Terrapoint

Geodetic Control Survey Report

11103U Worcester

Project Number: 2011-103U
Project: **FEMA Virginia** - Worcester Area
Client: Dewberry & Davis LLC

Prepared by: Adrian Salazar Camungol
Date: March 28 2011

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

Published Control Station:

AI7609
Latitude: N38 20 42.97627
Longitude: W75 30 31.23258
Ellipsoid Height: -20.249m
Orthometric Height: 15.631m

HU2327
Latitude: N38 27 12.90191
Longitude: W75 30 40.57738
Ellipsoid Height: -19.657m
Orthometric Height: 16.083m

New Control Stations:

1110312
Latitude: N38 18 22.12367
Longitude: **W**75 07 40.46389
Ellipsoid Height: -33.7921m
Orthometric Height: 2.2581m

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· *Final Coordinates (Geodetic and Grid)*
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· *Fully Constrained GPS Network*
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· New Control Station Descriptions
· *Published Control Station Descriptions and coordinates*

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.

CORS for GPS Control Network Observations

COR Stations may be used to supplement ground-based control but shall not be used exclusively. CORS shall not be relied upon to provide flight control (even if they do log at 1 second) since there is no guarantee that the station(s) are operational.

Map of Control Network

GrafNetv7.80.2517

Traverse - Map

Geographic, DMS

38 28 00.00

HU2327

38 24 00.00

AI7609

38 20 00.00

1110312

38 16 00.00

5 km

5 cm (95.0%)

75 28 00.00   75 24 00.00   75 20 00.00   75 16 00.00   75 12 00.00   75 08 00.00

— Ignored — Unprocessed — Approximate — Bad — Good ▲ GCP ▲ Tie
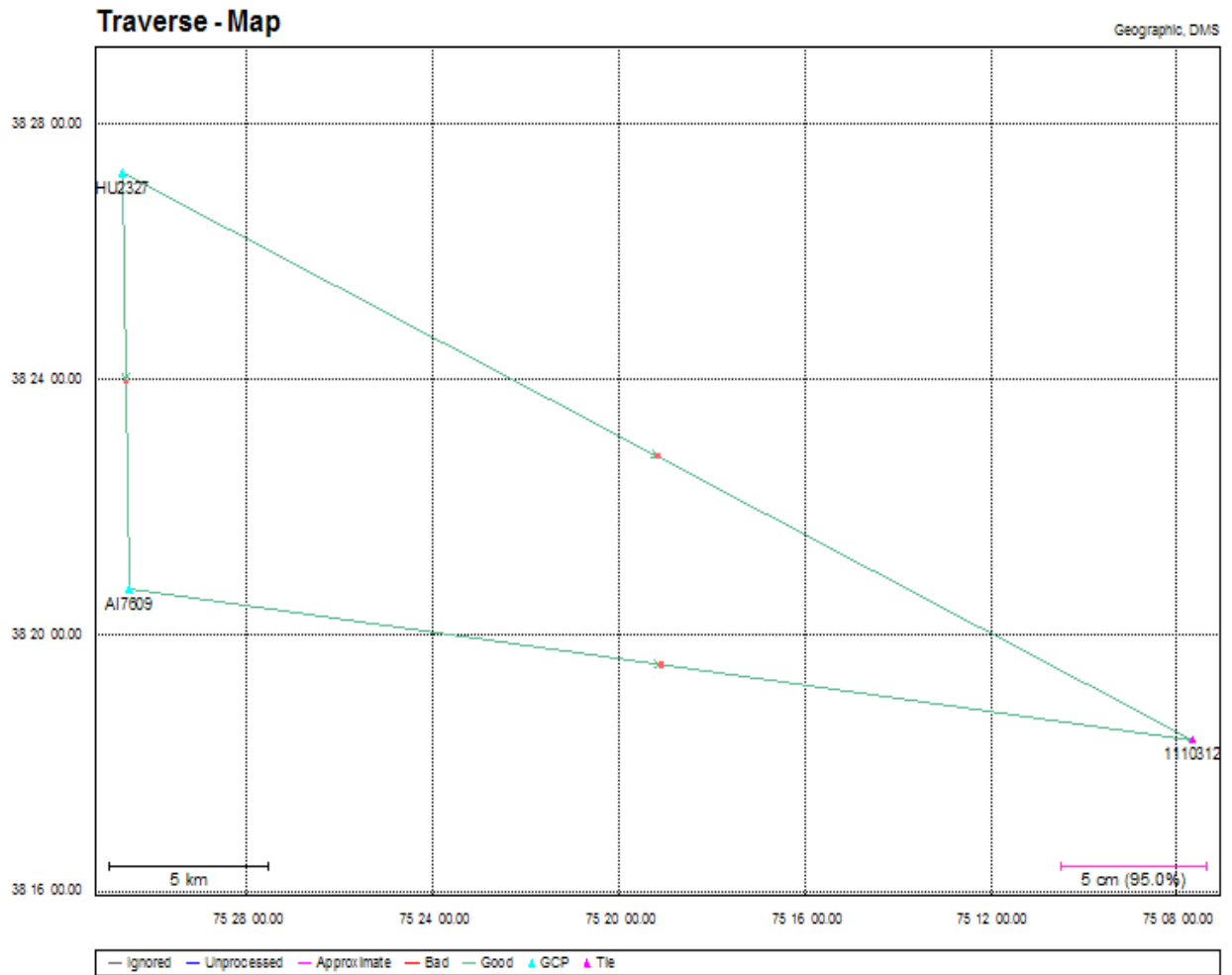
Fully Constrained GPS Network

```
                    11103U_fully_constrained_Worcester.net

            *******************************************************
            * NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT      *
            *                                                *
            * (c) Copyright NovAtel Inc., (2007)             *
            *                                                *
            * Version: 7.80.2517                             *
            *                                                *
            * FILE: C:\4_Control\Grafnet
Project\11103U_fully_constrained_Worcester.net
            *******************************************************

DATE(m/d/y): Mon.   3/28/11   TIME: 19:10:47




*****************************************************************
   DATUM:              'NAD83'
   GRID:               UTM, Zone 18
   SCALE_FACTOR:       35.4530
   CONFIDENCE LEVEL: 95.00 %   (Scale factor is 2.4479)


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

STA_ID      TYPE    -- LATITUDE --   -- LONGITUDE --  ELLHGT -   HZ-SD   V-SD
AI7609      GCP-3D  38 20 42.97627  -75 30 31.23258    -20.249 0.00500 0.00500
HU2327      GCP-3D  38 27 12.90191  -75 30 40.57738    -19.657 0.01000 0.01000



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

SESSION NAME              VECTOR(m)   ------ Covariance (m) [unscaled] ------
                          DX/DY/DZ           standard deviations in brackets
AI7609 to 1110312 (1) 32888.0026  2.0522e-007 (0.0005)
                       5843.5988  -1.9338e-007 2.4897e-006 (0.0016)
                      -3415.4838  3.5572e-007 -2.0531e-006 3.0459e-006 (0.0017)

AI7609 to 1110312 (2) 32887.9955  2.2210e-007 (0.0005)
                       5843.6189  -7.7573e-008 7.3251e-007 (0.0009)
                      -3415.5112  1.1126e-007 -4.5532e-007 6.4739e-007 (0.0008)

HU2327 to 1110312 (1) 34975.9989  1.4451e-007 (0.0004)
                      -1329.6876  -1.2995e-007 4.0267e-007 (0.0006)
                     -12838.3606  5.5099e-008 -1.9933e-007 2.6941e-007 (0.0005)

HU2327 to 1110312 (3) 34975.9982  2.1048e-007 (0.0005)
                      -1329.6682  -1.9757e-007 8.2807e-007 (0.0009)
                     -12838.3747  -2.4351e-008 -3.7633e-007 4.5210e-007 (0.0007)

HU2327 to AI7609  (2)  2087.9934  9.0257e-007 (0.0010)
                      -7173.2937  -6.2284e-007 1.1756e-006 (0.0011)
                      -9422.8653  4.7465e-007 -8.2261e-007 1.2514e-006 (0.0011)

HU2327 to AI7609  (3)  2088.0011  4.1264e-008 (0.0002)
```

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                       11103U_fully_constrained_Worcester.net
                       -7173.3163  -2.4614e-008 1.3298e-007 (0.0004)
                       -9422.8508   2.2193e-008 -7.3778e-008 9.7643e-008 (0.0003)



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

SESSION NAME                  -- RE --   -- RN --   -- RH --   - PPM -   DIST - STD -
                                 (m)        (m)        (m)                (km)   (m)
AI7609 to 1110312 (1)         0.0027    -0.0042    -0.0353      1.062    33.6  0.0265
AI7609 to 1110312 (2)         0.0045     0.0041    -0.0017      0.187    33.6  0.0140
HU2327 to 1110312 (1)         0.0009    -0.0015    -0.0032      0.097    37.3  0.0100
HU2327 to 1110312 (3)        -0.0034    -0.0022     0.0204      0.558    37.3  0.0135
HU2327 to AI7609  (2)         0.0029    -0.0024     0.0200      1.694    12.0  0.0202
HU2327 to AI7609  (3)         0.0011     0.0010    -0.0076      0.647    12.0  0.0058
                             -------------------------------
                    RMS       0.0029     0.0028     0.0189

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



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

STA. NAME     -- RE --   -- RN --   -- RH --
                 (m)        (m)        (m)
AI7609       -0.0022     0.0016     0.0036
HU2327        0.0090    -0.0062    -0.0144
             -------------------------------
RMS           0.0065     0.0045     0.0105



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

STA_ID       -- LATITUDE --   -- LONGITUDE --  - ELLHGT -   ORTHOHGT
AI7609       38 20 42.97632   -75 30 31.23267   -20.2455    15.6377
1110312      38 18 22.12367   -75 07 40.46389   -33.7921     2.2581
HU2327       38 27 12.90171   -75 30 40.57701   -19.6715    16.0724



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

STA_ID       - EASTING -   - NORTHING - - ELLHGT -   ORTHOHGT
                (m)           (m)          (m)          (m)
AI7609       455549.6956  4244247.1224   -20.2455    15.6377
1110312      488816.9824  4239791.1202   -33.7921     2.2581
HU2327       455389.4910  4256266.8142   -19.6715    16.0724



******************************************************************
    OUTPUT VARIANCE/COVARIANCE
```

```
                    11103U_fully_constrained_Worcester.net
*********************************************************************
                                      2
STA_ID        SE/SN/SUP  --------- CX matrix (m )-----------
              (95.00 %)  (not scaled by confidence level)
                 (m)          (ECEF, XYZ cartesian)
AI7609         0.0110  2.0151e-005
               0.0110  -8.2721e-008 2.0440e-005
               0.0111  7.1827e-008 -2.3961e-007 2.0346e-005

1110312        0.0122  2.5500e-005
               0.0128  -3.8240e-006 4.3169e-005
               0.0181  2.1354e-006 -1.3142e-005 3.7704e-005

HU2327         0.0115  2.2415e-005
               0.0116  -1.3235e-006 2.7034e-005
               0.0135  1.1492e-006 -3.8338e-006 2.5540e-005




*********************************************************************
    VARIANCE FACTOR = 1.0018

    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_fully_constrained_Worcester     *
        **************************************************


    DATE:   3/28/2011 (m/d/y)
    TIME:   19:11:41

    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...
    AI7609   Control-3D OK             Pub(3D) (-)
    1110312  Loop Tie   OK             Good    AI7609
    HU2327   Control-3D OK             Pub(3D) (-)


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

    Station          Latitude        Longitude       Grid-E       Grid-N
    EllHgt  OrthoHgt
                     (D M S)          (D M S)           (m)          (m)
    (m)        (m)
    AI7609   38 20 42.97627  -75 30 31.23258   455549.698   4244247.121   -
    20.249    15.634
    1110312  38 18 22.12376  -75 07 40.46391   488816.982   4239791.123   -
    33.760     2.290
    HU2327   38 27 12.90191  -75 30 40.57738   455389.482   4256266.821   -
    19.657    16.087


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

    Name/Session              Type       Result   DEast   DNorth  DHeight
                                                   (m)     (m)      (m)
    AI7609 to 1110312 (2)     Duplicate Good      0.0017  0.0083   0.0337
    HU2327 to 1110312 (1)     Duplicate Good      0.0093  -0.0051  0.0142
    HU2327 to 1110312         LoopTie   Good      0.0051  -0.0058  0.0378
                                                 ----------------------------


      RMS (tie points)                           0.0062  0.0065   0.0303
      RMS (check points)
                                                 ============================
```
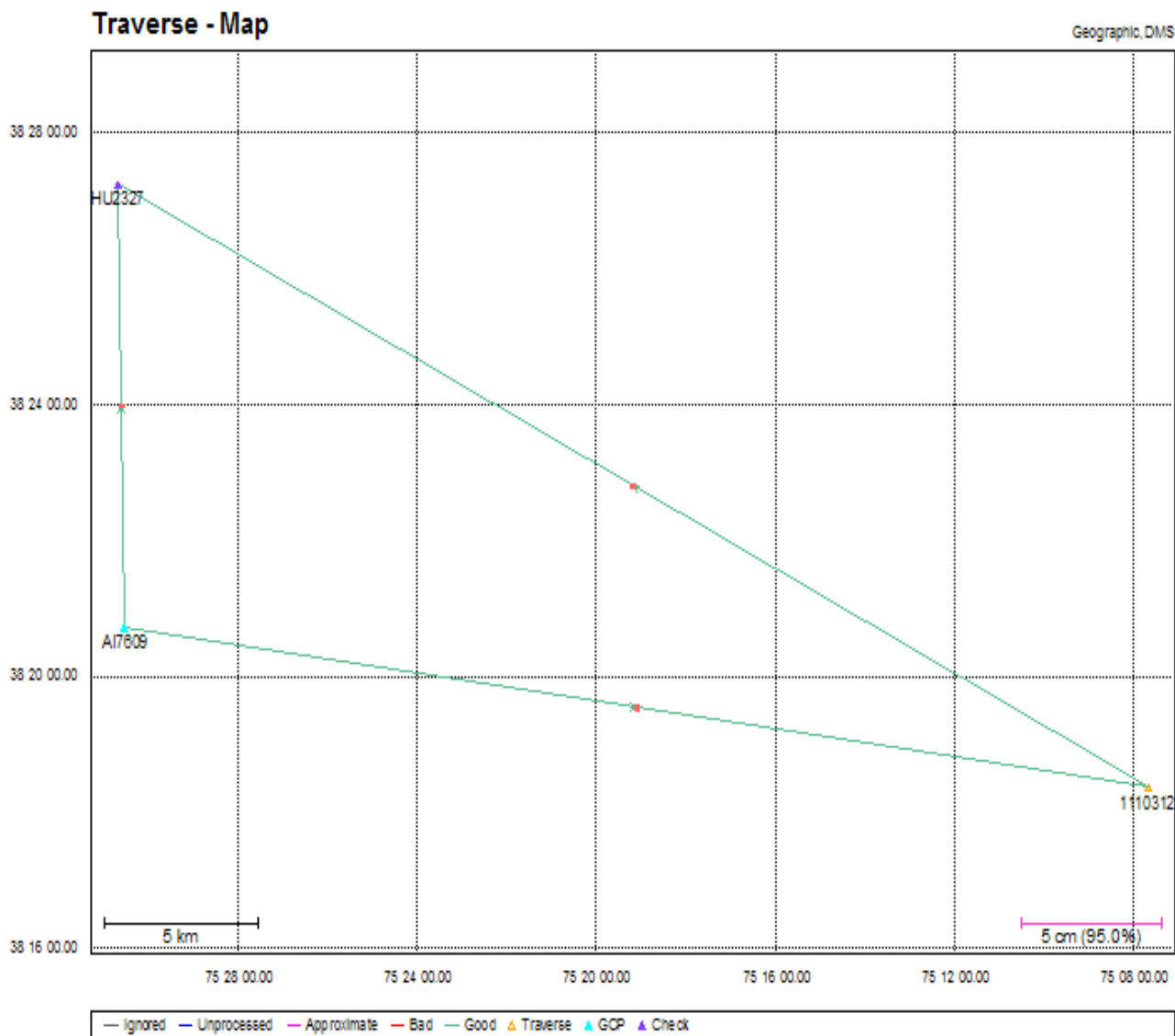
Minimally Constrained GPS Network

Traverse - Map

Geographic, DMS

Legend: Ignored — Unprocessed — Approximate — Bad — Good △ Traverse ▲ GCP ▲ Check

```
                      11103U_minimally_constrained_Worcester.net

              ***************************************************
              * NETWORK - WEIGHTED GPS NETWORK ADJUSTMENT        *
              *                                                  *
              * (c) Copyright NovAtel Inc., (2007)               *
              *                                                  *
              * Version: 7.80.2517                               *
              *                                                  *
              * FILE: C:\4_Control\Grafnet
     Project\11103U_minimally_constrained_Worcester.net
              ***************************************************

     DATE(m/d/y): Mon.   3/28/11   TIME: 19:16:23




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

       DATUM:             'NAD83'
       GRID:              UTM, Zone 18
       SCALE_FACTOR:      32.5640
       CONFIDENCE LEVEL: 95.00 %   (Scale factor is 2.4479)


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

     STA_ID      TYPE     -- LATITUDE --   -- LONGITUDE --  ELLHGT -   HZ-SD    V-SD
     AI7609      GCP-3D  38 20 42.97627  -75 30 31.23258    -20.249 0.00500 0.00500
     HU2327      CHK-3D  38 27 12.90191  -75 30 40.57738    -19.657


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

     SESSION NAME              VECTOR(m)   ------ Covariance (m) [unscaled] ------
                               DX/DY/DZ           standard deviations in brackets
     1110312 to HU2327 (1) -34975.9984  1.4479e-007 (0.0004)
                            1329.6856 -1.3036e-007 4.0288e-007 (0.0006)
                           12838.3622  5.5298e-008 -1.9921e-007 2.6925e-007 (0.0005)

     1110312 to HU2327 (3) -34975.9977  2.1049e-007 (0.0005)
                            1329.6668 -1.9789e-007 8.2742e-007 (0.0009)
                           12838.3758 -2.4013e-008 -3.7594e-007 4.5176e-007 (0.0007)

     AI7609 to 1110312 (2) 32887.9955  2.2210e-007 (0.0005)
                            5843.6189 -7.7573e-008 7.3251e-007 (0.0009)
                           -3415.5112  1.1126e-007 -4.5532e-007 6.4739e-007 (0.0008)

     AI7609 to 1110312 (1) 32888.0026  2.0522e-007 (0.0005)
                            5843.5988 -1.9338e-007 2.4897e-006 (0.0016)
                           -3415.4838  3.5572e-007 -2.0531e-006 3.0459e-006 (0.0017)

     AI7609 to HU2327 (1)  -2087.9879  4.1535e-007 (0.0006)
                            7173.2842 -2.2045e-007 6.7002e-007 (0.0008)
                            9422.8705 -1.5323e-008 -1.1245e-007 4.5229e-007 (0.0007)
```

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

SESSION NAME              -- RE --   -- RN --   -- RH --    - PPM -   DIST - STD -
                            (m)        (m)        (m)                 (km)   (m)
1110312 to HU2327 (1)     -0.0000    -0.0008     0.0102      0.273    37.3  0.0079
1110312 to HU2327 (3)      0.0041    -0.0000    -0.0127      0.357    37.3  0.0106
AI7609 to 1110312 (2)      0.0033     0.0029     0.0133      0.418    33.6  0.0110
AI7609 to 1110312 (1)      0.0015    -0.0054    -0.0203      0.629    33.6  0.0208
AI7609 to HU2327 (1)      -0.0061     0.0014    -0.0070      0.781    12.0  0.0108
                          ------------------------------------
                  RMS      0.0037     0.0028     0.0134

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


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

STA. NAME     -- RE --   -- RN --   -- RH --
                (m)        (m)        (m)
HU2327        0.0109    -0.0113     0.0065
              ------------------------------
RMS           0.0109     0.0113     0.0065




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

STA_ID       -- LATITUDE --   -- LONGITUDE --   - ELLHGT -   ORTHOHGT
1110312      38 18 22.12358   -75 07 40.46385    -33.7807     2.2695
AI7609       38 20 42.97627   -75 30 31.23258    -20.2491    15.6341
HU2327       38 27 12.90154   -75 30 40.57693    -19.6505    16.0934




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

STA_ID       - EASTING -   - NORTHING - - ELLHGT -   ORTHOHGT
                (m)           (m)          (m)          (m)
1110312      488816.9834   4239791.1174   -33.7807     2.2695
AI7609       455549.6979   4244247.1208   -20.2491    15.6341
HU2327       455389.4929   4256266.8091   -19.6505    16.0934




*************************************************************
    OUTPUT VARIANCE/COVARIANCE
*************************************************************
                                        2
STA_ID      SE/SN/SUP  --------- CX matrix (m )-----------
            (95.00 %)  (not scaled by confidence level)
               (m)             (ECEF, XYZ cartesian)
```

```
                          11103U_minimally_constrained_Worcester.net
1110312           0.0136  3.0922e-005
                  0.0143  -2.4311e-006 4.8871e-005
                  0.0191  2.7355e-006 -1.3064e-005 4.5925e-005

AI7609            0.0122  2.5000e-005
                  0.0122  3.9644e-021 2.5000e-005
                  0.0122  -4.4306e-021 5.1347e-021 2.5000e-005

HU2327            0.0140  3.4233e-005
                  0.0149  -4.8459e-006 5.0321e-005
                  0.0188  1.7733e-006 -1.0234e-005 4.4570e-005




**********************************************************************
   VARIANCE FACTOR = 1.0030

   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_minimally_constrained_Worcester.gnt *
**************************************************


DATE:   3/28/2011 (m/d/y)
TIME:   19:16:29

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...
1110312  Traverse     OK             Good    AI7609
AI7609   Control-3D   OK             Pub(3D) (-)
HU2327   Check-3D     OK             Good    AI7609


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

Station         Latitude       Longitude        Grid-E        Grid-N
EllHgt  OrthoHgt
                (D M S)        (D M S)            (m)           (m)
(m)        (m)
1110312  38 18 22.12376  -75 07 40.46391   488816.982   4239791.123   -
33.760    2.290
AI7609   38 20 42.97627  -75 30 31.23258   455549.698   4244247.121   -
20.249   15.634
HU2327   38 27 12.90150  -75 30 40.57668   455389.499   4256266.808   -
19.644   16.100


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

Name/Session             Type       Result    DEast   DNorth  DHeight
                                               (m)     (m)     (m)
AI7609 to 1110312 (2)    Duplicate Good       0.0017   0.0083   0.0337
POINT HU2327             CheckPnt  Good       0.0170  -0.0128   0.0134
1110312 to HU2327 (1)    Duplicate Good       0.0076  -0.0075  -0.0032
1110312 to HU2327        LoopTie   Good       0.0116  -0.0068  -0.0261

                                            ----------------------------
  RMS (tie points)                           0.0081   0.0076   0.0246
  RMS (check points)                         0.0170   0.0128   0.0134
                                            ============================
```

Station Description and Photos:

1110312
Latitude: N38 18 22.12367
Longitude: W75 07 40.46389
Ellipsoid Height: -33.7921m
Orthometric Height: 2.2581m

Final STATION COORDINATES (GRID)
Easting : 488816.9824
Northing: 4239791.1202
Ellipsoid Height: -33.7921m
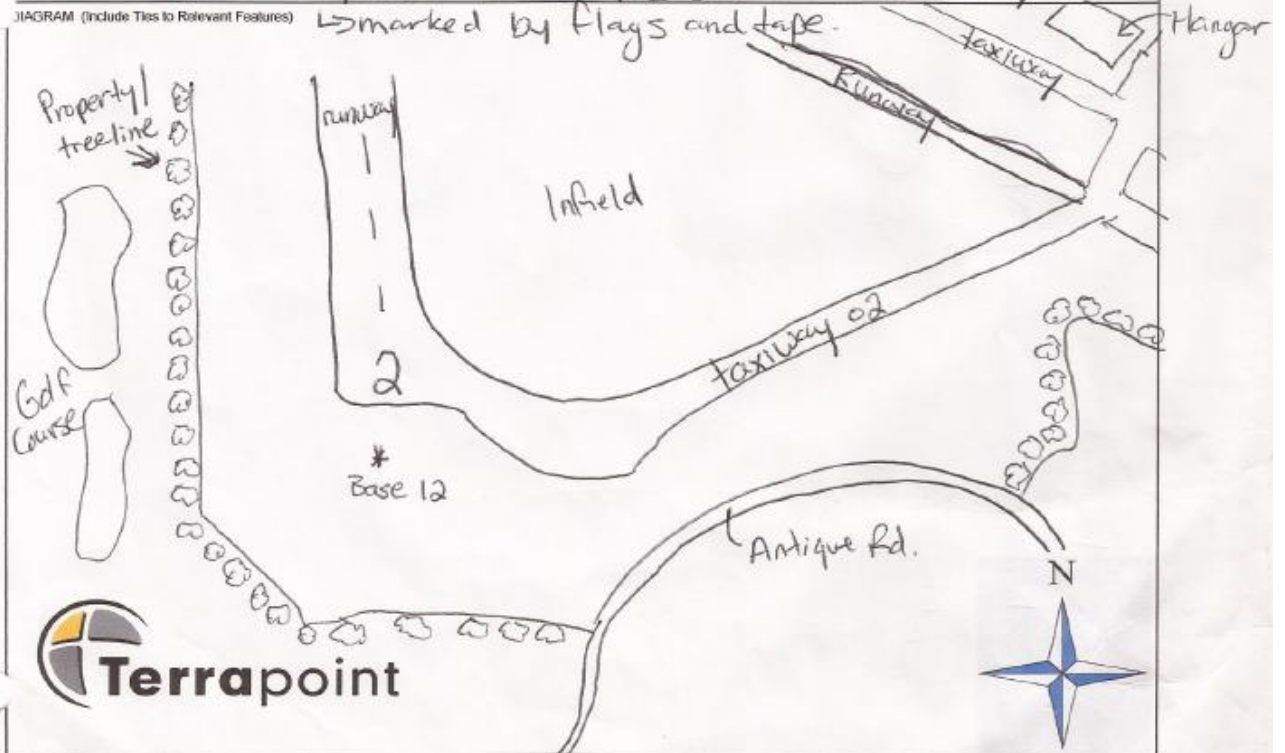**Orthometric Height:** 2.2581m

STATION DESCRIPTION FORM

Terrapoint

PROJECT No.: 111034
PROJECT NAME: FEMA Virginia
LOCATION: Ocean City, MD

PHOTOS TAKEN:

STATION NAME: 1110312	MARKER TYPE: 12" nail	DATE: mar 22/11
STATION NUMBER: 1110312	STATION LOCALITY: Ocean City Airport South of runway 02	LEGAL DESCRIPTION:
DATUM: NAD 83	CENTRAL MERIDIAN:	UTM ZONE: 18
LATITUDE: N38 18 22.12367	LONGITUDE: W75 07 40.46389	ELLIPSOID HEIGHT metres (h): -33.7921m
UTM NORTHING metres: 4239791.1202	UTM EASITNG metres: 488816.9824	GEOID HEIGHT metres (MSL): 2.2581m

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

MARKER LOCATION: At the ocean City Municipal Airport at the southern part of the property where runway 02# and taxiway 02 meet. Approximately 35 meters at the S south of runway 02. → marked by flags and tape.

DIAGRAM (Include Ties to Relevant Features)

Published Control Station Descriptions and Coordinates:

AI7609
Latitude: N38 20 42.97627
Longitude: W75 30 31.23258
Ellipsoid Height: -20.249m
Orthometric Height: 15.631m

Final STATION COORDINATES (GRID)
Easting : 455549.6956
Northing: 4244247.1224
Ellipsoid Height: -20.249m
Orthometric Height: 15.631m

Terrapoint

STATION DESCRIPTION FORM

PROJECT No.: 11034
PROJECT NAME: FEMA Virginia
LOCATION: Salisbury, MD

PHOTOS TAKEN:

STATION NAME:	MARKER TYPE:	DATE:
A17609	National Geodetic Survey Marker	Mar 22/11

STATION NUMBER:	STATION LOCALITY:	LEGAL DESCRIPTION:
	Salisbury Airport	

DATUM:	CENTRAL MERIDIAN:	UTM ZONE:
NAD 83		18

LATITUDE:	LONGITUDE:	ELLIPSOID HEIGHT metres (h):
N38 20 42.97627	W75 30 31.23258	-20.249m

UTM NORTHING metres:	UTM EASTING metres:	GEOID HEIGHT metres (MSL):
4244247.1224	455549.6956	15.631m

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

MARKER LOCATION: At the Salisbury-Ocean City-Wicomico Airport on the NE side of the Airport near the end of runway 23. From the taxiway Parallel approx. 33 meters SE of taxiway on top the hill. Indicate by stake and orange flag.

DIAGRAM (Include Ties to Relevant Features)

*= A17609
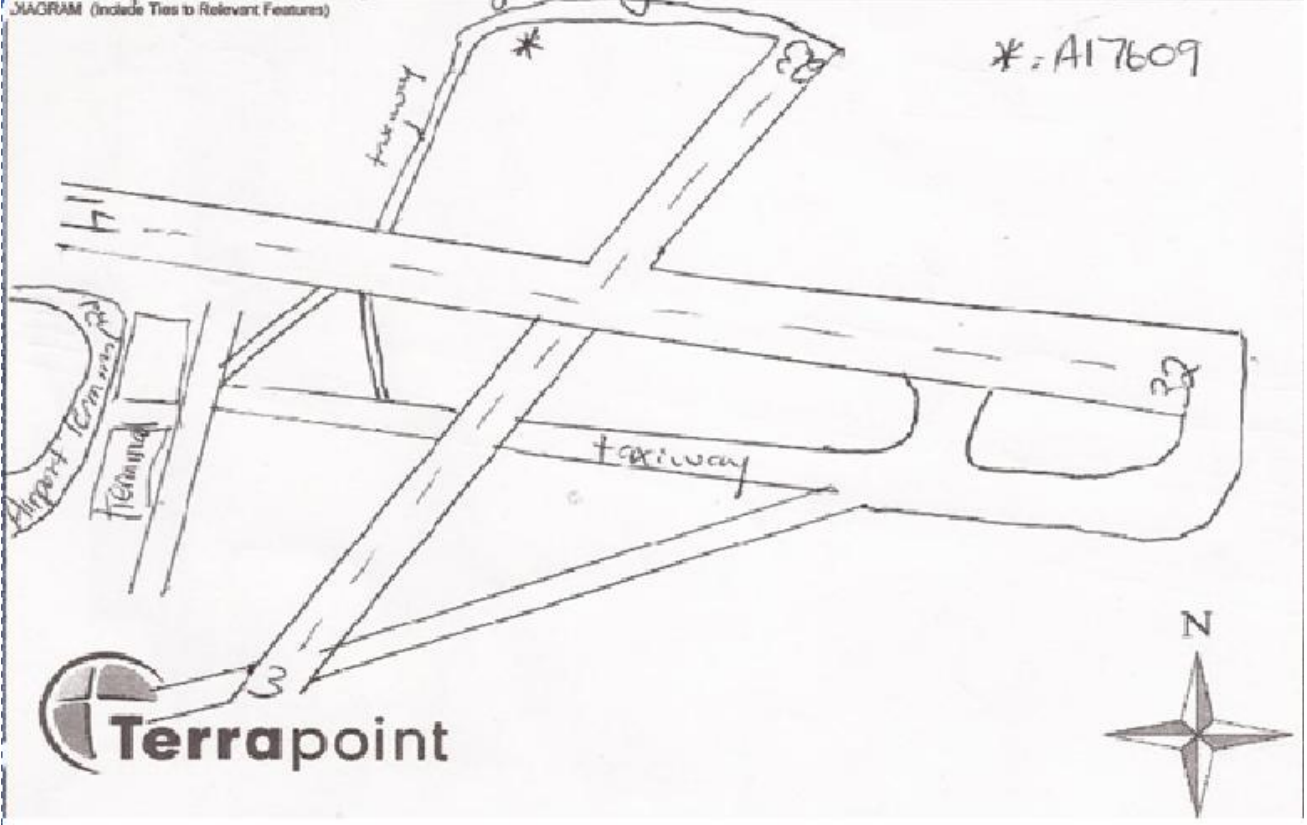
```
AI7609  PACS        -  This is a Primary Airport Control Station.
AI7609  DESIGNATION -  SBY E
AI7609  PID         -  AI7609
AI7609  STATE/COUNTY-  MD/WICOMICO
AI7609  USGS QUAD   -  SALISBURY (1982)
AI7609
AI7609                        *CURRENT SURVEY CONTROL
AI7609  _____
AI7609* NAD 83(2007)-  38 20 42.97627(N)    075 30 31.23258(W)    ADJUSTED
AI7609* NAVD 88     -        15.64  (meters)      51.3   (feet)  GPS OBS
AI7609  _____
AI7609  EPOCH DATE  -        2002.00
AI7609  X           -   1,253,350.897 (meters)                   COMP
AI7609  Y           -  -4,849,377.405 (meters)                   COMP
AI7609  Z           -   3,935,560.652 (meters)                   COMP
AI7609  LAPLACE CORR-          -1.27  (seconds)                   DEFLEC09
AI7609  ELLIP HEIGHT-         -20.249 (meters)      (02/10/07) ADJUSTED
AI7609  GEOID HEIGHT-         -35.88  (meters)                   GEOID09
AI7609
AI7609  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
AI7609  Type    PID    Designation                     North   East  Ellip
AI7609  -----------------------------------------------------------------
AI7609  NETWORK AI7609 SBY E                            0.35   0.31   2.25
AI7609  -----------------------------------------------------------------
AI7609
AI7609.This mark is at Salisbury-Wicomico Co Regional Airport (SBY)
AI7609
AI7609.The horizontal coordinates were established by GPS observations
AI7609.and adjusted by the National Geodetic Survey in February 2007.
AI7609
AI7609.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
AI7609.See National Readjustment for more information.
AI7609.The horizontal coordinates are valid at the epoch date displayed above.
AI7609.The epoch date for horizontal control is a decimal equivalence
AI7609.of Year/Month/Day.
AI7609
AI7609.The orthometric height was determined by GPS observations and a
AI7609.high-resolution geoid model.
AI7609
AI7609.GPS derived orthometric heights for airport stations designated as
AI7609.PACS or SACS are published to 2 decimal places.  This maintains
AI7609.centimeter relative accuracy between the PACS and SACS.  It does
AI7609.not indicate centimeter accuracy relative to other marks which are
AI7609.part of the NAVD 88 network.
AI7609
AI7609.The X, Y, and Z were computed from the position and the ellipsoidal ht.
AI7609
AI7609.The Laplace correction was computed from DEFLEC09 derived deflections.
AI7609
AI7609.The ellipsoidal height was determined by GPS observations
AI7609.and is referenced to NAD 83.
AI7609
AI7609.The geoid height was determined by GEOID09.
AI7609
AI7609;                     North         East     Units Scale Factor Converg.
AI7609;SPC MD     -     76,392.912   530,363.383    MT  0.99999243 +0 56 09.6
AI7609;SPC MD     -    250,632.41  1,740,033.87    sFT  0.99999243 +0 56 09.6
AI7609;UTM  18    -  4,244,247.121   455,549.698    MT  0.99962433 -0 18 56.1
AI7609
AI7609!              -  Elev Factor  x  Scale Factor =   Combined Factor
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AI7609!SPC MD      -   1.00000318  x  0.99999243  =  0.99999561
AI7609!UTM  18     -   1.00000318  x  0.99962433  =  0.99962751
AI7609
AI7609                        SUPERSEDED SURVEY CONTROL
AI7609
AI7609  ELLIP H (10/28/02)  -20.248  (m)                          GP(      ) 1 1
AI7609  NAD 83(1991)-  38 20 42.97646(N)    075 30 31.23242(W) AD(      ) B
AI7609  ELLIP H (09/18/00)  -20.235  (m)                          GP(      ) 1 1
AI7609
AI7609.Superseded values are not recommended for survey control.
AI7609.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
AI7609.See file dsdata.txt to determine how the superseded data were derived.
AI7609
AI7609_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SVH5554944247(NAD 83)
AI7609_MARKER: F = FLANGE-ENCASED ROD
AI7609_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
AI7609_STAMPING: SBY E 2000
AI7609_MARK LOGO: NGS
AI7609_PROJECTION: RECESSED 7 CENTIMETERS
AI7609_MAGNETIC: N = NO MAGNETIC MATERIAL
AI7609_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
AI7609+STABILITY: POSITION/ELEVATION WELL
AI7609_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
AI7609+SATELLITE: SATELLITE OBSERVATIONS - July 24, 2008
AI7609_ROD/PIPE-DEPTH: 32.4 meters
AI7609_SLEEVE-DEPTH  : 1.0 meters
AI7609
AI7609  HISTORY    - Date      Condition       Report By
AI7609  HISTORY    - 2000      MONUMENTED      NGS
AI7609  HISTORY    - 20000313 GOOD            NGS
AI7609  HISTORY    - 20080724 GOOD            WOOLPT
AI7609
AI7609                         STATION DESCRIPTION
AI7609'DESCRIBED BY NATIONAL GEODETIC SURVEY 2000 (ED)
AI7609'THIS STATION IS THE PRIMARY AIRPORT CONTROL STATION (PACS) FOR THIS
AI7609'AIRPORT. THE STATION IS LOCATED APPROXIMATELY 8.0 KM (4.95 MI)
AI7609'EAST-SOUTHEAST OF SALISBURY MARYLAND, AT THE SALISBURY-OCEAN
AI7609'CITY-WICOMICO REGIONAL AIRPORT, ON THE NORTHEAST SIDE OF THE AIRPORT,
AI7609'NEAR RUNWAY END 23. FOR ACCESS TO THE STATION--CONTACT-MR ROBERT L.
AI7609'BRYANT, A.A.E., AIRPORT MANAGER, 5485 AIRPORT TERMINAL ROAD, UNIT A,
AI7609'SALISBURY, MD 21804-1599.  PHONE--410-548-4827, FAX--410-548-4945.
AI7609'CONTACT AIRPORT MANAGER AT LEAST 1 WEEK IN ADVANCE. TO REACH THE
AI7609'STATION FROM THE INTERSECTION OF US HWY 13 BUISINESS, AND EAST MAIN
AI7609'STREET IN SALISBURY, TRAVEL EAST ON EAST MAIN STREET FOR 0.65 MI (1.05
AI7609'KM) TO A Y INTERSECTION PROCEED RIGHT AND SOUTHEAST ON STATE ROUTE
AI7609'350-MT HERMON RD- FOR 3 MI (4.8 KM) TO AIRPORT ROAD ON THE RIGHT,TURN
AI7609'RIGHT, SOUTH-SOUTHEAST AND CONTINUE FOR 0.9 MI (1.4 KM) TO TERMINAL
AI7609'ROAD ON THE LEFT, TURN LEFT, EAST, AND CONTINUE FOR 0.15 MI (0.24 KM)
AI7609'TO TOWER ACCESS ROAD AND OLD TERMINAL BUILDING ON THE RIGHT.  TURN
AI7609'RIGHT, EAST, FOR 0.05 MILES (0.08 KM) TO AIRPORT ACCESS GATE.  PASS
AI7609'THROUGH THE GATE AND DRIVE SOUTHEAST ACROSS THE RAMP FOR 0.025 MI
AI7609'(0.040 KM) TO TAXIWAY D.  CONTINUE ON DELTA FOR 0.075 MI (0.121 KM) TO
AI7609'RUNWAY 14/32, CROSS RUNWAY AND CONTINUE EAST ON TAXIWAY B FOR 0.1 MI
AI7609'(0.2 KM) TO THE STATION ON THE RIGHT AT TOP OF EMBANKMENT. THE STATION
AI7609'IS A PUNCH HOLE IN THE TOP OF A FLUTED SLEEVE ENCASED STAINLESS STEEL
AI7609'ROD IN A 6 IN DIA, 1 M (3.3 FT) LONG PVC PIPE WITH AN ALUMINUM LOGO
AI7609'CAP, DRIVEN TO A REFUSAL DEPTH OF 32.35 M, (106.13 FT) RECESSED TO A
AI7609'DEPTH OF 6 CM BELOW GROUND LEVEL.THE STATION IS 210 FT (64.0 M)
AI7609'SOUTHWEST OF EDGE OF TAXIWAY B, 32.3 M (106.0 FT) SOUTH-SOUTHEAST OF
AI7609'EDGE OF TAXIWAY B, 17.1 M (56.1 FT) SOUTH-SOUTHWEST OF THE NORTH END
AI7609'OF A CONCRETE DRAINAGE DITCH, 1.8 M (5.9 FT) NORTHWEST OF A CARSONITE
AI7609'WITNESS POST
```

HU2327
Latitude: N38 27 12.90191
Longitude: W75 30 40.57738
Ellipsoid Height: -19.657m
Orthometric Height: 16.083m

Final STATION COORDINATES (GRID)
Easting : 455389.4910
Northing: 4256266.8142
Ellipsoid Height: -16.6617 m
Orthometric Height: 16.3482m

STATION DESCRIPTION FORM

Terrapoint

PROJECT No.: 11034
PROJECT NAME: FEMA Virginia
LOCATION: Salisbury, MD

PHOTOS TAKEN:

STATION NAME:	MARKER TYPE:	DATE:
HU2327	NGS Marker	Mar 22/11

STATION NUMBER.	STATION LOCALITY.	LEGAL DESCRIPTION:
	Rum Ridge Rd Salisbury MD.	

DATUM:	CENTRAL MERIDIAN:	UTM ZONE:
NAD 83		18

LATITUDE:	LONGITUDE:	ELLIPSOID HEIGHT metres (h):
N38 27 12.90191	W75 30 40.57738	-19.657m

UTM NORTHING metres:	UTM EASTING metres:	GEOID HEIGHT metres (MSL):
4256266.8142	455389.4910	16.083m

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

MARKER LOCATION: 4.1 Km East along State Hwy 54 from the junction of U.S Hwy 13 in Delmar. Turn South on Rum Ridge Rd. for 90 meters. On the Westside of the road 7meters from a driveway and 3meters west of road stands a stake and flag.

DIAGRAM (Include Ties to Relevant Features)

Page 23
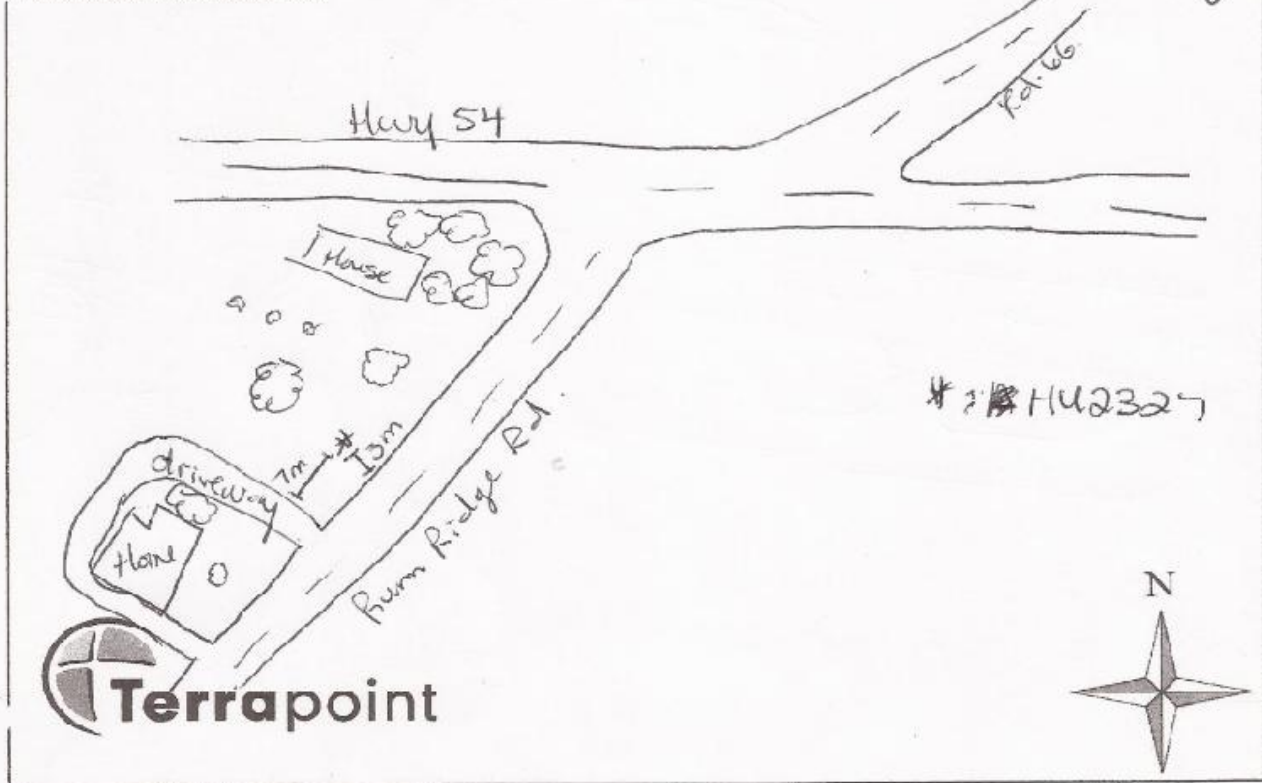
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HU2327  CBN         -  This is a Cooperative Base Network Control Station.
HU2327  DESIGNATION -  K 183
HU2327  PID         -  HU2327
HU2327  STATE/COUNTY-  MD/WICOMICO
HU2327  USGS QUAD   -  DELMAR (1992)
HU2327
HU2327                         *CURRENT SURVEY CONTROL
HU2327  _____
HU2327* NAD 83(2007)-  38 27 12.90191(N)    075 30 40.57738(W)    ADJUSTED
HU2327* NAVD 88     -        16.073  (meters)      52.73   (feet)  ADJUSTED
HU2327  _____
HU2327  EPOCH DATE  -       2002.00
HU2327  X           -   1,251,262.888 (meters)                     COMP
HU2327  Y           -  -4,842,204.107 (meters)                     COMP
HU2327  Z           -   3,944,983.524 (meters)                     COMP
HU2327  LAPLACE CORR-         -1.05  (seconds)                      DEFLEC09
HU2327  ELLIP HEIGHT-        -19.657 (meters)        (02/10/07) ADJUSTED
HU2327  GEOID HEIGHT-        -35.74  (meters)                      GEOID09
HU2327  DYNAMIC HT  -         16.063 (meters)      52.70  (feet)  COMP
HU2327
HU2327  ------- Accuracy Estimates (at 95% Confidence Level in cm) --------
HU2327  Type    PID   Designation                     North   East  Ellip
HU2327  ------------------------------------------------------------------
HU2327  NETWORK HU2327 K 183                            0.59   0.55   1.29
HU2327  ------------------------------------------------------------------
HU2327  MODELED GRAV-    980,012.4   (mgal)                      NAVD 88
HU2327
HU2327  VERT ORDER  -  SECOND    CLASS I
HU2327
HU2327.The horizontal coordinates were established by GPS observations
HU2327.and adjusted by the National Geodetic Survey in February 2007.
HU2327
HU2327.The datum tag of NAD 83(2007) is equivalent to NAD 83(NSRS2007).
HU2327.See National Readjustment for more information.
HU2327.The horizontal coordinates are valid at the epoch date displayed above.
HU2327.The epoch date for horizontal control is a decimal equivalence
HU2327.of Year/Month/Day.
HU2327
HU2327.The orthometric height was determined by differential leveling and
HU2327.adjusted in June 1991.
HU2327
HU2327.The X, Y, and Z were computed from the position and the ellipsoidal ht.
HU2327
HU2327.The Laplace correction was computed from DEFLEC09 derived deflections.
HU2327
HU2327.The ellipsoidal height was determined by GPS observations
HU2327.and is referenced to NAD 83.
HU2327
HU2327.The geoid height was determined by GEOID09.
HU2327
HU2327.The dynamic height is computed by dividing the NAVD 88
HU2327.geopotential number by the normal gravity value computed on the
HU2327.Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
HU2327.degrees latitude (g = 980.6199 gals.).
HU2327
HU2327.The modeled gravity was interpolated from observed gravity values.
HU2327
HU2327;                      North        East    Units Scale Factor Converg.
HU2327;SPC MD     -     88,410.567   529,940.433   MT  0.99997683 +0 56 03.8
HU2327;SPC MD     -    290,060.34  1,738,646.24   sFT  0.99997683 +0 56 03.8
HU2327;UTM  18    -  4,256,266.820   455,389.482   MT  0.99962451 -0 19 04.6
HU2327
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HU2327!              - Elev Factor  x  Scale Factor =   Combined Factor
HU2327!SPC MD        -  1.00000308  x  0.99997683  =   0.99997991
HU2327!UTM  18       -  1.00000308  x  0.99962451  =   0.99962759
HU2327
HU2327                        SUPERSEDED SURVEY CONTROL
HU2327
HU2327  NAD 83(1991)-  38 27 12.90193(N)    075 30 40.57719(W) AD(       ) A
HU2327  ELLIP H (02/12/02)  -19.652  (m)                        GP(       ) 4 1
HU2327  NAVD 88 (02/12/02)   16.07   (m)          52.7   (f) LEVELING   3
HU2327  NGVD 29 (06/12/91)   16.325  (m)          53.56  (f) ADJUSTED   2 1
HU2327
HU2327.Superseded values are not recommended for survey control.
HU2327.NGS no longer adjusts projects to the NAD 27 or NGVD 29 datums.
HU2327.See file dsdata.txt to determine how the superseded data were derived.
HU2327
HU2327_U.S. NATIONAL GRID SPATIAL ADDRESS: 18SVH5538956266(NAD 83)
HU2327_MARKER: I = METAL ROD
HU2327_SETTING: 59 = STAINLESS STEEL ROD IN SLEEVE (10 FT.+)
HU2327_SP_SET: STAINLESS STEEL ROD IN SLEEVE
HU2327_STAMPING: K 183 1990
HU2327_MARK LOGO: NGS
HU2327_PROJECTION: RECESSED 4 CENTIMETERS
HU2327_MAGNETIC: O = OTHER; SEE DESCRIPTION
HU2327_STABILITY: A = MOST RELIABLE AND EXPECTED TO HOLD
HU2327+STABILITY: POSITION/ELEVATION WELL
HU2327_SATELLITE: THE SITE LOCATION WAS REPORTED AS SUITABLE FOR
HU2327+SATELLITE: SATELLITE OBSERVATIONS - March 27, 2000
HU2327_ROD/PIPE-DEPTH: 28.0 meters
HU2327_SLEEVE-DEPTH  : 0.9 meters
HU2327
HU2327  HISTORY    - Date     Condition      Report By
HU2327  HISTORY    - 1990     MONUMENTED     NGS
HU2327  HISTORY    - 20000327 GOOD           MDSHA
HU2327
HU2327                     STATION DESCRIPTION
HU2327
HU2327'DESCRIBED BY NATIONAL GEODETIC SURVEY 1990
HU2327'4.1 KM (2.55 MI) EASTERLY ALONG STATE HIGHWAY 54 FROM THE JUNCTION OF
HU2327'U.S. HIGHWAY 13 IN DELMAR, 95.1 M (312.01 FT) SOUTH OF THE CENTER OF
HU2327'THE HIGHWAY, 30.5 M (100.07 FT) NORTHEAST OF THE NORTHEAST CORNER OF
HU2327'A HOUSE, 10.6 M (34.78 FT) NORTH-NORTHEAST OF THE CENTER OF A
HU2327'DRIVEWAY, 8.2 M (26.90 FT) NORTHWEST OF THE CENTER OF RUM RIDGE ROAD,
HU2327'AND LEVEL WITH THE HIGHWAY.  NOTE--ACCESS TO THE DATUM POINT IS
HU2327'THROUGH A 5-INCH LOGO CAP.  THE MONUMENT IS ON PROPERTY OWNED BY MR.
HU2327'GEORGE HEARN, RT 1 BOX 158, DELMAR, MD 21875, TELEPHONE NUMBER (301)
HU2327'896-2862.
HU2327
HU2327                     STATION RECOVERY (2000)
HU2327
HU2327'RECOVERY NOTE BY MARYLAND DOT HIGHWAY ADMINISTRATION 2000 (SFK)
HU2327'RECOVERED AS DESCRIBED.
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