0007)

1110302 to 1110301 (2) -24162.2356  8.9379e-008 (0.0003)
                       24948.3903  -5.1732e-008 3.3235e-007 (0.0006)
                       37203.1328  3.7671e-008 -1.9595e-007 2.4278e-007 (0.0005)

1110301 to DG4545 (4)   1243.3421  7.5480e-009 (0.0001)
                       -2267.7988  -4.4145e-009 2.8046e-008 (0.0002)
                       -3086.4119  3.0004e-009 -1.5050e-008 1.9796e-008 (0.0001)

1110301 to LWX1 (1)     -756.0371  1.0569e-006 (0.0010)
                       17386.9895  -7.4805e-007 3.8024e-006 (0.0019)
                       21340.0723  5.1373e-007 -2.2144e-006 3.0323e-006 (0.0017)

1110301 to LWX1 (2)     -756.0396  4.9629e-006 (0.0022)
                       17386.9954  -2.4500e-006 2.3707e-005 (0.0049)
                       21340.0686  1.2955e-006 -1.0094e-005 1.0264e-005 (0.0032)

1110301 to LWX1 (3)     -756.0440  6.3557e-006 (0.0025)
                       17386.9952  -4.1451e-006 1.8593e-005 (0.0043)
```

```
                      21340.0713  6.1321e-007 -5.7599e-006 1.0572e-005 (0.0033)

1110301b to LWX1 (1)   -731.6990  3.1008e-006 (0.0018)
                      17374.8046  -1.7027e-006 1.6240e-005 (0.0040)
                      21317.9087  6.9231e-007 -9.0925e-006 1.1839e-005 (0.0034)

DG4545 to 1110301b (1) -1267.6837  1.0032e-008 (0.0001)
                        2279.9920  -5.9245e-009 3.6169e-008 (0.0002)
                        3108.5892  3.5715e-009 -1.9565e-008 2.2601e-008 (0.0002)

1110301b to LWX1 (2)   -731.7039  5.1111e-006 (0.0023)
                      17374.8234  -2.8354e-006 1.5737e-005 (0.0040)
                      21317.8973  4.0835e-006 -7.2337e-006 1.3966e-005 (0.0037)

1110301b to LWX1 (3)   -731.7018  7.8616e-006 (0.0028)
                      17374.8283  -5.7559e-006 4.2127e-005 (0.0065)
                      21317.9006  -1.1462e-006 -1.0272e-005 9.3052e-006 (0.0031)

1110302 to DG4545 (1) -22918.8904  1.9835e-007 (0.0004)
                      22680.6028  -1.6027e-007 5.1383e-007 (0.0007)
                      34116.7065  9.1908e-008 -2.8085e-007 4.0128e-007 (0.0006)

1110302 to HV5411 (1) 24875.6714  2.9040e-007 (0.0005)
                      -12286.8020  -6.7916e-008 9.4062e-007 (0.0010)
                      -22277.4053  -2.8135e-008 -3.6399e-007 4.8984e-007 (0.0007)

1110302 to LOY8 (2)   -11503.2976  4.4302e-008 (0.0002)
                      -3590.9806  -2.6268e-008 1.6796e-007 (0.0004)
                      -1310.9878  1.8710e-008 -8.8607e-008 1.0349e-007 (0.0003)

1110304 to HV5411 (1) -17422.7849  1.3502e-007 (0.0004)
                       8650.9637  -1.3388e-007 3.7848e-007 (0.0006)
                      15855.9775  5.8353e-008 -1.7697e-007 2.1498e-007 (0.0005)

CORB to 1110302 (1)    3524.8625  6.5872e-008 (0.0003)
                       7531.4800  -4.4868e-008 2.5941e-007 (0.0005)
                       8328.6622  2.3541e-008 -1.1784e-007 1.3464e-007 (0.0004)

CORB to 1110304 (1)   45823.3167  5.8833e-008 (0.0002)
                      -13406.2941  -4.1276e-008 2.0623e-007 (0.0005)
                      -29804.7211  2.8237e-008 -1.0206e-007 1.2740e-007 (0.0004)

CORB to HV5411 (1)    28400.5268  2.6151e-007 (0.0005)
                      -4755.3298  -6.0883e-008 8.4380e-007 (0.0009)
                      -13948.7343  -2.5286e-008 -3.2676e-007 4.4052e-007 (0.0007)

CORB to LOY8 (1)      -7978.4382  6.9754e-009 (0.0001)
                       3940.5058  -4.8631e-009 2.4943e-008 (0.0002)
                       7017.6716  3.0152e-009 -1.3103e-008 1.7048e-008 (0.0001)

DG4545 to LWX1 (1)    -1999.3794  1.8459e-006 (0.0014)
                      19654.7933  -1.2075e-006 5.8548e-006 (0.0024)
                      24426.4780  1.0136e-006 -3.6628e-006 5.3851e-006 (0.0023)

DG4545 to LWX1 (2)    -1999.3803  7.0783e-006 (0.0027)
                      19654.7988  -2.6877e-006 4.0793e-005 (0.0064)
                      24426.4967  7.1441e-007 -1.6764e-005 1.7605e-005 (0.0042)

DG4545 to LWX1 (3)    -1999.3846  6.5023e-006 (0.0025)
                      19654.8058  -1.4594e-006 2.5345e-005 (0.0050)
                      24426.4853  -2.8264e-007 -9.2239e-006 1.1260e-005 (0.0034)

LOY8 to DG4545 (1)    -11415.5953  9.4031e-008 (0.0003)
                      26271.5735  -6.4180e-008 3.2327e-007 (0.0006)
                      35427.6980  3.7019e-008 -1.7289e-007 2.3376e-007 (0.0005)
```

****
OUTPUT VECTOR RESIDUALS (East, North, Height - Local Level)
****

SESSION NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)	- PPM -	DIST - (km)	STD - (m)
1110302 to 1110301 (1)	-0.0066	-0.0005	0.0111	0.254	50.9	0.0063
1110302 to 1110301 (2)	0.0035	-0.0026	-0.0124	0.258	50.9	0.0047
1110301 to DG4545 (4)	-0.0001	-0.0004	-0.0002	0.102	4.0	0.0013
1110301 to LWX1 (1)	-0.0006	0.0048	-0.0040	0.228	27.5	0.0161
1110301 to LWX1 (2)	0.0006	0.0037	0.0032	0.179	27.5	0.0357
1110301 to LWX1 (3)	0.0049	0.0011	0.0021	0.198	27.5	0.0341
1110301b to LWX1 (1)	0.0011	-0.0110	-0.0056	0.451	27.5	0.0320
DG4545 to 1110301b (1)	0.0000	-0.0001	0.0000	0.016	4.1	0.0015
1110301b to LWX1 (2)	0.0018	-0.0143	0.0167	0.802	27.5	0.0338
1110301b to LWX1 (3)	-0.0013	-0.0196	0.0180	0.969	27.5	0.0441
1110302 to DG4545 (1)	-0.0021	0.0018	0.0045	0.113	46.9	0.0060
1110302 to HV5411 (1)	-0.0029	-0.0018	0.0075	0.231	35.6	0.0075
1110302 to LOY8 (2)	0.0003	0.0017	-0.0040	0.361	12.1	0.0032
1110304 to HV5411 (1)	-0.0007	0.0025	-0.0008	0.108	25.1	0.0049
CORB to 1110302 (1)	-0.0018	0.0004	-0.0026	0.273	11.8	0.0039
CORB to 1110304 (1)	-0.0001	0.0013	-0.0001	0.022	56.3	0.0036
CORB to HV5411 (1)	0.0040	-0.0046	-0.0054	0.253	32.0	0.0071
CORB to LOY8 (1)	0.0001	-0.0001	0.0005	0.046	11.3	0.0013
DG4545 to LWX1 (1)	-0.0014	0.0069	0.0039	0.255	31.4	0.0207
DG4545 to LWX1 (2)	-0.0017	-0.0112	-0.0035	0.377	31.4	0.0463
DG4545 to LWX1 (3)	0.0010	-0.0072	0.0097	0.384	31.4	0.0376
LOY8 to DG4545 (1)	0.0022	0.0029	-0.0009	0.083	45.6	0.0046
RMS	0.0024	0.0068	0.0074			

$ - This session is flagged as a 3-sigma outlier

****
CHECK POINT RESIDUALS (East, North, Height - Local Level)
****

STA. NAME	-- RE -- (m)	-- RN -- (m)	-- RH -- (m)
DG4545	0.0068	-0.0020	-0.0006
HV5411	-0.0025	-0.0412	0.0399
LOY8	-0.0088	0.0024	-0.0041
LWX1	0.0028	-0.0010	0.0199
RMS	0.0058	0.0207	0.0224

****
OUTPUT STATION COORDINATES (LAT/LONG/HT)
****

STA_ID	-- LATITUDE --	-- LONGITUDE --	- ELLHGT -	ORTHOHGT
1110301	38 43 34.05312	-77 31 24.33947	23.6196	55.6522
1110301b	38 43 34.96240	-77 31 25.21433	24.1032	56.1358
1110302	38 17 51.99403	-77 18 55.26407	29.0366	61.6303
1110304	37 51 41.39580	-76 53 55.13353	5.1719	38.9265
CORB	38 12 07.82819	-77 22 24.57106	37.2519	69.7943
DG4545	38 41 25.59538	-77 30 54.38008	31.0273	63.0742
HV5411	38 02 33.30557	-77 04 10.63728	16.2099	49.5491

```
LOY8          38 16 58.69177   -77 27 09.46899     -4.8912     27.6185
LWX1          38 58 21.63401   -77 29 18.96302     62.0658     94.0430


*********************************************************************
    OUTPUT STATION COORDINATES (GRID)
*********************************************************************

STA_ID        - EASTING -    - NORTHING -  - ELLHGT -    ORTHOHGT
                    (m)            (m)          (m)          (m)
1110301       280636.5533   4289408.3090     23.6196     55.6522
1110301b      280616.1976   4289436.9251     24.1032     56.1358
1110302       297530.1842   4241390.8776     29.0366     61.6303
1110304       332983.1247   4192146.9894      5.1719     38.9265
CORB          292173.0314   4230910.1006     37.2519     69.7943
DG4545        281251.3099   4285428.0043     31.0273     63.0742
HV5411        318388.2972   4212561.7434     16.2099     49.5491
LOY8          285480.2955   4240057.4506     -4.8912     27.6185
LWX1          284410.5255   4316690.1946     62.0658     94.0430


*********************************************************************
    OUTPUT VARIANCE/COVARIANCE
*********************************************************************
                                                        2
STA_ID        SE/SN/SUP    --------- CX matrix (m )-----------
              (95.00 %)    (not scaled by confidence level)
                 (m)             (ECEF, XYZ cartesian)
1110301          0.0125   2.6532e-005
                 0.0126   -1.0321e-006 3.0211e-005
                 0.0140   6.2984e-007 -2.7784e-006 2.8620e-005

1110301b         0.0126   2.6830e-005
                 0.0127   -1.2180e-006 3.1248e-005
                 0.0143   7.3369e-007 -3.3335e-006 2.9275e-005

1110302          0.0124   2.5773e-005
                 0.0124   -4.8309e-007 2.7870e-005
                 0.0132   2.8356e-007 -1.4132e-006 2.6697e-005

1110304          0.0126   2.6577e-005
                 0.0126   -1.0755e-006 3.0423e-005
                 0.0139   6.5777e-007 -2.6079e-006 2.8255e-005

CORB             0.0122   2.5000e-005
                 0.0122   -7.6427e-020 2.5000e-005
                 0.0122   3.1798e-020 -5.5137e-019 2.5000e-005

DG4545           0.0125   2.6503e-005
                 0.0126   -1.0253e-006 3.0069e-005
                 0.0139   6.1769e-007 -2.6967e-006 2.8539e-005

HV5411           0.0128   2.7564e-005
                 0.0129   -1.4809e-006 3.3064e-005
                 0.0145   4.1214e-007 -3.3706e-006 2.9482e-005

LOY8             0.0123   2.5212e-005
                 0.0123   -1.4687e-007 2.5761e-005
                 0.0125   9.0284e-008 -3.9694e-007 2.5513e-005

LWX1             0.0147   3.7771e-005
                 0.0155   -7.6538e-006 7.2027e-005
                 0.0232   4.2468e-006 -2.3242e-005 5.6400e-005


  *********************************************************************
      VARIANCE FACTOR = 1.0000

      Note: Values < 1.0 indicate statistics are pessimistic, while
            values > 1.0 indicate optimistic statistics. Entering this
            value as the network adjustment scale factor will bring
            variance factor to one.
  *********************************************************************
```

```
*************************************************
* GrafNet - GRAPHIC GPS NETWORK PROCESSING      *
*           SOFTWARE PACKAGE                    *
*                                               *
* TRAVERSE SOLUTION:                            *
*                                               *
* Copyright NovAtel Inc. (2007)                 *
*                                               *
* Version: 7.80.2517                            *
*                                               *
* PROJECT: 11103U_North_Area_minimally_constrained *
*************************************************


DATE:   4/30/2011 (m/d/y)
TIME:   16:09:25

DATUM:  NAD83
GRID:   UTM, Zone 18
UNITS:  metres (see preferences to change)
GEOID:  C:\Documents and Settings\adrian.camungol\Desktop\Operations_DVD\Software\Geo
ids\USA\Geoid09\Geoid09_CONUS.wpg


*********************************
  STATIONS (STATUS):
*********************************

Station  Type       HgtStatus      Result  Coordinates derrived from...
1110301  Traverse   OK             Good    1110302  CORB
1110301b Loop Tie   OK             Good    DG4545   1110302  CORB
1110302  Loop Tie   OK             Good    CORB
1110304  Loop Tie   OK             Good    CORB
CORB     Control-3D OK             Pub(3D) (-)
DG4545   Check-3D   OK             Good    1110302  CORB
HV5411   Check-3D   OK             Good    CORB
LOY8     Check-3D   OK             Good    CORB
LOYB     Check-3D
LWX1     Check-3D   OK             Good    1110301  1110302  CORB

* Indicates that height determined from horizontal control point whose
  elevation value is estimated either by the user or the network adjustment.
  Height values from these points should not be used.  Use the network
  adjustment values instead.


*********************************
  STATIONS (COORDINATES):
*********************************

Station          Latitude         Longitude        Grid-E        Grid-N     EllHgt  OrthoH
gt
                   (D M S)           (D M S)          (m)           (m)        (m)       (
m)
1110301    38 43 34.05319  -77 31 24.33953   280636.552  4289408.311    23.635    55.6
67
1110301b   38 43 34.96233  -77 31 25.21417   280616.201  4289436.923    24.101    56.1
34
1110302    38 17 51.99402  -77 18 55.26400   297530.186  4241390.877    29.039    61.6
33
1110304    37 51 41.39576  -76 53 55.13353   332983.125  4192146.988     5.172    38.9
27
CORB       38 12 07.82819  -77 22 24.57106   292173.031  4230910.101    37.252    69.7
94
DG4545     38 41 25.59531  -77 30 54.37992   281251.314  4285428.002    31.025    63.0
72
```

HV5411	38 02 33.30572	-77 04 10.63744	318388.293	4212561.748	16.215	49.5
54						
LOY8	38 16 58.69178	-77 27 09.46900	285480.295	4240057.451	-4.892	27.6
18						
LOYB	(-)	(-)	(-)	(-)	(-)	(
-)						
LWX1	38 58 21.63405	-77 29 18.96330	284410.519	4316690.196	62.079	94.0
56						

****
LOOP, CHECK & DUPLICATE TIES:
****

Name/Session	Type	Result	DEast (m)	DNorth (m)	DHeight (m)
1110302 to 1110301 (1)	Duplicate	Good	-0.0100	0.0020	0.0236
DG4545 to 1110301b (2)	Duplicate	Good	0.0005	0.0001	0.0002
DG4545 to 1110301b (3)	Duplicate	Good	0.0017	0.0075	-0.0031
POINT DG4545	CheckPnt	Good	0.0107	-0.0043	-0.0025
LOY8 to DG4545	LoopTie	Good	0.0062	0.0007	-0.0023
1110301 to DG4545	LoopTie	Good	0.0055	-0.0048	-0.0171
POINT HV5411	CheckPnt	Good	-0.0064	-0.0367	0.0452
1110302 to HV5411	LoopTie	Good	-0.0086	0.0032	0.0102
1110304 to HV5411	LoopTie	Good	-0.0047	0.0084	0.0044
POINT LOY8	CheckPnt	Good	-0.0089	0.0023	-0.0047
1110302 to LOY8	LoopTie	Good	-0.0016	0.0021	-0.0072
POINT LWX1	CheckPnt	Good	-0.0038	-0.0001	0.0328
1110301 to LWX1 (2)	Duplicate	Good	-0.0043	0.0026	0.0011
1110301 to LWX1 (1)	Duplicate	Good	-0.0055	0.0037	-0.0061
DG4545 to LWX1 (1)	Duplicate	Good	-0.0118	0.0101	0.0187
DG4545 to LWX1	LoopTie	Good	-0.0121	-0.0080	0.0113
DG4545 to LWX1 (3)	Duplicate	Good	-0.0095	-0.0040	0.0245
1110301b to LWX1 (1)	Duplicate	Good	-0.0093	-0.0079	0.0093
1110301b to LWX1	LoopTie	Good	-0.0086	-0.0112	0.0315
1110301b to LWX1 (3)	Duplicate	Good	-0.0117	-0.0165	0.0328
RMS (tie points)			0.0079	0.0072	0.0164
RMS (check points)			0.0079	0.0185	0.0281

Station Description and Photos:

1110301

Latitude: N 38 43 34.05308
Longitude: W 77 31 24.33961
Ellipsoid Height: 23.6231m
Orthometric Height: 55.6556m

Final STATION COORDINATES (GRID)
Easting: 280636.5498
Northing: 4289408.3079
Ellipsoid Height: 23.6231m
Orthometric Height: 55.6556m

Terrapoint

STATION DESCRIPTION FORM

PROJECT No.: FEMA Virginia
PROJECT NAME: 111034
LOCATION: Manassas, VA

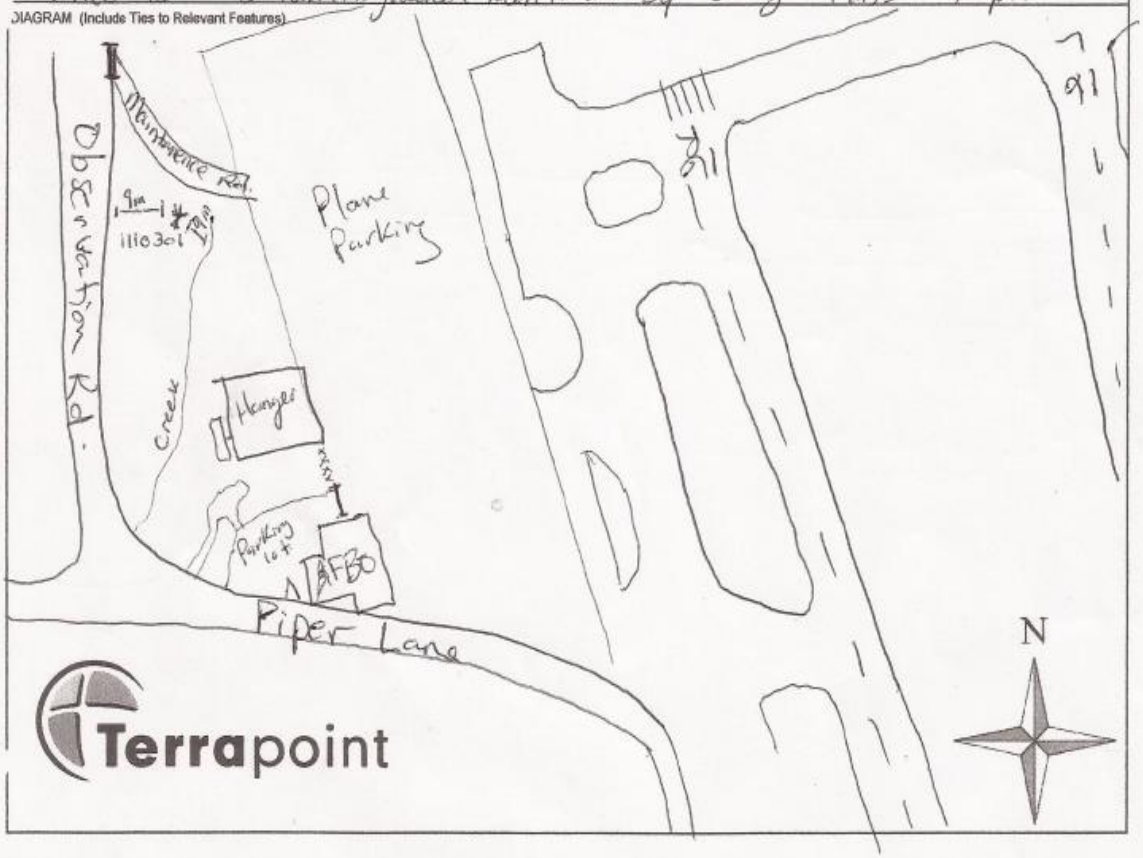
PHOTOS TAKEN:

STATION NAME:	MARKER TYPE:	DATE:
1110301	12" Nail	April 3/11
STATION NUMBER:	**STATION LOCALITY:**	**LEGAL DESCRIPTION:**
1110301	Dulles Aviation @ Manassas Airport	
DATUM:	**CENTRAL MERIDIAN:**	**UTM ZONE:**
NAD 83		18
LATITUDE:	**LONGITUDE:**	**ELLIPSOID HEIGHT metres (h):**
N 38 43 34.05308	W 77 31 24.33961	23.6231m
UTM NORTHING metres:	**UTM EASTING metres:**	**GEOID HEIGHT metres (MSL):**
4289408.3079	280636.5498	55.6556m

MONUMENT IS: ☐ FLUSH WITH GROUND ☒ ABOVE GROUND 2.5 cm ☐ BELOW GROUND _____ cm

MARKER LOCATION: At Dulles Aviation on the ~~South~~ East side of Manassas Regional Air drive in thru Dulles Av gate and head North thru plane parking, turn west onto gravel road (maintenance rd). Approx 30 ft from creek and 30 ft. from fence is a 12" Nail in ground identified by orange flags + tape.

DIAGRAM (Include Ties to Relevant Features)



1110301_Backup

Latitude: N 38 43 34.96223
Longitude: W -77 31 25.21449
Ellipsoid Height: 24.1074m
Orthometric Height: 56.1400m

Final STATION COORDINATES (GRID)
Easting: 280616.1936
Northing: 4289436.9199
Ellipsoid Height: 24.1074m
Orthometric Height: 56.1400m

Terrapoint

STATION DESCRIPTION FORM

PROJECT No.: 111034
PROJECT NAME: FEMA VA
LOCATION: Manassas, VA

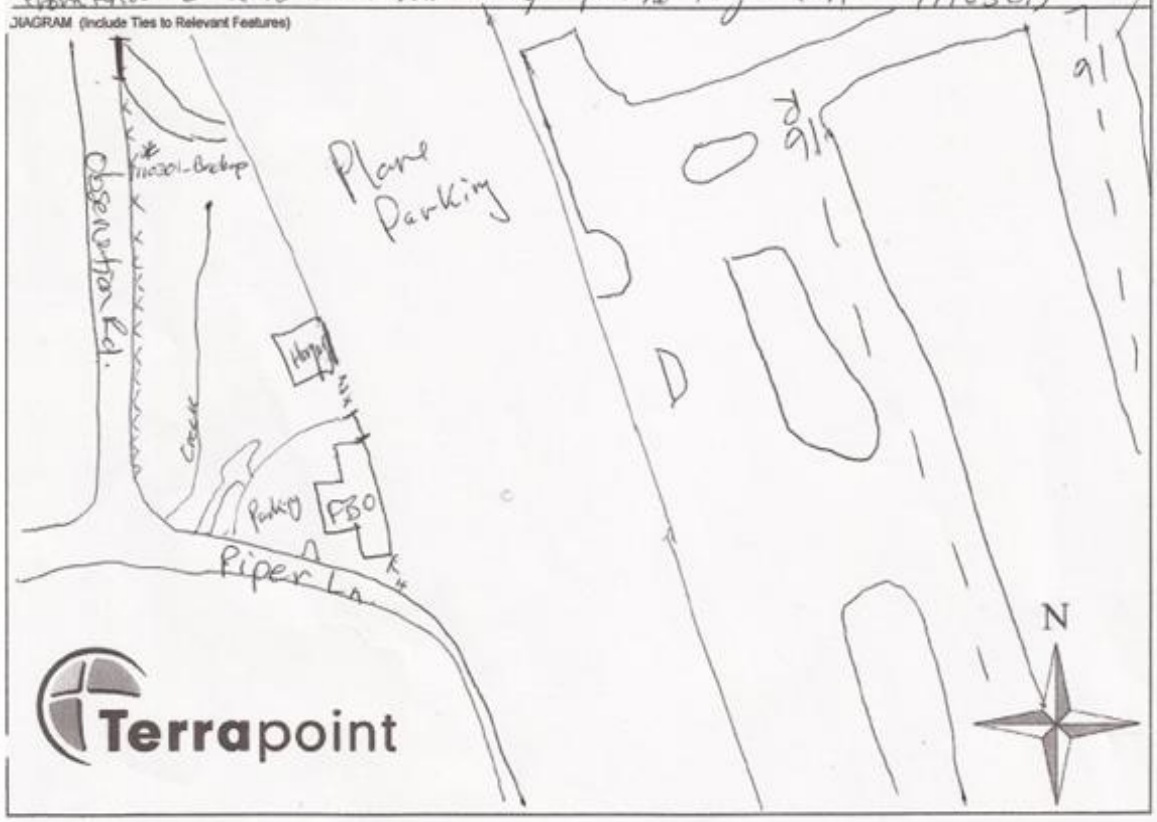
PHOTOS TAKEN:

STATION NAME: 111301_Backup	MARKER TYPE: 12" Nail	DATE: Apr. 3/11
STATION NUMBER: 111301_Backup	STATION LOCALITY: Dulles Aviation @ Manassas Regional Airpt	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN:	UTM ZONE: 18
LATITUDE: N 38 43 34.96223	LONGITUDE: W 77 31 25.21449	ELLIPSOID HEIGHT metres (h): 24.1074m
UTM NORTHING metres: 4289436.9199	UTM EASITNG metres: 280616.1936	GEOID HEIGHT metres (MSL): 56.1400m

MONUMENT IS: ☐ FLUSH WITH GROUND ☒ ABOVE GROUND 2.5 cm ☐ BELOW GROUND _____ cm

MARKER LOCATION: At Dulles Aviation FBO @ West side of Manassas Regional Airport Drive North thru plane parking lot then head West onto maintenance road. Drive for. 30 m. on the West side of Radd Approx 6m from road and 3m from fence is a 12" Nail marked by tape and flags. (Approx 180 ft. North of 111301)

DIAGRAM (Include Ties to Relevant Features)



1110302

Latitude: N 38 17 51.99406
Longitude: W 77 18 55.26399
Ellipsoid Height: 29.0382m
Orthometric Height: 61.6319m

Final STATION COORDINATES (GRID)
Easting: 297530.1861
Northing: 4241390.8785
Ellipsoid Height: 29.0382m
Orthometric Height: 61.6319m

Terrapoint

STATION DESCRIPTION FORM

PROJECT No.: 111030

PROJECT NAME: Fema Virginia

LOCATION: Fredericksburg

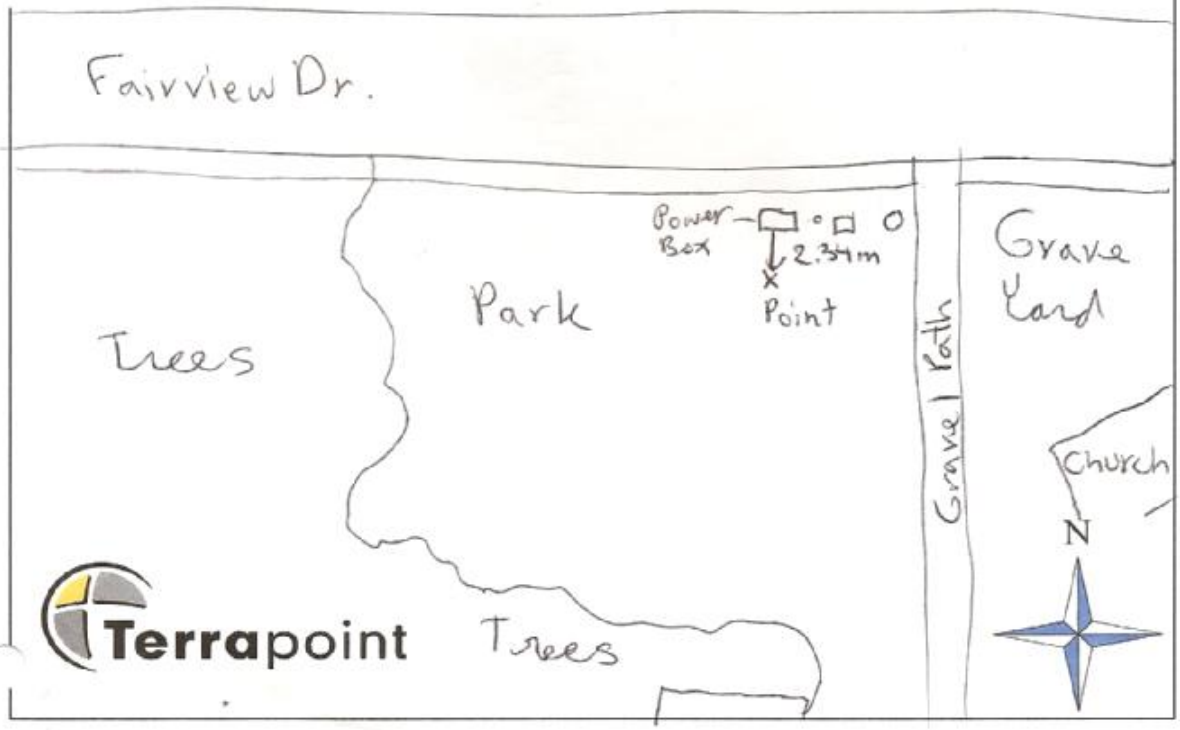
PHOTOS TAKEN:

STATION NAME: 1110302	MARKER TYPE: Rebar in ground	DATE: 2/6/4/2011
STATION NUMBER: 1110302	STATION LOCALITY: Fredericksburg.	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN:	UTM ZONE: 18
LATITUDE: N 38 17 51.99406	LONGITUDE: W 77 18 55.26399	ELLIPSOID HEIGHT metres (h): 29.0382m
UTM NORTHING metres: 4241390.8785	UTM EASITNG metres: 297530.1861	GEOID HEIGHT metres (MSL): 61.6319m

MONUMENT IS: ☐ FLUSH WITH GROUND ☒ ABOVE GROUND 3 cm ☐ BELOW GROUND _____ cm

MARKER LOCATION:

DIAGRAM (Include Ties to Relevant Features)



1110304

Latitude: N 37 51 41.39611
Longitude: W 76 53 55.13346
Ellipsoid Height: 5.1619m
Orthometric Height: 38.9165m

Final STATION COORDINATES (GRID)
Easting: 332983.1267
Northing: 4192146.9986
Ellipsoid Height: 5.1619m
Orthometric Height: 38.9165m

STATION DESCRIPTION FORM

PROJECT No.: 111030

PROJECT NAME: Fema VA

LOCATION: Tappahannock

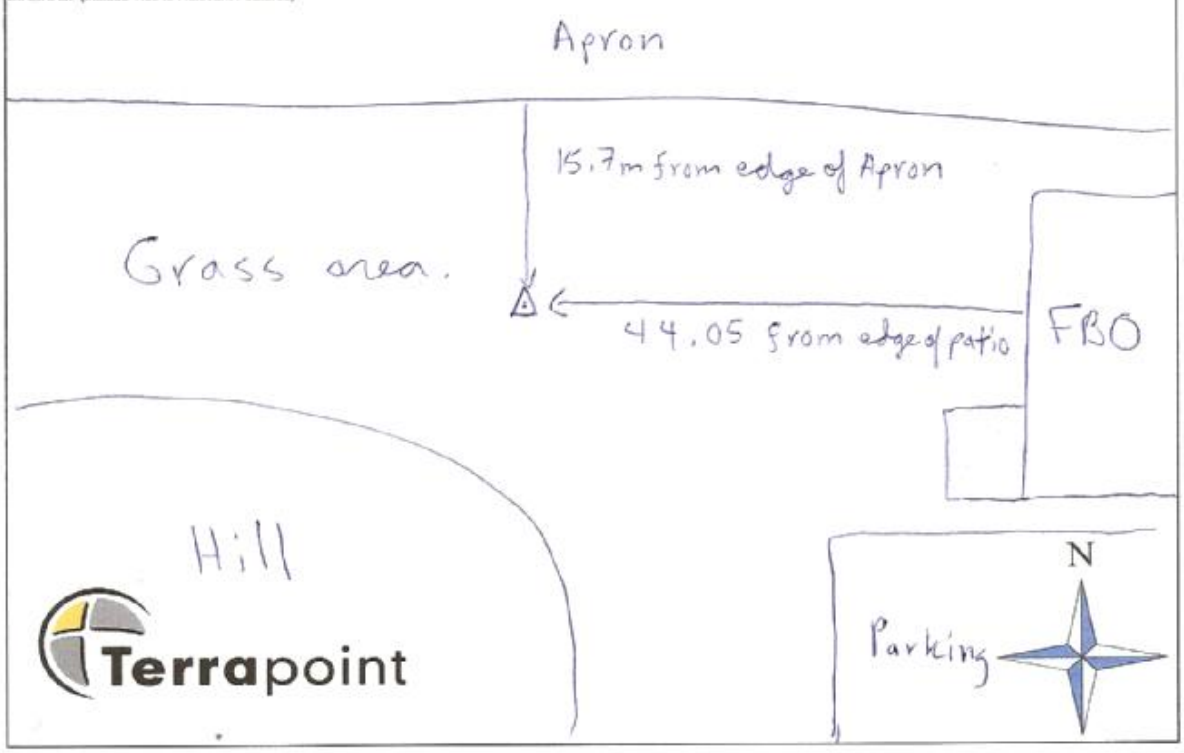
PHOTOS TAKEN:

STATION NAME: 1110304	MARKER TYPE: Rebar	DATE: 29/4/2011
STATION NUMBER: 1110304	STATION LOCALITY: Tappahannock Airport	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN:	UTM ZONE: UTM 18
LATITUDE: N 37 51 41.39611	LONGITUDE: W 76 53 55.13346	ELLIPSOID HEIGHT metres (h): 5.1619m
UTM NORTHING metres: 4192146.9986	UTM EASTING metres: 332983.1267	GEOID HEIGHT metres (MSL): 38.9165m

MONUMENT IS: ☐ FLUSH WITH GROUND ☒ ABOVE GROUND 3 cm ☐ BELOW GROUND _____ cm

MARKER LOCATION:

DIAGRAM (Include Ties to Relevant Features)



DG4545

Latitude: N38 41 25.59545
Longitude: W77 30 54.38036
Ellipsoid Height: 31.028m
Orthometric Height: 63.078m

STATION DESCRIPTION FORM

PROJECT No.: 11103U

PROJECT NAME: Fenwa VA

LOCATION:

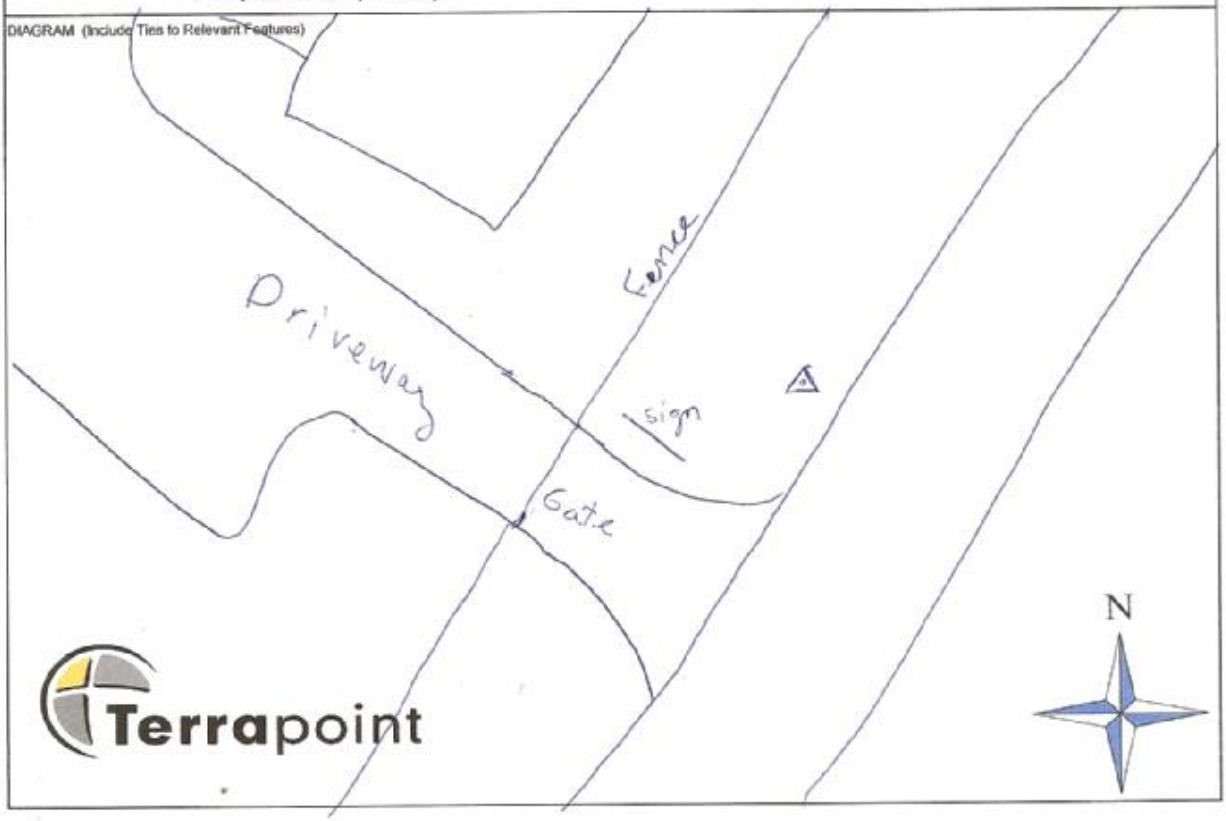
PHOTOS TAKEN:

STATION NAME: DG4545	MARKER TYPE: Stainless Steel Rod	DATE: 30/4/2011
STATION NUMBER: DG4545	STATION LOCALITY: NOKESVILLE, VIRGINIA	LEGAL DESCRIPTION:
DATUM: NAD83	CENTRAL MERIDIAN:	UTM ZONE: 18
LATITUDE: N38 41 25.59545	LONGITUDE: W77 30 54.38036	ELLIPSOID HEIGHT metres (h): 31.028m
UTM NORTHING metres: 4285428.0107	UTM EASITNG metres: 281251.3107	GEOID HEIGHT metres (MSL): 63.078m

MONUMENT IS: ☐ FLUSH WITH GROUND ☐ ABOVE GROUND _____ cm ☐ BELOW GROUND (9 CM) cm

MARKER LOCATION: THE STATION IS A PUNCH MARK ON THE TOP OF A STAINLESS STEEL ROD DRIVEN TO A REFUSAL
CHAIN-LINK FENCE, 10.0 FT (3.05 M) WEST OF THE END OF CURB TO HOOE ROAD, 15.0 FT (4.57 M)

DIAGRAM (Include Ties to Relevant Features)



```
DG4545  DESIGNATION -  PW06
DG4545  PID         -  DG4545
DG4545  STATE/COUNTY-  VA/PRINCE WILLIAM
DG4545  USGS QUAD   -  NOKESVILLE (1994)
DG4545
DG4545                        *CURRENT SURVEY CONTROL
DG4545  ______________________________________________________________________
DG4545* NAD 83(2007)-  38 41 25.59545(N)    077 30 54.38036(W)     ADJUSTED
DG4545* NAVD 88     -        63.0    (meters)     207.     (feet)  GPS OBS
DG4545  ______________________________________________________________________
DG4545  EPOCH DATE  -        2002.00
DG4545  X           -   1,077,647.944 (meters)                     COMP
DG4545  Y           -  -4,867,027.820 (meters)                     COMP
DG4545  Z           -   3,965,571.751 (meters)                     COMP
DG4545  LAPLACE CORR-           0.67  (seconds)                    DEFLEC09
DG4545  ELLIP HEIGHT-          31.028 (meters)          (02/10/07) ADJUSTED
DG4545  GEOID HEIGHT-         -32.05  (meters)                     GEOID09
DG4545
DG4545  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
DG4545  Type    PID    Designation                      North   East  Ellip
DG4545  ----------------------------------------------------------------------
DG4545  NETWORK DG4545 PW06                               0.45   0.39   1.06
DG4545  ----------------------------------------------------------------------
DG4545
DG4545.The horizontal coordinates were established by GPS observations
DG4545.and adjusted by the National Geodetic Survey in February 2007.
DG4545
DG4545.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
DG4545.See National Readjustment for more information.
DG4545.The horizontal coordinates are valid at the epoch date displayed above.
DG4545.The epoch date for horizontal control is a decimal equivalence
DG4545.of Year/Month/Day.
DG4545
DG4545.The orthometric height was determined by GPS observations and a
DG4545.high-resolution geoid model.
DG4545
DG4545.Photographs are available for this station.
DG4545
DG4545.The X, Y, and Z were computed from the position and the ellipsoidal ht.
DG4545
DG4545.The Laplace correction was computed from DEFLEC09 derived deflections.
DG4545
DG4545.The ellipsoidal height was determined by GPS observations
DG4545.and is referenced to NAD 83.
DG4545
DG4545.The geoid height was determined by GEOID09.
DG4545
DG4545;                    North         East     Units Scale Factor Converg.
DG4545;SPC VA N     - 2,114,097.620 3,585,682.366   MT  0.99994919   +0 36 52.9
DG4545;SPC VA N     - 6,936,001.94 11,764,026.23   sFT  0.99994919   +0 36 52.9
DG4545;UTM  18      - 4,285,428.006   281,251.303   MT  1.00018929   -1 34 22.2
DG4545
DG4545!             -  Elev Factor  x  Scale Factor =   Combined Factor
DG4545!SPC VA N     -   0.99999513  x   0.99994919  =   0.99994432
DG4545!UTM  18      -   0.99999513  x   1.00018929  =   1.00018442
DG4545
DG4545                         SUPERSEDED SURVEY CONTROL
DG4545
DG4545  NAD 83(1993)-  38 41 25.59575(N)    077 30 54.38026(W) AD(       ) B
DG4545  ELLIP H (03/02/04)   31.028  (m)                        GP(       ) 3 2
DG4545
DG4545.Superseded values are not recommended for survey control.
DG4545.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
DG4545.See file dsdata.txt to determine how the superseded data were derived.
DG4545
DG4545_U.S. NATIONAL GRID SPATIAL ADDRESS: 18STH8125185428(NAD 83)
DG4545_MARKER: I = METAL ROD
DG4545_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
DG4545_STAMPING: PW06
```

DG4545_MARK LOGO: VA-153
DG4545_PROJECTION: FLUSH
DG4545_MAGNETIC: I = MARKER IS A STEEL ROD
DG4545_STABILITY: B = PROBABLY HOLD POSITION/ELEVATION WELL
DG4545_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
DG4545+SATELLITE: SATELLITE OBSERVATIONS - January 17, 2001
DG4545_ROD/PIPE-DEPTH: 6.1 meters
DG4545_SLEEVE-DEPTH : 1.0 meters
DG4545
DG4545 HISTORY   - Date   Condition   Report By
DG4545 HISTORY   - 20010117 MONUMENTED   VA-153
DG4545
DG4545   STATION DESCRIPTION
DG4545
DG4545'DESCRIBED BY PRINCE WILLIAM COUNTY VIRGINIA 2001 (TRE)
DG4545'THE STATION IS LOCATED IN SOUTHERN PRINCE WILLIAM COUNTY, VIRGINIA
DG4545'APPROXIMATELY 3.5
DG4545'MILES (5.7 KM) SOUTHEAST OF THE POST OFFICE AT NOKESVILLE, VIRGINIA
DG4545'AND NEXT TO THE PRINCE
DG4545'WILLIAM COUNTY SCHOOLS TRANSPORTATION OFFICE PROPERTY. THE STATION IS
DG4545'IN THE STATE
DG4545'RIGHT-OF-WAY TO HOOE ROAD (SR 651).
DG4545'
DG4545'TO REACH THE STATION FROM THE INTERSECTION OF NOKESVILLE ROAD (SR 28)
DG4545'AND FITZWATER
DG4545'DRIVE (SR 652), GO NORTHEAST ON NOKESVILLE ROAD FOR 3.10 MILES (5.0
DG4545'KM) TO THE INTERSECTION
DG4545'OF NOKESVILLE ROAD, BRISTOW ROAD (SR 619), AND LINTON HALL ROAD (SR
DG4545'619). TURN RIGHT ON
DG4545'BRISTOW ROAD AND GO 3.5 MILES (5.6 KM) TO THE INTERSECTION OF BRISTOW
DG4545'ROAD AND HOOE
DG4545'ROAD (SR 651). TURN RIGHT AND GO 0.30 MILES (0.5 KM) TO THE STATION ON
DG4545'THE RIGHT, NORTHEAST
DG4545'OF THE SOUTHWEST ENTRANCE TO THE PRINCE WILLIAM COUNTY SCHOOLS
DG4545'TRANSPORTATION
DG4545'OFFICE.
DG4545'
DG4545'THE STATION IS A PUNCH MARK ON THE TOP OF A STAINLESS STEEL ROD DRIVEN
DG4545'TO A REFUSAL
DG4545'DEPTH OF 6.1M, ENCASED IN A 1 M FINNED SLEEVE WITH NON-TOXIC GREASE
DG4545'AND RECESSED 0.30 FT
DG4545'(9 CM) BELOW A STANDARD NGS LOGO CAP STAMPED --PW06--, ENCASED IN AN
DG4545'8-INCH PVC PIPE WITH
DG4545'A 12-INCH CONCRETE COLLAR. THE STATION IS LOCATED 18.40 FT (5.61 M)
DG4545'SOUTHEAST OF A
DG4545'CHAIN-LINK FENCE, 10.0 FT (3.05 M) WEST OF THE END OF CURB TO HOOE
DG4545'ROAD, 15.0 FT (4.57 M)
DG4545'NORTHEAST OF THE SOUTHEAST POST TO A WOODEN SIGN AND 3.3 FT SOUTHEAST
DG4545'OF A STANDARD
DG4545'ORANGE CARSONITE WITNESS POST

HV5411

Latitude: N38 02 33.30691
Longitude: W77 04 10.63718
Ellipsoid Height: 16.170m
Orthometric Height: 49.51m

STATION DESCRIPTION FORM

PROJECT No.: 11103V
PROJECT NAME: Fenn VA.
LOCATION: Essex County

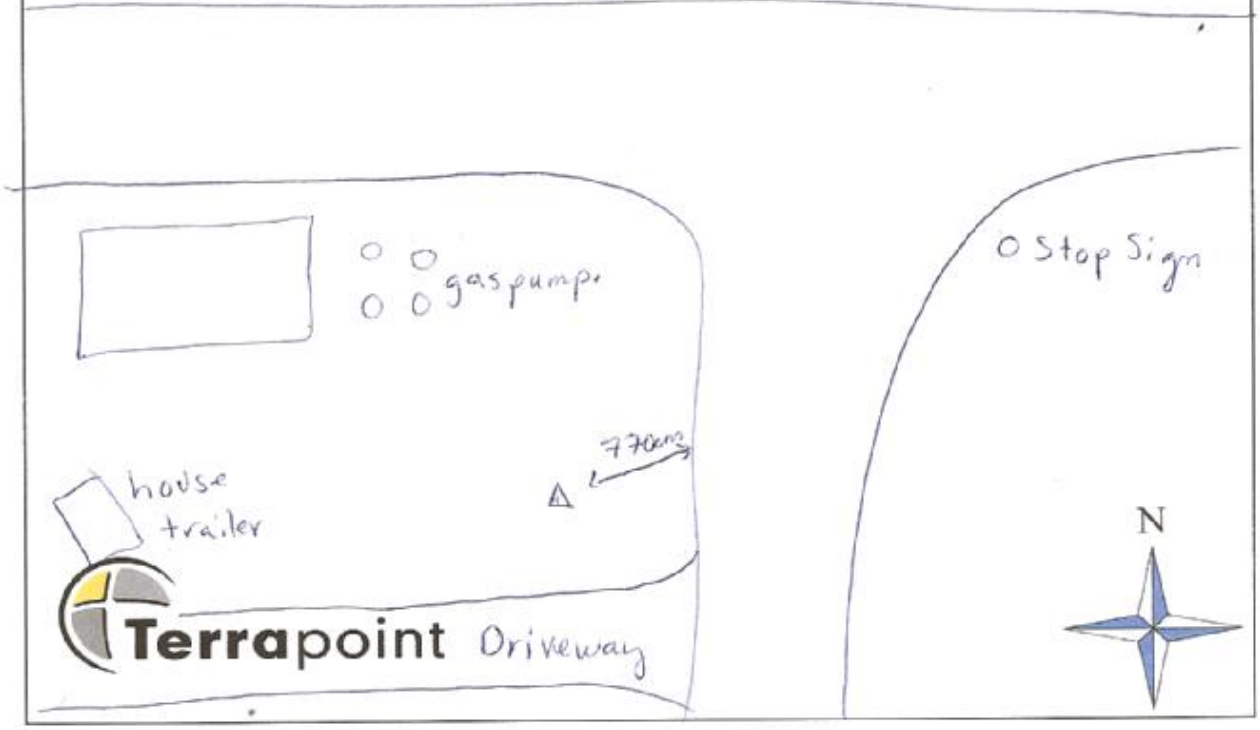
PHOTOS TAKEN:

STATION NAME:	MARKER TYPE:	DATE:
HV 5411	Bronze Marker	25/9/2011
STATION NUMBER:	**STATION LOCALITY:**	**LEGAL DESCRIPTION:**
HV 5411	Hustle Post Off in Essex County	
DATUM:	**CENTRAL MERIDIAN:**	**UTM ZONE:**
NAD83		18
LATITUDE:	**LONGITUDE:**	**ELLIPSOID HEIGHT metres (h):**
N38 02 33.30691	W77 04 10.63718	16.170m
UTM NORTHING metres:	**UTM EASITNG metres:**	**GEOID HEIGHT metres (MSL):**
4212561.7555	318388.2985	49.51m

MONUMENT IS: ☒ FLUSH WITH GROUND ☐ ABOVE GROUND _____ cm ☐ BELOW GROUND _____ cm

MARKER LOCATION: 10.9m East of SE corner of abandoned store

DIAGRAM (Include Ties to Relevant Features)



```
HV5411  CBN         -  This is a Cooperative Base Network Control Station.
HV5411  DESIGNATION -  HUSTLE RESET
HV5411  PID         -  HV5411
HV5411  STATE/COUNTY-  VA/ESSEX
HV5411  USGS QUAD   -  LORETTO (1978)
HV5411
HV5411                        *CURRENT SURVEY CONTROL
HV5411  ______________________________________________________________________
HV5411* NAD 83(2007)-  38 02 33.30691(N)    077 04 10.63718(W)     ADJUSTED
HV5411* NAVD 88     -        49.5    (meters)     162.     (feet)  GPS OBS
HV5411  ______________________________________________________________________
HV5411  EPOCH DATE  -        2002.00
HV5411  X           -   1,125,442.503 (meters)                     COMP
HV5411  Y           -  -4,901,995.173 (meters)                     COMP
HV5411  Z           -   3,909,177.644 (meters)                     COMP
HV5411  LAPLACE CORR-          -3.36  (seconds)                    DEFLEC09
HV5411  ELLIP HEIGHT-          16.170 (meters)          (02/10/07) ADJUSTED
HV5411  GEOID HEIGHT-         -33.34  (meters)                     GEOID09
HV5411
HV5411  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
HV5411  Type    PID    Designation                      North   East  Ellip
HV5411  ----------------------------------------------------------------------
HV5411  NETWORK HV5411 HUSTLE RESET                      0.53   0.47   1.67
HV5411  ----------------------------------------------------------------------
HV5411
HV5411.The horizontal coordinates were established by GPS observations
HV5411.and adjusted by the National Geodetic Survey in February 2007.
HV5411
HV5411.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
HV5411.See National Readjustment for more information.
HV5411.The horizontal coordinates are valid at the epoch date displayed above.
HV5411.The epoch date for horizontal control is a decimal equivalence
HV5411.of Year/Month/Day.
HV5411
HV5411.The orthometric height was determined by GPS observations and a
HV5411.high-resolution geoid model.
HV5411
HV5411.The X, Y, and Z were computed from the position and the ellipsoidal ht.
HV5411
HV5411.The Laplace correction was computed from DEFLEC09 derived deflections.
HV5411
HV5411.The ellipsoidal height was determined by GPS observations
HV5411.and is referenced to NAD 83.
HV5411
HV5411.The geoid height was determined by GEOID09.
HV5411
HV5411;                    North         East     Units Scale Factor Converg.
HV5411;SPC VA S     - 1,190,643.602 3,625,558.030   MT  1.00001474 +0 52 05.3
HV5411;SPC VA S     - 3,906,303.22 11,894,851.64   sFT  1.00001474 +0 52 05.3
HV5411;SPC VA N     - 2,042,704.356 3,625,555.700   MT  0.99999838 +0 53 33.8
HV5411;SPC VA N     - 6,701,772.54 11,894,843.99   sFT  0.99999838 +0 53 33.8
HV5411;UTM  18      - 4,212,561.784   318,388.301   MT  1.00000624 -1 16 32.7
HV5411
HV5411!             -  Elev Factor  x  Scale Factor =   Combined Factor
HV5411!SPC VA S     -   0.99999746  x   1.00001474  =   1.00001220
HV5411!SPC VA N     -   0.99999746  x   0.99999838  =   0.99999584
HV5411!UTM  18      -   0.99999746  x   1.00000624  =   1.00000370
HV5411
HV5411:                Primary Azimuth Mark                    Grid Az
HV5411:SPC VA S     -  HUSTLE RM 2 AZIMUTH                    270 46 55.6
HV5411:SPC VA N     -  HUSTLE RM 2 AZIMUTH                    270 45 27.1
HV5411:UTM  18      -  HUSTLE RM 2 AZIMUTH                    272 55 33.6
```

```
HV5411
HV5411|---------------------------------------------------------------------|
HV5411| PID    Reference Object                    Distance      Geod. Az   |
HV5411|                                                          dddmmss.s |
HV5411| DC6015 HUSTLE RM 1                         35.140 METERS 02806     |
HV5411| DC6018 HUSTLE RM 4                         30.700 METERS 17657     |
HV5411| DC6016 HUSTLE RM 2 AZIMUTH                               2713900.9 |
HV5411| DC6017 HUSTLE RM 3                         32.559 METERS 31356     |
HV5411|---------------------------------------------------------------------|
HV5411
HV5411                          SUPERSEDED SURVEY CONTROL
HV5411
HV5411  NAD 83(1993)-  38 02 33.30721(N)    077 04 10.63693(W) AD(       ) A
HV5411  ELLIP H (07/14/04)   16.173  (m)                       GP(       ) 3 2
HV5411  NAD 83(1993)-  38 02 33.30728(N)    077 04 10.63714(W) AD(       ) A
HV5411  ELLIP H (08/14/01)   16.110  (m)                       GP(       ) 4 1
HV5411  ELLIP H (09/08/95)   16.742  (m)                       GP(       ) 4 2
HV5411  NAD 83(1993)-  38 02 33.30867(N)    077 04 10.63420(W) AD(       ) 1
HV5411  ELLIP H (11/14/94)   16.276  (m)                       GP(       ) 4 2
HV5411  NAD 83(1991)-  38 02 33.30821(N)    077 04 10.65046(W) AD(       ) 1
HV5411  NAD 83(1986)-  38 02 33.30876(N)    077 04 10.65284(W) AD(       ) 1
HV5411  NAD 27      -  38 02 32.82500(N)    077 04 11.74600(W) AD(       ) 1
HV5411
HV5411.Superseded values are not recommended for survey control.
HV5411.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HV5411.See file dsdata.txt to determine how the superseded data were derived.
HV5411
HV5411_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUH1838812561(NAD 83)
HV5411_MARKER: DD = SURVEY DISK
HV5411_SETTING: 7 = SET IN TOP OF CONCRETE MONUMENT
HV5411_SP_SET: CONCRETE POST
HV5411_STAMPING: HUSTLE 1934 1963
HV5411_MARK LOGO: CGS
HV5411_MAGNETIC: N = NO MAGNETIC MATERIAL
HV5411_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
HV5411+STABILITY: POSITION/ELEVATION WELL
HV5411_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HV5411+SATELLITE: SATELLITE OBSERVATIONS - April 09, 2009
HV5411
HV5411  HISTORY     - Date     Condition        Report By
HV5411  HISTORY     - 1963     MONUMENTED       CGS
HV5411  HISTORY     - 19920414 GOOD             NOS
HV5411  HISTORY     - 19990609 GOOD             USPSQD
HV5411  HISTORY     - 20000308 GOOD             VADOT
HV5411  HISTORY     - 20020328 GOOD             GEOMET
HV5411  HISTORY     - 20040313 GOOD             USPSQD
HV5411  HISTORY     - 20090409 GOOD             GEOCAC
HV5411
HV5411                          STATION DESCRIPTION
HV5411
HV5411'DESCRIBED BY NATIONAL OCEAN SERVICE 1992
HV5411'THE STATION IS LOCATED AT THE HUSTLE POST OFFICE IN ESSEX COUNTY
HV5411'VA.
HV5411'TO REACH THE STATION FROM THE LORETTO POST OFFICE, PROCEED
HV5411'NORTHWEST ALONG HIGHWAY 17 FOR 0.05 MI (0.08 KM) , TURN LEFT ON STATE
HV5411'ROUTE 635 AND PROCEED 3.25 MI (5.23 KM) TO THE HUSTLE POST
HV5411'OFFICE.
HV5411'THE STATION IS A STANDARD USC AND GS DISK SET IN TOP OF A 1
HV5411'FT (0.30 M) DIAMETER ROUND CONCRETE MONUMENT PROJECTING 4 IN ABOVE
HV5411'GROUND, IT IS 23.8 M (78.08 FT) EAST-SOUTHEAST OF THE SOUTHEAST CORNER
HV5411'OF THE POST OFFICE, 91 FT (27.74 M) SOUTH OF THE T-INTERSECTION
HV5411'IN A GRAVEL PARKING LOT NEXT TO AN ABANDONED STORE.
HV5411
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HV5411                          STATION RECOVERY (1999)
HV5411
HV5411'RECOVERY NOTE BY US POWER SQUADRON 1999
HV5411'RECOVERED IN GOOD CONDITION.
HV5411
HV5411                          STATION RECOVERY (2000)
HV5411
HV5411'RECOVERY NOTE BY VIRGINIA DEPARTMENT OF TRANSPORTATION 2000 (MB)
HV5411'RECOVERED WITH CHANGES NOTED.  DISK IS LOCATED 10.9M EAST SOUTHEAST OF
HV5411'THE SOUTHEAST CORNER OF AN ABANDONED STORE.  POST OFFICE IS IN A NEW
HV5411'LOCATION, NORTH OF T-INTERSECTION.
HV5411
HV5411                          STATION RECOVERY (2002)
HV5411
HV5411'RECOVERY NOTE BY GEOMETRICS GPS INCORPORATED 2002 (MAJ)
HV5411'RECOVERED IN GOOD CONDITION.
HV5411
HV5411                          STATION RECOVERY (2004)
HV5411
HV5411'RECOVERY NOTE BY US POWER SQUADRON 2004
HV5411'MARK IS IN MIDDLE OF DRIVEWAY NEXT TO ABANDONED STORE.  RM1 IS 10 FT
HV5411'FROM SE CORNER OF HUSTLE POST OFFICE NEXT TO PARKING AREA
HV5411
HV5411                          STATION RECOVERY (2009)
HV5411
HV5411'RECOVERY NOTE BY GEOCACHING 2009 (WD)
HV5411'THE STATION IS LOCATED NEAR THE NORTHWEST EDGE OF A GRAVEL DRIVEWAY,
HV5411'ABOUT 110 FEET SOUTHWEST OF THE SOUTHWEST CORNER OF THE POST OFFICE,
HV5411'ABOUT 91 FEET SOUTH OF THE CENTERLINE OF EAST-WEST HUSTLE ROAD, ABOUT
HV5411'39 FEET SOUTH-SOUTHWEST OF THE SOUTHEAST CORNER OF A WHITE CINDER
HV5411'BLOCK BUILDING, AND ABOUT 33 FEET WEST OF THE CENTERLINE OF PILKINGTON
HV5411'ROAD LEADING SOUTH.  REFERENCE MARK NO. 1 IS ABOUT 18 FEET NORTH OF
HV5411'THE CENTERLINE OF HUSTLE ROAD, ABOUT 10 FEET SOUTHEAST OF THE
HV5411'SOUTHEAST CORNER OF THE POST OFFICE, AND ABOUT 2.5 FEET SOUTHEAST
HV5411'OF A FLAG POLE.  REFERENCE MARK NOS. 3 AND 4 WERE NOT FOUND AFTER A 20
HV5411'MINUTE SEARCH BY A PARTY OF ONE.
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CORB

Latitude: N38 12 07.82819
Longitude: W77 22 24.57106
Ellipsoid Height: 37.252m
Orthometric Height: 69.792m

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AJ2122  CORS         -  This is a GPS Continuously Operating Reference Station.
AJ2122  DESIGNATION  -  CORBIN CORS ARP
AJ2122  CORS_ID      -  CORB
AJ2122  PID          -  AJ2122
AJ2122  STATE/COUNTY-  VA/CAROLINE
AJ2122  USGS QUAD    -
AJ2122
AJ2122                        *CURRENT SURVEY CONTROL
AJ2122  ______________________________________________________________________
AJ2122* NAD 83(CORS)-  38 12 07.82819(N)    077 22 24.57106(W)     ADJUSTED
AJ2122* NAVD 88     -              **(meters)            **(feet)
AJ2122  ______________________________________________________________________
AJ2122  EPOCH DATE  -        2002.00
AJ2122  X           -   1,097,041.982 (meters)                     COMP
AJ2122  Y           -  -4,897,239.901 (meters)                     COMP
AJ2122  Z           -   3,923,126.377 (meters)                     COMP
AJ2122  ELLIP HEIGHT-          37.252 (meters)          (03/??/02) ADJUSTED
AJ2122  GEOID HEIGHT-         -32.54  (meters)                     GEOID09
AJ2122  HORZ ORDER  -  SPECIAL (CORS)
AJ2122  ELLP ORDER  -  SPECIAL (CORS)
AJ2122
AJ2122.ITRF positions are available for this station.
AJ2122.The coordinates were established by GPS observations
AJ2122.and adjusted by the National Geodetic Survey in March 2002.
AJ2122.The coordinates are valid at the epoch date displayed above.
AJ2122.The epoch date for horizontal control is a decimal equivalence
AJ2122.of Year/Month/Day.
AJ2122
AJ2122
AJ2122.The PID for the CORS L1 Phase Center is AJ2123.
AJ2122
AJ2122.The XYZ, and position/ellipsoidal ht. are equivalent.
AJ2122
AJ2122.The ellipsoidal height was determined by GPS observations
AJ2122.and is referenced to NAD 83.
AJ2122
AJ2122.The geoid height was determined by GEOID09.
AJ2122
AJ2122;                    North         East     Units Scale Factor Converg.
AJ2122;SPC VA N     - 2,060,045.533 3,598,666.726   MT  0.99997449   +0 42 11.1
AJ2122;SPC VA N     - 6,758,666.05 11,806,625.75   sFT  0.99997449   +0 42 11.1
AJ2122
AJ2122!             -  Elev Factor  x  Scale Factor =   Combined Factor
AJ2122!SPC VA N     -   0.99999415  x   0.99997449  =   0.99996864
AJ2122
AJ2122                          SUPERSEDED SURVEY CONTROL
AJ2122
AJ2122  NAD 83(CORS)-  38 12 07.82820(N)    077 22 24.57106(W) AD(1997.00) c
AJ2122  ELLIP H (03/??/01)   37.251  (m)                       GP(1997.00) c c
AJ2122
AJ2122.Superseded values are not recommended for survey control.
AJ2122.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AJ2122.See file dsdata.txt to determine how the superseded data were derived.
AJ2122
AJ2122_U.S. NATIONAL GRID SPATIAL ADDRESS: 18STH9217330910(NAD 83)
AJ2122_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
AJ2122
AJ2122                          STATION DESCRIPTION
AJ2122
AJ2122'DESCRIBED BY NATIONAL GEODETIC SURVEY 200
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LOYB

Latitude: N38 43 42.02222
Longitude: W77 11 02.29856
Ellipsoid Height: -1.544m
Orthometric Height: 30.656m

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DH7960  CORS        -  This is a GPS Continuously Operating Reference Station.
DH7960  DESIGNATION -  LOYOLA B COOP CORS ARP
DH7960  CORS_ID     -  LOYB
DH7960  PID         -  DH7960
DH7960  STATE/COUNTY-  VA/FAIRFAX
DH7960  USGS QUAD   -  FORT BELVOIR (1983)
DH7960
DH7960                      *CURRENT SURVEY CONTROL
DH7960  ______________________________________________________________________
DH7960* NAD 83(CORS)-  38 43 42.02222(N)    077 11 02.29856(W)     ADJUSTED
DH7960* NAVD 88     -              **(meters)           **(feet)
DH7960  ______________________________________________________________________
DH7960  EPOCH DATE  -        2002.00
DH7960  X           -   1,105,168.954 (meters)                     COMP
DH7960  Y           -  -4,858,128.341 (meters)                     COMP
DH7960  Z           -   3,968,834.126 (meters)                     COMP
DH7960  ELLIP HEIGHT-          -1.544 (meters)          (02/??/06) ADJUSTED
DH7960  GEOID HEIGHT-         -32.20  (meters)                     GEOID09
DH7960  HORZ ORDER  -  SPECIAL (CORS)
DH7960  ELLP ORDER  -  SPECIAL (CORS)
DH7960
DH7960.ITRF positions are available for this station.
DH7960.The coordinates were established by GPS observations
DH7960.and adjusted by the National Geodetic Survey in February 2006.
DH7960.The coordinates are valid at the epoch date displayed above.
DH7960.The epoch date for horizontal control is a decimal equivalence
DH7960.of Year/Month/Day.
DH7960
DH7960
DH7960.The PID for the CORS L1 Phase Center is DK8276.
DH7960
DH7960.The XYZ, and position/ellipsoidal ht. are equivalent.
DH7960
DH7960.The ellipsoidal height was determined by GPS observations
DH7960.and is referenced to NAD 83.
DH7960
DH7960.The geoid height was determined by GEOID09.
DH7960
DH7960;                    North         East     Units Scale Factor Converg.
DH7960;SPC VA N     - 2,118,664.854 3,614,427.826   MT  0.99995025   +0 49 16.9
DH7960;SPC VA N     - 6,950,986.28 11,858,335.29   sFT  0.99995025   +0 49 16.9
DH7960
DH7960!             -  Elev Factor  x  Scale Factor =   Combined Factor
DH7960!SPC VA N     -   1.00000024  x   0.99995025  =   0.99995049
DH7960
DH7960                          SUPERSEDED SURVEY CONTROL
DH7960
DH7960.No superseded survey control is available for this station.
DH7960
DH7960_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SUH1015488895(NAD 83)
DH7960_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DH7960
DH7960                          STATION DESCRIPTION
DH7960
DH7960'DESCRIBED BY NATIONAL GEODETIC SURVEY 2006
DH7960'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
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LOY8

Latitude: N38 16 58.69170
Longitude: W77 27 09.46863
Ellipsoid Height: -4.887m
Orthometric Height: 27.623m

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DH7954 ******************************************************************
DH7954  CORS         -  This is a GPS Continuously Operating Reference Station.
DH7954  DESIGNATION -  LOYOLA 8 COOP CORS ARP
DH7954  CORS_ID      -  LOY8
DH7954  PID          -  DH7954
DH7954  STATE/COUNTY-  VA/SPOTSYLVANIA
DH7954  USGS QUAD    -  FREDERICKSBURG (1994)
DH7954
DH7954                        *CURRENT SURVEY CONTROL
DH7954  ______________________________________________________________________
DH7954* NAD 83(CORS)-  38 16 58.69170(N)    077 27 09.46863(W)     ADJUSTED
DH7954* NAVD 88      -              **(meters)            **(feet)
DH7954  ______________________________________________________________________
DH7954  EPOCH DATE   -        2002.00
DH7954  X            -   1,089,063.554 (meters)                    COMP
DH7954  Y            -  -4,893,299.399 (meters)                    COMP
DH7954  Z            -   3,930,144.050 (meters)                    COMP
DH7954  ELLIP HEIGHT-          -4.887 (meters)          (02/??/06) ADJUSTED
DH7954  GEOID HEIGHT-         -32.51  (meters)                    GEOID09
DH7954  HORZ ORDER   -  SPECIAL (CORS)
DH7954  ELLP ORDER   -  SPECIAL (CORS)
DH7954
DH7954.ITRF positions are available for this station.
DH7954.The coordinates were established by GPS observations
DH7954.and adjusted by the National Geodetic Survey in February 2006.
DH7954.The coordinates are valid at the epoch date displayed above.
DH7954.The epoch date for horizontal control is a decimal equivalence
DH7954.of Year/Month/Day.
DH7954
DH7954
DH7954.The PID for the CORS L1 Phase Center is DH7955.
DH7954
DH7954.The XYZ, and position/ellipsoidal ht. are equivalent.
DH7954
DH7954.The ellipsoidal height was determined by GPS observations
DH7954.and is referenced to NAD 83.
DH7954
DH7954.The geoid height was determined by GEOID09.
DH7954
DH7954;                    North         East     Units Scale Factor Converg.
DH7954;SPC VA N     - 2,068,930.988 3,591,633.297   MT  0.99996533   +0 39 13.3
DH7954;SPC VA N     - 6,787,817.75 11,783,550.24   sFT  0.99996533   +0 39 13.3
DH7954
DH7954!             -  Elev Factor  x  Scale Factor =   Combined Factor
DH7954!SPC VA N     -   1.00000077  x   0.99996533  =   0.99996610
DH7954
DH7954                          SUPERSEDED SURVEY CONTROL
DH7954
DH7954.No superseded survey control is available for this station.
DH7954
DH7954_U.S. NATIONAL GRID SPATIAL ADDRESS: 18STH8548040057(NAD 83)
DH7954_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
DH7954
DH7954                          STATION DESCRIPTION
DH7954
DH7954'DESCRIBED BY NATIONAL GEODETIC SURVEY 2006
DH7954'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
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LWX

Latitude: N38 58 21.63405
Longitude: W077 29 18.96314
Ellipsoid Height: 62.046m
Orthometric Height: 94.026m

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DH4144  CORS        -  This is a GPS Continuously Operating Reference Station.
 DH4144  DESIGNATION -  STERLING CORS ARP
 DH4144  CORS_ID     -  LWX1
 DH4144  PID         -  DH4144
 DH4144  STATE/COUNTY-  VA/LOUDOUN
 DH4144  USGS QUAD   -  HERNDON (1994)
 DH4144
 DH4144                        *CURRENT SURVEY CONTROL
 DH4144  ______________________________________________________________________
 DH4144* NAD 83(CORS)-  38 58 21.63405(N)    077 29 18.96314(W)     ADJUSTED
 DH4144* NAVD 88     -              **(meters)           **(feet)
 DH4144  ______________________________________________________________________
 DH4144  EPOCH DATE  -        2002.00
 DH4144  X           -   1,075,648.564 (meters)                    COMP
 DH4144  Y           -  -4,847,373.011 (meters)                    COMP
 DH4144  Z           -   3,989,998.224 (meters)                    COMP
 DH4144  ELLIP HEIGHT-          62.046 (meters)          (06/??/05) ADJUSTED
 DH4144  GEOID HEIGHT-         -31.98  (meters)                    GEOID09
 DH4144  HORZ ORDER  -  SPECIAL (CORS)
 DH4144  ELLP ORDER  -  SPECIAL (CORS)
 DH4144
 DH4144.ITRF positions are available for this station.
 DH4144.The coordinates were established by GPS observations
 DH4144.and adjusted by the National Geodetic Survey in June 2005.
 DH4144.The coordinates are valid at the epoch date displayed above.
 DH4144.The epoch date for horizontal control is a decimal equivalence
 DH4144.of Year/Month/Day.
 DH4144
 DH4144
 DH4144.The PID for the CORS L1 Phase Center is DH4145.
 DH4144
 DH4144.The XYZ, and position/ellipsoidal ht. are equivalent.
 DH4144
 DH4144.The ellipsoidal height was determined by GPS observations
 DH4144.and is referenced to NAD 83.
 DH4144
 DH4144.The geoid height was determined by GEOID09.
 DH4144
 DH4144;                    North         East     Units Scale Factor Converg.
 DH4144;SPC VA N     - 2,145,450.742 3,587,642.940   MT  0.99996755   +0 37 52.4
 DH4144;SPC VA N     - 7,038,866.31 11,770,458.55   sFT  0.99996755   +0 37 52.4
 DH4144
 DH4144!             -  Elev Factor  x  Scale Factor =   Combined Factor
 DH4144!SPC VA N     -   0.99999027  x   0.99996755  =   0.99995782
 DH4144
 DH4144                          SUPERSEDED SURVEY CONTROL
 DH4144
 DH4144.No superseded survey control is available for this station.
 DH4144
 DH4144_U.S. NATIONAL GRID SPATIAL ADDRESS: 18STJ8441016690(NAD 83)
 DH4144_MARKER: STATION IS THE ANTENNA REFERENCE POINT OF THE GPS ANTENNA
 DH4144
 DH4144                          STATION DESCRIPTION
 DH4144
 DH4144'DESCRIBED BY NATIONAL GEODETIC SURVEY 2005
 DH4144'STATION IS A GPS CORS.  LATEST INFORMATION INCLUDING POSITIONS AND
 DH4144'VELOCITIES ARE AVAILABLE IN THE COORDINATE AND LOG FILES ACCESSIBLE
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