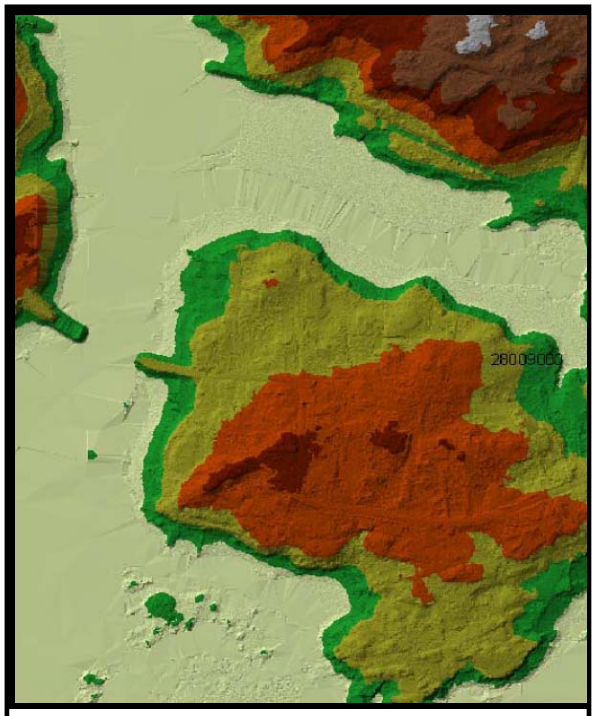
CDM



Kittery Point
York County, Maine

Flood Mapping Activities for York County, Maine

Task Order 16
Task 4 Topographic Data Acquisition
Summary Report

Contract No. EME-2003-CO-0340
Task Order T016

Prepared for:

FEMA Region I

August 2007

Contents

Tables

Figures

Section 1
Introduction

This report was prepared as the deliverable Task 4 Acquire Topographic Data for the coastal areas of York County, Maine under Federal Emergency Management Agency (FEMA) Contract No. EME-2003-CO-0340, Task Order 16. This section of the report explains the objective of the task and the purpose of the report.

1.1 Background

FEMA is embarking on a map modernization program nationwide to:

- Develop up-to-date data for all flood prone areas in support of floodplain management
- Provide maps and data in digital format to improve the efficiency and precision of the mapping program
- Integrate FEMA's community and state partners into the mapping process

In Region I, FEMA selected CDM as an IDIQ contractor to help the region accomplish its map modernization goals. One of the region's priorities is to develop updated Digital Flood Insurance Rate Maps (DFIRMs) and Flood Insurance Study (FIS) for York County, Maine. FEMA's Task Order 16 for CDM includes development of topographic data to support subsequent flood mapping tasks. The information provided in this report describes the methods used to acquire the topographic data and to verify that the data meets FEMA standards. The topographic data will ultimately be used in the production of new DFIRMs and FIS in York County, Maine.

1.2 Scope of Work

The following is the scope of work for Task 4 (Optional Task) – Topographic Data Development:

Task 4: Acquire Topographic Data

Under this task, CDM will obtain topographic data to support coastal engineering and for future use in the delineation of flood elevations along the York County coastline.

Specifically, CDM will generate new topographic data for the areas identified in Figure 1-1 in the form of bare-earth points. This includes aerial acquisition and limited processing to bare-earth point data. Additional LiDAR data processing will be performed under a future task order to produce 2-foot contour data for flood plain delineation.

- Acquired LiDAR data will be suitable for creation of a contour interval and/or accuracy for the topographic data of 2-feet based on the current FEMA requirements, as documented in Guidelines and Specifications for Flood Hazard Mapping Partners.

- Acquired LiDAR data will be suitable for creation of a Digital Elevation Model, a TIN and mass points for the delineation of coastal flood zones under a future task order.
- LiDAR intensity data will be collected as part of the aerial mission but will not be delivered under this task order. The LiDAR intensity data will be suitable for production of breaklines.
- CDM will produce a bare-earth point data deliverable.
- CDM will acquire ground survey points to check the accuracy of the LIDAR data.

County/Option	LIDAR Coverage (square miles)	Number of Survey Points to Check LIDAR
York County Coastal Areas	215	24

Deliverables: Upon completion of topographic data collection and limited processing to bare-earth point data, CDM will submit these data to FEMA or their designate for a QA/QC review. In accordance with the TSDN format described in Appendix M of Guidelines and Specifications for Flood Hazard Mapping Partners, CDM will make the following products available to FEMA:

- Report summarizing methodology and results.
- A Summary Report that describes and provides the results of all automated or manual QA/QC review steps taken during the preparation of the data. In addition, CDM will be prepared to address all concerns or questions regarding this activity that are raised as a result of an independent QA/QC review. At the appropriate time, FEMA may elect to forgo the Independent Quality Assurance of this activity, which would leave CDM solely responsible for ensuring the accuracy of its work under this Activity.
- Bare-earth point data on CD-ROM or DVD media.
- Checkpoint analyses to assess the accuracy of data, including Root Mean Square Error calculations to support vertical accuracy.
- National Geodetic Survey (NGS) data sheets for Network Control Points used to control remote-sensing and ground surveys.
- Metadata compliant with Federal Geographic Data Committee standards.

National Service Provider (NSP) Format Terrain Database or Intermediate Data Delivery consistent with the NSP Data Capture Standards and Guidelines.

This report responds to these deliverable requirements. It provides a summary of data collection efforts conducted for this task, as well as information on quality control.

Figure 1-1, LiDAR Coverage Area shows the location of the LiDAR coverage.

Additional detail is included in LiDAR Campaign Final Report for Cumberland County and York County, Vermont dated November 2006 prepared by Sanborn Mapping Company, included in Appendix A of this report. The LiDAR Checkpoint Survey Data Report and field survey notes and sketches prepared by Green International Affiliates, Inc. are found in Appendix B.

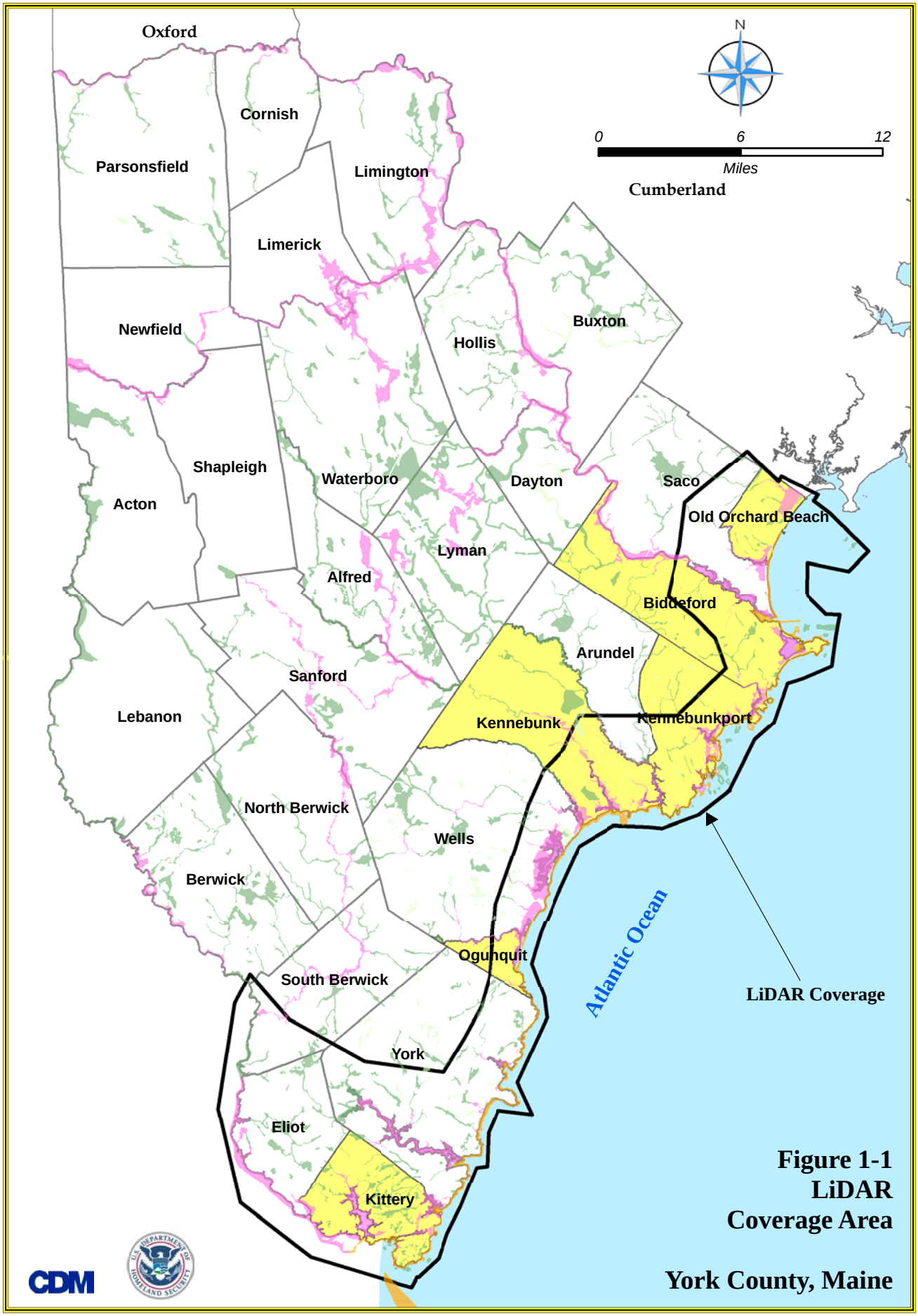


Figure 1-1
LiDAR Coverage Area

York County, Maine

CDM

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Section 2
LIDAR Data Acquisition and Processing

The LIDAR Data Acquisition and Processing was completed by Sanborn Mapping Company (Sanborn) under subcontract to CDM. This section summarizes the objectives, accuracy, specifications and tasks completed to acquire and process the LIDAR data.

A detailed LiDAR Campaign Final Report for York County, Maine dated November 2006 prepared by Sanborn is included in Appendix A of this report. The report documents the tools and techniques applied by Sanborn to acquire, process, check and deliver the LIDAR data.

2.1 Objectives

The project objectives are to produce digital topographic data needed for flood mapping; including production and delivery of digital terrain models within the project area (see Figure 1-1, LiDAR Coverage Area). The data is provided in two formats:

(1) Triangulated irregular networks (TIN) in the ESRI Coverage format

(2) Masspoints as x, y and z-attributed points in ASCII format

The data formats were developed using automated procedures with manual intervention as necessary (such as point cloud cleansing) to achieve accuracy requirements.

Another objective was to capture the LiDAR data within three hours of the time of the low tide. This will enable mapping of the zero elevation contour line (NAVD 88) that is needed for coastal flood zone delineation.

2.2 Accuracy

Vertical accuracy requirements for all data sets in both formats are 1.2-feet absolute at the 95 percent confidence interval, as defined by the Federal NSSDA (National Spatial Standard for Accuracy).

2.3 Specifications

All work products, performance specifications and compliance standards are in accordance with Subcontractor's Proposal for LIDAR Mapping Services for Riverine and Coastal Flood Insurance Studies in FEMA Region I dated April 5, 2004 and the Federal Emergency Management Agency's (FEMA) Guidelines and Specifications for Flood Hazard Mapping Partners (http://www.fema.gov/fhm/dl_cgs.shtm). Special attention shall be paid to Sections 1.4, A.2, A.3, A.8, Appendix I (Task 2) and Appendix M of said guidelines.

2.4 Work Plan

To generate new topographic data using LiDAR technology as defined in Volume 1 of the Guidelines and described in Appendix A.8, activities included in this work are:

1. Flight mission planning
2. LiDAR data acquisition (point clouds at required density to support vertical accuracy requirements)
3. LiDAR data inspection and cleansing
4. Data set production and quality control
5. Data set delivery
6. Federal Geographic Data Committee (FGDC) compliant Metadata including an indication of when each LiDAR strip was flown

All data sets were submitted by Sanborn to CDM for independent QA/QC review, inspection and acceptance.

A report summarizing methodology and results is included in Appendix A.

2.5 Quality Control Requirements

Sanborn has maintained relevant documentation as a result of the activities conducted for this scope of work and conduct internal QC review of all deliverable products prior to submittal to CDM.

2.6 Schedule

The LIDAR flights were completed November 7, 2006 through November 26, 2006. Processing of the LIDAR data was completed in February 2007.

Section 3
LIDAR Data Quality Review

Following LIDAR acquisition and processing, the resulting work products (DEM and Masspoints) were reviewed and independently checked for accuracy and for systematic error. This was accomplished by using check-point survey at points within the project area and comparing the surveyed elevations to the LIDAR topography.

Note that Sanborn also performed a ground-based check point survey as described in Appendix A. The LiDAR data was evaluated by Sanborn using a collection of 21 GPS surveyed check points. Sanborn reports an RMS average difference between the LiDAR data and ground surveyed points of 0.097 meters (0.32 feet), yielding a much better result than was required for the project.

3.1 Field Survey

CDM identified the general location for each of the 24 check point locations. The check-point locations are shown on Figure 3-1, Location of Field Surveyed Check-Points. Green International Affiliates, Inc. (GIA), a CDM subcontractor, performed the check-point field surveys. GIA employed an RTK GPS system on this project. The field survey report, field notes and photographs are included in Appendix C.

The LiDAR checkpoint survey was performed for twenty four (24) locations, twelve points on paved surfaces and the remaining on grass surfaces, in York County, (ME). Horizontal and vertical controls (x, y and z) were established for these points using Global Position System (GPS) equipment (TPS Hiper GD integrated antenna/receiver) in conformance with FEMA Standards. The GPS data was processed using the online positioning user services from the National Geodetic Survey (NGS) and the National Oceanic and Atmospheric Administration (NOAA) website. The horizontal coordinates (northing and easting) are referenced to the Universal Transverse Mercator (UTM) Zone 19 and to the North American Datum NAD 83 Coordinate System, Maine State Plane Coordinate, West zone, (SPC 1802 ME-West) (U.S. English units in the NGS date reports). Elevations are referenced to the North American Vertical Datum (NAVD 88) (U.S. English units).

3.2 Comparison of Field Survey to LIDAR

Table 3-1 LIDAR Data Check Analysis presents each of the 24 check points surveyed for comparison to the LIDAR elevations. LIDAR elevation values were derived from the TIN data using GIS tools. For each location (e.g., G1, P1) the table presents the check point number, town, ground surface type, location (Maine state-plane coordinates, NAD 83), surveyed elevation (NAVD 88), the elevation derived from the LiDAR TIN data and the difference between surveyed and LiDAR elevations.

The LIDAR and Survey data are in good agreement with all but one point within the 1.2 foot elevation accuracy specification. The data quality review did not indicate any systematic errors in the LIDAR topography.

- The RMS average difference in elevation for the 24 Surveyed Points as compared to the LiDAR TIN data is 0.54 feet.

This is an excellent result and well within the 1.2-foot accuracy requirement. Based on this analysis, this LiDAR data is acceptable for use in H&H analyses and flood zone mapping.

This independent LiDAR Check Point analysis supports Sanborn's evaluation included in Appendix A.

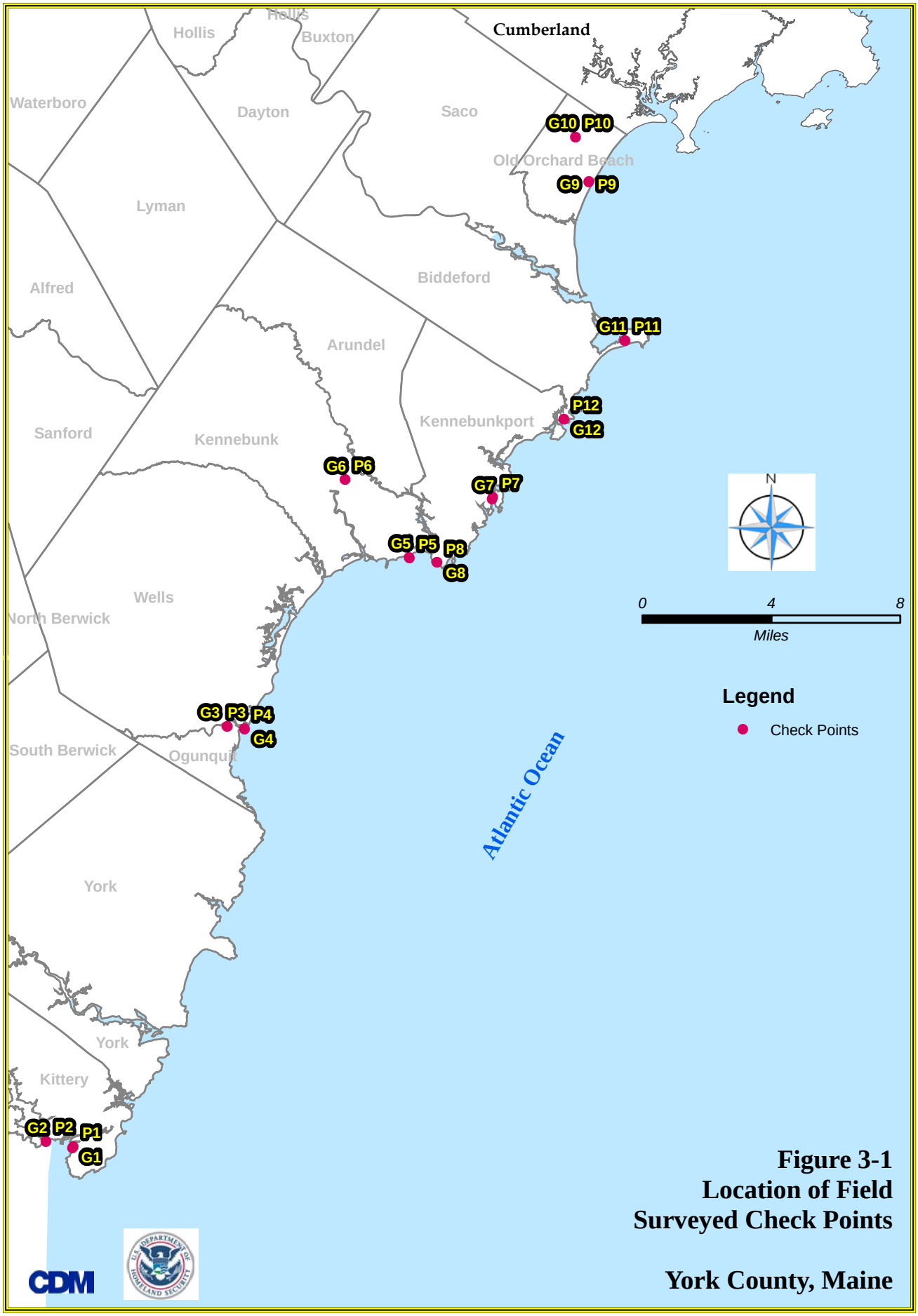

Figure 3-1
Location of Field Surveyed Check Points

York County, Maine

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Table 3-1 LIDAR Data Check Analysis, York County, ME

17-Aug-07
TO 16 York County, Maine -- LIDAR Data Check Analysis
Analysis by R. Miner
Survey Data by Green International Report dated June 15, 2007
LiDAR Data by Sanborn Mapping Company, Hard Drive delivered to CDM on February 20, 2007
Reference ArcGIS Project "York LiDAR Check.mxd"
Results: The RMS average difference in elevation for 24 surveyed points as compared to the LiDAR TIN data is 0.54 ft.
This exceeds FEMA's requirements for use in H&H analyses and flood zone mapping.

York County, Maine

Checkpoint #	Town	Ground Surface	SPC (NAD 83) 1802-MAINE WEST ZONE Coordinate System		Elevation (NAVD 88 - ft)	LiDAR Data	
			Northing (ft)	Easting (ft)		LiDAR TIN ELV(ft)	Difference ELV-TIN (ft)
G1	Kittery	Grass	89913.94	2812245.97	7.52	8.44	-0.92
G2	Kittery	Grass	90911.47	2807922.76	31.22	31.43	-0.21
G3	Ogunquit	Grass	159019.839	2837588.072	57.07	56.62	0.45
G4	Ogunquit	Grass	158503.371	2840531.737	10.07	10.17	-0.10
G5	Kennebunk	Grass	186710.82	2867502.64	10.98	12.01	-1.03
G6	Kennebunk	Grass	199404.86	2857025.46	43.33	43.45	-0.12
G7	Kennebunk Port	Grass	196246.34	2881150.31	7.62	7.83	-0.21
G8	Kennebunk Port	Grass	185904.55	2872055.3	19.11	19.34	-0.23
G9	Old Orchard Beach	Grass	248236.672	2897002.241	14.37	15.16	-0.79
G10	Old Orchard Beach	Grass	255562.848	2894821.822	87.30	87.60	-0.30
G11	Biddeford	Grass	222285.776	2902870.818	7.63	8.27	-0.64
G12	Biddeford	Grass	209314.921	2892928.632	13.66	13.68	-0.02
P1	Kittery	Pavement	90156.97	2812434.01	16.59	16.89	-0.30
P2	Kittery	Pavement	91080.31	2807929.07	34.94	35.00	-0.06
P3	Ogunquit	Pavement	159015.555	2837726.798	55.02	55.13	-0.11
P4	Ogunquit	Pavement	158613.994	2840482.387	7.85	7.73	0.12
P5	Kennebunk	Pavement	186579.23	2867570.52	11.07	11.10	-0.03
P6	Kennebunk	Pavement	199462.78	2856978.19	45.19	45.28	-0.09
P7	Kennebunk Port	Pavement	196553.02	2881267.36	8.88	7.23	1.65
P8	Kennebunk Port	Pavement	185827.75	2872112.66	16.98	17.03	-0.05
P9	Old Orchard Beach	Pavement	248280.087	2897012.5	15.34	15.49	-0.15
P10	Old Orchard Beach	Pavement	255564.561	2894804.61	86.21	86.97	-0.76
P11	Biddeford	Pavement	222252.236	2902990.61	8.08	8.27	-0.19
P12	Biddeford	Pavement	209344.719	2892903.768	13.19	13.45	-0.26
						RMS:	**0.54**
						No. of Points:	**24**

Section 4
LIDAR Data Deliverables

4.1 Introduction

This section describes the LIDAR deliverables for this task order. Deliverables include this report, Sanborn's LiDAR Campaign Final Report for York County, Maine dated November 2006 (Appendix A), LiDAR Metadata (Appendix B), the LiDAR Checkpoints Survey and Data Report containing field notes and sketches (Appendix C) and digital data files.

The digital data files are large (more than 250 GB) and it is not practical to deliver the data on DVD media with this report as it would require more than 30 discs. The data have been delivered for upload to the FEMA data portal via portable hard drive and is available from the CITRIX server submittal drive "drive K":

- https://tools.hazards.fema.gov/Citrix/MetaFrame/default/default.aspx
- K:\R01\MAINE_23\YORK_23031\YORK_031C\xx-xx-xxxxx\Terrain

Figures 4-1 and 4-2 present filled out FEMA Table A-3, Digital Topographic Data Requirements Checklist, and FEMA Table A-4, LiDAR System Mission Data Collection Checklist. Both are from Appendix A of FEMA's Guidelines and Specifications for Flood Mapping Partners and provide a summary of the data.

Figure 4-3 shows the LiDAR data tile layout.

4.2 Deliverable Listing

The following items comprise the project deliverables:

- This report

- One disc containing project data
  - This report (PDF file)
  - LIDAR Metadata (HTML format)
  - LIDAR Tile Layout Figure (PDF file)
  - LIDAR Tile Layout (ESRI shapefile format)

Sent to FEMA Data Repository:
- LIDAR Data Files:
  - This report (PDF file)
  - LIDAR Metadata (HTML format)
  - LIDAR Tile Layout (ESRI shapefile format)
  - BareEarthGrids (elevation data in ASCI format, x, y, z coordinates)
  - First Return (elevation data in ASCI format, x, y, z coordinates)
  - Last Return (elevation data in ASCI format, x, y, z coordinates)
  - TIN (elevation data in TIN format)

Figure 4-1
FEMA Table A-3

Table A-3. Digital Topographic Data Requirements Checklist

Surface Description (choose one)
- [x] Bare-earth surface (FEMA default)
- [ ] Top surface (e.g., treetops/rooftops)
- [ ] Bathymetric surface

Reflective surface (if using LIDAR)
- [x] First [x] Last (FEMA default) [ ] All
- [ ] LIDAR intensity returns
- [ ] Other simultaneous imagery

Vertical Accuracy (choose one)
- [ ] 1' contour equiv. ($Accuracy_z$ = 0.6 ft.)
- [x] 2' contour equiv. ($Accuracy_z$ = 1.2 ft.)
- [ ] 4' contour equiv. ($Accuracy_z$ = 2.4 ft.)
- [ ] 5' contour equiv. ($Accuracy_z$ = 3.0 ft.)
- [ ] Other: $Accuracy_z$ = ___ ft.

Vertical accuracy at the 95% confidence level ($Accuracy_z$) = $RMSE_z$ x 1.9600 with normal distribution

Horizontal Accuracy (choose one)
- [ ] 1" = 500' equiv. ($Accuracy_r$ = 11' or 3.35 m)
- [ ] 1" = 1000' equiv. ($Accuracy_r$ = 22' or 6.7 m)
- [x] $RMSE_r$ = 1 m
- [ ] $RMSE_r$ = _____

Horizontal accuracy at the 95% confidence level ($Accuracy_r$) = $RMSE_r$ x 1.7308

Data Model (choose one or more)
- [ ] Contours
- [ ] Cross sections
- [x] Mass points
- [ ] Breaklines
- [x] TIN (average point spacing = ___meters) *
- [x] DEM (post spacing = 6-foot)

* FEMA's standard DEM post spacing is 5-meters when mass points are supplemented with breaklines for hydraulic modeling. The TIN point spacing is typically smaller than the DEM post spacing to allow a denser network of irregularly-spaced points for interpolation of the uniformly-spaced DEM.

Horizontal Datum (choose one)
- [ ] NAD 27
- [x] NAD 83 (default)

Vertical Datum (choose one)
- [ ] NGVD 29
- [x] NAVD 88 (default)

Coordinate System (choose one)
- [ ] UTM
- [x] State Plane
- [ ] Geographic

Units Note: For feet and meters, vertical (V) units may differ from horizontal (H) units
- [x] Feet to ___ decimal places [ ] V [ ] H
- [ ] Meters to ___ decimal places [ ] V [ ] H
- [ ] Decimal degrees to ___ decimal places
- [ ] DDDMMSS to ___ decimal places

Feet are assumed to be U.S. Survey Feet unless specified to the contrary: US Survey foot, ME State Plane

Data Format (choose one or more)

Digital contour lines and breaklines
- [ ] .DGN
- [ ] .DO (DLG Optional)
- [ ] .DWG
- [ ] .DXF
- [ ] .E00
- [ ] .MIF/.MID
- [ ] .SHP
- [ ] SDTS
- [ ] TAB
- [ ] Other _____

Mass points and TINs
- [x] ASCII x/y/z
- [ ] ASCII with attribute data
- [ ] BIN
- [ ] TIN Arc/Info Export File
- [x] Other: TIN in ESRI .adf (grid format)

DEMs
- [x] ASCII x/y/z
- [ ] .BIL
- [ ] .BIP
- [ ] .BSQ
- [ ] .DEM (USGS standard)
- [ ] ESRI Float Grid
- [ ] ESRI Integer Grid
- [ ] GeoTiff
- [ ] .RLE
- [ ] Other _____

File size or Tile size (choose one)
- [ ] File size ____ MB or 1 GB (max)
- [ ] Tile size _____ x _____ (specify feet or meters)
- [x] Other tile size: 10,000-ft by 10,000-ft grid
- [ ] Buffer size: _____

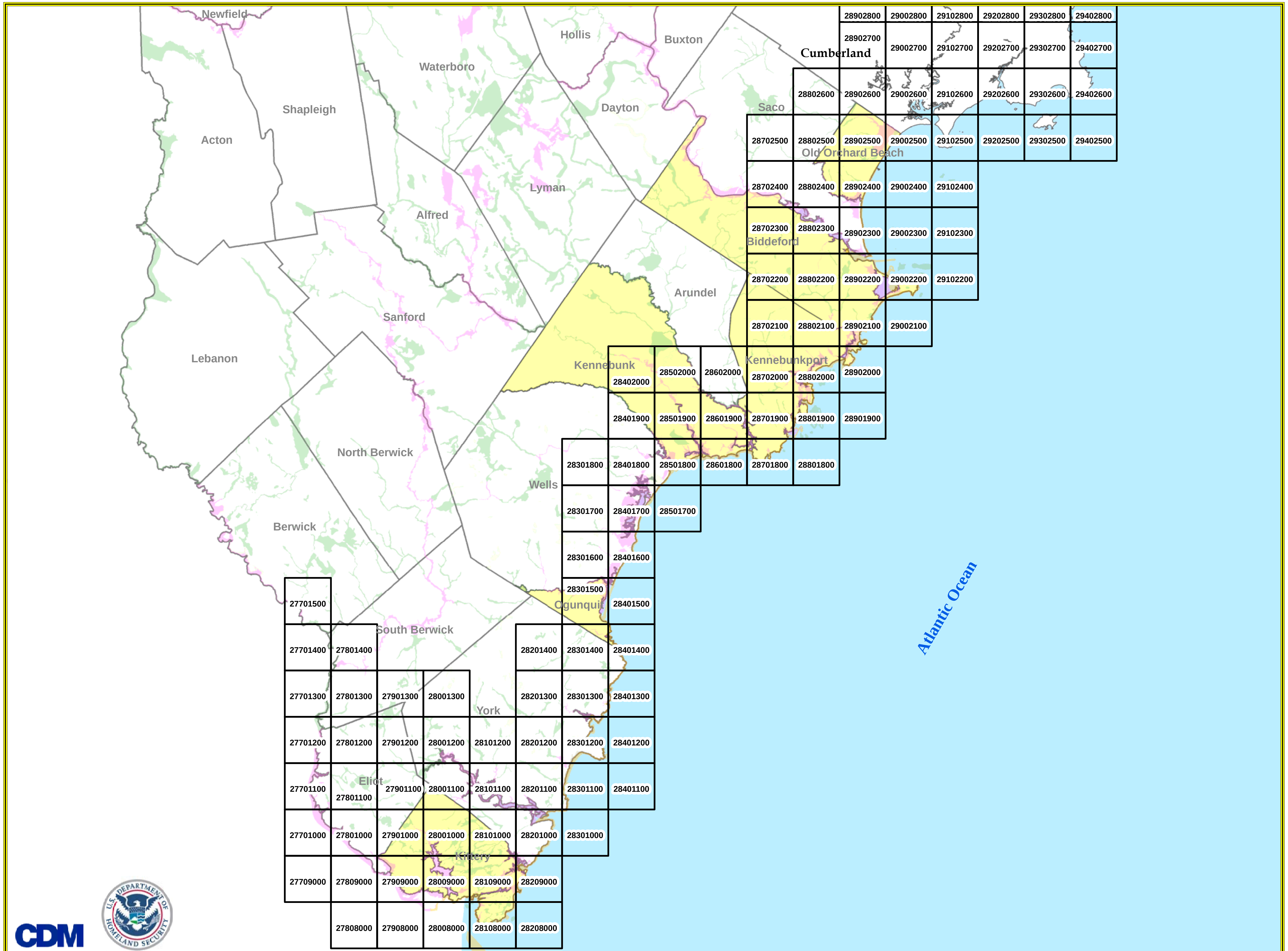
Other Quality Factors (optional, explain on separate page)
- [ ] Cleanness from artifacts
- [ ] Limits on size/location of void areas where there are no elevation data shown
- [ ] How elevations are to be shown for void areas
- [ ] Hydro-enforcement
- [ ] Other requirements

Bridges/culverts removed? [ ] Yes [ ] No

Figure 4-2
FEMA Table A-4

Table A-4. LIDAR System Mission Data Collection Checklist	
Notes	**A. Data collection (each flight)**
LIDAR Parameters Leica ALS-50 System 50kHz pulse rate 36 Hertz scan frequency 16 degree scan width half angle Flying height 1,200 meters AGL Flying speed 120 knots Vertical Accuracy 18.5 cm Bare Earth Flight Date: 11/7/06 through 11/26/06 LiDAR acquisition within 3-hours of low tide	1. Record flight date and time.* 2. Record flight altitude(s).* 3. Record LIDAR system scan angle, scan rates, and pulse rates.* 4. Record time LIDAR system receiver is activated/ deactivated.* 5. Record all Position Dilution of Precision values.* 6. Record height of instrument (before and after flight). 7. Record on-board antenna offsets. 8. Note any site obstructions at GPS base station(s). 9. Record airborne and ground-site GPS receiver types and serial numbers. 10. Record ground site GPS station monument names and stability.* 11. Record flight staff.
Notes	**B. Data handling (each flight)**
LiDAR filtering was accomplished using TerraSolid, TerraScan LiDAR processing and modeling software	1. Record that all files have been labeled correctly and cross-indexed. 2. Record analyst name(s) responsible for processing and product generation. 3. List any auxiliary information used during processing of LIDAR to generate products delivered. 4. List major data processing components used.

* Denotes Minimum Required Information



N

0 4 8
Miles

Legend

LiDAR Tile Layout

FEMA Q3 Data

Zone

- A
- AE
- AO
- UNDES
- VE
- X500

Figure 4-3
LiDAR Tile Layout

York County, Maine

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Appendix A

LiDAR Campaign Final Report

Camp Dresser McKee Inc.
LiDAR Campaign
Final Report
For
Cumberland & York Counties, Maine
November 2006

Prepared by:
Sanborn
1935 Jamboree Dr., Suite 100
Colorado Springs, CO, 80920
Phone: (719) 593-0093
Fax: (719) 528-5093

EXECUTIVE SUMMARY

In the fall of 2006, Sanborn was contracted by Camp Dresser McKee, Inc to execute a LiDAR (Light Detection and Ranging) survey campaign in the state of Maine. LiDAR data in the form of 3-dimensional positions of a dense set of masspoints was collected for the 584 sqaure miles of Cumberland and York Counties. This data was used in the development of the bare-earth-classified elevation point data sets.

The Leica ALS-50 LiDAR system was used to collect data for the whole survey campaign. The LiDAR system is calibrated by conducting flight passes over a known ground surface before and after each LiDAR mission. During final data processing, the calibration parameters are inserted into post-processing software.

Six airborne GPS (Global Positioning System) base stations were used in this project. A new point was set at the Portland Airport (501) The other base stations were set up at National Geodetic Survey (NGS) markers. NGS Monuments 901 – PID: OC0229 and 801 – PID: OC0230 are located at the Biddeford Airport. The other existing NGS monuments used in the network are point 701 – PID: AJ2697, located on Bailey Island, point 702 – PID: OC0429, located at Fort Constitution, and point 703 – PID: OC0478 located southeast of York Beach were tied to the other three points to create a GPS survey network. The coordinates of these stations were checked against each other with the three dimensional GPS baseline created at the airborne support set up and determined to be within project specifications.

The acquired LiDAR data was processed to obtain first and last return point data. The last return data was further filtered to yield a LiDAR surface representing the bare earth.

The contents of this report summarize the methods used to establish the base station coordinate check, perform the LiDAR data collection and post-processing as well as the results of these methods.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

This report contains the technical write-up of the Camp Dresser McKee, Inc LiDAR campaign, including system calibration techniques, the establishment of base stations by a differential GPS network survey, and the collection and post-processing of the LiDAR data**.**

1.1 Contact Information

Questions regarding the technical aspects of this report should be addressed to:

Sanborn
1935 Jamboree Drive, Suite 100
Colorado Springs, CO 80920

Attention: --------- Jamie Young (Data Processing Manager)
Telephone: ------ 1–719-593-0093
FAX: ---------- 1–719-528-5093
email: ---------- jyoung@sanborn.com

1.2 Purpose of the LiDAR Acquisition

This LiDAR operation was designed to provide a highly detailed ground surface dataset to be used for the development of topographic and contour mapping as well as hydraulic modeling.

1.3 Project Location

Cumberland and York Counties in Maine, coastal areas

1.4 Project Scope, Specifications and Time Line

In November 2006, acquisition of all new LiDAR data was captured for both Cumberland and York Counties, Maine. The total size of the area is approximately 584 square miles, see Table 1. Acquisition was restricted to +/- 3 hours from low tide. Flight planning needed to be sure to follow this requirement and to schedule flight plan to successfully meet this requirement.

Table 1: Project Specifications and Deliverable Coordinate and Datum Systems

Area (sq. mi)	584	**Product type**	Fema(F)	**Projection**	Maine SPZ
Vertical Accuracy (CM)	Bare Earth 18.5 (F)	**Check Points required**	Yes	**Horizontal Datum Vertical Datum**	NAD 83 NAVD 88
Horizontal accuracy (M)	1meter (F)	**Number Collected**	42	**Units**	US Survey Ft

Table 2: Project Timeline and Actual Finish Dates

Schedule Assumptions:	Days	Start	Actual Finish
LiDAR Collection	6	11/07/2006	11/26/06
Weather factor	3x		
Total days:	18	11/07/2006	11/26/06

Additional Basic Project Information: There are two project areas to acquire. Cumberland County is 369 square miles, see Figure 2, and York County is 215 square miles, see Figure 3. The areas should be blocked for acquisition since the boundary is so convoluted along the coastlines.

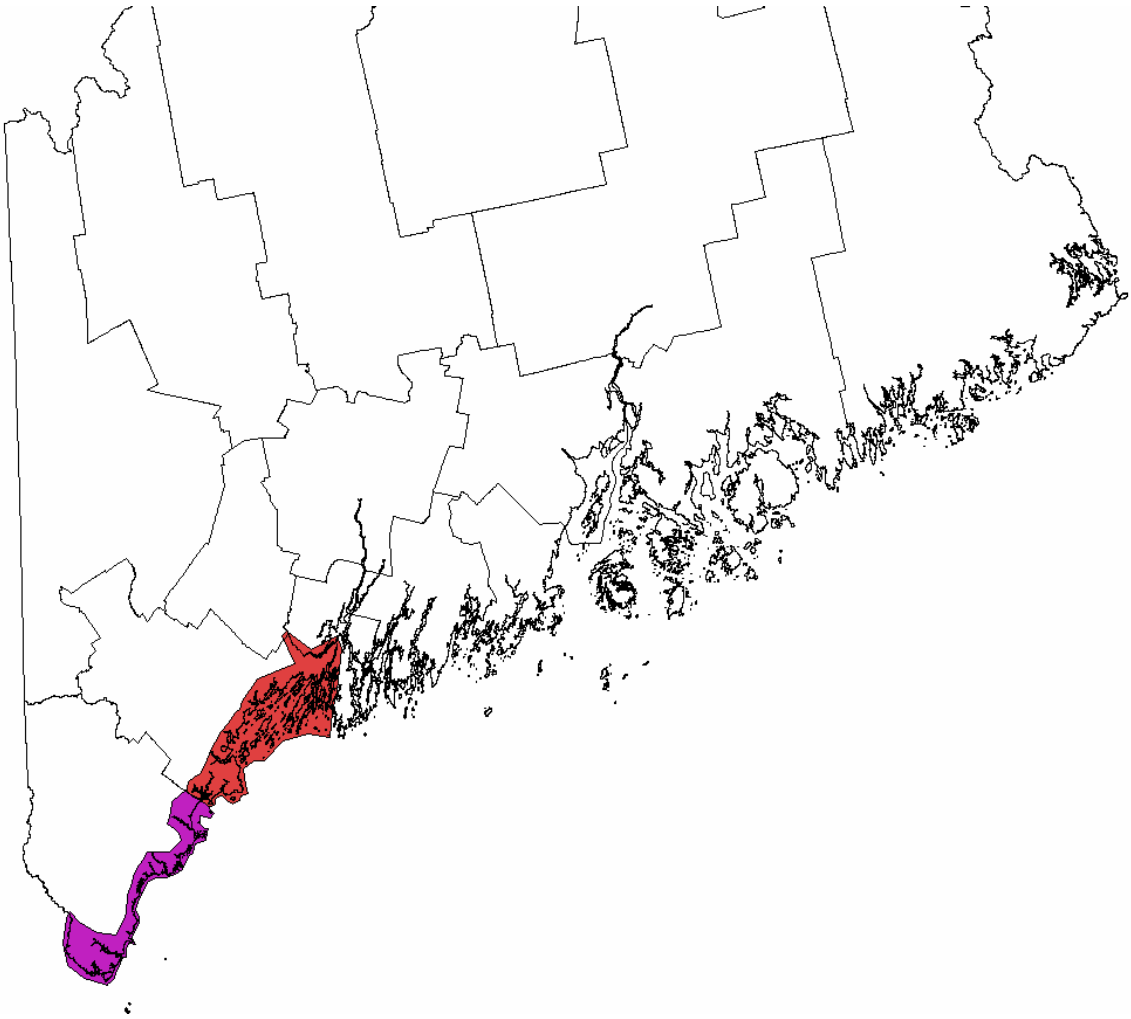

Figure 1: Maine Coastline

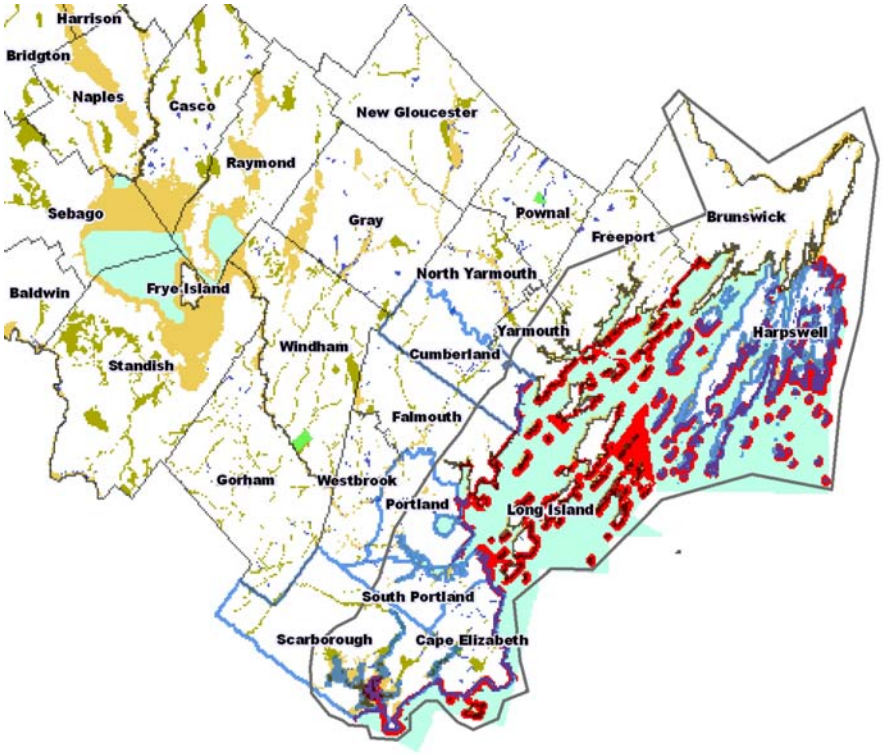

Figure 2: Cumberland County FEMA 1.4M LiDAR (369 square miles)

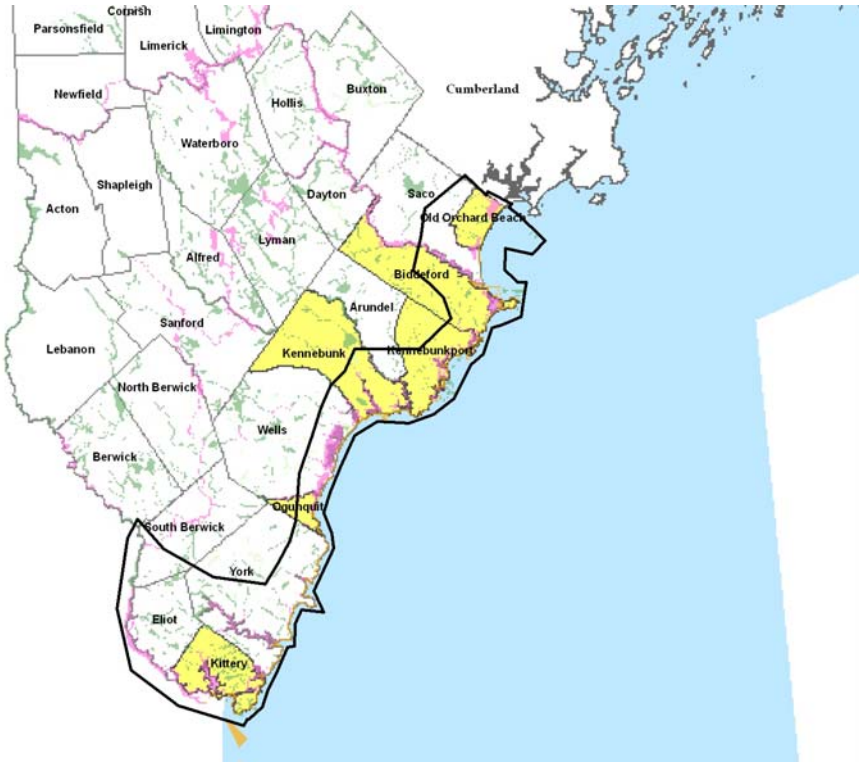

Figure 3: York County FEMA 1.4M LiDAR (215 square miles)

2 LiDAR CALIBRATION

2.1 Introduction

LiDAR calibrations are performed to determine and therefore eliminate systematic biases that occur within the hardware of the Leica ALS-50 system. Once the biases are determined they can be modeled out. The systematic biases are corrected for include scale, roll, and pitch.

The following procedures are intended to prevent operational errors in the field and office work, and are designed to detect inconsistencies. The emphasis is not only on the quality control (QC) aspects, but also on the documentation, i.e., on the quality assurance (QA).

2.2 Calibration Procedures

Sanborn performs two types of calibrations on its LiDAR system. The first is a building calibration, and it is done any time the LiDAR system has been moved from one plane to another. New calibration parameters are computed and compared with previous calibration runs. If there is any change, the new values are updated internally or during the LiDAR post-processing. These values are applied to all data collected with this plane/ALS-50 system configuration.

Once final processing calibration parameters are established from the building data, a precisely-surveyed surface is observed with the LiDAR system to check for stability in the system. This is done several times during each mission. An average of the systematic biases are applied on a per mission basis.

2.3 Building Calibration

Whenever the ALS-50 is moved to a new aircraft, a building calibration is performed. The rooftop of a large, flat, rectangular building is surveyed on the ground using conventional survey methods, and used as the LiDAR calibration target. The aircraft flies several specified passes over the building with the ALS-50 system set first in scan mode, then in profile mode, and finally in both scan and profile modes with the scan angle set to zero degrees.

Figure 4 shows a pass over the center of the building. The purpose of this pass is to identify a systematic bias in the scale of the system.

Figure 5 demonstrates a pass along a distinct edge of the building to verify the roll compensation performed by the Inertial Navigation System, INS.

Additionally, a pass is made in profile mode across the middle of the building to compensate for any bias in pitch.

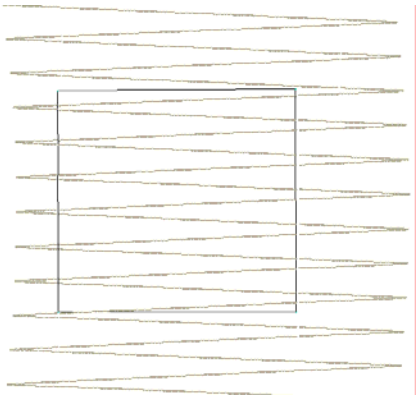

Figure 4: Calibration Pass 1

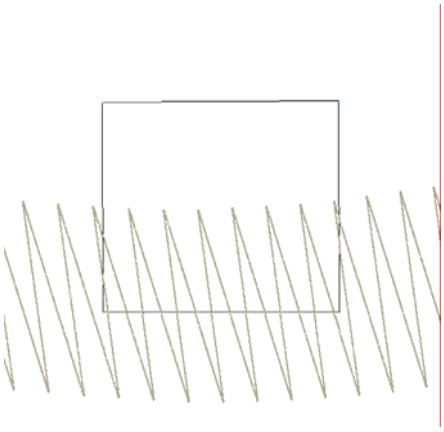

Figure 5: Calibration Pass 2

2.4 Runway Calibration, System Performance Validation

An active asphalt runway was precisely-surveyed at the Biddeford and Portland airports using kinematic GPS survey techniques (accuracy: ±3cm at 1σ, along each coordinate axis) to establish an accurate digital terrain model of the runway surface. The LiDAR system is flown at right angles over the runway several times and residuals are generated from the processed data. Figure 6 shows a typical pass over the runway surface.

Approximately 25,000 LiDAR points are observed with each pass. These points are "draped" over the runway surface's Triangular Irregular Network, TIN, to compute vertical residuals for every data point. The residuals are analyzed with respect to the location along the runway to identify the level of noise and system biases.

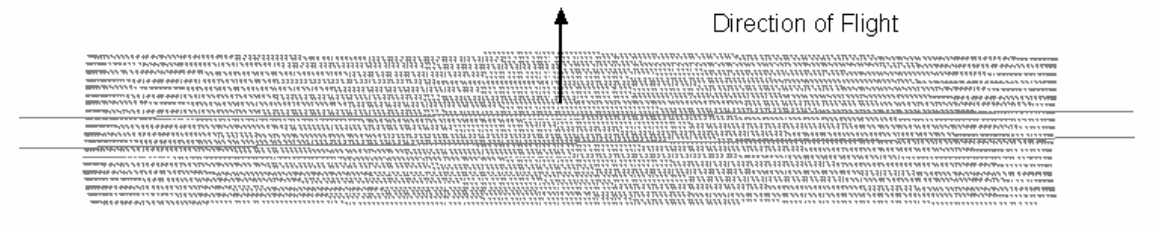

Figure 6: Runway Calibration

3 RUNWAY CALIBRATION, SYSTEM PERFORMANCE VALIDATION

3.1 Calibration Results

The LiDAR data captured over the building is used to determine whether there have been any changes to the alignment of the Inertial Measurement Unit, IMU, with respect to the laser system. The parameters are designed to eliminate systematic biases within certain system parameters.

The runway over-flights are intended to be a quality check on the calibration and to identify any system irregularities and the overall noise. IMU misalignments and internal system calibration parameters are verified by comparing the collected LiDAR points with the runway surface.

Figure 7 shows the typical results of a runway over-flight analysis. The X-axis represents the position along the runway. The overall statistics from this analysis provides evidence of the overall random noise in the data (typically, 7cm standard deviation – an unbiased estimator, and 8cm RMS which includes any biases) and indicates that the system is performing within specifications. As described in later sections of this report, this analysis will identify any peculiarities within the data along with mirror-angle scale errors (identified as a “smile” or “frown” in the data band) or roll biases.

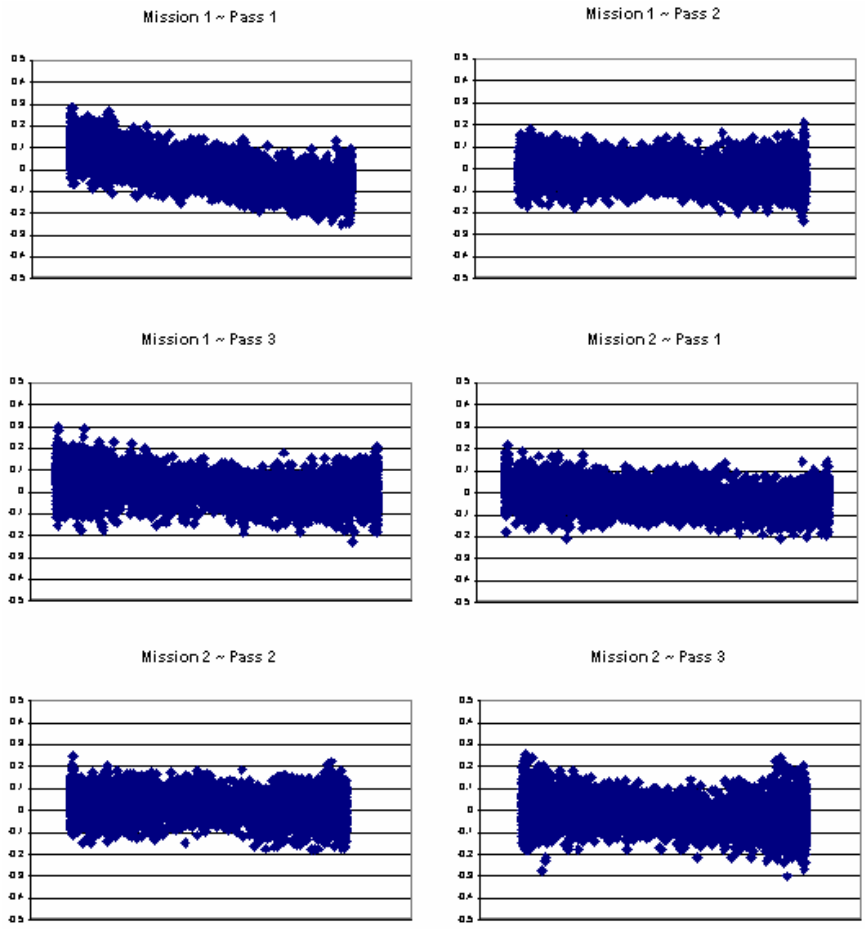

Figure 7: Runway Calibration Results

3.2 Daily Runway Performance/Data Validation Tests

Performance flights over the runway test field were performed before and after each mission. Table 3 shows the standard deviation and RMS values of the residuals between the test flights and the known surface of the test ranges for each pass. The maximum RMS value is 0.0766 meters and the maximum standard deviation is 0.0763 meters. The average RMS among all test flights is 0.0522 meters.

Rigorous quality assurance procedures were followed to ensure that the appropriate data accuracy was achieved

Table 3: Runway Validation Results (meters)

Mission	Passes	Standard Deviation	RMS
311a	4	0.0527	0.0527
314a	4	0.0593	0.0592
314b	4	0.0501	0.0501
315a	4	0.0533	0.0535
322a	4	0.0437	0.0437
322b	4	0.0532	0.0532
324b	4	0.0417	0.0419
325a	4	0.0763	0.0766
326a	4	0.0466	0.0466
328a	4	0.0434	0.0445

4 LiDAR FLIGHT AND SYSTEM REPORT

4.1 Introduction

This section addresses LiDAR system, flight reporting and data acquisition methodology used during the collection of the Cumberland and York Counties campaign. Although Sanborn conducts all LiDAR with the same rigorous and strict procedures and processes, all LiDAR collections are unique.

4.2 Field Work Procedures

A minimum of two GPS base stations were set up, with one receiver located at the airport, and the secondary GPS receiver placed at a survey control point within the project area or within the required baseline specifications of the project.

Pre-flight checks such as cleaning the sensor head glass are performed. A four minute INS initialization is conducted on the ground, with the engines running, prior to flight, to establish fine-alignment of the INS. GPS ambiguities are resolved by flying within ten kilometers of the base stations.

The flight missions were typically four or five hours in duration including runway calibration flights flown at the beginning and the end of each mission. During the data collection, the operator recorded information on log sheets which includes weather conditions, LiDAR operation parameters, and flight line statistics. Near the end of the mission GPS ambiguities are again resolved by flying within ten kilometers of the base stations, to aid in post-processing.

Table 4 shows the planned LiDAR acquisition parameters with a flying height of 1,200 meters above ground level (AGL) on a mission to mission basis.

Table 4: LiDAR Acquisition Parameters

Average Altitude	1,200 Meters AGL
Airspeed	~120 Knots
Scan Frequency	36 Hertz
Scan Width Half Angle	18 Degrees
Pulse Rate	50000 Hertz

Preliminary data processing was performed in the field immediately following the missions for quality control of GPS data and to ensure sufficient overlap between flight lines. Any problematic data could then be re-flown immediately as required. Final data processing was completed in the Colorado Springs office

Table 5: Collection Dates, Times, Average Per Flight Collection Parameters and PDOP

Mission	Date	Start Time	End Time	Altitude (m)	Airspeed (Knots)	Scan Angle	Scan Rate	Pulse Rate	PDOP
311a	Nov 07	21:06	23:23	1200	120	18°	36	50000	1.23
314a	Nov 10	11:18	14:39	1200	120	18°	36	50000	1.10
314b	Nov 10	23:17	04:18	1200	120	18°	36	50000	1.09
315a	Nov 11	14:12	17:38	1200	120	18°	36	50000	1.05
322a	Nov 18	17:51	18:44	1200	120	18°	36	50000	1.20
322b	Nov 18	21:49	23:48	1200	120	18°	36	50000	1.50
324b	Nov 20	22:09	23:09	1200	120	18°	36	50000	1.60
325a	Nov 21	19:21	00:35	1200	120	18°	36	50000	1.50
326a	Nov 22	21:58	02:07	1200	120	18°	36	50000	1.70
328a	Nov 24	20:25	01:01	1200	120	18°	36	50000	1.43

4.3 Final LiDAR Processing

Final post-processing of LiDAR data involves several steps. The airborne GPS data was post-processed using Waypoint's GravNAV™ software (version 7.5). A fixed-bias carrier phase solution was computed in both the forward and reverse chronological directions. The data was processed for both base stations and combined. In the event that the solution worsened as a result of the combination of both solutions the best of both solutions was used to yield more accurate data. LiDAR acquisition was limited to periods when the PDOP was less than 3.2.

The GPS trajectory was combined with the raw IMU data and post-processed using Applanix Inc.'s POSPROC (version 4.3) Kalman Filtering software. This results in a two-fold improvement in the attitude accuracies over the real-time INS data. The best estimated trajectory (BET) and refined attitude data are then re-introduced into the LEICA ALS post processor to compute the laser point-positions. The trajectory is then combined with the attitude data and laser range measurements to produce the 3-dimensional coordinates of the mass points.

All return values are produced within ALS Post processing software. The multi-return information minus the last return provides a useful depiction of the "canopy" within the project area. The last return is further processed to obtain the "Bare Earth Dataset" as a deliverable. All LiDAR data is processed using the binary LAS format 1.1 file format.

LiDAR filtering was accomplished using TerraSolid, TerraScan LiDAR processing and modeling software. The filtering process reclassifies all the data into classes with in the LAS formatted file based scheme set using the LAS format 1.1 specifications or by the client. Once the data is classified, the entire data set is reviewed and manually edited for anomalies that are outside the required guidelines of the product specification or contract guidelines, whichever apply. Table 6 indicates the required product specifications.

The coordinate and datum transformations are then applied to the data set to reflect the required deliverable projection, coordinate and datum systems as provided in the contract.

The client required deliverables are then generated. At this time, a final QC process is undertaken to validate all deliverables for the project. Prior to release of data for delivery, Sanborn's Quality control/ quality assurance department reviews the data and then releases it for delivery.

Table 6: Processing Accuracies and Requirements

Accuracy of LiDAR Data (H)	1 meter RMSE
Accuracy of LiDAR data in bare areas	18.5 cm RMSE
Accuracy of LiDAR data in bare areas	37 cm RMSE
Percent of artifacts removed (terrain and vegetation dependent)	90%
Percent of all outliers removed	95%
Percent of all vegetation removed	95%
Percent of all buildings removed	98%

5 GEODETIC BASE NETWORK

5.1 Network Scope

During the LiDAR campaign, the Sanborn field crew conducted a GPS field survey to establish final coordinates of the ground base stations for final processing of the base-remote GPS solutions. NGS points numbered 901 located at the Biddeford Airport, 801, 701, 702, 703, and a 12 inch spike set at the Portland Airport were used for the LiDAR missions. See Table 7 for station names, orders and constraints.

5.2 Data Processing and Network Adjustment

The static baselines created between points 901, 801, 701, 702, 703, and 501 were processed using Trimble Geomatics Office™ (Ver. 1.62) software. Fixed bias solution was obtained for the baseline. The broadcast ephemeris was used, since the accuracy and extent of the network does not warrant the use of the precise ephemeris. Seqentially points 901, 801, 701, 702 were held fixed and the coordinates of points 703 and 501 were checked. The results were satisfactory; therefore, fulfilling project specifications for first order control network.

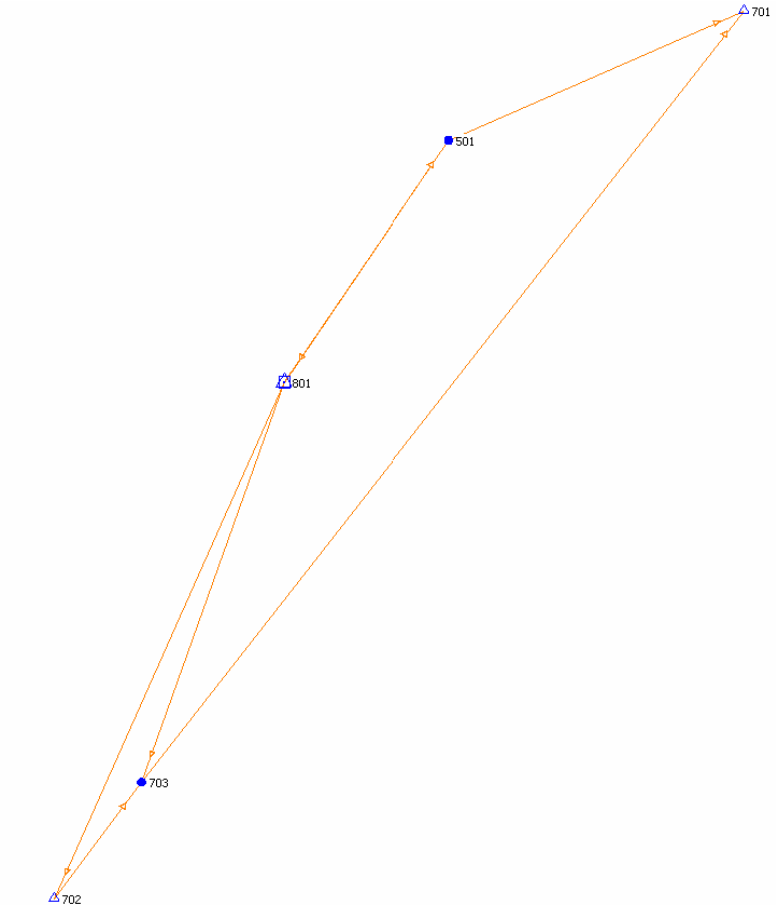

Figure 8: Survey Network Diagram

Table 7: NGS Control Constraints
Horizontal

Code	NGS Station Name	PID	Order	Constrain
901	S 161	OC0229	B	Constrained
701	17 M	AJ2697	A	Constrained
702	Constitution 147 RM1	OC0429	A	Constrained
703	J 99	OC0478	A	Checkpoint

Vertical

Code	NGS Station Name	PID	Order	Constrain
901	S 161	OC0229	1 – I	Constrained
801	T 161	OC0230	1 – I	Constrained

Table 8: Survey Loop Closure Summary

Loop	ΔHoriz (cm)	Δ Vert (cm)	Dist. (m)	ppm
901-703-701-501-801-901	1.0	4.3	171137	0.257
901-703-701-501-901	1.1	3.8	171112	0.230
901-703-702-901	0.2	0.1	96087	0.026
901-702-703-701-501-801-901	0.8	4.4	195338	0.227
901-702-703-701-501-901	0.9	3.9	195312	0.203
901-801-501-901	0.1	0.5	49678	0.104

5.3 Final LiDAR Processing

The LiDAR data was evaluated using a collection of 42 GPS surveyed checkpoints. 16 points were collected in each bare earth, low grass, and urban vegetation classes. The LiDAR data was compared to each of these classes and Table 9 indicates the results for each point and the overall results as it compares to the LiDAR data set. Points indicating removed are points outside the statistical variance in the data. Points indicating outside indicate points taken in areas where LiDAR data is not present or the TIN used to generate the analysis could not compute a value as a result of data void as a result of the filtering process. Z and statistical data are represented in meters. The standard deviation is 0.092 and the root mean squared is 0.097, yielding much better result than was required for the project.

Table 9: LiDAR Accuracy Assessment Based on the Checkpoint Survey

Number	Easting	Northing	Known Z	Laser Z	Dz	Intensity
2	871674.505	4827671.402	-16.150	-16.080	+0.070	25.3
3	872358.517	4823884.737	-23.824	-23.750	+0.074	13.9
4	871769.618	4819268.125	-12.341	-12.210	+0.131	14.1
5	870253.565	4815977.257	-18.319	-18.290	+0.029	24.8
6	868815.445	4812175.266	-13.875	-13.780	+0.095	5.6
9	858048.097	4799933.577	-23.884	-24.050	-0.166	20.4
10	856872.448	4789604.679	-23.326	-23.280	+0.046	10.8
11	851992.303	4786456.129	-15.290	-15.330	-0.040	10.1
12	846875.577	4789599.885	-17.982	-17.940	+0.042	16.1
15	910943.827	4871398.507	-15.750	-15.630	+0.120	15.3
16	879015.758	4843636.859	-14.829	-14.750	+0.079	17.7
17	889149.114	4859467.440	-11.106	-11.120	-0.014	17.3
18	896584.321	4866710.722	-2.472	-2.420	+0.052	17.7
20	905251.900	4874776.963	-13.756	-13.860	-0.104	6.3
21	913144.438	4878125.862	-10.291	-10.310	-0.019	7.8
22	882743.113	4851783.783	-9.750	-9.690	+0.060	19.7
23	874724.205	4832958.469	3.013	3.290	+0.277	16.7
24	885989.558	4837845.940	-17.530	-17.500	+0.030	17.1
25	880525.874	4844529.241	-18.049	-18.120	-0.071	5.0
26	907648.611	4862836.359	-20.978	-20.990	-0.012	4.7
27	901429.339	4857523.198	7.925	8.010	+0.085	18.2
1	866159.274	4822361.087	23.490	outside	*	*
7	866159.274	4822361.087	23.490	outside	*	*
8	858399.512	4815431.474	15.799	outside	*	*
13	855786.523	4803286.046	16.784	outside	*	*
14	855033.633	4808569.524	20.315	outside	*	*
19	898358.549	4876580.562	36.757	outside	*	*

Average dz +0.036
Minimum dz -0.166
Maximum dz +0.277
Average magnitude 0.077
Root mean square 0.097
Std deviation 0.092

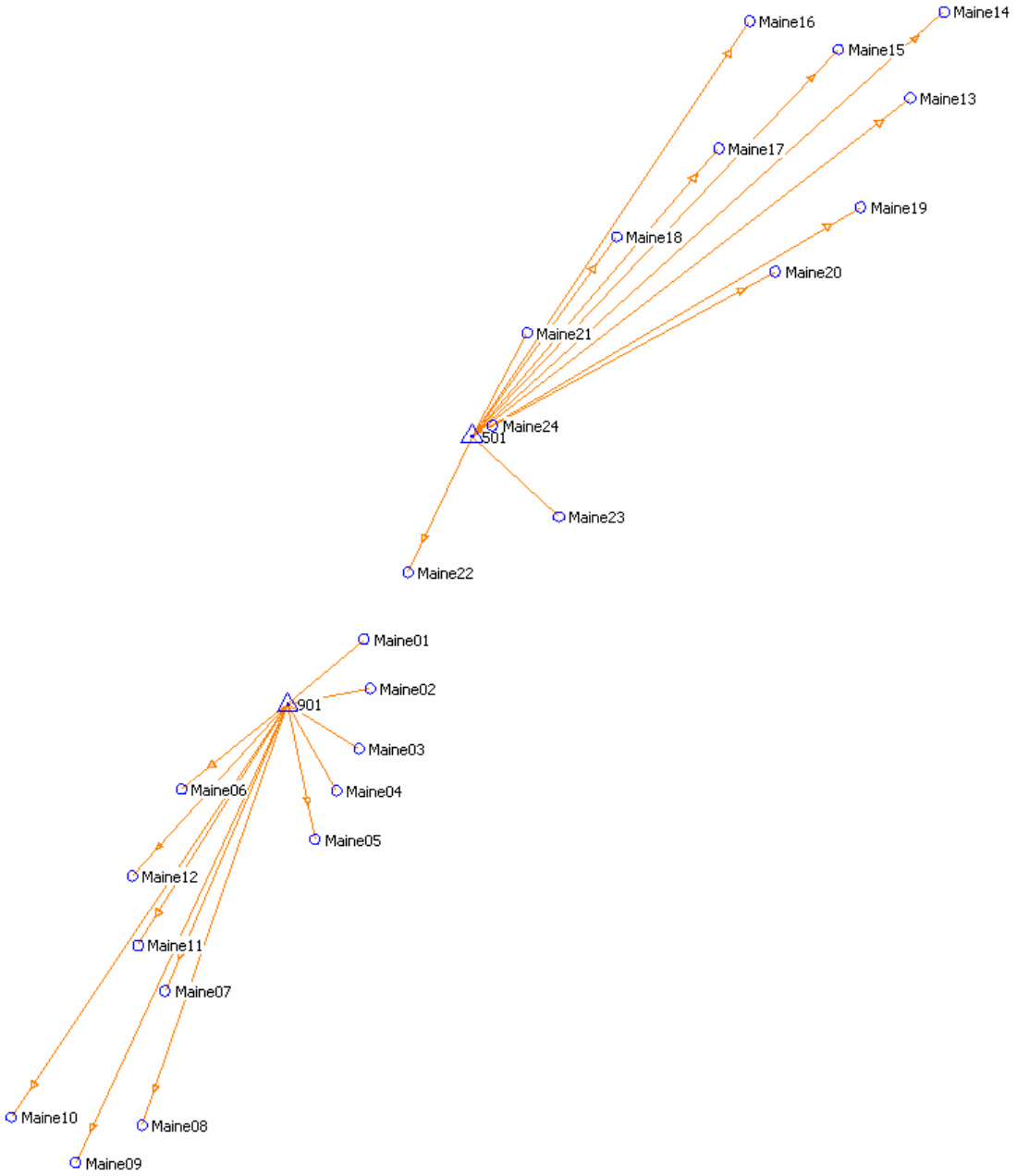

Figure 9: Survey Checkpoint Diagram

6 GROUND CONTROL REPORT

6.1 Introduction

This section addresses Ground Control reporting in the Ellipsoid model used as part of the collection and the Geoid model used to compute orthometric heights.

6.2 Horizontal Datum

The horizontal datum associated with the LiDAR data is NAD83 (1993), as realized by the physical NGS control monuments used to constrain the survey control network.

6.3 Vertical Datum

The vertical datum associated with the LiDAR data is the NAVD88, as realized by the physical NGS benchmarks used to constrain the survey control network.

Appendix B

LiDAR Metadata

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  - <lineage>
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          specifications to fully meet the project requirements - single pass
          density of approximately 1.4 square meters per sample * Swath
          width ~688 meters * Flight altitude 1200 meters * flight line
          spacing ~516 meters with ~125 meters overlap *Scan Frequency-
          36 Hz *Scan Angle- 16 degrees * Aircraft ground speed -- 120
          knots * System Calibration pre and post mission * Two GPS base
          stations within 30 KM. Multiple returns were recorded for each
          laser pulse along with an intensity value for each return. The data
          are calibrated for geographic referencing. Points are further
          processed, using TerraSolid® software, to classify return values.
          The first and last return data is filtered to remove the vegetation
          and above ground manmade features to yield a ground surface.
          The Bare Earth was then used to produce a 6' GRID DEM and a
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          surface accuracy and have been provided and documented in a
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  - <attracc>
      <attraccr>All formatted data are validated using commercial GIS
```

(ArcGIS) software to ensure proper formatting and loading before delivery. This validation procedure ensures that data on delivery media is in correct physical format and is readable.</attraccr>
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Appendix C

LiDAR Checkpoints Survey Data Report

DIGITAL FLOOD INSURANCE
RATE MAP TASK FOR COASTAL ANALYSIS
YORK COUNTY (ME)

FEMA CONTRACT NO. EME-2003-CO-0340 (TASK ORDER #16)
CDM SUBCONTRACT NO. 2809-999-002-CS (TASK ORDER #08)

LIDAR CHECKPOINTS SURVEY
DATA REPORT

for

YORK COUNTY, ME

Prepared for:

Camp Dresser & McKee, Inc.

June 15, 2007

Prepared By

Green International Affiliates, Inc.

GREEN INTERNATIONAL AFFILIATES, INC.
407R MYSTIC AVENUE, UNIT 25, MEDFORD, MA 02155
(781) 391-5757 FAX (781) 391-8889

June 15, 2007

Ronald Miner, P.E.
Camp Dresser & McKee, Inc.
50 Hampshire Street
Cambridge, MA 02139

Subject:

York County (ME)
LiDAR Checkpoints Survey
FEMA Contract No.
EME-2003-CO-340 (Task Order 16)

Dear Ron:

Enclosed please find the LiDAR checkpoint survey report for the above referenced project. The checkpoint survey was performed for twenty four (24) locations, twelve points on paved surfaces and the remaining on grass surfaces, in York County, (ME). Green International Affiliates, Inc. (Green) established x, y and z coordinates for these points using Global Position System (GPS) equipment (TPS Hiper GD integrated antenna/receiver) in conformance with FEMA Standards.

The GPS data was processed using the online positioning user services from the National Geodetic Survey (NGS) and the National Oceanic and Atmospheric Administration (NOAA) website. The horizontal coordinates (northing and easting) are referenced to the Universal Transverse Mercator (UTM) Zone 19 and to the North American Datum NAD 83 Coordinate System, Maine State Plane Coordinate, West zone, (SPC 1802 ME- West) (U.S. English units in the NGS date reports).

Elevations are referenced to the North American Vertical Datum (NAVD 88) (U.S. English units).

Below is a summary table for the checkpoints to be used for LiDAR mapping:

Checkpoint #	Town	Ground Surface	SPC (NAD 83) 1802-MAINE WEST ZONE Coordinate System		Elevation (NAVD 88 - ft)
			Northing (ft)	Easting (ft)	
G1	Kittery	Grass	89913.940	2812245.970	7.52
G2	Kittery	Grass	90911.470	2807922.760	31.22
G3	Ogunquit	Grass	159019.839	2837588.072	57.07
G4	Ogunquit	Grass	158503.371	2840531.737	10.07
G5	Kennebunk	Grass	186710.820	2867502.640	10.98
G6	Kennebunk	Grass	199404.860	2857025.460	43.33
G7	Kennebunk Port	Grass	196246.340	2881150.310	7.62
G8	Kennebunk Port	Grass	185904.550	2872055.300	19.11
G9	Old Orchard Beach	Grass	248236.672	2897002.241	14.37
G10	Old Orchard Beach	Grass	255562.848	2894821.822	87.30
G11	Biddeford	Grass	222285.776	2902870.818	7.63
G12	Biddeford	Grass	209314.921	2892928.632	13.66
P1	Kittery	Pavement	90156.970	2812434.010	16.59
P2	Kittery	Pavement	91080.310	2807929.070	34.94
P3	Ogunquit	Pavement	159015.555	2837726.798	55.02
P4	Ogunquit	Pavement	158613.994	2840482.387	7.85
P5	Kennebunk	Pavement	186579.230	2867570.520	11.07
P6	Kennebunk	Pavement	199462.780	2856978.190	45.19
P7	Kennebunk Port	Pavement	196553.020	2881267.360	8.88
P8	Kennebunk Port	Pavement	185827.750	2872112.660	16.98
P9	Old Orchard Beach	Pavement	248280.087	2897012.500	15.34
P10	Old Orchard Beach	Pavement	255564.561	2894804.610	86.21
P11	Biddeford	Pavement	222252.236	2902990.610	8.08
P12	Biddeford	Pavement	209344.719	2892903.768	13.19

Please refer to the Appendixes for the checkpoints photos, field notes and sketches.

Please feel free to contact me should you have any questions regarding this matter.

Sincerely,

Green International Affiliates, Inc.

Peter A. Richardson

Peter A. Richardson, P.E., CFM
Vice President

SMS/sase

KT G1 – Grass

KT P1 - Pavement

KT P2 – Pavement

KT G2 - Grass

OQ G3 – Grass

OQ-P3 – Pavement

OQ G4 – Grass

OQ P4 – Pavement

KB P5– Pavement

KB G5– Grass

KB P6 – Pavement

KB G6– Grass

KBP P7 – Pavement

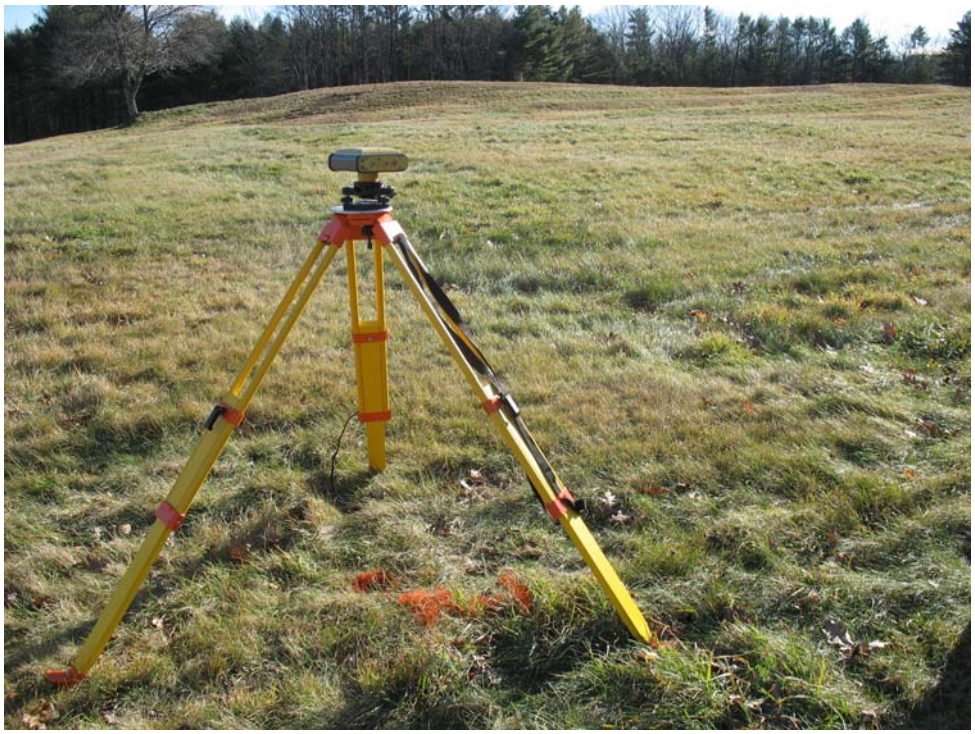
KBP G7– Grass

KBP P8 – Pavement

KBP G8– Grass

OOB P9 – Pavement

OOB G9– Grass



OOB G10– Grass

OOB P10 – Pavement

BF P11 – Pavement

BF G11– Grass

BF P12 – Pavement

BF G12– Grass

Field Notes & Sketches

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2
OBSERVER KS, KR DATE 12/8/06
TEMPERATURE 15°F WEATHER Snow
STATION NAME
LOCATION Captains Way - Kittery, ME

Station/Monument Designation: kt-G1
Receiver Number: R1 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N:

Slant Height: 1.37 (m) 4.49 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.34 (m) 4.39 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

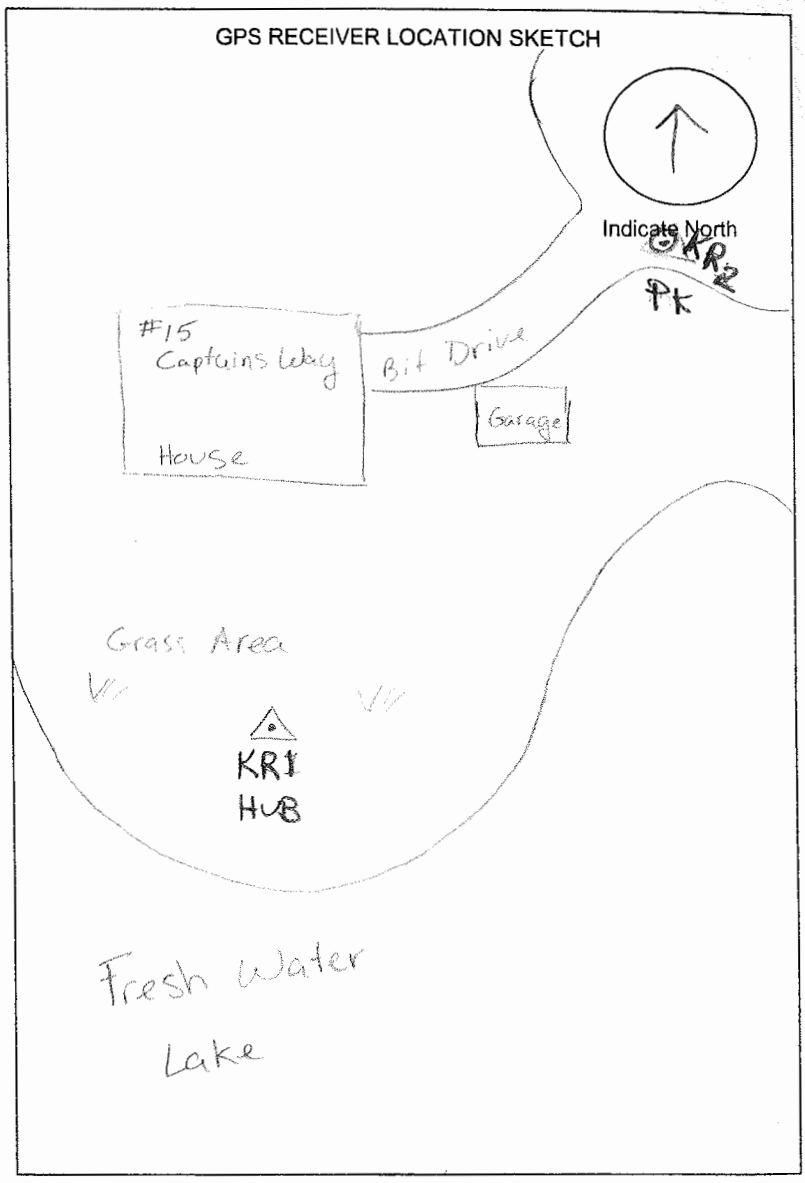
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 11:00 AM
End Time: 1:30 PM

Actual Observation
Start Time: 10:55AM
End Time: 1:30PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 2 OF 2
OBSERVER KS, KR DATE 12/8/06
TEMPERATURE 15°F WEATHER Sunny
STATION NAME
LOCATION FORT McClary state Historic SITE

Station/Monument Designation: KT-PZ G2
Receiver Number: R1 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N:

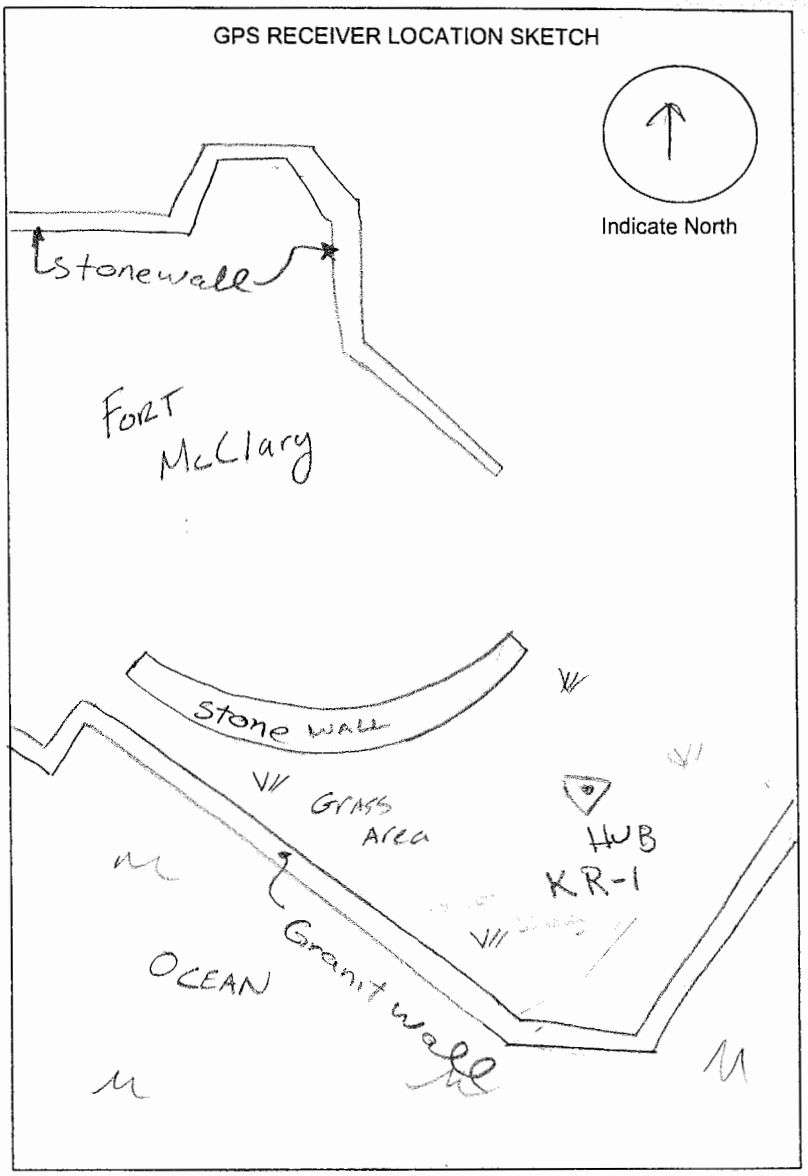
Slant Height: 1.375 (m) 4.52 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.345 (m) 4.42 (ft)

$$ARP\,Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\,Height = \sqrt{Slantheigh\,t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 2:30 PM
End Time: 5:00 PM

Actual Observation
Start Time: 2:28 PM
End Time: 5:05 PM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control G3
SHEET NO. 1 OF 2
OBSERVER KS, KR DATE 12/11/06
TEMPERATURE 40°F WEATHER RAIN/CLOUDY
STATION NAME
LOCATION OGUNQUIT PLAZA & Professional Center

Station/Monument Designation: OQ-G3
Receiver Number: R2 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N:

Slant Height: 1.356 (m) 4.45 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.326 (m) 4.35 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

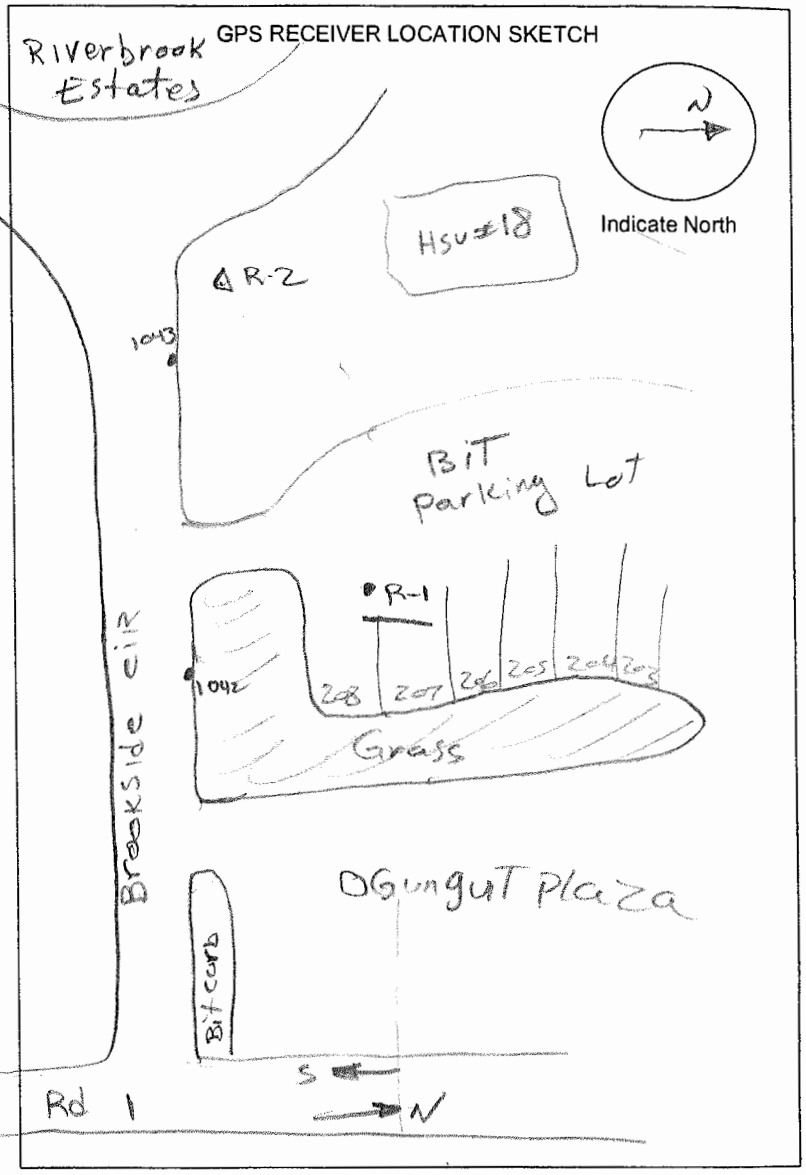
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 10:30 AM
End Time: 2:00 PM

Actual Observation
Start Time: 10:39 AM
End Time: 2:12 PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control

SHEET NO. 2 OF 2

OBSERVER KS, KR DATE 12/11/06

TEMPERATURE 40°F WEATHER CLOUDY

STATION NAME

LOCATION

Station/Monument Designation: OQ-PHG4

Receiver Number: R2 Session: B

Receiver Model: Topcon HIPER GD

Receiver S/N:

Slant Height: 1.356 (m) 4.45 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

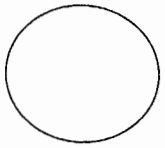
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.326 (m) 4.35 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Indicate North

Session Information

Planned Observation

Start Time: 2:30 PM

End Time: 5:00 PM

Actual Observation Start Time: 2:24 PM

End Time: 4:56 PM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control G5

SHEET NO. 1 OF 1

OBSERVER KB - AD DATE 12/12/06

TEMPERATURE _____ WEATHER _____

STATION NAME MIDDLE BEACH

LOCATION BEACH RD # HOUSE NARAGANSETT condo Kennebunk, ME

Station/Monument Designation: KN - G5

Receiver Number: R1 Session: A

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.275 (m) 4.18 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

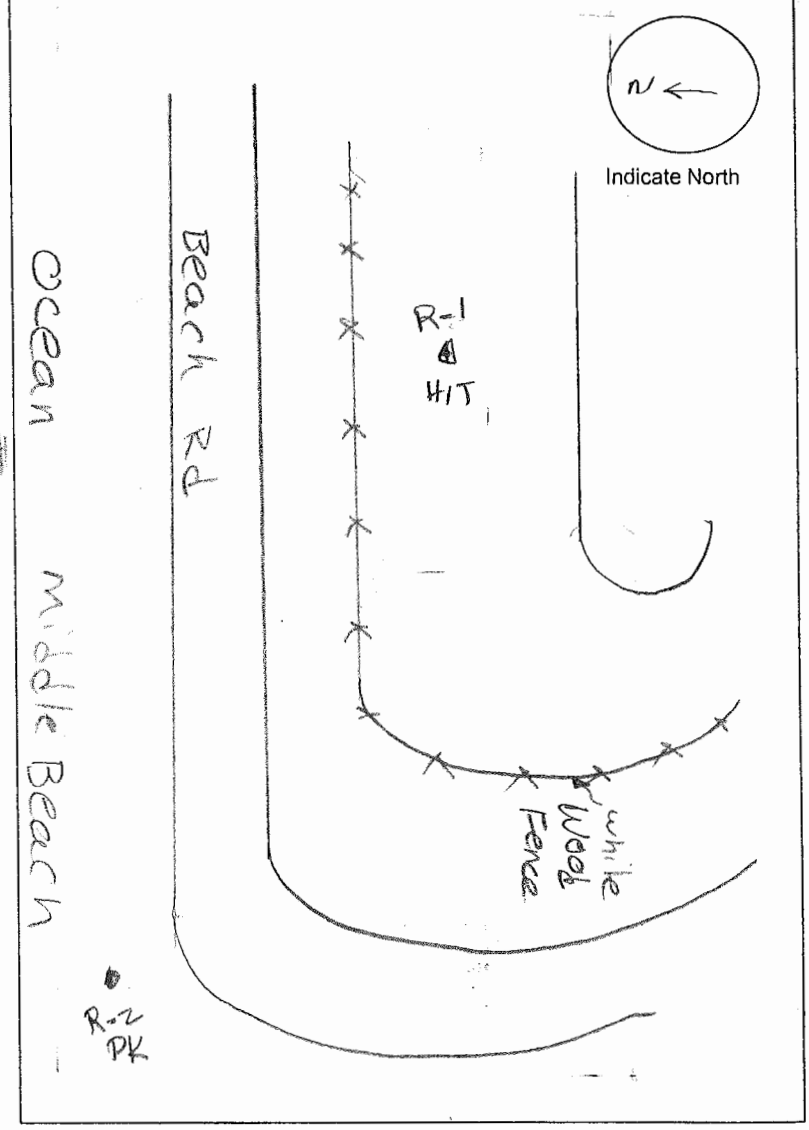
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.245 (m) 4.08 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 10.02
End Time: 12.32

Actual Observation
Start Time: 10.02
End Time: 12.35

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control G-6
SHEET NO. _____ OF _____
OBSERVER K.R DATE 12/12/06
TEMPERATURE 46 WEATHER _____
STATION NAME 18 Sea Rd
LOCATION Kennebunk, ME

Station/Monument Designation: KN-G6

Receiver Number: R2 Session: B

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.276 (m) 4.20 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

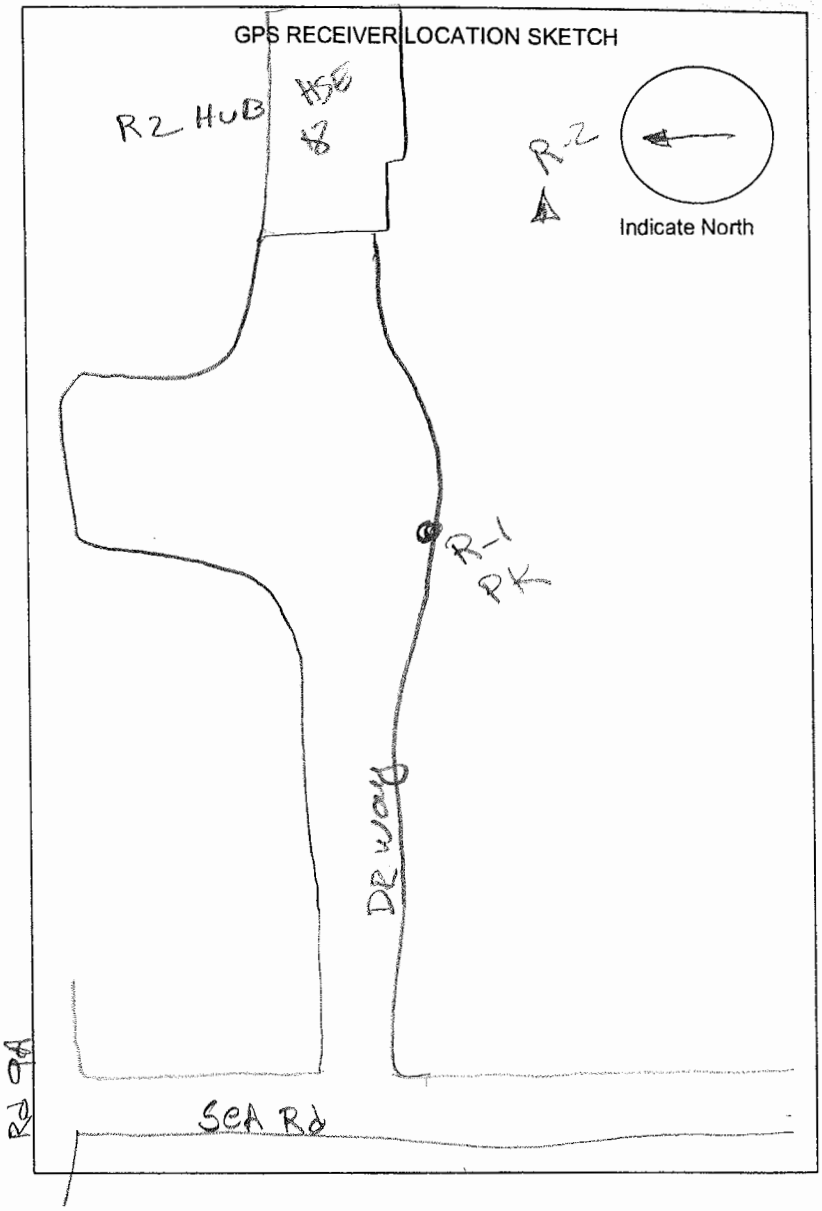
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.246 (m) 4.10 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 1:39
End Time: 4:09

Actual Observation
Start Time: 1:39
End Time: 4:11

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control

SHEET NO. 1 OF 1 G-7

OBSERVER K.R DATE 12/14/06

TEMPERATURE _____ WEATHER _____

STATION NAME _____

LOCATION Kennebunk Port

Station/Monument Designation: KNP-G7

Receiver Number: R2 SPK Session: A

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.46 (m) 4.80 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

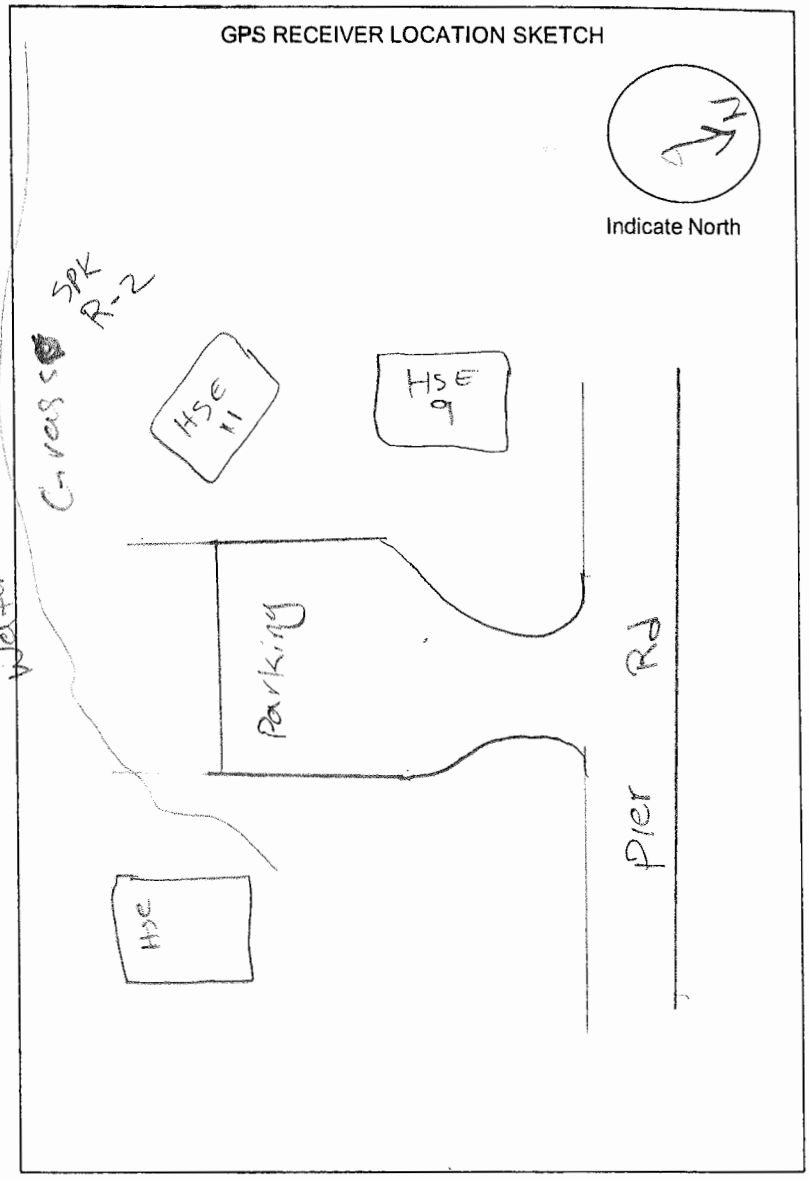
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.43 (m) 4.70 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 9.40
End Time: 12:10

Actual Observation
Start Time: 9.40:
End Time: 12:30

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. _____ OF G-8
OBSERVER K.R DATE 12/14/06
TEMPERATURE _____ WEATHER _____
STATION NAME _____
LOCATION Kennebunkport

Station/Monument Designation: KNP-G8

Receiver Number: R-2 Session: B

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.3005 (m) 4.28 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

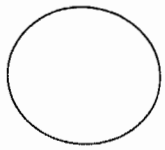
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.2705 (m) 4.16 (ft)

$$ARP\,Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\,Height = \sqrt{Slantheigh\,t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Indicate North

Session Information

Planned Observation
Start Time: 12:48
End Time: 3:18

Actual Observation
Start Time: 12:48
End Time: 3:18

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 2 OF 2 G9
OBSERVER KS, KR DATE 12/19/06
TEMPERATURE _____ WEATHER Sunny
STATION NAME _____
LOCATION Old Orchard Beach

Station/Monument Designation: OOB - G9
Receiver Number: R-1 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N: _____

Slant Height: 1.40 (m) 4.59 (ft)

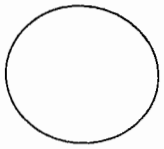
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.37 (m) 4.49 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Indicate North

Session Information

Planned Observation
Start Time: 9:00 AM
End Time: 11:30 AM

Actual Observation
Start Time: 8:55 AM
End Time: 11:27 AM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control

SHEET NO. 2 OF 2 G10

OBSERVER KS, KR DATE 12/19/06

TEMPERATURE _____ WEATHER Sunny

STATION NAME _____

LOCATION Old Orchard Beach

Station/Monument Designation: OOB-G10

Receiver Number: R-1 Session: B

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.25 (m) 4.10 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.22 (m) 4.00 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

Session Information

Planned Observation

Start Time: 12:00 PM

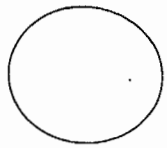
End Time: 2:30 PM

Actual Observation

Start Time: 12:13 PM

End Time: 2:43 PM

GPS RECEIVER LOCATION SKETCH



Indicate North

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 G11
OBSERVER KS, KR DATE 12/18/06
TEMPERATURE ____ WEATHER Cloudy
STATION NAME #109 DEL Restaurant
LOCATION BIDDEFord MAINE

Station/Monument Designation: BF. G11
Receiver Number: R-1 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N: ____

Slant Height: 1.38 (m) 4.54 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.35 (m) 4.44 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

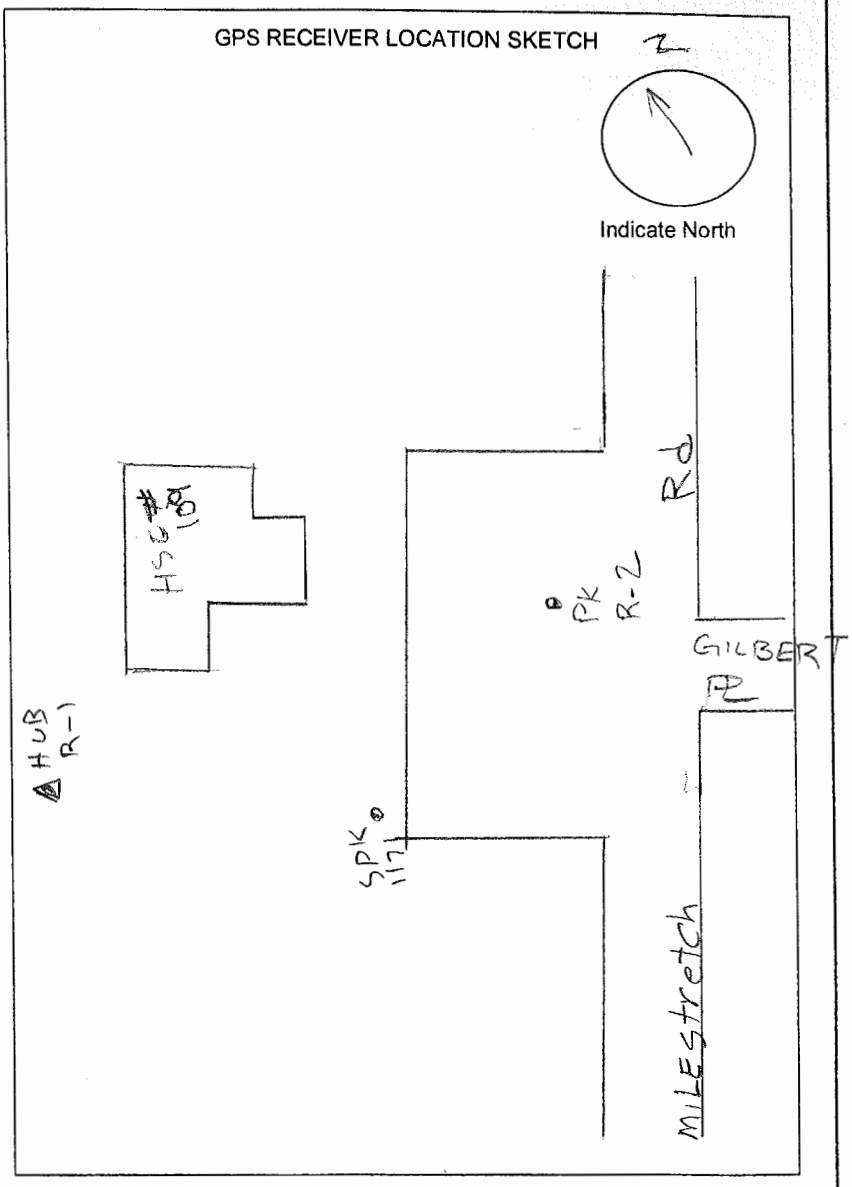
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 10:30 AM
End Time: 1:00 PM

Actual Observation
Start Time: 10:19 AM
End Time: 1:08 PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB **2320.016** FEMA York County Maine - GPS Control

SHEET NO. 2 OF 2 GPS 12

OBSERVER KS, KR DATE 12/18/06

TEMPERATURE _____ WEATHER Cloudy

STATION NAME _____

LOCATION Biddeford, ME

Station/Monument Designation: BFG12

Receiver Number: R-2 Session: B

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.375 (m) 4.52 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

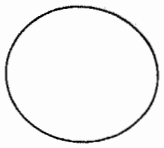
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.345 (m) 4.42 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Indicate North

Session Information

Planned Observation

Start Time: 1:24 PM

End Time: 3:54 PM

Actual Observation

Start Time: 1:24 PM

End Time: 3:56 PM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 2 OF 2
OBSERVER KS, KR DATE 12/8/06
TEMPERATURE 15°F WEATHER Snow
STATION NAME
LOCATION Captains Way - Kittery, ME

Station/Monument Designation: KT-P1
Receiver Number: R2 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N:

Slant Height: 1.45 (m) 4.85 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)
ARP Height: 1.45 (m) 4.75 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

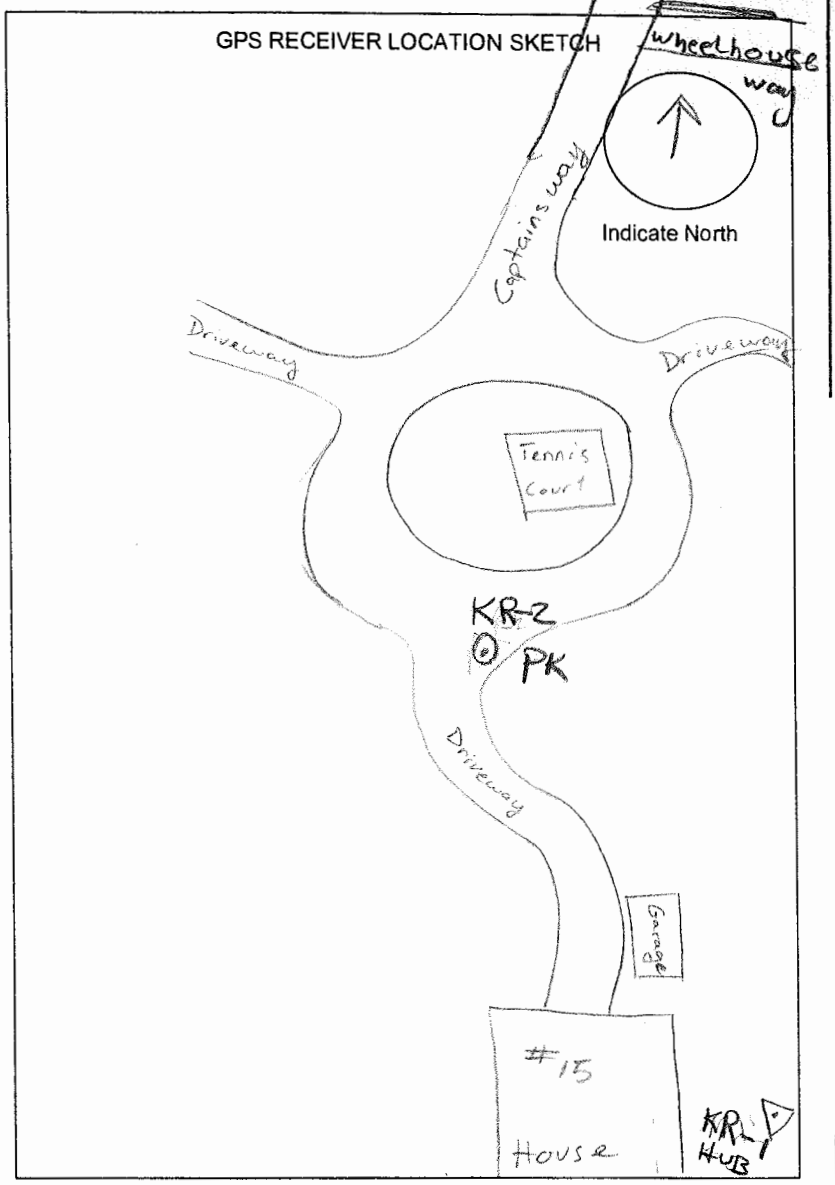
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 11:00AM
End Time: 1:30PM

Actual Observation
Start Time: 11:02 AM
End Time: 1:35PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2
OBSERVER KS, KR DATE 12/5/06
TEMPERATURE 15°F WEATHER Sunny
STATION NAME
LOCATION FORT McClary State HISTORIC SITE

Station/Monument Designation: KT-G2 P2
Receiver Number: R2 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N:

Slant Height: 1.47 (m) 4.83 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)
ARP Height: 1.44 (m) 4.73 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

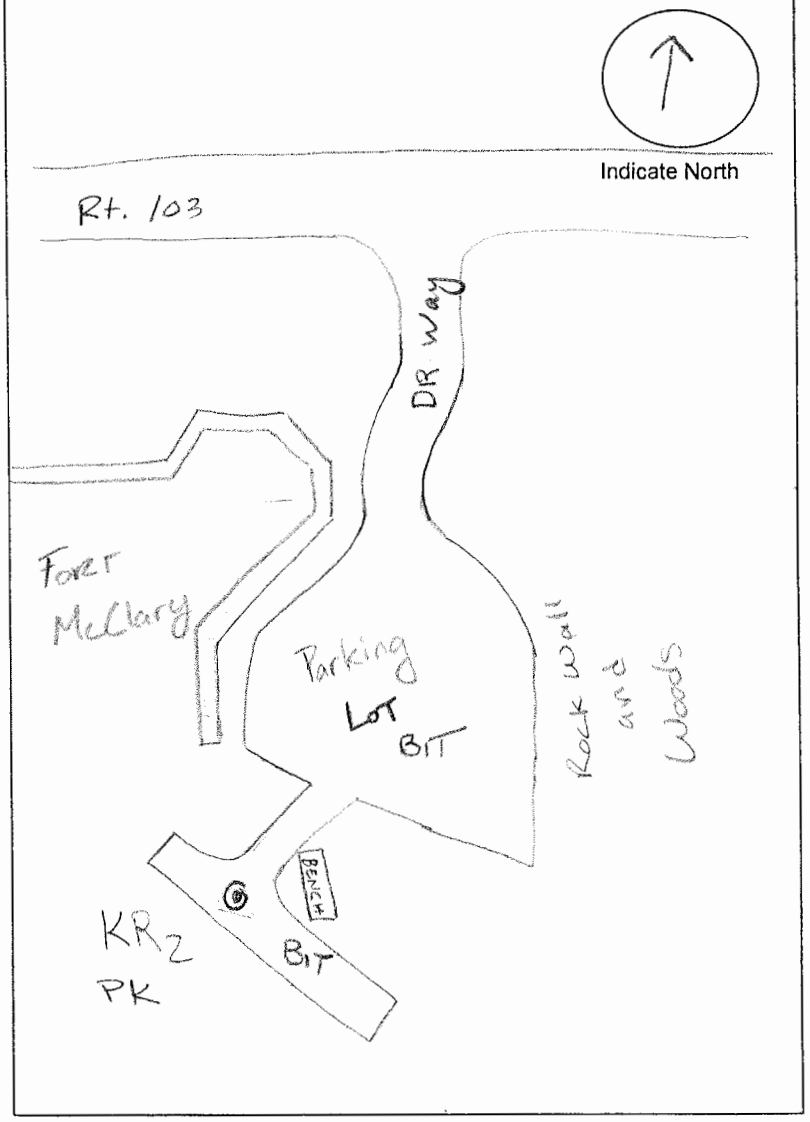
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 1:30 PM
End Time: 5:00 PM

Actual Observation
Start Time: 1:25 PM
End Time: 5:07 PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control

SHEET NO. 2 OF 2

OBSERVER KS, KR DATE 12/11/06

TEMPERATURE 40°F WEATHER RAIN/CLOUDY

STATION NAME

LOCATION Brookside Circle, Ogunquit, ME

Station/Monument Designation: OQ-P3

Receiver Number: R1 Session: A

Receiver Model: Topcon HIPER GD

Receiver S/N:

Slant Height: 1.47 (m) 4.82 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

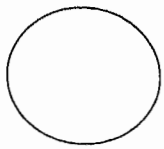
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.44 (m) 4.72 (ft)

$$ARP\,Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\,Height = \sqrt{Slantheigh\,t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Indicate North

Session Information

Planned Observation
Start Time: 10:30 AM
End Time: 2:00 PM

Actual Observation
Start Time: 10:45 AM
End Time: 2:15 PM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2
OBSERVER KS, KR DATE 12/11/06
TEMPERATURE 40°F WEATHER CLOUDY
STATION NAME
LOCATION Ocean Ave, Oquinquit, ME

Station/Monument Designation: OQ-GY P4
Receiver Number: R1 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N:

Slant Height: 1.484 (m) 4.87 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)
ARP Height: 1.454 (m) 4.77 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

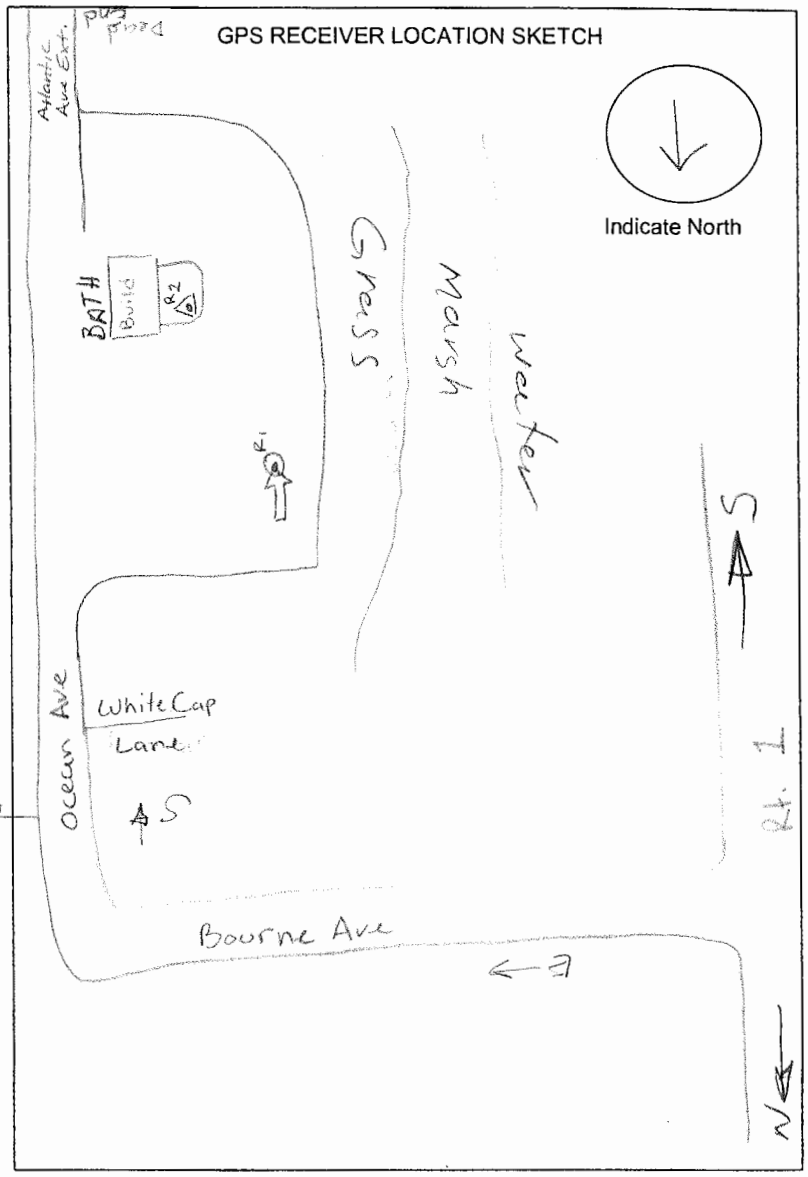
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 2:30 PM
End Time: 5:00 PM

Actual Observation
Start Time: 2:25 PM
End Time: 4:55 PM

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control PS
SHEET NO. 1 OF 2
OBSERVER K.R. DATE 12/12/06
TEMPERATURE 40° WEATHER sunny
STATION NAME Middle Beach
LOCATION Beach Rd. Front HSE "Naragansett II" Condo Kennebunk, ME

Station/Monument Designation: KN-PS
Receiver Number: R-2 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N:

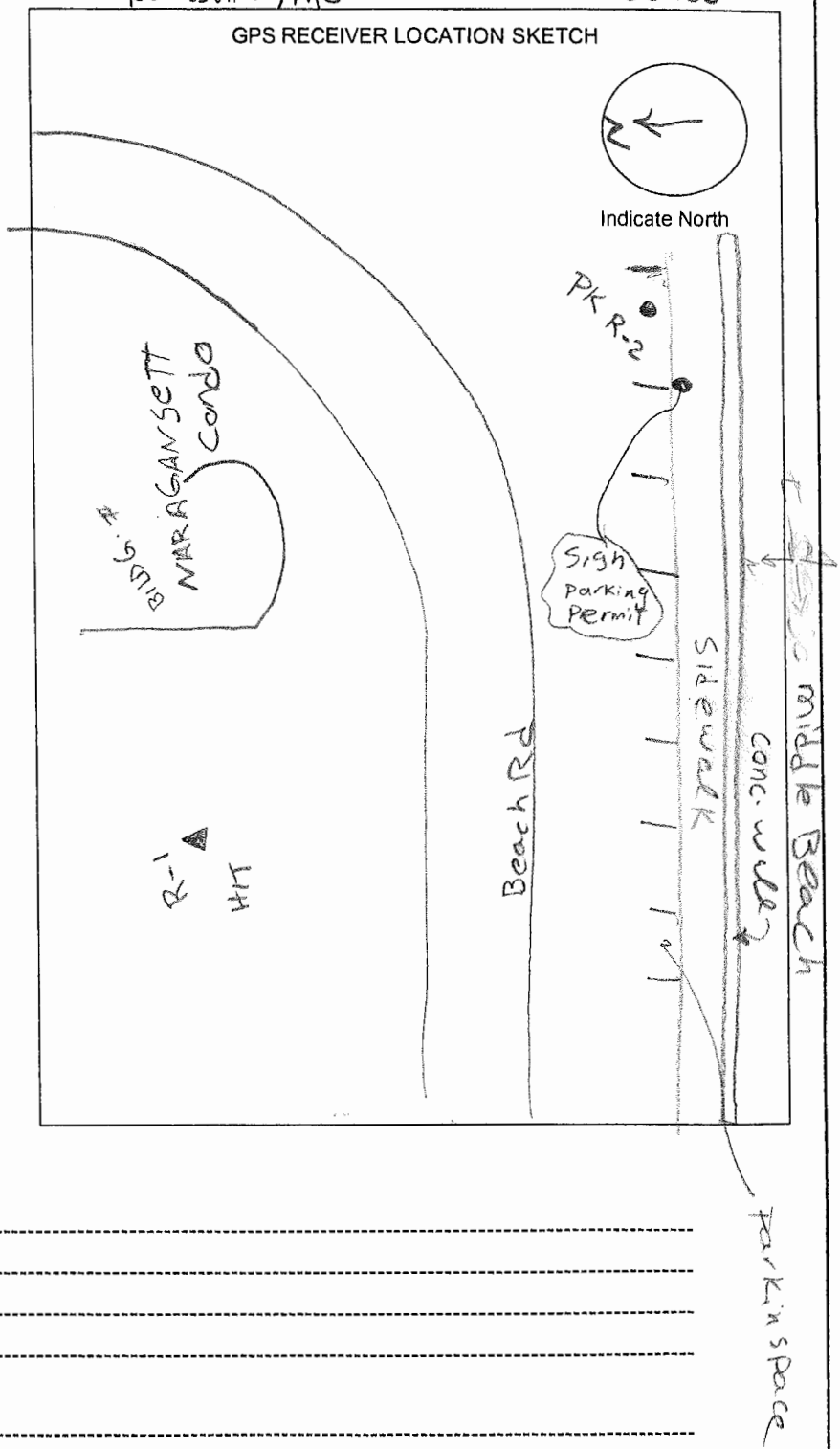
Slant Height: 1.45 (m) 4.75 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.42 (m) 4.65 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 10:16
End Time: 12:46

Actual Observation
Start Time: 10:16
End Time: 12:48

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control PC
SHEET NO. _____ OF _____
OBSERVER K.R DATE 12/12/06
TEMPERATURE 40 WEATHER _____
STATION NAME 18 Sea Rd
LOCATION Kennebunk, ME

Station/Monument Designation: KN-P6
Receiver Number: R1 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N: _____

Slant Height: 1.39 (m) 4.56 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.36 (m) 4.46 (ft)

$$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$$ METRIC

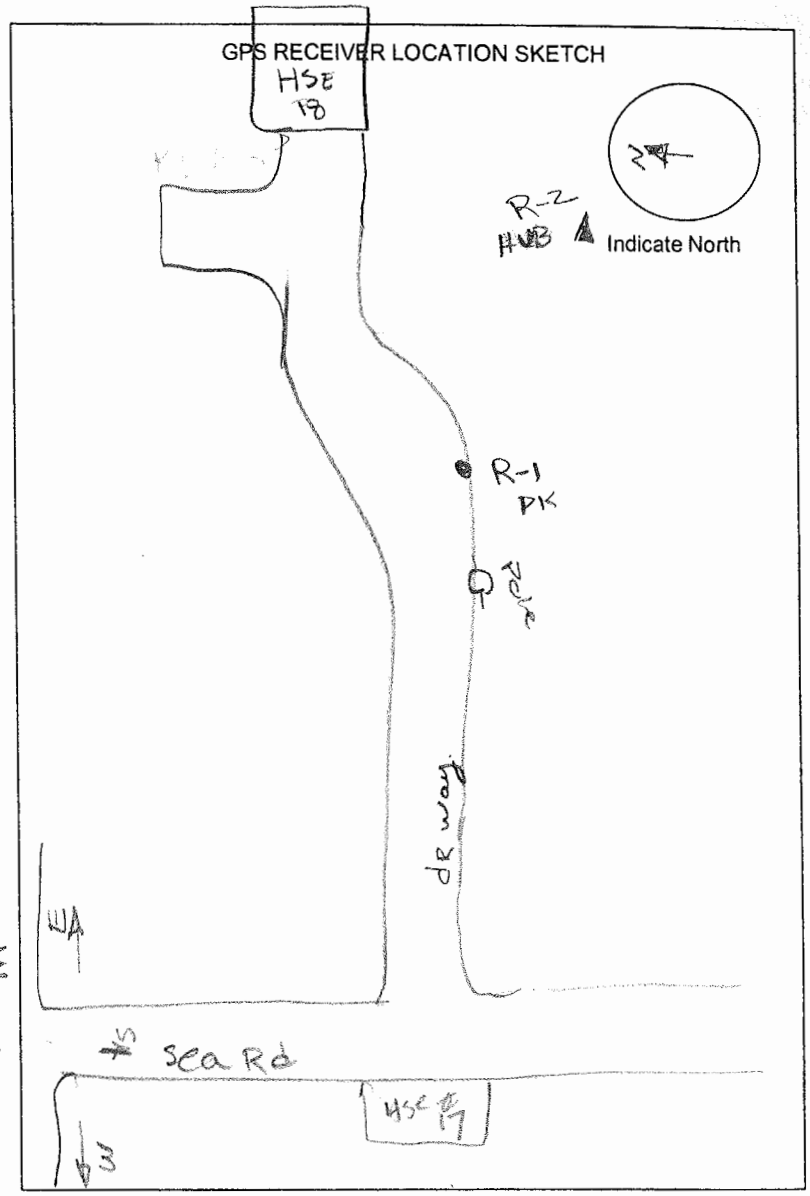
$$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$$ ENGLISH

Session Information

Planned Observation
Start Time: 1.40
End Time: 4.10

Actual Observation
Start Time: 1.40
End Time: 4.11

GPS RECEIVER LOCATION SKETCH



Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 P7
OBSERVER K.R DATE 12/4/06
TEMPERATURE _____ WEATHER _____
STATION NAME _____
LOCATION KENNEBUNKPORT

Station/Monument Designation: KNP-P7
Receiver Number: R-1 PK Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N: _____

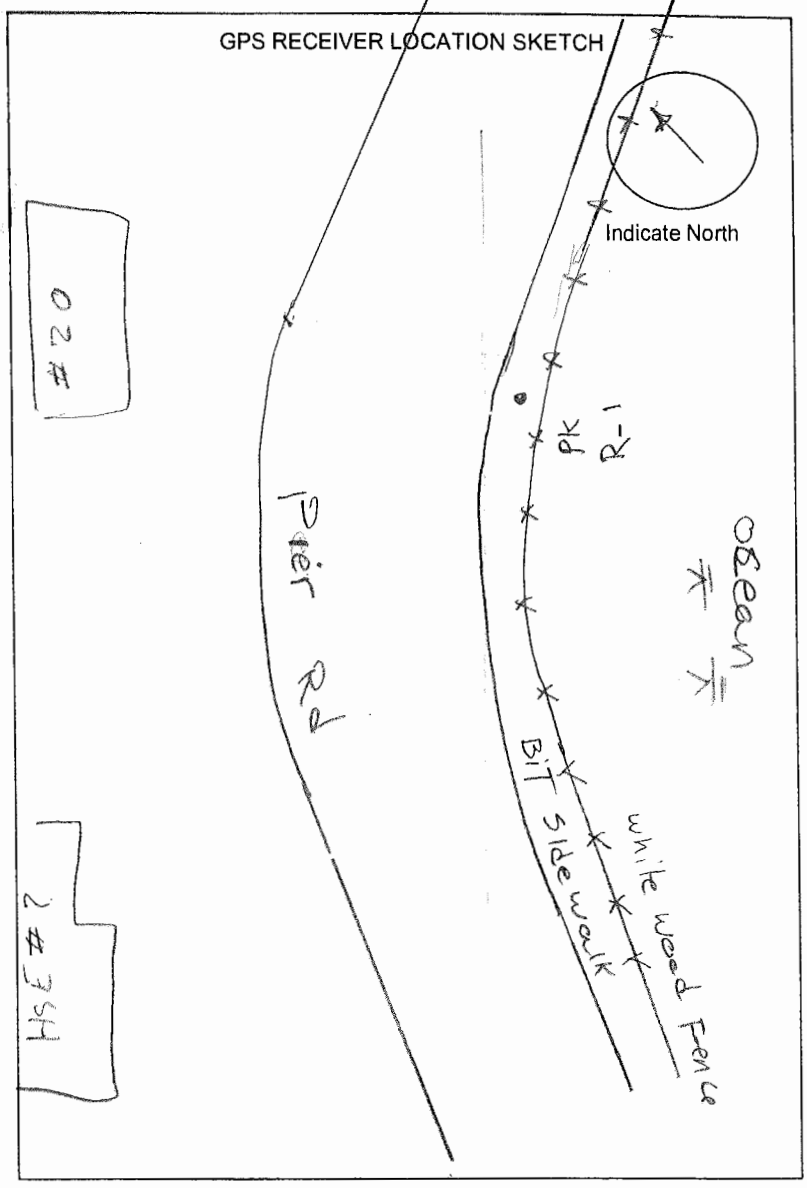
Slant Height: 1.38 (m) 4.53 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.35 (m) 4.43 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 9:49
End Time: 12:19

Actual Observation
Start Time: _____
End Time: 12:29

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 P8
OBSERVER K.R DATE 12/14/06
TEMPERATURE _____ WEATHER _____
STATION NAME _____
LOCATION KennebunkPort

Station/Monument Designation: KNP-P8
Receiver Number: R-1 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N: _____

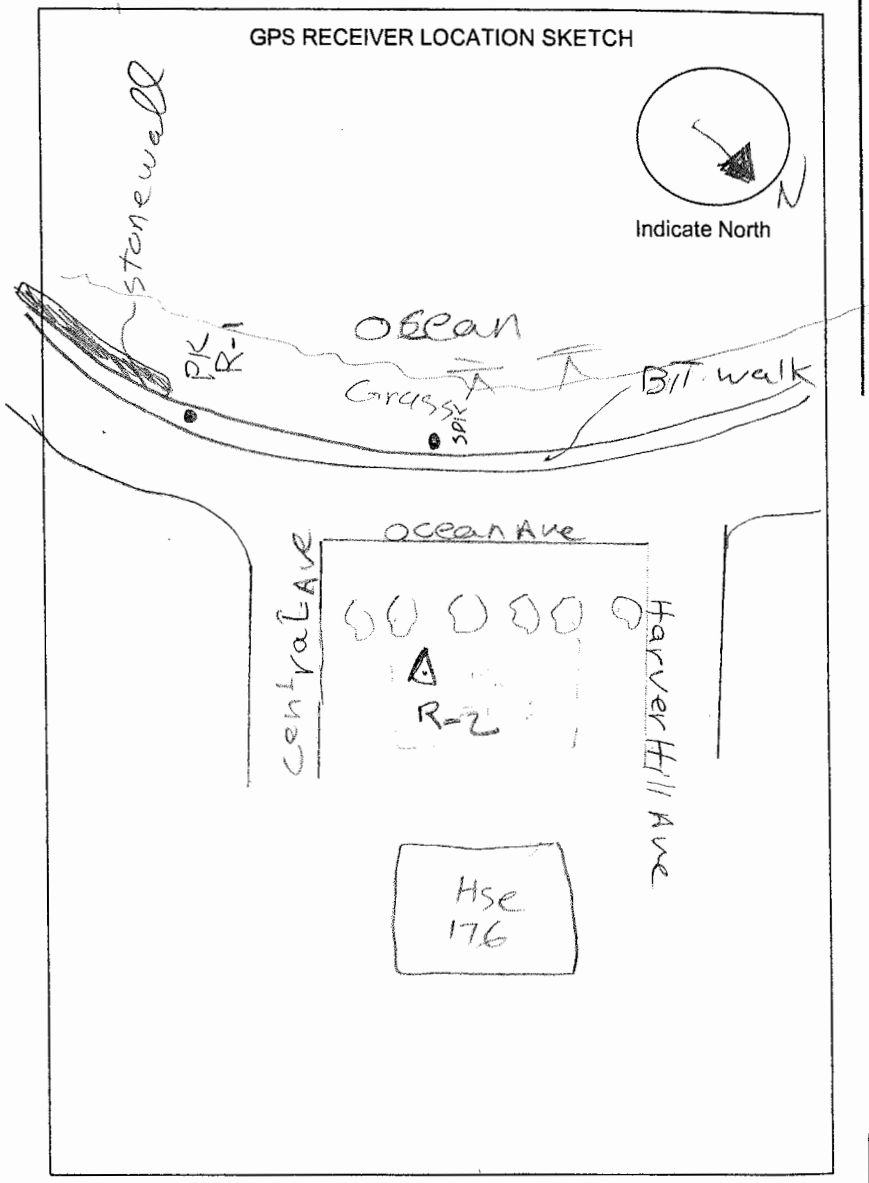
Slant Height: 1.43 (m) 4.68 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.40 (m) 4.58 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 12.45
End Time: 3.15

Actual Observation
Start Time: 12.45
End Time: 3:15

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 P9
OBSERVER KS, KR DATE 12/19/06
TEMPERATURE ____ WEATHER Sunny
STATION NAME Memorial Parking Lot
LOCATION Old Orchard Beach

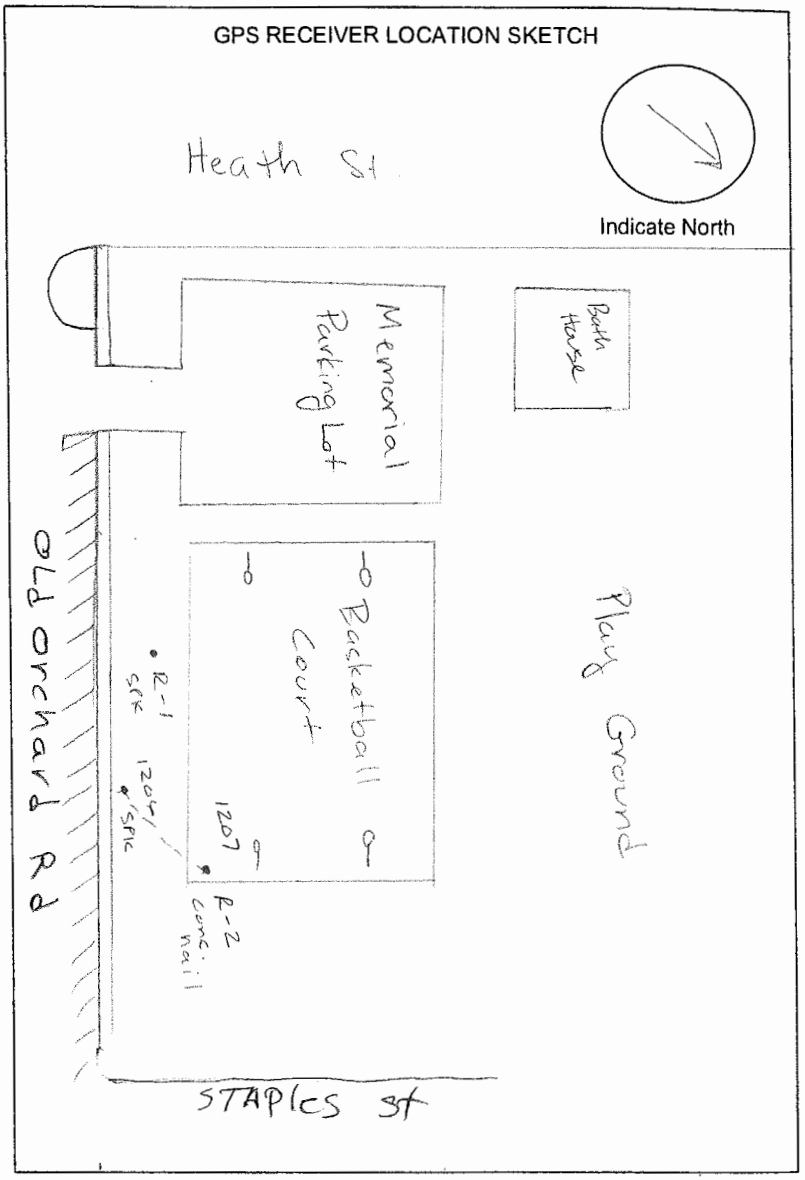
Station/Monument Designation: OOB-P9
Receiver Number: R-2 Session: A
Receiver Model: Topcon HIPER GD
Receiver S/N: ____

Slant Height:	1.325 (m)	4.34 (ft)
ARP vertical offset:	0.0305 (m)	0.10 (ft)
ARP horizontal offset:	0.0763 (m)	0.25 (ft)
ARP Height:	1.295 (m)	4.24 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 9:00 AM
End Time: 11:30 AM

Actual Observation
Start Time: 8:53 AM
End Time: 11:26 AM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 P10
OBSERVER KS, KR DATE 12/19/06
TEMPERATURE _____ WEATHER Sunny
STATION NAME Pine Acres Greenhouses
LOCATION Old Orchard Beach

Station/Monument Designation: OOB - P10
Receiver Number: R-2 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N: _____

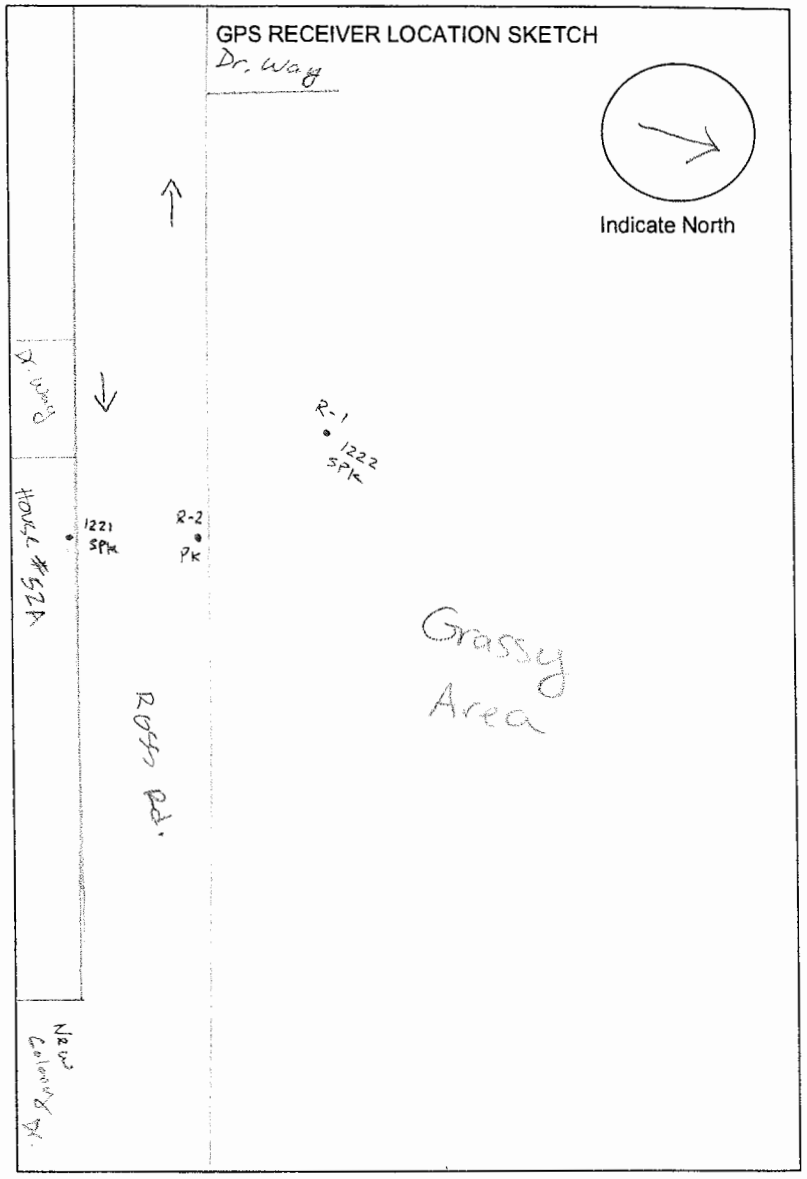
Slant Height: 1.51 (m) 4.95 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.48 (m) 4.85 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 12:00 PM
End Time: 2:30 PM

Actual Observation
Start Time: 12:12 PM
End Time: 2:43 PM

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 2 OF 2 P11
OBSERVER KS, KR DATE 12/18/06
TEMPERATURE _____ WEATHER Cloudy
STATION NAME _____
LOCATION Biddeford MAINE

Station/Monument Designation: BF-P11

Receiver Number: R-2 Session: A

Receiver Model: Topcon HIPER GD

Receiver S/N: _____

Slant Height: 1.42 (m) 4.66 (ft)

ARP vertical offset: 0.0305 (m) 0.10 (ft)

ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.39 (m) 4.56 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

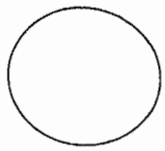
$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

Session Information

Planned Observation
Start Time: 10:30 AM
End Time: 1:00 PM

Actual Observation
Start Time: 10:30 AM
End Time: 1:08 PM

GPS RECEIVER LOCATION SKETCH



Indicate North

Site Description:

Comments:

GREEN INTERNATIONAL AFFILIATES, INC.
Engineers and Planners
407 R Mystic Avenue Unit 25
MEDFORD, MA 02155

JOB 2320.016 FEMA York County Maine - GPS Control
SHEET NO. 1 OF 2 P12
OBSERVER KS, KR DATE 12/18/06
TEMPERATURE ____ WEATHER Cloudy
STATION NAME HOYT NECK Seaport DR.
LOCATION Biddeford, ME.

Station/Monument Designation: BF-B12
Receiver Number: R-1 Session: B
Receiver Model: Topcon HIPER GD
Receiver S/N: ____

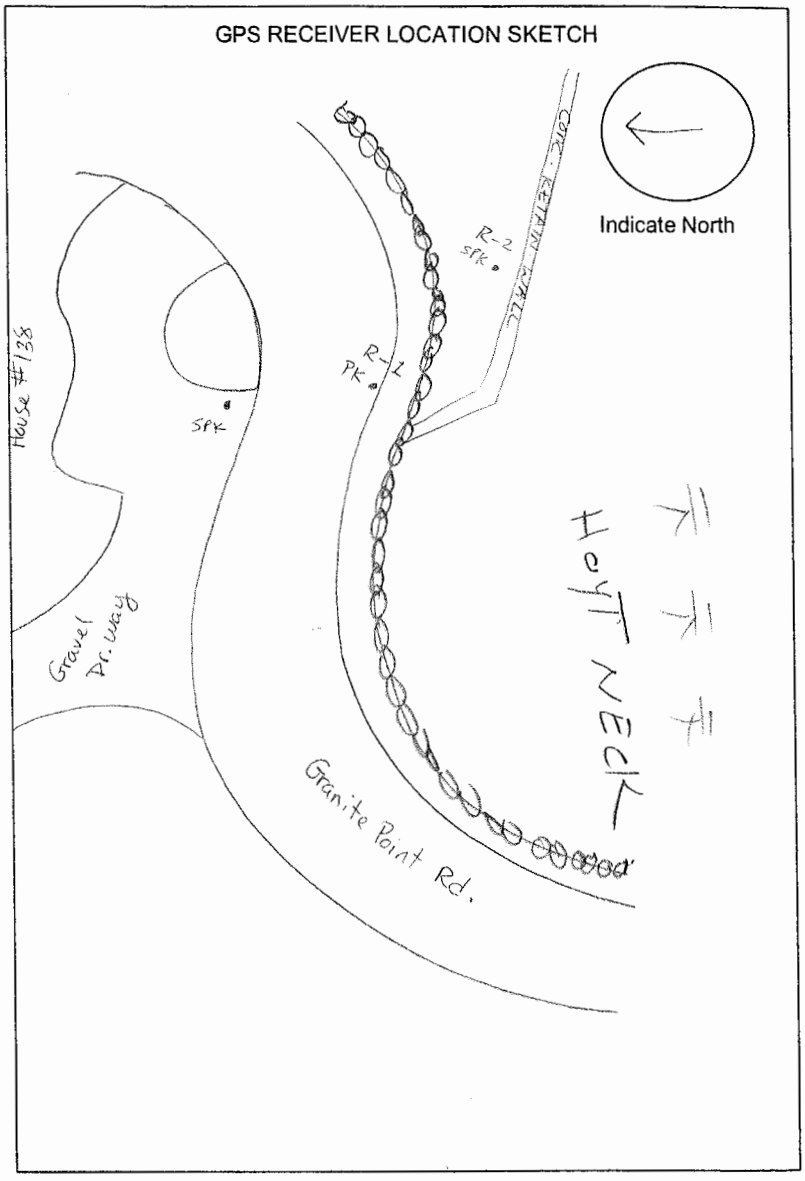
Slant Height: 1.5 (m) 4.92 (ft)
ARP vertical offset: 0.0305 (m) 0.10 (ft)
ARP horizontal offset: 0.0763 (m) 0.25 (ft)

ARP Height: 1.47 (m) 4.82 (ft)

$ARP\ Height = \sqrt{Slantheight^2 - 0.0763^2} - 0.0305$ METRIC

$ARP\ Height = \sqrt{Slantheigh\ t^2 - 0.25^2} - 0.10$ ENGLISH

GPS RECEIVER LOCATION SKETCH



Session Information

Planned Observation
Start Time: 1:25 PM
End Time: 3:55 PM

Actual Observation
Start Time: 1:25 PM
End Time: 3:56 PM

Site Description:

Comments:

NGS Data Base Stations
"Backup Information"

Adel M. Shahin, P.E.

From: opus@ngs.noaa.gov
Sent: Friday, March 02, 2007 9:20 AM
To: Adel M. Shahin, P.E.
Subject: OPUS solution : R1_1208a.tps 000086739

FILE: R1_1208a.tps 000086739

NGS OPUS SOLUTION REPORT
==========

USER: Ashahin@greenintl.com DATE: March 02, 2007
RINEX FILE: r1_1342p.06o TIME: 14:20:22 UTC

SOFTWARE: page5 0612.06 master3.pl START: 2006/12/08 15:55:00
EPHEMERIS: igs14045.eph [precise] STOP: 2006/12/08 18:30:00
NAV FILE: brdc3420.06n OBS USED: 3838 / 3912 : 98%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 23 / 24 : 96%
ARP HEIGHT: 1.34 OVERALL RMS: 0.018(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9362)

X:	1542738.233(m)	0.084(m)	1542737.509(m)	0.084(m)
Y:	-4403536.015(m)	0.028(m)	-4403534.587(m)	0.028(m)
Z:	4333885.768(m)	0.038(m)	4333885.708(m)	0.038(m)

LAT:	43 4 43.78186	0.022(m)	43 4 43.81557	0.022(m)
E LON:	289 18 26.77932	0.072(m)	289 18 26.76999	0.072(m)
W LON:	70 41 33.22068	0.072(m)	70 41 33.23001	0.072(m)
EL HGT:	-24.264(m)	0.061(m)	-25.465(m)	0.061(m)
ORTHO HGT:	2.292(m)	0.066(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (UTM (Zone 19))	STATE PLANE COORDINATES (SPC (1802 ME W))
Northing (Y) [meters]	4770958.799	27405.827
Easting (X) [meters]	362217.231	857174.288
Convergence [degrees]	-1.15620736	-0.35919354
Point Scale	0.99983354	0.99998922
Combined Factor	0.99983735	0.99999303

US NATIONAL GRID DESIGNATOR: 19TCH6221770959(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	119462.1
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	22264.6
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	108442.0

NEAREST NGS PUBLISHED CONTROL POINT

OC2212	RED HILL	N430459.889	W0704115.343	641.2

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577
XYZ 1481595.0978 -4342107.8567 4416102.0767 MON @ 1997.0000 (M)
XYZ -0.0177 -0.0019 0.0044 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0740 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0703 ARP TO L2 PHASE CENTER (M)
XYZ -0.1759 -0.0189 0.0437 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0172 -0.0503 0.0515 ARP TO L1 PHASE CENTER
XYZ 1481594.9391 -4342107.9259 4416102.1719 L1 PHS CEN @ 2006.9362
XYZ -0.0001 -0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1481594.9390 -4342107.9259 4416102.1719 NEW L1 PHS CEN @ 2006.9362
XYZ 1481594.9219 -4342107.8756 4416102.1204 NEW ARP @ 2006.9362
XYZ 1481594.9219 -4342107.8756 4416102.1204 NEW MON @ 2006.9362
LLH 44 5 56.71848 288 50 25.58928 139.7019 NEW L1 PHS CEN @ 2006.9362
LLH 44 5 56.71848 288 50 25.58928 139.6279 NEW ARP @ 2006.9362
LLH 44 5 56.71848 288 50 25.58928 139.6279 NEW MON @ 2006.9362

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1729 -0.0189 0.0447 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5354 -4405922.5791 4339076.5774 L1 PHS CEN @ 2006.9362
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5354 -4405922.5791 4339076.5774 NEW L1 PHS CEN @ 2006.9362
XYZ 1521218.5184 -4405922.5299 4339076.5286 NEW ARP @ 2006.9362
XYZ 1521218.5184 -4405922.5299 4339076.5286 NEW MON @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9845 NEW L1 PHS CEN @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9131 NEW ARP @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9131 NEW MON @ 2006.9362

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1391 -0.0258 0.0427 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0403 -4324850.0301 4399278.2449 L1 PHS CEN @ 2006.9362
XYZ 0.0000 -0.0001 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0403 -4324850.0302 4399278.2448 NEW L1 PHS CEN @ 2006.9362
XYZ 1578685.0186 -4324849.9708 4399278.1840 NEW ARP @ 2006.9362
XYZ 1578685.0186 -4324849.9708 4399278.1840 NEW MON @ 2006.9362
LLH 43 53 23.34022 290 3 12.32629 2.0021 NEW L1 PHS CEN @ 2006.9362
LLH 43 53 23.34022 290 3 12.32629 1.9144 NEW ARP @ 2006.9362

LLH 43 53 23.34022 290 3 12.32629 1.9144 NEW MON @ 2006.9362

REMOTE STATION INFORMATION

STATION NAME: r1_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1542740.8080 -4403535.3215 4333886.0252 MON @ 2006.9361 (M)
NEU 0.0000 -0.0000 1.3400 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3236 -0.9237 0.9152 MON TO ARP
XYZ 0.0256 -0.0731 0.0724 ARP TO L1 PHASE CENTER
XYZ 1542741.1572 -4403536.3183 4333887.0128 L1 PHS CEN @ 2006.9362

BASELINE NAME: barn r1_1
XYZ -3.2988 0.7462 -0.3096 + XYZ ADJUSTMENTS
XYZ 1542737.8584 -4403535.5720 4333886.7032 NEW L1 PHS CEN @ 2006.9362
XYZ 1542737.8328 -4403535.4990 4333886.6308 NEW ARP @ 2006.9362
XYZ 1542737.5092 -4403534.5753 4333885.7156 NEW MON @ 2006.9362
LLH 43 4 43.81599 289 18 26.77017 -24.0215 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 43.81599 289 18 26.77017 -24.1275 NEW ARP @ 2006.9362
LLH 43 4 43.81599 289 18 26.77017 -25.4675 NEW MON @ 2006.9362

BASELINE NAME: nhun r1_1
XYZ -3.3417 0.7396 -0.3404 + XYZ ADJUSTMENTS
XYZ 1542737.8155 -4403535.5787 4333886.6724 NEW L1 PHS CEN @ 2006.9362
XYZ 1542737.7899 -4403535.5056 4333886.6000 NEW ARP @ 2006.9362
XYZ 1542737.4663 -4403534.5819 4333885.6848 NEW MON @ 2006.9362
LLH 43 4 43.81544 289 18 26.76828 -24.0484 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 43.81544 289 18 26.76828 -24.1544 NEW ARP @ 2006.9362
LLH 43 4 43.81544 289 18 26.76828 -25.4944 NEW MON @ 2006.9362

BASELINE NAME: bru1 r1_1
XYZ -3.2576 0.7185 -0.3028 + XYZ ADJUSTMENTS
XYZ 1542737.8996 -4403535.5998 4333886.7100 NEW L1 PHS CEN @ 2006.9362
XYZ 1542737.8740 -4403535.5267 4333886.6376 NEW ARP @ 2006.9362
XYZ 1542737.5504 -4403534.6030 4333885.7224 NEW MON @ 2006.9362
LLH 43 4 43.81527 289 18 26.77148 -23.9878 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 43.81527 289 18 26.77148 -24.0938 NEW ARP @ 2006.9362
LLH 43 4 43.81527 289 18 26.77148 -25.4338 NEW MON @ 2006.9362

G-FILES

Axx200612 8 612 8
B200612 81554 612 81830 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
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C00090001 -611425873 11 614266997 27 822164048 25 X3426AR1_1X3426ABARN
D 1 2 -8684508 1 3 6527586 2 3 -8569228

Axx200612 8 612 8
B200612 81554 612 81830 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -215189479 20 -23879480 43 51908439 44 X3426AR1_1X3426ANHUN
D 1 2 -7099907 1 3 6636897 2 3 -9456550

Axx200612 8 612 8
B200612 81554 612 81830 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090003 359474683 15 786846322 40 653924617 38 X3426AR1_1X3426ABRU1

D 1 2 -7347431 1 3 7950917 2 3 -8859485

POST-FIT RMS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   11   17   19   20   27
barn-r1_1| 0.012 0.023 0.017 0.009   ... 0.011 0.017 0.021 0.010
        28
barn-r1_1| 0.008

      OVERALL   03   04   08   11   17   19   20   27
nhun-r1_1| 0.019 0.026 0.028 0.019   ... 0.015 0.022 0.020 0.014
        28
nhun-r1_1|   ...

      OVERALL   03   04   08   11   17   19   20   27
bru1-r1_1| 0.022 0.027 0.022 0.017   ... 0.018 0.027 0.026 0.020
        28
bru1-r1_1| 0.023
```

OBS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   11   17   19   20   27
barn-r1_1| 1383   34   28  299   ...  229  184  100  201
        28
barn-r1_1|  308
      OVERALL   03   04   08   11   17   19   20   27
nhun-r1_1| 1054   32   26  278   ...  232  183   90  213
        28
nhun-r1_1|   ...
      OVERALL   03   04   08   11   17   19   20   27
bru1-r1_1| 1401   34   26  304   ...  227  184  109  209
        28
bru1-r1_1|  308
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000016578   -0.0000002910    0.0000002704
 -0.0000002910    0.0000092844   -0.0000008254
  0.0000002704   -0.0000008254    0.0000089000
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000023099    0.0000014519   -0.0000015892
  0.0000014519    0.0000079100    0.0000001975
 -0.0000015892    0.0000001975    0.0000096223
```

Horizontal network accuracy = 0.00584 meters.
Vertical network accuracy = 0.00608 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

```
          Xa(m)         Ya(m)         Za(m)
   BARN  1481595.64851 -4342109.28925  4416102.17122   2002.00
   NHUN  1521219.24202 -4405923.95539  4339076.58831   2002.00
   BRU1  1578685.72814 -4324851.38849  4399278.23594   2002.00
```

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument
in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-61142.58449	61426.72575	82216.40322	2002.00
NHUN	-21518.99098	-2387.94039	5190.82031	2002.00
BRU1	35947.49514	78684.62651	65392.46794	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.35919354
Point Scale	0.99998922
Combined Factor	0.99999303

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

G2

Emily Caruso

From: opus@ngs.noaa.gov
Sent: Friday, May 25, 2007 11:16 AM
To: Emily Caruso
Subject: OPUS solution : R1_1208b.tps 000139089

FILE: R1_1208b.tps 000139089

NGS OPUS SOLUTION REPORT
==========

USER: ecaruso@greenintl.com
RINEX FILE: r1_1342t.06o
DATE: May 25, 2007
TIME: 15:16:13 UTC

SOFTWARE: page5 0612.06 master28.pl
EPHEMERIS: igs14045.eph [precise]
NAV FILE: brdc3420.06n
ANT NAME: TPSHIPER_GD NONE
ARP HEIGHT: 1.345
START: 2006/12/08 19:28:00
STOP: 2006/12/08 22:05:00
OBS USED: 5206 / 5439 : 96%
FIXED AMB: 39 / 40 : 98%
OVERALL RMS: 0.017(m)

REF FRAME:	NAD_83(CORS96)(EPOCH:2002.0000)		ITRF00 (EPOCH:2006.9366)	
X:	1541427.759(m)	0.022(m)	1541427.035(m)	0.022(m)
Y:	-4403786.541(m)	0.009(m)	-4403785.114(m)	0.009(m)
Z:	4334106.644(m)	0.019(m)	4334106.584(m)	0.019(m)
LAT:	43 4 53.36261	0.009(m)	43 4 53.39629	0.009(m)
E LON:	289 17 28.44206	0.022(m)	289 17 28.43270	0.022(m)
W LON:	70 42 31.55794	0.022(m)	70 42 31.56730	0.022(m)
EL HGT:	-17.048(m)	0.019(m)	-18.247(m)	0.019(m)
ORTHO HGT:	9.524(m)	0.031(m)	[Geoid03 NAVD88]	

	UTM COORDINATES UTM (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4771281.099	27709.876
Easting (X) [meters]	360904.077	855856.575
Convergence [degrees]	-1.16733853	-0.37028038
Point Scale	0.99983801	0.99999063
Combined Factor	0.99984069	0.99999330

US NATIONAL GRID DESIGNATOR: 19TCH6090471281(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF9215	ZBW1 BOSTON WAAS 1 CORS ARP	N424408.559	W0712849.518	73799.0
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	20920.2
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	108932.3

NEAREST NGS PUBLISHED CONTROL POINT

OC2242	APEX	N430454.318	W0704233.227	47.9

BASE STATION INFORMATION

STATION NAME: zbw1 a 2 (BOSTON WAAS 1; Nashua, New Hampshire, U.S.A.)
ANTENNA: NOV_WAAS_600 NONE S/N=UNKNOWN
XYZ 1490299.3919 -4448982.8359 4306010.1266 MON @ 1997.0000 (M)

```
XYZ         -0.0173         -0.0019          0.0044  VEL (M/YR)
NEU          0.0000          0.0000          0.0000  MON TO ARP (M)
NEU         -0.0000          0.0000          0.3930  ARP TO L1 PHASE CENTER (M)
NEU         -0.0000          0.0000          0.3975  ARP TO L2 PHASE CENTER (M)
XYZ         -0.1719         -0.0189          0.0437  VEL TIMES 9.9355 YRS
XYZ          0.0000          0.0000          0.0000  MON TO ARP
XYZ          0.0917         -0.2737          0.2667  ARP TO L1 PHASE CENTER
XYZ    1490299.3117  -4448983.1285   4306010.4370  L1 PHS CEN @ 2006.9366
XYZ         -0.0000         -0.0001         -0.0001  + XYZ ADJUSTMENTS
XYZ    1490299.3117  -4448983.1286   4306010.4369  NEW L1 PHS CEN @ 2006.9366
XYZ    1490299.2200  -4448982.8549   4306010.1702  NEW ARP @ 2006.9366
XYZ    1490299.2200  -4448982.8549   4306010.1702  NEW MON @ 2006.9366
LLH   42 44  8.59263  288 31 10.47130     39.0662  NEW L1 PHS CEN @ 2006.9366
LLH   42 44  8.59263  288 31 10.47130     38.6732  NEW ARP @ 2006.9366
LLH   42 44  8.59263  288 31 10.47130     38.6732  NEW MON @ 2006.9366

STATION NAME: nhun  a    2 (University of New Hampsh; Town of Durham, New Hamp
 ANTENNA: TRM41249.00     NONE                                 S/N=12475400
XYZ    1521218.6913  -4405922.5110   4339076.4839  MON @ 1997.0000 (M)
XYZ         -0.0174         -0.0019          0.0045  VEL (M/YR)
NEU          0.0000          0.0000          0.0000  MON TO ARP (M)
NEU         -0.0000          0.0000          0.0714  ARP TO L1 PHASE CENTER (M)
NEU         -0.0000          0.0000          0.0682  ARP TO L2 PHASE CENTER (M)
XYZ         -0.1729         -0.0189          0.0447  VEL TIMES 9.9355 YRS
XYZ          0.0000          0.0000          0.0000  MON TO ARP
XYZ          0.0170         -0.0492          0.0488  ARP TO L1 PHASE CENTER
XYZ    1521218.5354  -4405922.5791   4339076.5774  L1 PHS CEN @ 2006.9366
XYZ         -0.0000         -0.0000         -0.0000  + XYZ ADJUSTMENTS
XYZ    1521218.5354  -4405922.5791   4339076.5774  NEW L1 PHS CEN @ 2006.9366
XYZ    1521218.5184  -4405922.5299   4339076.5286  NEW ARP @ 2006.9366
XYZ    1521218.5184  -4405922.5299   4339076.5286  NEW MON @ 2006.9366
LLH   43  8 33.21317  289  2 53.12702      7.9845  NEW L1 PHS CEN @ 2006.9366
LLH   43  8 33.21317  289  2 53.12702      7.9131  NEW ARP @ 2006.9366
LLH   43  8 33.21317  289  2 53.12702      7.9131  NEW MON @ 2006.9366

STATION NAME: bru1  a    6 (Brunswick 1; Brunswick, Maine  USA)
 ANTENNA: ASH700829.3     SNOW                                 S/N=11098
XYZ    1578685.1577  -4324849.9449   4399278.1414  MON @ 1997.0000 (M)
XYZ         -0.0140         -0.0026          0.0043  VEL (M/YR)
NEU          0.0000          0.0000          0.0000  MON TO ARP (M)
NEU         -0.0000          0.0000          0.0877  ARP TO L1 PHASE CENTER (M)
NEU         -0.0000          0.0000          0.0598  ARP TO L2 PHASE CENTER (M)
XYZ         -0.1391         -0.0258          0.0427  VEL TIMES 9.9355 YRS
XYZ          0.0000          0.0000          0.0000  MON TO ARP
XYZ          0.0217         -0.0594          0.0608  ARP TO L1 PHASE CENTER
XYZ    1578685.0403  -4324850.0301   4399278.2449  L1 PHS CEN @ 2006.9366
XYZ          0.0001         -0.0000         -0.0001  + XYZ ADJUSTMENTS
XYZ    1578685.0403  -4324850.0302   4399278.2448  NEW L1 PHS CEN @ 2006.9366
XYZ    1578685.0187  -4324849.9708   4399278.1840  NEW ARP @ 2006.9366
XYZ    1578685.0187  -4324849.9708   4399278.1840  NEW MON @ 2006.9366
LLH  43 53 23.34022  290  3 12.32629      2.0021  NEW L1 PHS CEN @ 2006.9366
LLH  43 53 23.34022  290  3 12.32629      1.9144  NEW ARP @ 2006.9366
LLH  43 53 23.34022  290  3 12.32629      1.9144  NEW MON @ 2006.9366

                        REMOTE STATION INFORMATION

STATION NAME: r1_1       1
 ANTENNA: TPSHIPER_GD     NONE                                 S/N=UNKNOWN
XYZ    1541429.5979  -4403785.1457   4334106.4435  MON @ 2006.9365 (M)
NEU          0.0000         -0.0000          1.3450  MON TO ARP (M)
NEU         -0.0000          0.0000          0.1060  ARP TO L1 PHASE CENTER (M)
NEU         -0.0000          0.0000          0.1012  ARP TO L2 PHASE CENTER (M)
XYZ          0.3245         -0.9272          0.9187  MON TO ARP
XYZ          0.0256         -0.0731          0.0724  ARP TO L1 PHASE CENTER
XYZ    1541429.9480  -4403786.1460   4334107.4346  L1 PHS CEN @ 2006.9366

BASELINE NAME:    zbw1  r1_1
```

```
XYZ        -2.5635          0.0268          0.1511  + XYZ ADJUSTMENTS
XYZ   1541427.3845  -4403786.1192   4334107.5857  NEW L1 PHS CEN @ 2006.9366
XYZ   1541427.3589  -4403786.0461   4334107.5133  NEW ARP @ 2006.9366
XYZ   1541427.0344  -4403785.1189   4334106.5946  NEW MON @ 2006.9366
LLH  43  4 53.39644  289 17 28.43260    -16.7860  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 53.39644  289 17 28.43260    -16.8920  NEW ARP @ 2006.9366
LLH  43  4 53.39644  289 17 28.43260    -18.2370  NEW MON @ 2006.9366

BASELINE NAME:   nhun  r1_1
XYZ        -2.5731          0.0317          0.1317  + XYZ ADJUSTMENTS
XYZ   1541427.3749  -4403786.1143   4334107.5663  NEW L1 PHS CEN @ 2006.9366
XYZ   1541427.3493  -4403786.0412   4334107.4939  NEW ARP @ 2006.9366
XYZ   1541427.0248  -4403785.1140   4334106.5752  NEW MON @ 2006.9366
LLH  43  4 53.39616  289 17 28.43227    -16.8049  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 53.39616  289 17 28.43227    -16.9109  NEW ARP @ 2006.9366
LLH  43  4 53.39616  289 17 28.43227    -18.2559  NEW MON @ 2006.9366

BASELINE NAME:   bru1  r1_1
XYZ        -2.5513          0.0354          0.1402  + XYZ ADJUSTMENTS
XYZ   1541427.3967  -4403786.1106   4334107.5748  NEW L1 PHS CEN @ 2006.9366
XYZ   1541427.3711  -4403786.0375   4334107.5024  NEW ARP @ 2006.9366
XYZ   1541427.0466  -4403785.1103   4334106.5837  NEW MON @ 2006.9366
LLH  43  4 53.39628  289 17 28.43323    -16.7964  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 53.39628  289 17 28.43323    -16.9024  NEW ARP @ 2006.9366
LLH  43  4 53.39628  289 17 28.43323    -18.2474  NEW MON @ 2006.9366
```

G-FILES

```
Axx200612 8   612 8
B200612 81928   612 822 4 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
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C00090001 -511278144   13 -451977360   33 -280964244   30 X3426AR1_1X3426AZBW1
D  1  2 -6463865  1  3  7646201  2  3 -8858460

Axx200612 8   612 8
B200612 81928   612 822 4 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090002 -202085064   12  -21374159   26   49699534   25 X3426AR1_1X3426ANHUN
D  1  2 -6910658  1  3  5836876  2  3 -9107510

Axx200612 8   612 8
B200612 81928   612 822 4 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090003  372579721   11  789351395   32  651716003   27 X3426AR1_1X3426ABRU1
D  1  2 -7178763  1  3  8551779  2  3 -8018606
```

POST-FIT RMS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     11     12     13
zbw1-r1_1|  0.016  0.014    ...  0.016  0.027  0.024    ...    ...  0.022
             17     20     23     24     28     30
zbw1-r1_1|  0.010  0.013  0.024  0.015  0.015  0.024

           OVERALL     02     04     05     09     10     11     12     13
nhun-r1_1|  0.014  0.013    ...  0.013  0.021  0.016    ...    ...  0.019
             17     20     23     24     28     30
nhun-r1_1|  0.008  0.012  0.020  0.014    ...    ...

           OVERALL     02     04     05     09     10     11     12     13
bru1-r1_1|  0.019  0.019    ...  0.020  0.015  0.021    ...  0.020  0.023
             17     20     23     24     28     30
bru1-r1_1|  0.018  0.016  0.021  0.020  0.015  0.019
```

OBS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     11     12     13
zbw1-r1_1|   1680    253    ...    183     51     64    ...    ...     95
```

	17	20	23	24	28	30				
zbw1-r1_1|	311	206	134	236	143	4				
	OVERALL	02	04	05	09	10	11	12	13	
nhun-r1_1|	1558	252	...	201	66	49	...	...	106	
	17	20	23	24	28	30				
nhun-r1_1|	312	208	140	224	...	...				
	OVERALL	02	04	05	09	10	11	12	13	
bru1-r1_1|	1968	265	...	201	61	61	...	228	94	
	17	20	23	24	28	30				
bru1-r1_1|	312	211	124	239	140	32				

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000009644	-0.0000001657	0.0000001616
-0.0000001657	0.0000061978	-0.0000004804
0.0000001616	-0.0000004804	0.0000050089

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000014323	0.0000010180	-0.0000011049
0.0000010180	0.0000048374	-0.0000003222
-0.0000011049	-0.0000003222	0.0000059014

Horizontal network accuracy = 0.00459 meters.
Vertical network accuracy = 0.00476 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
ZBW1	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
ZBW1	-51127.81726	-45197.74182	-28096.40883	2002.00
NHUN	-20208.51698	-2137.41439	4969.94431	2002.00
BRU1	37257.96914	78935.15251	65171.59194	2002.00

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1211a.tps 000086850

Date: Friday, March 02, 2007 11:17:48 AM

Attachments:

FILE: R2_1211a.tps 000086850

NGS OPUS SOLUTION REPORT
==========

USER: sabedi@greenintl.com DATE: March 02, 2007
RINEX FILE: r2_1345p.06o TIME: 16:01:20 UTC

SOFTWARE: page5 0612.06 master11.pl START: 2006/12/11 15:40:00
EPHEMERIS: igs14051.eph [precise] STOP: 2006/12/11 19:12:00
NAV FILE: brdc3450.06n OBS USED: 5174 / 5403 : 96%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 36 / 36 : 100%
ARP HEIGHT: 1.326 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9445)

X:	1545129.718(m)	0.038(m)	1545128.993(m)	0.038(m)
Y:	-4387400.593(m)	0.021(m)	-4387399.167(m)	0.021(m)
Z:	4349289.568(m)	0.015(m)	4349289.511(m)	0.015(m)
LAT:	43 16 7.76287	0.021(m)	43 16 7.79675	0.021(m)
E LON:	289 24 3.43274	0.029(m)	289 24 3.42342	0.029(m)
W LON:	70 35 56.56726	0.029(m)	70 35 56.57658	0.029(m)
EL HGT:	-9.045(m)	0.031(m)	-10.239(m)	0.031(m)
ORTHO HGT:	17.396(m)	0.040(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4791909.175	48469.344

Easting (X) [meters]	370232.951	864898.574
Convergence [degrees]	-1.09617452	-0.29636574
Point Scale	0.99980715	0.99998182
Combined Factor	0.99980857	0.99998324

US NATIONAL GRID DESIGNATOR: 19TCH7023391909(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	102722.0
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	31923.8
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	86817.5

NEAREST NGS PUBLISHED CONTROL POINT

OC0460	43.8	N431615.	W0703552.	246.3

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1760	-0.0189	0.0438	VEL TIMES 9.9433 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9390	-4342107.9259	4416102.1719	L1 PHS CEN @ 2006.9445
XYZ	-0.0001	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9388	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9445
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW ARP @ 2006.9445
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW MON @ 2006.9445
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9445
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9445

LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW MON @ 2006.9445

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1730 -0.0189 0.0447 VEL TIMES 9.9433 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5353 -4405922.5791 4339076.5775 L1 PHS CEN @ 2006.9445
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5353 -4405922.5791 4339076.5775 NEW L1 PHS CEN @ 2006.9445
XYZ 1521218.5183 -4405922.5299 4339076.5287 NEW ARP @ 2006.9445
XYZ 1521218.5183 -4405922.5299 4339076.5287 NEW MON @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9445

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9433 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0402 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9445
XYZ -0.0001 -0.0002 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0303 4399278.2448 NEW L1 PHS CEN @ 2006.9445
XYZ 1578685.0184 -4324849.9710 4399278.1840 NEW ARP @ 2006.9445
XYZ 1578685.0184 -4324849.9710 4399278.1840 NEW MON @ 2006.9445
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9445
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9445
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9445

REMOTE STATION INFORMATION

```
STATION NAME: r2_1      1
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1545132.2989 -4387399.8409  4349289.7235  MON @ 2006.9443 (M)
NEU      -0.0000      -0.0000       1.3260  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.3207      -0.9107       0.9089  MON TO ARP
XYZ       0.0256      -0.0728       0.0727  ARP TO L1 PHASE CENTER
XYZ  1545132.6453 -4387400.8244  4349290.7050  L1 PHS CEN @ 2006.9445

BASELINE NAME:  barn  r2_1
XYZ      -3.3225       0.6799      -0.2073  + XYZ ADJUSTMENTS
XYZ  1545129.3228 -4387400.1445  4349290.4977  NEW L1 PHS CEN @ 2006.9445
XYZ  1545129.2971 -4387400.0717  4349290.4251  NEW ARP @ 2006.9445
XYZ  1545128.9764 -4387399.1610  4349289.5162  NEW MON @ 2006.9445
LLH  43 16  7.79712  289 24  3.42281    -8.8111  NEW L1 PHS CEN @ 2006.9445
LLH  43 16  7.79712  289 24  3.42281    -8.9171  NEW ARP @ 2006.9445
LLH  43 16  7.79712  289 24  3.42281   -10.2431  NEW MON @ 2006.9445

BASELINE NAME:  nhun  r2_1
XYZ      -3.3108       0.6811      -0.2226  + XYZ ADJUSTMENTS
XYZ  1545129.3345 -4387400.1433  4349290.4824  NEW L1 PHS CEN @ 2006.9445
XYZ  1545129.3089 -4387400.0705  4349290.4098  NEW ARP @ 2006.9445
XYZ  1545128.9881 -4387399.1598  4349289.5009  NEW MON @ 2006.9445
LLH  43 16  7.79670  289 24  3.42332    -8.8196  NEW L1 PHS CEN @ 2006.9445
LLH  43 16  7.79670  289 24  3.42332    -8.9256  NEW ARP @ 2006.9445
LLH  43 16  7.79670  289 24  3.42332   -10.2516  NEW MON @ 2006.9445

BASELINE NAME:  bru1  r2_1
XYZ      -3.2848       0.6598      -0.2071  + XYZ ADJUSTMENTS
XYZ  1545129.3605 -4387400.1646  4349290.4980  NEW L1 PHS CEN @ 2006.9445
XYZ  1545129.3348 -4387400.0918  4349290.4253  NEW ARP @ 2006.9445
XYZ  1545129.0141 -4387399.1811  4349289.5164  NEW MON @ 2006.9445
LLH  43 16  7.79643  289 24  3.42409    -8.7881  NEW L1 PHS CEN @ 2006.9445
LLH  43 16  7.79643  289 24  3.42409    -8.8941  NEW ARP @ 2006.9445
LLH  43 16  7.79643  289 24  3.42409   -10.2201  NEW MON @ 2006.9445

                    G-FILES

Axx20061211  61211
B200612111540  612111912 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
```

```
2IFDDFX
Iant_info.003       NGS   20070226
C00090001 -635340547   9 452912854   21  668126043   21
X3456AR2_1X3456ABARN
D  1  2 -8377227  1  3  6411167  2  3 -8926853

Axx20061211   61211
B200612111540   612111912 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090002 -239104699   13 -185233701   31 -102129722   28
X3456AR2_1X3456ANHUN
D  1  2 -7807669  1  3  8223354  2  3 -9382578

Axx20061211   61211
B200612111540   612111912 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090003  335560043   16  625492101   37  499886676   36
X3456AR2_1X3456ABRU1
D  1  2 -7698664  1  3  8569572  2  3 -8715209

                POST-FIT RMS BY SATELLITE VS. BASELINE

        OVERALL    03    04    08    09    11    17    19    20
 barn-r2_1| 0.012 0.016 0.011 0.011 0.014 0.010 0.011 0.013 0.015
           27    28
 barn-r2_1| 0.013    ...

        OVERALL    03    04    08    09    11    17    19    20
 nhun-r2_1| 0.014 0.018 0.019 0.012 0.017    ... 0.013 0.013 0.014
           27    28
 nhun-r2_1| 0.015    ...

        OVERALL    03    04    08    09    11    17    19    20
 bru1-r2_1| 0.023 0.022 0.020 0.020 0.024 0.023 0.025 0.021 0.030
           27    28
 bru1-r2_1| 0.021    ...

                OBS BY SATELLITE VS. BASELINE

        OVERALL    03    04    08    09    11    17    19    20
```

```
barn-r2_1|  1872   41   136   310   65   406   338   169   207
          27   28
barn-r2_1|   200   ...
        OVERALL   03   04   08   09   11   17   19   20
nhun-r2_1|  1409   39   72   307   64   ...   325   191   196
          27   28
nhun-r2_1|   215   ...
        OVERALL   03   04   08   09   11   17   19   20
bru1-r2_1|  1893   41   133   311   66   424   322   192   204
          27   28
bru1-r2_1|   200   ...
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000011244   -0.0000002064    0.0000002031
-0.0000002064    0.0000061578   -0.0000005264
 0.0000002031   -0.0000005264    0.0000056022
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000015505    0.0000009794   -0.0000010230
 0.0000009794    0.0000050999   -0.0000000268
-0.0000010230   -0.0000000268    0.0000062341
```

Horizontal network accuracy = 0.00471 meters.
Vertical network accuracy = 0.00490 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-63534.06949	45291.30375	66812.60322	2002.00
NHUN	-23910.47598	-18523.36239	-10212.97969	2002.00
BRU1	33556.01014	62549.20451	49988.66794	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.29636574
Point Scale	0.99998182
Combined Factor	0.99998324

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

G4

Emily Caruso

From: opus@ngs.noaa.gov
Sent: Friday, May 25, 2007 10:28 AM
To: Emily Caruso
Subject: OPUS solution : R2_1211b.tps 000138918

FILE: R2_1211b.tps 000138918

NGS OPUS SOLUTION REPORT
==========

USER: ECARUSO@GREENINTL.COM
RINEX FILE: r2_1345t.06o
DATE: May 25, 2007
TIME: 14:28:08 UTC

SOFTWARE: page5 0612.06 master28.pl
EPHEMERIS: igs14051.eph [precise]
NAV FILE: brdc3450.06n
ANT NAME: TPSHIPER_GD NONE
ARP HEIGHT: 1.326
START: 2006/12/11 19:24:00
STOP: 2006/12/11 21:57:00
OBS USED: 5116 / 5372 : 95%
FIXED AMB: 45 / 45 : 100%
OVERALL RMS: 0.018(m)

REF FRAME:	NAD_83(CORS96)(EPOCH:2002.0000)		ITRF00 (EPOCH:2006.9448)	
X:	1546008.085(m)	0.038(m)	1546007.360(m)	0.038(m)
Y:	-4387191.188(m)	0.039(m)	-4387189.762(m)	0.039(m)
Z:	4349168.484(m)	0.056(m)	4349168.427(m)	0.056(m)
LAT:	43 16 2.81047	0.017(m)	43 16 2.84435	0.017(m)
E LON:	289 24 43.25458	0.029(m)	289 24 43.24528	0.029(m)
W LON:	70 35 16.74542	0.029(m)	70 35 16.75472	0.029(m)
EL HGT:	-23.339(m)	0.070(m)	-24.533(m)	0.070(m)
ORTHO HGT:	3.093(m)	0.074(m)	[Geoid03 NAVD88]	

	UTM COORDINATES UTM (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4791739.282	48311.929
Easting (X) [meters]	371127.744	865795.808
Convergence [degrees]	-1.08856173	-0.28877627
Point Scale	0.99980430	0.99998105
Combined Factor	0.99980796	0.99998471

US NATIONAL GRID DESIGNATOR: 19TCH7112891739(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF9215	ZBW1 BOSTON WAAS 1 CORS ARP	N424408.559	W0712849.518	93725.2
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	32668.8
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	86400.6

NEARBY NGS PUBLISHED CONTROL POINT

OC0460	43.8	N431615.	W0703552.	878.7

BASE STATION INFORMATION

STATION NAME: zbw1 a 2 (BOSTON WAAS 1; Nashua, New Hampshire, U.S.A.)
ANTENNA: NOV_WAAS_600 NONE S/N=UNKNOWN
XYZ 1490299.3919 -4448982.8359 4306010.1266 MON @ 1997.0000 (M)

```
XYZ        -0.0173        -0.0019         0.0044  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.3930  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.3975  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1720        -0.0189         0.0438  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0917        -0.2737         0.2667  ARP TO L1 PHASE CENTER
XYZ   1490299.3116 -4448983.1285   4306010.4370  L1 PHS CEN @ 2006.9448
XYZ        -0.0001        -0.0001        -0.0000  + XYZ ADJUSTMENTS
XYZ   1490299.3115 -4448983.1286   4306010.4370  NEW L1 PHS CEN @ 2006.9448
XYZ   1490299.2198 -4448982.8549   4306010.1703  NEW ARP @ 2006.9448
XYZ   1490299.2198 -4448982.8549   4306010.1703  NEW MON @ 2006.9448
LLH  42 44  8.59264  288 31 10.47129     39.0662  NEW L1 PHS CEN @ 2006.9448
LLH  42 44  8.59264  288 31 10.47129     38.6732  NEW ARP @ 2006.9448
LLH  42 44  8.59264  288 31 10.47129     38.6732  NEW MON @ 2006.9448

STATION NAME: nhun  a    2 (University of New Hampsh; Town of Durham, New Hamp
 ANTENNA: TRM41249.00     NONE                                 S/N=12475400
XYZ   1521218.6913 -4405922.5110   4339076.4839  MON @ 1997.0000 (M)
XYZ        -0.0174        -0.0019         0.0045  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0714  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0682  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1730        -0.0189         0.0447  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0170        -0.0492         0.0488  ARP TO L1 PHASE CENTER
XYZ   1521218.5353 -4405922.5791   4339076.5775  L1 PHS CEN @ 2006.9448
XYZ         0.0000         0.0000         0.0000  + XYZ ADJUSTMENTS
XYZ   1521218.5353 -4405922.5791   4339076.5775  NEW L1 PHS CEN @ 2006.9448
XYZ   1521218.5183 -4405922.5299   4339076.5287  NEW ARP @ 2006.9448
XYZ   1521218.5183 -4405922.5299   4339076.5287  NEW MON @ 2006.9448
LLH  43  8 33.21317  289  2 53.12702      7.9845  NEW L1 PHS CEN @ 2006.9448
LLH  43  8 33.21317  289  2 53.12702      7.9131  NEW ARP @ 2006.9448
LLH  43  8 33.21317  289  2 53.12702      7.9131  NEW MON @ 2006.9448

STATION NAME: brul  a    6 (Brunswick 1; Brunswick, Maine  USA)
 ANTENNA: ASH700829.3     SNOW                                 S/N=11098
XYZ   1578685.1577 -4324849.9449   4399278.1414  MON @ 1997.0000 (M)
XYZ        -0.0140        -0.0026         0.0043  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0877  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0598  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1392        -0.0259         0.0428  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0217        -0.0594         0.0608  ARP TO L1 PHASE CENTER
XYZ   1578685.0402 -4324850.0301   4399278.2450  L1 PHS CEN @ 2006.9448
XYZ        -0.0001        -0.0000        -0.0000  + XYZ ADJUSTMENTS
XYZ   1578685.0401 -4324850.0302   4399278.2449  NEW L1 PHS CEN @ 2006.9448
XYZ   1578685.0184 -4324849.9708   4399278.1841  NEW ARP @ 2006.9448
XYZ   1578685.0184 -4324849.9708   4399278.1841  NEW MON @ 2006.9448
LLH  43 53 23.34022  290  3 12.32628      2.0021  NEW L1 PHS CEN @ 2006.9448
LLH  43 53 23.34022  290  3 12.32628      1.9144  NEW ARP @ 2006.9448
LLH  43 53 23.34022  290  3 12.32628      1.9144  NEW MON @ 2006.9448

                        REMOTE STATION INFORMATION

STATION NAME: r2_1       1
 ANTENNA: TPSHIPER_GD     NONE                                 S/N=UNKNOWN
XYZ   1546009.9391 -4387189.7138   4349168.2843  MON @ 2006.9447 (M)
NEU         0.0000        -0.0000         1.3260  MON TO ARP (M)
NEU        -0.0000         0.0000         0.1060  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.1012  ARP TO L2 PHASE CENTER (M)
XYZ         0.3209        -0.9107         0.9088  MON TO ARP
XYZ         0.0257        -0.0728         0.0727  ARP TO L1 PHASE CENTER
XYZ   1546010.2857 -4387190.6973   4349169.2658  L1 PHS CEN @ 2006.9448

BASELINE NAME:    zbw1  r2_1
```

```
XYZ        -2.5902        -0.0296         0.1279  + XYZ ADJUSTMENTS
XYZ   1546007.6954  -4387190.7268   4349169.3937  NEW L1 PHS CEN @ 2006.9448
XYZ   1546007.6698  -4387190.6540   4349169.3211  NEW ARP @ 2006.9448
XYZ   1546007.3489  -4387189.7434   4349168.4122  NEW MON @ 2006.9448
LLH  43 16  2.84447  289 24 43.24509    -23.1268  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  2.84447  289 24 43.24509    -23.2328  NEW ARP @ 2006.9448
LLH  43 16  2.84447  289 24 43.24509    -24.5588  NEW MON @ 2006.9448

BASELINE NAME:   nhun  r2_1
XYZ        -2.5924        -0.0460         0.1225  + XYZ ADJUSTMENTS
XYZ   1546007.6932  -4387190.7433   4349169.3883  NEW L1 PHS CEN @ 2006.9448
XYZ   1546007.6676  -4387190.6705   4349169.3157  NEW ARP @ 2006.9448
XYZ   1546007.3467  -4387189.7598   4349168.4068  NEW MON @ 2006.9448
LLH  43 16  2.84402  289 24 43.24475    -23.1198  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  2.84402  289 24 43.24475    -23.2258  NEW ARP @ 2006.9448
LLH  43 16  2.84402  289 24 43.24475    -24.5518  NEW MON @ 2006.9448

BASELINE NAME:   bru1  r2_1
XYZ        -2.5540        -0.0682         0.1782  + XYZ ADJUSTMENTS
XYZ   1546007.7316  -4387190.7655   4349169.4440  NEW L1 PHS CEN @ 2006.9448
XYZ   1546007.7060  -4387190.6927   4349169.3713  NEW ARP @ 2006.9448
XYZ   1546007.3851  -4387189.7820   4349168.4625  NEW MON @ 2006.9448
LLH  43 16  2.84458  289 24 43.24603    -23.0571  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  2.84458  289 24 43.24603    -23.1631  NEW ARP @ 2006.9448
LLH  43 16  2.84458  289 24 43.24603    -24.4891  NEW MON @ 2006.9448
```

G-FILES

```
Axx20061211   61211
B200612111924   612112156 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090001 -557081291   12 -617931115   33 -431582419   30 X3456AR2_1X3456AZBW1
D  1  2 -6598102  1  3  7974414  2  3 -8624153

Axx20061211   61211
B200612111924   612112156 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090002 -247888284   12 -187327701   29 -100918782   26 X3456AR2_1X3456ANHUN
D  1  2 -6646875  1  3  7393912  2  3 -8712726

Axx20061211   61211
B200612111924   612112156 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090003  326776333   14  623398112   41  501097216   35 X3456AR2_1X3456ABRU1
D  1  2 -6944277  1  3  8514764  2  3 -8052812
```

POST-FIT RMS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     12     13     17
zbw1-r2_1|  0.015  0.012    ...  0.015  0.026  0.021    ...  0.025  0.009
              20     23     24     28     30
zbw1-r2_1|  0.013  0.016  0.013  0.018    ...

           OVERALL     02     04     05     09     10     12     13     17
nhun-r2_1|  0.013  0.013    ...  0.011  0.021  0.014    ...  0.022  0.008
              20     23     24     28     30
nhun-r2_1|  0.010  0.015  0.012    ...    ...

           OVERALL     02     04     05     09     10     11     12     13
bru1-r2_1|  0.023  0.020    ...  0.020  0.035  0.029    ...  0.018  0.030
              17     20     23     24     28     30
bru1-r2_1|  0.027  0.015  0.024  0.023  0.025  0.025
```

OBS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     12     13     17
zbw1-r2_1|   1660    267    ...    197     30     69    ...    106    305
```

	20	23	24	28	30				
zbw1-r2_1|	190	137	232	127	...				
	OVERALL	02	04	05	09	10	12	13	17
nhun-r2_1|	1532	266	...	210	39	35	...	115	305
	20	23	24	28	30				
nhun-r2_1|	195	136	231	...	...				
	OVERALL	02	04	05	09	10	11	12	13
bru1-r2_1|	1924	273	...	210	45	68	...	214	103
	17	20	23	24	28	30			
bru1-r2_1|	305	179	126	235	125	41			

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000010756	-0.0000001980	0.0000002078
-0.0000001980	0.0000080244	-0.0000005925
0.0000002078	-0.0000005925	0.0000062244

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000017190	0.0000013816	-0.0000014791
0.0000013816	0.0000061374	-0.0000005348
-0.0000014791	-0.0000005348	0.0000074680

Horizontal network accuracy = 0.00516 meters.
Vertical network accuracy = 0.00536 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
ZBW1	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
ZBW1	-55708.14326	-61793.09482	-43158.24883	2002.00
NHUN	-24788.84298	-18732.76739	-10091.89569	2002.00
BRU1	32677.64314	62339.79951	50109.75194	2002.00

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov
To: Sean Abedi;
CC:
Subject: OPUS solution : R1_1212a.tps 000086880
Date: Friday, March 02, 2007 11:56:36 AM
Attachments:

FILE: R1_1212a.tps 000086880

NGS OPUS SOLUTION REPORT
==========

USER: sabedi@greenintl.com DATE: March 02, 2007
RINEX FILE: r1_1346p.06o TIME: 17:00:04 UTC

SOFTWARE: page5 0612.06 master31.pl START: 2006/12/12 15:04:00
EPHEMERIS: igs14052.eph [precise] STOP: 2006/12/12 17:35:00
NAV FILE: brdc3460.06n OBS USED: 3257 / 3317 : 98%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 22 / 22 : 100%
ARP HEIGHT: 1.245 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9471)

X:	1551750.041(m)	0.035(m)	1551749.316(m)	0.035(m)
Y:	-4378881.252(m)	0.019(m)	-4378879.827(m)	0.019(m)
Z:	4355451.809(m)	0.009(m)	4355451.753(m)	0.009(m)

LAT:	43 20 42.59139	0.026(m)	43 20 42.62533	0.026(m)
E LON:	289 30 46.32488	0.027(m)	289 30 46.31567	0.027(m)
W LON:	70 29 13.67512	0.027(m)	70 29 13.68433	0.027(m)
EL HGT:	-23.006(m)	0.015(m)	-24.197(m)	0.015(m)
ORTHO HGT:	3.336(m)	0.029(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4800219.674	56909.571

Easting (X) [meters]	379466.224	874016.552
Convergence [degrees]	-1.02087776	-0.21996599
Point Scale	0.99977871	0.99997497
Combined Factor	0.99978232	0.99997858

US NATIONAL GRID DESIGNATOR: 19TCJ7946600220(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	99761.1
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	43949.8
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	74602.4

NEAREST NGS PUBLISHED CONTROL POINT

OC2022	BOOTHBEY 1851	N432053.774	W0702947.888	843.5

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1760	-0.0189	0.0438	VEL TIMES 9.9459 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9389	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9471
XYZ	-0.0000	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9389	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9471
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW ARP @ 2006.9471
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW MON @ 2006.9471
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9471
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9471
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW MON @ 2006.9471

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp

ANTENNA: TRM41249.00 NONE S/N=12475400

XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1731 -0.0189 0.0448 VEL TIMES 9.9459 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5352 -4405922.5791 4339076.5775 L1 PHS CEN @ 2006.9471
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5352 -4405922.5791 4339076.5775 NEW L1 PHS CEN @ 2006.9471
XYZ 1521218.5182 -4405922.5299 4339076.5287 NEW ARP @ 2006.9471
XYZ 1521218.5182 -4405922.5299 4339076.5287 NEW MON @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9471

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)

ANTENNA: ASH700829.3 SNOW S/N=11098

XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9460 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9471
XYZ -0.0000 -0.0001 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0401 -4324850.0302 4399278.2449 NEW L1 PHS CEN @ 2006.9471
XYZ 1578685.0184 -4324849.9708 4399278.1841 NEW ARP @ 2006.9471
XYZ 1578685.0184 -4324849.9708 4399278.1841 NEW MON @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9471

REMOTE STATION INFORMATION

```
STATION NAME: r1_1       1
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1551752.3595 -4378881.8200  4355452.1894  MON @ 2006.9469 (M)
NEU        0.0000      -0.0000       1.2450  MON TO ARP (M)
NEU       -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU       -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ        0.3024      -0.8534       0.8546  MON TO ARP
XYZ        0.0257      -0.0727       0.0728  ARP TO L1 PHASE CENTER
XYZ  1551752.6877 -4378882.7461  4355453.1167  L1 PHS CEN @ 2006.9471

BASELINE NAME:   barn  r1_1
XYZ       -3.0607       2.0034      -0.4325  + XYZ ADJUSTMENTS
XYZ  1551749.6269 -4378880.7427  4355452.6842  NEW L1 PHS CEN @ 2006.9471
XYZ  1551749.6012 -4378880.6700  4355452.6115  NEW ARP @ 2006.9471
XYZ  1551749.2988 -4378879.8166  4355451.7569  NEW MON @ 2006.9471
LLH  43 20 42.62576  289 30 46.31510    -22.8549  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 42.62576  289 30 46.31510    -22.9609  NEW ARP @ 2006.9471
LLH  43 20 42.62576  289 30 46.31510    -24.2059  NEW MON @ 2006.9471

BASELINE NAME:   nhun  r1_1
XYZ       -3.0451       1.9908      -0.4360  + XYZ ADJUSTMENTS
XYZ  1551749.6426 -4378880.7552  4355452.6807  NEW L1 PHS CEN @ 2006.9471
XYZ  1551749.6169 -4378880.6826  4355452.6079  NEW ARP @ 2006.9471
XYZ  1551749.3144 -4378879.8292  4355451.7534  NEW MON @ 2006.9471
LLH  43 20 42.62530  289 30 46.31557    -22.8449  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 42.62530  289 30 46.31557    -22.9509  NEW ARP @ 2006.9471
LLH  43 20 42.62530  289 30 46.31557    -24.1959  NEW MON @ 2006.9471

BASELINE NAME:   bru1  r1_1
XYZ       -3.0254       1.9849      -0.4410  + XYZ ADJUSTMENTS
XYZ  1551749.6623 -4378880.7612  4355452.6757  NEW L1 PHS CEN @ 2006.9471
XYZ  1551749.6365 -4378880.6885  4355452.6029  NEW ARP @ 2006.9471
XYZ  1551749.3341 -4378879.8351  4355451.7484  NEW MON @ 2006.9471
LLH  43 20 42.62491  289 30 46.31631    -22.8395  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 42.62491  289 30 46.31631    -22.9455  NEW ARP @ 2006.9471
LLH  43 20 42.62491  289 30 46.31631    -24.1905  NEW MON @ 2006.9471

                    G-FILES

Axx20061212   61212
B2006121215 3   612121734 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3 2IFDDFX
Iant_info.003       NGS   20070226
```

C00090001 -701543770 14 367719410 31 606503636 29
X3466AR1_1X3466ABARN
D 1 2 -7808650 1 3 6961532 2 3 -9331243

Axx20061212 61212
B2006121215 3 612121734 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -305307962 16 -270427007 42 -163752247 39
X3466AR1_1X3466ANHUN
D 1 2 -6836296 1 3 7244139 2 3 -9413602

Axx20061212 61212
B2006121215 3 612121734 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090003 269356843 18 540298643 61 438264357 51
X3466AR1_1X3466ABRU1
D 1 2 -7780598 1 3 8557269 2 3 -9240780

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 17 19 20 27 28
barn-r1_1| 0.011 ... ... 0.009 0.016 0.010 0.018 0.011 0.011

OVERALL 03 08 11 13 17 19 20 27
nhun-r1_1| 0.014 ... ... 0.011 ... 0.020 0.011 0.023 0.012
28
nhun-r1_1| ...

OVERALL 03 08 11 17 19 20 27 28
bru1-r1_1| 0.019 ... ... 0.020 0.025 0.020 0.026 0.017 0.017

OBS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 17 19 20 27 28
barn-r1_1| 1192 ... ... 299 150 136 28 279 300
OVERALL 03 08 11 13 17 19 20 27
nhun-r1_1| 884 ... ... 301 ... 132 139 29 283
28
nhun-r1_1| ...
OVERALL 03 08 11 17 19 20 27 28
bru1-r1_1| 1181 ... ... 301 141 140 27 280 292

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000017244	-0.0000003672	0.0000003378
-0.0000003672	0.0000143244	-0.0000011679
0.0000003378	-0.0000011679	0.0000110289

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000028990	0.0000024658	-0.0000027349
0.0000024658	0.0000108099	-0.0000009801
-0.0000027349	-0.0000009801	0.0000133689

Horizontal network accuracy = 0.00684 meters.
Vertical network accuracy = 0.00717 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-70154.39249	36771.96275	60650.36222	2002.00
NHUN	-30530.79898	-27042.70339	-16375.22069	2002.00
BRU1	26935.68714	54029.86351	43826.42694	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.21996599
Point Scale	0.99997497
Combined Factor	0.99997858

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1212b.tps 000086885

Date: Friday, March 02, 2007 11:58:43 AM

Attachments:

FILE: R2_1212b.tps 000086885

NGS OPUS SOLUTION REPORT
==========

USER: sabedi@greenintl.com DATE: March 02, 2007
RINEX FILE: r2_1346s.06o TIME: 17:02:13 UTC

SOFTWARE: page5 0612.06 master29.pl START: 2006/12/12 18:39:00
EPHEMERIS: igs14052.eph [precise] STOP: 2006/12/12 21:11:00
NAV FILE: brdc3460.06n OBS USED: 1859 / 4562 : 41%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 15 / 19 : 79%
ARP HEIGHT: 1.246 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9475)

X:	1547843.609(m)	0.216(m)	1547842.884(m)	0.216(m)
Y:	-4377462.876(m)	0.174(m)	-4377461.451(m)	0.174(m)
Z:	4358262.031(m)	0.058(m)	4358261.975(m)	0.058(m)
LAT:	43 22 47.54484	0.141(m)	43 22 47.57880	0.141(m)
E LON:	289 28 23.79793	0.174(m)	289 28 23.78867	0.174(m)
W LON:	70 31 36.20207	0.174(m)	70 31 36.21133	0.174(m)
EL HGT:	-13.272(m)	0.144(m)	-14.463(m)	0.144(m)
ORTHO HGT:	13.128(m)	0.146(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4804132.351	60778.728

Easting (X) [meters]	376327.839	870823.149
Convergence [degrees]	-1.04873496	-0.24729990
Point Scale	0.99978814	0.99997713
Combined Factor	0.99979022	0.99997922

US NATIONAL GRID DESIGNATOR: 19TCJ7632804132(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	94784.6
DI0876	ACU5 ACUSHNET 5 CORS ARP	N414436.796	W0705313.027	184153.5
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	73495.2

NEAREST NGS PUBLISHED CONTROL POINT

OC0380	W 5	N432300.	W0703142.	406.6

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9464 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9389	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9475
XYZ	0.0000	0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9389	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9475
XYZ	1481594.9218	-4342107.8756	4416102.1205	NEW ARP @ 2006.9475
XYZ	1481594.9218	-4342107.8756	4416102.1205	NEW MON @ 2006.9475
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9475
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9475
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW MON @ 2006.9475

STATION NAME: acu5 a 2 (ACUSHNET 5; Acushnet, Massachusetts USA)
ANTENNA: TRM41249USCG SCIT S/N=60052145
XYZ 1560550.6359 -4503284.5346 4224398.0248 MON @ 1997.0000 (M)
XYZ -0.0170 -0.0019 0.0046 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0813 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0689 ARP TO L2 PHASE CENTER (M)
XYZ -0.1691 -0.0189 0.0458 VEL TIMES 9.9464 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0199 -0.0573 0.0541 ARP TO L1 PHASE CENTER
XYZ 1560550.4867 -4503284.6108 4224398.1247 L1 PHS CEN @ 2006.9475
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1560550.4867 -4503284.6108 4224398.1247 NEW L1 PHS CEN @ 2006.9475
XYZ 1560550.4668 -4503284.5535 4224398.0706 NEW ARP @ 2006.9475
XYZ 1560550.4668 -4503284.5535 4224398.0706 NEW MON @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.3219 NEW L1 PHS CEN @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.2406 NEW ARP @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.2406 NEW MON @ 2006.9475

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9464 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9475
XYZ -0.0000 -0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0401 -4324850.0301 4399278.2450 NEW L1 PHS CEN @ 2006.9475
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW ARP @ 2006.9475
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW MON @ 2006.9475
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9475
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9475
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9475

REMOTE STATION INFORMATION

STATION NAME: r2_1 1

ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1547885.8083 -4377512.4183 4358263.7705 MON @ 2006.9473 (M)
NEU 0.0000 -0.0000 1.2460 MON TO ARP (M)
NEU -0.0000 -0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3019 -0.8538 0.8558 MON TO ARP
XYZ 0.0257 -0.0726 0.0728 ARP TO L1 PHASE CENTER
XYZ 1547886.1359 -4377513.3447 4358264.6991 L1 PHS CEN @ 2006.9475

BASELINE NAME: barn r2_1
XYZ -43.0486 50.9722 -1.7623 + XYZ ADJUSTMENTS
XYZ 1547843.0873 -4377462.3726 4358262.9368 NEW L1 PHS CEN @ 2006.9475
XYZ 1547843.0617 -4377462.3000 4358262.8640 NEW ARP @ 2006.9475
XYZ 1547842.7597 -4377461.4461 4358262.0082 NEW MON @ 2006.9475
LLH 43 22 47.58060 289 28 23.78354 -13.1214 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 47.58060 289 28 23.78354 -13.2274 NEW ARP @ 2006.9475
LLH 43 22 47.58060 289 28 23.78354 -14.4734 NEW MON @ 2006.9475

BASELINE NAME: acu5 r2_1
XYZ -42.8919 51.0509 -1.8198 + XYZ ADJUSTMENTS
XYZ 1547843.2440 -4377462.2938 4358262.8793 NEW L1 PHS CEN @ 2006.9475
XYZ 1547843.2183 -4377462.2212 4358262.8065 NEW ARP @ 2006.9475
XYZ 1547842.9164 -4377461.3674 4358261.9507 NEW MON @ 2006.9475
LLH 43 22 47.57974 289 28 23.79127 -13.1768 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 47.57974 289 28 23.79127 -13.2828 NEW ARP @ 2006.9475
LLH 43 22 47.57974 289 28 23.79127 -14.5288 NEW MON @ 2006.9475

BASELINE NAME: bru1 r2_1
XYZ -42.8324 50.8774 -1.8037 + XYZ ADJUSTMENTS
XYZ 1547843.3035 -4377462.4673 4358262.8954 NEW L1 PHS CEN @ 2006.9475
XYZ 1547843.2778 -4377462.3947 4358262.8226 NEW ARP @ 2006.9475
XYZ 1547842.9759 -4377461.5409 4358261.9668 NEW MON @ 2006.9475
LLH 43 22 47.57604 289 28 23.79119 -13.0325 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 47.57604 289 28 23.79119 -13.1385 NEW ARP @ 2006.9475
LLH 43 22 47.57604 289 28 23.79119 -14.3845 NEW MON @ 2006.9475

G-FILES

Axx20061212 61212
B200612121839 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226

C00090001 -662478380 36 353535705 123 578401123 67
X3466AR2_1X3466ABARN
D 1 2 -9218083 1 3 5788282 2 3 -7472147

Axx20061212 61212
B200612121839 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 127075504 69-1258231861 316-1338638801 101
X3466AR2_1X3466AACU5
D 1 2 -9585252 1 3 9630808 2 3 -9486498

Axx20061212 61212
B200612121839 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 308420425 62 526115701 320 410162173 144
X3466AR2_1X3466ABRU1
D 1 2 -9498947 1 3 9723016 2 3 -9738642

POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	02	04	05	09	11	12	13	17
barn-r2_1	0.015	0.014	...	...	0.022	...	...	...	0.008
	20	23	24	28					
barn-r2_1	...	...	0.015	0.011					

	OVERALL	02	04	05	09	11	12	13	17
acu5-r2_1	0.013	0.013	...	...	0.017	...	...	...	0.011
	20	23	24	28					
acu5-r2_1	...	...	0.015	0.011					

	OVERALL	02	04	05	09	11	12	13	17
bru1-r2_1	0.020	0.021	...	...	0.022	...	...	...	0.024
	20	23	24	28					
bru1-r2_1	...	...	0.020	0.016					

OBS BY SATELLITE VS. BASELINE

	OVERALL	02	04	05	09	11	12	13	17
barn-r2_1	650	171	...	...	113	...	...	...	54
	20	23	24	28					

```
barn-r2_1|  ...  ...  134  178
       OVERALL   02   04   05   09   11   12   13   17
acu5-r2_1|  625  193  ...  ...   66  ...  ...  ...   54
         20   23   24   28
acu5-r2_1|  ...  ...  134  178
       OVERALL   02   04   05   09   11   12   13   17
bru1-r2_1|  584  163  ...  ...  100  ...  ...  ...   44
         20   23   24   28
bru1-r2_1|  ...  ...  108  169
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000220022  -0.0000097394   0.0000037308
-0.0000097394   0.0004830778  -0.0000180690
 0.0000037308  -0.0000180690   0.0000787244
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000671211   0.0000921672  -0.0001018520
 0.0000921672   0.0002287445  -0.0001781025
-0.0001018520  -0.0001781025   0.0002879388
```

Horizontal network accuracy = 0.03262 meters.
Vertical network accuracy = 0.03327 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

ACU5	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-66247.96049	35353.58675	57840.14022	2002.00
ACU5	12707.57744	-125823.11983	-133863.88795	2002.00
BRU1	30842.11914	52611.48751	41016.20494	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.24729990
Point Scale	0.99997713
Combined Factor	0.99997922

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1214a.tps 000087005

Date: Friday, March 02, 2007 1:44:51 PM

Attachments:

FILE: R2_1214a.tps 000087005

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1348o.06o TIME: 18:37:56 UTC

SOFTWARE: page5 0612.06 master4.pl START: 2006/12/14 14:40:00
EPHEMERIS: igs14054.eph [precise] STOP: 2006/12/14 17:31:00
NAV FILE: brdc3480.06n OBS USED: 3912 / 4222 : 93%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 28 / 28 : 100%
ARP HEIGHT: 1.43 OVERALL RMS: 0.018(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9525)

X:	1554989.742(m)	0.029(m)	1554989.017(m)	0.029(m)
Y:	-4375602.728(m)	0.030(m)	-4375601.303(m)	0.030(m)
Z:	4357575.069(m)	0.031(m)	4357575.013(m)	0.031(m)

LAT:	43 22 17.24763	0.020(m)	43 22 17.28159	0.020(m)
E LON:	289 33 50.60390	0.026(m)	289 33 50.59475	0.026(m)
W LON:	70 26 9.39610	0.026(m)	70 26 9.40525	0.026(m)
EL HGT:	-23.959(m)	0.039(m)	-25.150(m)	0.039(m)
ORTHO HGT:	2.319(m)	0.046(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4803067.089	59816.004

Easting (X) [meters]	383665.428	878176.372
Convergence [degrees]	-0.98620916	-0.18491989
Point Scale	0.99976648	0.99997252
Combined Factor	0.99977023	0.99997628

US NATIONAL GRID DESIGNATOR: 19TCJ8366503067(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	99669.1
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	49010.4
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	69830.9

NEAREST NGS PUBLISHED CONTROL POINT

OC2015	CAPE PORPOISE CHURCH SPIRE	N432217.983	W0702616.734	166.5

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9514 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9388	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9525
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9388	-4342107.9259	4416102.1719	NEW L1 PHS CEN @ 2006.9525
XYZ	1481594.9216	-4342107.8756	4416102.1204	NEW ARP @ 2006.9525
XYZ	1481594.9216	-4342107.8756	4416102.1204	NEW MON @ 2006.9525
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9525
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9525

LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW MON @ 2006.9525

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1732 -0.0189 0.0448 VEL TIMES 9.9514 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5351 -4405922.5792 4339076.5775 L1 PHS CEN @ 2006.9525
XYZ -0.0000 0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5351 -4405922.5791 4339076.5775 NEW L1 PHS CEN @ 2006.9525
XYZ 1521218.5181 -4405922.5299 4339076.5287 NEW ARP @ 2006.9525
XYZ 1521218.5181 -4405922.5299 4339076.5287 NEW MON @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9525

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1393 -0.0259 0.0428 VEL TIMES 9.9514 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9525
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9525
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW ARP @ 2006.9525
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW MON @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9525

REMOTE STATION INFORMATION

STATION NAME: r2_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1554992.2059 -4375601.9109 4357575.6004 MON @ 2006.9524 (M)
NEU 0.0000 0.0000 1.4300 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3481 -0.9795 0.9820 MON TO ARP
XYZ 0.0258 -0.0726 0.0728 ARP TO L1 PHASE CENTER
XYZ 1554992.5798 -4375602.9630 4357576.6552 L1 PHS CEN @ 2006.9525

BASELINE NAME: barn r2_1
XYZ -3.1992 0.6008 -0.5717 + XYZ ADJUSTMENTS
XYZ 1554989.3806 -4375602.3622 4357576.0836 NEW L1 PHS CEN @ 2006.9525
XYZ 1554989.3548 -4375602.2895 4357576.0108 NEW ARP @ 2006.9525
XYZ 1554989.0067 -4375601.3101 4357575.0287 NEW MON @ 2006.9525
LLH 43 22 17.28189 289 33 50.59421 -23.6008 NEW L1 PHS CEN @ 2006.9525
LLH 43 22 17.28189 289 33 50.59421 -23.7068 NEW ARP @ 2006.9525
LLH 43 22 17.28189 289 33 50.59421 -25.1368 NEW MON @ 2006.9525

BASELINE NAME: nhun r2_1
XYZ -3.1965 0.6269 -0.6030 + XYZ ADJUSTMENTS
XYZ 1554989.3833 -4375602.3361 4357576.0522 NEW L1 PHS CEN @ 2006.9525
XYZ 1554989.3575 -4375602.2635 4357575.9794 NEW ARP @ 2006.9525
XYZ 1554989.0094 -4375601.2840 4357574.9974 NEW MON @ 2006.9525
LLH 43 22 17.28168 289 33 50.59472 -23.6395 NEW L1 PHS CEN @ 2006.9525
LLH 43 22 17.28168 289 33 50.59472 -23.7455 NEW ARP @ 2006.9525
LLH 43 22 17.28168 289 33 50.59472 -25.1755 NEW MON @ 2006.9525

BASELINE NAME: bru1 r2_1
XYZ -3.1707 0.5971 -0.5865 + XYZ ADJUSTMENTS
XYZ 1554989.4090 -4375602.3659 4357576.0687 NEW L1 PHS CEN @ 2006.9525
XYZ 1554989.3832 -4375602.2933 4357575.9959 NEW ARP @ 2006.9525
XYZ 1554989.0352 -4375601.3138 4357575.0139 NEW MON @ 2006.9525
LLH 43 22 17.28125 289 33 50.59535 -23.6015 NEW L1 PHS CEN @ 2006.9525
LLH 43 22 17.28125 289 33 50.59535 -23.7075 NEW ARP @ 2006.9525
LLH 43 22 17.28125 289 33 50.59535 -25.1375 NEW MON @ 2006.9525

G-FILES

Axx20061214 61214
B200612141440 612141730 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3

2IFDDFX
Iant_info.003 NGS 20070226
C00090001 -733940850 17 334934344 32 585270917 30
X3486AR2_1X3486ABARN
D 1 2 -8418752 1 3 6704114 2 3 -9223959

Axx20061214 61214
B200612141440 612141730 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -337704913 16 -303212459 53 -184984687 45
X3486AR2_1X3486ANHUN
D 1 2 -7099997 1 3 7592736 2 3 -9594944

Axx20061214 61214
B200612141440 612141730 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 236959832 18 507513430 47 417031702 43
X3486AR2_1X3486ABRU1
D 1 2 -7572454 1 3 8023241 2 3 -9063777

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 17 19 20 27
barn-r2_1| 0.015 0.020 ... 0.012 0.018 0.017 0.017 0.023 0.014
28
barn-r2_1| 0.011

OVERALL 03 08 11 13 17 19 20 27
nhun-r2_1| 0.016 0.016 ... 0.014 0.022 0.020 0.016 ... 0.015
28
nhun-r2_1| ...

OVERALL 03 08 11 13 17 19 20 27
bru1-r2_1| 0.022 0.024 ... 0.023 0.026 0.024 0.022 0.034 0.017
28
bru1-r2_1| 0.017

OBS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 17 19 20 27

```
barn-r2_1|  1391   116   ...   337    25   160   251    36   296
          28
barn-r2_1|   170
        OVERALL    03    08    11    13    17    19    20    27
nhun-r2_1|  1122    85   ...   324    21   153   232   ...   307
          28
nhun-r2_1|   ...
        OVERALL    03    08    11    13    17    19    20    27
bru1-r2_1|  1399   119   ...   337    21   157   246    41   308
          28
bru1-r2_1|   170
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000019311   -0.0000003779    0.0000003355
 -0.0000003779    0.0000134267   -0.0000011124
  0.0000003355   -0.0000011124    0.0000106089
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000029816    0.0000022403   -0.0000024698
  0.0000022403    0.0000102783   -0.0000008081
 -0.0000024698   -0.0000008081    0.0000127068
```

Horizontal network accuracy = 0.00669 meters.
Vertical network accuracy = 0.00699 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-73394.09349	33493.43875	58527.10222	2002.00
NHUN	-33770.49998	-30321.22739	-18498.48069	2002.00
BRU1	23695.98614	50751.33951	41703.16694	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.18491989
Point Scale	0.99997252
Combined Factor	0.99997628

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov
To: Sean Abedi;
CC:
Subject: OPUS solution : R2_1214b.tps 000087009
Date: Friday, March 02, 2007 1:46:10 PM
Attachments:

FILE: R2_1214b.tps 000087009

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1348r.06o TIME: 18:39:14 UTC

SOFTWARE: page5 0612.06 master3.pl START: 2006/12/14 17:48:00
EPHEMERIS: igs14054.eph [precise] STOP: 2006/12/14 20:18:00
NAV FILE: brdc3480.06n OBS USED: 3994 / 4259 : 94%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 33 / 35 : 94%
ARP HEIGHT: 1.2705 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9529)

X:	1553114.613(m)	0.038(m)	1553113.888(m)	0.038(m)
Y:	-4378574.627(m)	0.134(m)	-4378573.202(m)	0.134(m)
Z:	4355278.613(m)	0.087(m)	4355278.557(m)	0.087(m)
LAT:	43 20 34.79604	0.032(m)	43 20 34.82998	0.032(m)
E LON:	289 31 47.97604	0.013(m)	289 31 47.96685	0.013(m)
W LON:	70 28 12.02396	0.013(m)	70 28 12.03315	0.013(m)
EL HGT:	-20.445(m)	0.161(m)	-21.636(m)	0.161(m)
ORTHO HGT:	5.877(m)	0.163(m) [Geoid03 NAVD88]		

	UTM COORDINATES (UTM (Zone 19))	STATE PLANE COORDINATES (SPC (1802 ME W))
Northing (Y) [meters]	4799954.602	56663.819

Easting (X) [meters]	380850.034	875404.206
Convergence [degrees]	-1.00907849	-0.20820279
Point Scale	0.99977463	0.99997411
Combined Factor	0.99977784	0.99997731

US NATIONAL GRID DESIGNATOR: 19TCH8085099955(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	100718.3
DI0876	ACU5 ACUSHNET 5 CORS ARP	N414436.796	W0705313.027	180936.2
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	74000.3

NEAREST NGS PUBLISHED CONTROL POINT

OC2010	BREAKWATER COURT CUPOLA	N432050.647	W0702819.257	516.5

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9517 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9388	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9529
XYZ	0.0000	-0.0001	-0.0001	+ XYZ ADJUSTMENTS
XYZ	1481594.9389	-4342107.9260	4416102.1719	NEW L1 PHS CEN @ 2006.9529
XYZ	1481594.9217	-4342107.8757	4416102.1204	NEW ARP @ 2006.9529
XYZ	1481594.9217	-4342107.8757	4416102.1204	NEW MON @ 2006.9529
LLH	44 5 56.71848	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9529

LLH 44 5 56.71848 288 50 25.58927 139.6279 NEW ARP @ 2006.9529
LLH 44 5 56.71848 288 50 25.58927 139.6279 NEW MON @ 2006.9529

STATION NAME: acu5 a 2 (ACUSHNET 5; Acushnet, Massachusetts USA)
ANTENNA: TRM41249USCG SCIT S/N=60052145
XYZ 1560550.6359 -4503284.5346 4224398.0248 MON @ 1997.0000 (M)
XYZ -0.0170 -0.0019 0.0046 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0813 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0689 ARP TO L2 PHASE CENTER (M)
XYZ -0.1692 -0.0189 0.0458 VEL TIMES 9.9517 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0199 -0.0573 0.0541 ARP TO L1 PHASE CENTER
XYZ 1560550.4866 -4503284.6108 4224398.1247 L1 PHS CEN @ 2006.9529
XYZ -0.0001 -0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1560550.4865 -4503284.6108 4224398.1247 NEW L1 PHS CEN @ 2006.9529
XYZ 1560550.4666 -4503284.5535 4224398.0706 NEW ARP @ 2006.9529
XYZ 1560550.4666 -4503284.5535 4224398.0706 NEW MON @ 2006.9529
LLH 41 44 36.82970 289 6 46.96365 5.3219 NEW L1 PHS CEN @ 2006.9529
LLH 41 44 36.82970 289 6 46.96365 5.2406 NEW ARP @ 2006.9529
LLH 41 44 36.82970 289 6 46.96365 5.2406 NEW MON @ 2006.9529

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1393 -0.0259 0.0428 VEL TIMES 9.9517 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0400 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9529
XYZ 0.0001 -0.0000 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0402 -4324850.0302 4399278.2449 NEW L1 PHS CEN @ 2006.9529
XYZ 1578685.0185 -4324849.9708 4399278.1841 NEW ARP @ 2006.9529
XYZ 1578685.0185 -4324849.9708 4399278.1841 NEW MON @ 2006.9529
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9529
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9529
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9529

REMOTE STATION INFORMATION

STATION NAME: r2_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1553114.3596 -4378574.1432 4355279.2906 MON @ 2006.9527 (M)
NEU 0.0000 -0.0000 1.2705 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3089 -0.8708 0.8720 MON TO ARP
XYZ 0.0258 -0.0727 0.0728 ARP TO L1 PHASE CENTER
XYZ 1553114.6943 -4378575.0867 4355280.2354 L1 PHS CEN @ 2006.9529

BASELINE NAME: barn r2_1
XYZ -0.4876 0.9930 -0.7632 + XYZ ADJUSTMENTS
XYZ 1553114.2066 -4378574.0937 4355279.4722 NEW L1 PHS CEN @ 2006.9529
XYZ 1553114.1808 -4378574.0210 4355279.3994 NEW ARP @ 2006.9529
XYZ 1553113.8720 -4378573.1502 4355278.5274 NEW MON @ 2006.9529
LLH 43 20 34.83049 289 31 47.96695 -20.3193 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.83049 289 31 47.96695 -20.4253 NEW ARP @ 2006.9529
LLH 43 20 34.83049 289 31 47.96695 -21.6958 NEW MON @ 2006.9529

BASELINE NAME: acu5 r2_1
XYZ -0.4768 0.9726 -0.7602 + XYZ ADJUSTMENTS
XYZ 1553114.2174 -4378574.1141 4355279.4751 NEW L1 PHS CEN @ 2006.9529
XYZ 1553114.1917 -4378574.0414 4355279.4024 NEW ARP @ 2006.9529
XYZ 1553113.8828 -4378573.1706 4355278.5304 NEW MON @ 2006.9529
LLH 43 20 34.83005 289 31 47.96710 -20.3006 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.83005 289 31 47.96710 -20.4066 NEW ARP @ 2006.9529
LLH 43 20 34.83005 289 31 47.96710 -21.6771 NEW MON @ 2006.9529

BASELINE NAME: bru1 r2_1
XYZ -0.4500 0.8591 -0.6761 + XYZ ADJUSTMENTS
XYZ 1553114.2442 -4378574.2275 4355279.5593 NEW L1 PHS CEN @ 2006.9529
XYZ 1553114.2185 -4378574.1549 4355279.4865 NEW ARP @ 2006.9529
XYZ 1553113.9096 -4378573.2841 4355278.6145 NEW MON @ 2006.9529
LLH 43 20 34.82945 289 31 47.96654 -20.1586 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.82945 289 31 47.96654 -20.2646 NEW ARP @ 2006.9529
LLH 43 20 34.82945 289 31 47.96654 -21.5351 NEW MON @ 2006.9529

G-FILES

Axx20061214 61214
B200612141748 612142017 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3

```
2IFDDFX
Iant_info.003       NGS   20070226
C00090001 -715189503   17  364652745   33  608235930   34
X3486AR2_1X3486ABARN
D  1  2 -8650639  1  3  6316424  2  3 -8738105

Axx20061214   61214
B200612141748   612142017 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090002   74365838   16-1247113829   37-1308804597   29
X3486AR2_1X3486AACU5
D  1  2 -9156880  1  3  8267106  2  3 -8345625

Axx20061214   61214
B200612141748   612142017 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090003  255711089   24  537233133   53  439995696   44
X3486AR2_1X3486ABRU1
D  1  2 -8500240  1  3  8811096  2  3 -8406922

            POST-FIT RMS BY SATELLITE VS. BASELINE

       OVERALL    02    04    05    08    09    11    12    17
barn-r2_1| 0.014  0.015  0.012  0.020  0.016  0.019  0.013  0.013    ...
          20    24    28
barn-r2_1| 0.013  0.020  0.011

       OVERALL    02    04    05    08    09    11    12    17
acu5-r2_1| 0.013  0.016  0.011    ...  0.019  0.022  0.013  0.020    ...
          20    24    28
acu5-r2_1| 0.011  0.019  0.011

       OVERALL    02    04    05    08    09    11    12    17
bru1-r2_1| 0.023  0.032  0.022  0.026  0.015  0.026  0.019  0.016    ...
          20    24    28
bru1-r2_1| 0.023  0.028  0.019

                OBS BY SATELLITE VS. BASELINE

       OVERALL    02    04    05    08    09    11    12    17
```

```
barn-r2_1|  1357   103   292    36    28   133   130    23   ...
          20    24    28
barn-r2_1|   294    50   268
        OVERALL    02    04    05    08    09    11    12    17
acu5-r2_1|  1269   103   294   ...    31    43   130    30   ...
          20    24    28
acu5-r2_1|   298    52   288
        OVERALL    02    04    05    08    09    11    12    17
bru1-r2_1|  1368    99   291    36    28   133   123    47   ...
          20    24    28
bru1-r2_1|   298    30   283
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000024911   -0.0000004686    0.0000003731
-0.0000004686    0.0000117044   -0.0000008525
 0.0000003731   -0.0000008525    0.0000087400
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000032255    0.0000017851   -0.0000018067
 0.0000017851    0.0000088568   -0.0000010528
-0.0000018067   -0.0000010528    0.0000108532
```

Horizontal network accuracy = 0.00629 meters.
Vertical network accuracy = 0.00646 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
ACU5	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-71518.96449	36465.33775	60823.55822	2002.00
ACU5	7436.57344	-124711.36883	-130880.46995	2002.00
BRU1	25571.11514	53723.23851	43999.62294	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.20820279
Point Scale	0.99997411
Combined Factor	0.99997731

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1219a.tps 000087039

Date: Friday, March 02, 2007 2:03:45 PM

Attachments:

FILE: R1_1219a.tps 000087039

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1353n.06o TIME: 18:56:48 UTC

SOFTWARE: page5 0612.06 master2.pl START: 2006/12/19 13:55:00
EPHEMERIS: igs14062.eph [precise] STOP: 2006/12/19 16:27:00
NAV FILE: brdc3530.06n OBS USED: 4088 / 4162 : 98%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 23 / 23 : 100%
ARP HEIGHT: 1.37 OVERALL RMS: 0.015(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9661)

X:	1555841.865(m)	0.032(m)	1555841.139(m)	0.032(m)
Y:	-4363724.251(m)	0.019(m)	-4363722.827(m)	0.019(m)
Z:	4369092.526(m)	0.051(m)	4369092.472(m)	0.051(m)

LAT:	43 30 51.18827	0.032(m)	43 30 51.22236	0.032(m)
E LON:	289 37 23.44797	0.036(m)	289 37 23.43882	0.036(m)
W LON:	70 22 36.55203	0.036(m)	70 22 36.56118	0.036(m)
EL HGT:	-21.821(m)	0.043(m)	-23.007(m)	0.043(m)
ORTHO HGT:	4.379(m)	0.050(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4818841.218	75662.689

Easting (X) [meters]	388717.462	883008.049
Convergence [degrees]	-0.94808516	-0.14469818
Point Scale	0.99975233	0.99997022
Combined Factor	0.99975575	0.99997364

US NATIONAL GRID DESIGNATOR: 19TCJ8871718841(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	90496.5
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	62293.6
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	54259.7

NEAREST NGS PUBLISHED CONTROL POINT

OC1918	OLD ORCHARD HOTEL FLAGPOLE HAR	N433057.135	W0702241.098	210.3

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1764	-0.0189	0.0438	VEL TIMES 9.9650 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9661
XYZ	-0.0000	0.0001	0.0001	+ XYZ ADJUSTMENTS
XYZ	1481594.9385	-4342107.9259	4416102.1721	NEW L1 PHS CEN @ 2006.9661
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW ARP @ 2006.9661
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW MON @ 2006.9661
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9661
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9661

LLH 44 5 56.71849 288 50 25.58926 139.6279 NEW MON @ 2006.9661

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1734 -0.0189 0.0448 VEL TIMES 9.9650 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5349 -4405922.5792 4339076.5776 L1 PHS CEN @ 2006.9661
XYZ 0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5349 -4405922.5792 4339076.5776 NEW L1 PHS CEN @ 2006.9661
XYZ 1521218.5179 -4405922.5299 4339076.5287 NEW ARP @ 2006.9661
XYZ 1521218.5179 -4405922.5299 4339076.5287 NEW MON @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9845 NEW L1 PHS CEN @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9131 NEW ARP @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9131 NEW MON @ 2006.9661

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0428 VEL TIMES 9.9650 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2450 L1 PHS CEN @ 2006.9661
XYZ -0.0001 -0.0001 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0398 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9661
XYZ 1578685.0181 -4324849.9709 4399278.1842 NEW ARP @ 2006.9661
XYZ 1578685.0181 -4324849.9709 4399278.1842 NEW MON @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW ARP @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW MON @ 2006.9661

REMOTE STATION INFORMATION

STATION NAME: r1_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1555841.8209 -4363722.8260 4369091.7693 MON @ 2006.9660 (M)
NEU 0.0000 -0.0000 1.3700 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3337 -0.9358 0.9433 MON TO ARP
XYZ 0.0258 -0.0724 0.0730 ARP TO L1 PHASE CENTER
XYZ 1555842.1804 -4363723.8342 4369092.7856 L1 PHS CEN @ 2006.9661

BASELINE NAME: barn r1_1
XYZ -0.6984 -0.0141 0.7366 + XYZ ADJUSTMENTS
XYZ 1555841.4820 -4363723.8484 4369093.5222 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.4562 -4363723.7760 4369093.4492 NEW ARP @ 2006.9661
XYZ 1555841.1225 -4363722.8401 4369092.5059 NEW MON @ 2006.9661
LLH 43 30 51.22301 289 37 23.43793 -21.5032 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.22301 289 37 23.43793 -21.6092 NEW ARP @ 2006.9661
LLH 43 30 51.22301 289 37 23.43793 -22.9792 NEW MON @ 2006.9661

BASELINE NAME: nhun r1_1
XYZ -0.6813 0.0046 0.6861 + XYZ ADJUSTMENTS
XYZ 1555841.4991 -4363723.8297 4369093.4717 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.4733 -4363723.7572 4369093.3987 NEW ARP @ 2006.9661
XYZ 1555841.1396 -4363722.8214 4369092.4554 NEW MON @ 2006.9661
LLH 43 30 51.22208 289 37 23.43893 -21.5466 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.22208 289 37 23.43893 -21.6526 NEW ARP @ 2006.9661
LLH 43 30 51.22208 289 37 23.43893 -23.0226 NEW MON @ 2006.9661

BASELINE NAME: bru1 r1_1
XYZ -0.6667 0.0050 0.6858 + XYZ ADJUSTMENTS
XYZ 1555841.5136 -4363723.8292 4369093.4714 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.4878 -4363723.7568 4369093.3984 NEW ARP @ 2006.9661
XYZ 1555841.1542 -4363722.8210 4369092.4551 NEW MON @ 2006.9661
LLH 43 30 51.22198 289 37 23.43954 -21.5435 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.22198 289 37 23.43954 -21.6495 NEW ARP @ 2006.9661
LLH 43 30 51.22198 289 37 23.43954 -23.0195 NEW MON @ 2006.9661

G-FILES

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D 1 2 -7371237 1 3 5957189 2 3 -9436361

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B200612191355 612191627 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -346226217 12 -421997085 29 -300159266 32
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D 1 2 -7407347 1 3 7839464 2 3 -9067925

Axx20061219 61219
B200612191355 612191627 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 228438640 15 388728501 37 301857291 37
X3536AR1_1X3536ABRU1
D 1 2 -7486371 1 3 8458696 2 3 -9002246

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 16 17 19 27
barn-r1_1| 0.014 0.017 ... 0.012 0.022 ... 0.019 0.013 0.008
28
barn-r1_1| 0.014

OVERALL 03 08 11 13 16 17 19 27
nhun-r1_1| 0.012 0.015 ... ... 0.019 ... 0.015 0.011 0.009
28
nhun-r1_1| 0.010

OVERALL 03 08 11 13 16 17 19 27
bru1-r1_1| 0.018 0.019 ... 0.017 0.022 ... 0.019 0.020 0.013
28
bru1-r1_1| 0.020

OBS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 16 17 19 27

```
barn-r1_1|  1418   179   ...   274    75   ...    68   287   291
          28
barn-r1_1|   244
       OVERALL    03    08    11    13    16    17    19    27
nhun-r1_1|  1177   185   ...   ...    59   ...    71   303   303
          28
nhun-r1_1|   256
       OVERALL    03    08    11    13    16    17    19    27
bru1-r1_1|  1493   188   ...   301    76   ...    68   303   303
          28
bru1-r1_1|   254
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000012556   -0.0000002207    0.0000002324
 -0.0000002207    0.0000070467   -0.0000006754
  0.0000002324   -0.0000006754    0.0000077378
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000017691    0.0000011338   -0.0000012138
  0.0000011338    0.0000064577    0.0000006431
 -0.0000012138    0.0000006431    0.0000078132
```

Horizontal network accuracy = 0.00526 meters.
Vertical network accuracy = 0.00548 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-74246.21649	21614.96175	47009.64522	2002.00
NHUN	-34622.62298	-42199.70439	-30015.93769	2002.00
BRU1	22843.86314	38872.86251	30185.70994	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.14469818
Point Scale	0.99997022
Combined Factor	0.99997364

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1219b.tps 000087041

Date: Friday, March 02, 2007 2:05:13 PM

Attachments:

FILE: R1_1219b.tps 000087041

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1353r.06o TIME: 19:08:44 UTC

SOFTWARE: page5 0612.06 master30.pl START: 2006/12/19 17:13:00
EPHEMERIS: igs14062.eph [precise] STOP: 2006/12/19 19:44:00
NAV FILE: brdc3530.06n OBS USED: 3743 / 3926 : 95%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 27 / 27 : 100%
ARP HEIGHT: 1.22 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9665)

X:	1554699.872(m)	0.048(m)	1554699.146(m)	0.048(m)
Y:	-4362517.052(m)	0.013(m)	-4362515.629(m)	0.013(m)
Z:	4370725.742(m)	0.021(m)	4370725.688(m)	0.021(m)

LAT:	43 32 3.48996	0.013(m)	43 32 3.52405	0.013(m)
E LON:	289 36 53.59671	0.049(m)	289 36 53.58753	0.049(m)
W LON:	70 23 6.40329	0.049(m)	70 23 6.41247	0.049(m)
EL HGT:	0.383(m)	0.017(m)	-0.803(m)	0.017(m)
ORTHO HGT:	26.605(m)	0.030(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4821082.855	77895.712

Easting (X) [meters]	388084.388	882343.456
Convergence [degrees]	-0.95414828	-0.15046309
Point Scale	0.99975406	0.99997050
Combined Factor	0.99975400	0.99997044

US NATIONAL GRID DESIGNATOR: 19TCJ8808421083(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	88429.2
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	53002.5
AH8904	PNB1 PENOBSCOT 1 CORS ARP	N442706.177	W0684620.162	164698.5

NEAREST NGS PUBLISHED CONTROL POINT

OC0073	C 162	N433116.	W0702212.	1909.0

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1764	-0.0189	0.0438	VEL TIMES 9.9654 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9665
XYZ	0.0000	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9386	-4342107.9259	4416102.1721	NEW L1 PHS CEN @ 2006.9665
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW ARP @ 2006.9665
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW MON @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW MON @ 2006.9665

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0429 VEL TIMES 9.9654 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2451 L1 PHS CEN @ 2006.9665
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0398 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9665
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW ARP @ 2006.9665
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW MON @ 2006.9665
LLH 43 53 23.34023 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9665
LLH 43 53 23.34023 290 3 12.32627 1.9144 NEW ARP @ 2006.9665
LLH 43 53 23.34023 290 3 12.32627 1.9144 NEW MON @ 2006.9665

STATION NAME: pnb1 a 3 (Penobscot 1; Penobscot, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=16034
XYZ 1651242.9738 -4251054.4532 4444083.2680 MON @ 1997.0000 (M)
XYZ -0.0173 -0.0026 0.0039 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1724 -0.0259 0.0389 VEL TIMES 9.9654 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0227 -0.0584 0.0614 ARP TO L1 PHASE CENTER
XYZ 1651242.8241 -4251054.5375 4444083.3683 L1 PHS CEN @ 2006.9665
XYZ -0.0000 0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1651242.8240 -4251054.5375 4444083.3683 NEW L1 PHS CEN @ 2006.9665
XYZ 1651242.8014 -4251054.4791 4444083.3069 NEW ARP @ 2006.9665
XYZ 1651242.8014 -4251054.4791 4444083.3069 NEW MON @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.6493 NEW L1 PHS CEN @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.5616 NEW ARP @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.5616 NEW MON @ 2006.9665

REMOTE STATION INFORMATION

STATION NAME: r1_1 1

```
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1554699.6876 -4362516.0405  4370726.2450  MON @ 2006.9663 (M)
NEU       0.0000      -0.0000       1.2200  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.2969      -0.8331       0.8403  MON TO ARP
XYZ       0.0258      -0.0724       0.0730  ARP TO L1 PHASE CENTER
XYZ  1554700.0103 -4362516.9460  4370727.1583  L1 PHS CEN @ 2006.9665

BASELINE NAME:  barn  r1_1
XYZ      -0.5592       0.4053      -0.5476  + XYZ ADJUSTMENTS
XYZ  1554699.4511 -4362516.5407  4370726.6107  NEW L1 PHS CEN @ 2006.9665
XYZ  1554699.4253 -4362516.4684  4370726.5377  NEW ARP @ 2006.9665
XYZ  1554699.1284 -4362515.6352  4370725.6974  NEW MON @ 2006.9665
LLH  43 32  3.52427  289 36 53.58669     0.5295  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.52427  289 36 53.58669     0.4235  NEW ARP @ 2006.9665
LLH  43 32  3.52427  289 36 53.58669    -0.7965  NEW MON @ 2006.9665

BASELINE NAME:  bru1  r1_1
XYZ      -0.5114       0.4180      -0.5550  + XYZ ADJUSTMENTS
XYZ  1554699.4989 -4362516.5280  4370726.6033  NEW L1 PHS CEN @ 2006.9665
XYZ  1554699.4731 -4362516.4556  4370726.5303  NEW ARP @ 2006.9665
XYZ  1554699.1762 -4362515.6225  4370725.6900  NEW MON @ 2006.9665
LLH  43 32  3.52400  289 36 53.58889     0.5273  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.52400  289 36 53.58889     0.4213  NEW ARP @ 2006.9665
LLH  43 32  3.52400  289 36 53.58889    -0.7987  NEW MON @ 2006.9665

BASELINE NAME:  pnb1  r1_1
XYZ      -0.5553       0.4101      -0.5689  + XYZ ADJUSTMENTS
XYZ  1554699.4550 -4362516.5359  4370726.5895  NEW L1 PHS CEN @ 2006.9665
XYZ  1554699.4292 -4362516.4635  4370726.5165  NEW ARP @ 2006.9665
XYZ  1554699.1323 -4362515.6304  4370725.6761  NEW MON @ 2006.9665
LLH  43 32  3.52384  289 36 53.58693     0.5125  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.52384  289 36 53.58693     0.4065  NEW ARP @ 2006.9665
LLH  43 32  3.52384  289 36 53.58693    -0.8135  NEW MON @ 2006.9665

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```

C00090001 -731042070 17 204077596 31 453764232 31
X3536AR1_1X3536ABARN
D 1 2 -8317002 1 3 6362394 2 3 -9115199

Axx20061219 61219
B200612191713 612191943 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 239858420 22 376656517 49 285524943 42
X3536AR1_1X3536ABRU1
D 1 2 -8197229 1 3 8993671 2 3 -8773701

Axx20061219 61219
B200612191713 612191943 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 965436691 16 1114611513 34 733576307 31
X3536AR1_1X3536APNB1
D 1 2 -7768049 1 3 8528780 2 3 -9107919

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 08 09 11 12 17
barn-r1_1| 0.013 0.018 0.009 ... 0.025 0.021 0.011 ... ...
20 24 28
barn-r1_1| 0.011 ... 0.010

OVERALL 02 04 05 08 09 11 12 17
bru1-r1_1| 0.021 0.022 0.020 ... 0.019 0.027 0.020 0.014 ...
20 24 28
bru1-r1_1| 0.020 ... 0.020

OVERALL 02 04 05 08 09 11 12 17
pnb1-r1_1| 0.013 0.022 0.011 ... 0.023 0.023 0.013 ... ...
20 24 28
pnb1-r1_1| 0.012 ... 0.010

OBS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 08 09 11 12 17
barn-r1_1| 1286 70 250 ... 57 132 185 ... ...
20 24 28

```
barn-r1_1|   296   ...   296
        OVERALL    02    04    05    08    09    11    12    17
brul-r1_1|  1269    71   247   ...    57    96   178    20   ...
          20    24    28
brul-r1_1|   300   ...   300
        OVERALL    02    04    05    08    09    11    12    17
pnbl-r1_1|  1188    65   251   ...    52    43   188   ...   ...
          20    24    28
pnbl-r1_1|   289   ...   300
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000022867   -0.0000003877    0.0000003532
-0.0000003877    0.0000100400   -0.0000008092
 0.0000003532   -0.0000008092    0.0000081911
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000029152    0.0000015210   -0.0000015228
 0.0000015210    0.0000078866   -0.0000005582
-0.0000015228   -0.0000005582    0.0000097159
```

Horizontal network accuracy = 0.00593 meters.
Vertical network accuracy = 0.00611 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

BRU1	0.00360	-0.00070	-0.00040
PNB1	0.00050	-0.00070	-0.00110

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-73104.22349	20407.76275	45376.42922	2002.00
BRU1	23985.85614	37665.66351	28552.49394	2002.00
PNB1	96543.65865	111461.15707	73357.61115	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.15046309
Point Scale	0.99997050
Combined Factor	0.99997044

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1218a.tps 000087085

Date: Friday, March 02, 2007 2:40:46 PM

Attachments:

FILE: R1_1218a.tps 000087085

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1352p.06o TIME: 19:44:17 UTC

SOFTWARE: page5 0612.06 master30.pl START: 2006/12/18 15:19:00
EPHEMERIS: igs14061.eph [precise] STOP: 2006/12/18 18:08:00
NAV FILE: brdc3520.06n OBS USED: 4065 / 4161 : 98%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 25 / 25 : 100%
ARP HEIGHT: 1.35 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9635)

X:	1559371.830(m)	0.033(m)	1559371.104(m)	0.033(m)
Y:	-4368238.998(m)	0.032(m)	-4368237.573(m)	0.032(m)
Z:	4363354.476(m)	0.025(m)	4363354.421(m)	0.025(m)

LAT:	43 26 35.01981	0.019(m)	43 26 35.05386	0.019(m)
E LON:	289 38 43.88424	0.024(m)	289 38 43.87514	0.024(m)
W LON:	70 21 16.11576	0.024(m)	70 21 16.12486	0.024(m)
EL HGT:	-23.834(m)	0.046(m)	-25.023(m)	0.046(m)
ORTHO HGT:	2.325(m)	0.052(m)	[Geoid03 NAVD88]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 19)	SPC (1802 ME W)
Northing (Y) [meters]	4810908.826	67752.840

Easting (X) [meters]	390394.830	884796.795
Convergence [degrees]	-0.93147577	-0.12914463
Point Scale	0.99974777	0.99996951
Combined Factor	0.99975151	0.99997325

US NATIONAL GRID DESIGNATOR: 19TCJ9039510909(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	97540.8
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	58865.9
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	59548.5

NEAREST NGS PUBLISHED CONTROL POINT

OC0256	T 98	N432636.	W0702111.	118.8

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)				
ANTENNA: TRM33429.00+GP NONE				S/N=0220132577
XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1763	-0.0189	0.0438	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9635
XYZ	-0.0001	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9385	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9635
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW ARP @ 2006.9635
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW MON @ 2006.9635
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9635
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9635
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW MON @ 2006.9635

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp

ANTENNA: TRM41249.00 NONE S/N=12475400

XYZ	1521218.6913	-4405922.5110	4339076.4839	MON @ 1997.0000 (M)
XYZ	-0.0174	-0.0019	0.0045	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0714	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0682	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1733	-0.0189	0.0448	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0170	-0.0492	0.0488	ARP TO L1 PHASE CENTER
XYZ	1521218.5350	-4405922.5792	4339076.5776	L1 PHS CEN @ 2006.9635
XYZ	-0.0000	0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1521218.5349	-4405922.5792	4339076.5775	NEW L1 PHS CEN @ 2006.9635
XYZ	1521218.5179	-4405922.5299	4339076.5287	NEW ARP @ 2006.9635
XYZ	1521218.5179	-4405922.5299	4339076.5287	NEW MON @ 2006.9635
LLH	43 8 33.21317	289 2 53.12700	7.9845	NEW L1 PHS CEN @ 2006.9635
LLH	43 8 33.21317	289 2 53.12700	7.9131	NEW ARP @ 2006.9635
LLH	43 8 33.21317	289 2 53.12700	7.9131	NEW MON @ 2006.9635

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)

ANTENNA: ASH700829.3 SNOW S/N=11098

XYZ	1578685.1577	-4324849.9449	4399278.1414	MON @ 1997.0000 (M)
XYZ	-0.0140	-0.0026	0.0043	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0877	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0598	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1395	-0.0259	0.0428	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0217	-0.0594	0.0608	ARP TO L1 PHASE CENTER
XYZ	1578685.0399	-4324850.0302	4399278.2450	L1 PHS CEN @ 2006.9636
XYZ	-0.0000	-0.0001	-0.0001	+ XYZ ADJUSTMENTS
XYZ	1578685.0399	-4324850.0303	4399278.2450	NEW L1 PHS CEN @ 2006.9636
XYZ	1578685.0182	-4324849.9709	4399278.1842	NEW ARP @ 2006.9636
XYZ	1578685.0182	-4324849.9709	4399278.1842	NEW MON @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	2.0021	NEW L1 PHS CEN @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	1.9144	NEW ARP @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	1.9144	NEW MON @ 2006.9636

REMOTE STATION INFORMATION

STATION NAME: r1_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1559374.4152 -4368238.4528 4363354.7444 MON @ 2006.9634 (M)
NEU 0.0000 0.0000 1.3500 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3295 -0.9231 0.9283 MON TO ARP
XYZ 0.0259 -0.0725 0.0729 ARP TO L1 PHASE CENTER
XYZ 1559374.7706 -4368239.4484 4363355.7456 L1 PHS CEN @ 2006.9635

BASELINE NAME: barn r1_1
XYZ -3.3252 0.8827 -0.3172 + XYZ ADJUSTMENTS
XYZ 1559371.4454 -4368238.5657 4363355.4284 NEW L1 PHS CEN @ 2006.9635
XYZ 1559371.4196 -4368238.4932 4363355.3555 NEW ARP @ 2006.9635
XYZ 1559371.0900 -4368237.5701 4363354.4272 NEW MON @ 2006.9635
LLH 43 26 35.05417 289 38 43.87459 -23.5681 NEW L1 PHS CEN @ 2006.9635
LLH 43 26 35.05417 289 38 43.87459 -23.6741 NEW ARP @ 2006.9635
LLH 43 26 35.05417 289 38 43.87459 -25.0241 NEW MON @ 2006.9635

BASELINE NAME: nhun r1_1
XYZ -3.3176 0.8941 -0.3389 + XYZ ADJUSTMENTS
XYZ 1559371.4531 -4368238.5543 4363355.4067 NEW L1 PHS CEN @ 2006.9635
XYZ 1559371.4272 -4368238.4818 4363355.3338 NEW ARP @ 2006.9635
XYZ 1559371.0976 -4368237.5587 4363354.4055 NEW MON @ 2006.9635
LLH 43 26 35.05384 289 38 43.87508 -23.5890 NEW L1 PHS CEN @ 2006.9635
LLH 43 26 35.05384 289 38 43.87508 -23.6950 NEW ARP @ 2006.9635
LLH 43 26 35.05384 289 38 43.87508 -25.0450 NEW MON @ 2006.9635

BASELINE NAME: bru1 r1_1
XYZ -3.2918 0.8616 -0.3134 + XYZ ADJUSTMENTS
XYZ 1559371.4789 -4368238.5868 4363355.4322 NEW L1 PHS CEN @ 2006.9636
XYZ 1559371.4530 -4368238.5143 4363355.3593 NEW ARP @ 2006.9636
XYZ 1559371.1234 -4368237.5912 4363354.4310 NEW MON @ 2006.9636
LLH 43 26 35.05357 289 38 43.87568 -23.5429 NEW L1 PHS CEN @ 2006.9636
LLH 43 26 35.05357 289 38 43.87568 -23.6489 NEW ARP @ 2006.9636
LLH 43 26 35.05357 289 38 43.87568 -24.9989 NEW MON @ 2006.9636

G-FILES

Axx20061218 61218
B200612181518 6121818 7 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226

```
C00090001 -777761686  13  261296944  26  527476933  26
X3526AR1_1X3526ABARN
D  1  2 -7848359  1  3  5900652  2  3 -9155764

Axx20061218  61218
B200612181518  6121818 7 1 page5 v0612.06IGS    222 1 2 27NGS  2007 3 2IFDDFX
Iant_info.003      NGS  20070226
C00090002 -381525797  14 -376849713  35 -242778768  34
X3526AR1_1X3526ANHUN
D  1  2 -7572029  1  3  7953395  2  3 -9323283

Axx20061218  61218
B200612181518  6121818 7 1 page5 v0612.06IGS    222 1 2 27NGS  2007 3 2IFDDFX
Iant_info.003      NGS  20070226
C00090003  193138947  15  433876203  40  359237532  38
X3526AR1_1X3526ABRU1
D  1  2 -7336643  1  3  7949251  2  3 -8761406

           POST-FIT RMS BY SATELLITE VS. BASELINE

       OVERALL    03    04    08    09    11    17    19    20
barn-r1_1| 0.012  0.022  0.016  0.010   ...   ... 0.011  0.017  0.016
         27    28
barn-r1_1| 0.010  0.008

       OVERALL    03    04    08    11    17    19    20    27
nhun-r1_1| 0.013   ... 0.017  0.013   ... 0.013  0.015  0.013  0.012
         28
nhun-r1_1|   ...

       OVERALL    03    04    08    11    17    19    20    27
bru1-r1_1| 0.022  0.021  0.021  0.020   ... 0.018  0.027  0.028  0.019
         28
bru1-r1_1| 0.022

              OBS BY SATELLITE VS. BASELINE

       OVERALL    03    04    08    09    11    17    19    20
barn-r1_1|  1462    24    59   289   ...   ...   259   175   133
         27    28
barn-r1_1|   198   325
       OVERALL    03    04    08    11    17    19    20    27
```

```
nhun-r1_1|  1102   ...    27   295   ...   265   173   139   203
          28
nhun-r1_1|   ...
        OVERALL    03    04    08    11    17    19    20    27
bru1-r1_1|  1501    27    63   293   ...   263   170   148   201
          28
bru1-r1_1|   336
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000013111   -0.0000002392    0.0000002291
 -0.0000002392    0.0000077800   -0.0000006800
  0.0000002291   -0.0000006800    0.0000072800
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000018908    0.0000012672   -0.0000013658
  0.0000012672    0.0000065264    0.0000000835
 -0.0000013658    0.0000000835    0.0000079539
```

Horizontal network accuracy = 0.00531 meters.
Vertical network accuracy = 0.00553 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument
in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-77776.18149	26129.70875	52747.69522	2002.00
NHUN	-38152.58798	-37684.95739	-24277.88769	2002.00
BRU1	19313.89814	43387.60951	35923.75994	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.12914463
Point Scale	0.99996951
Combined Factor	0.99997325

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1218b.tps 000087089

Date: Friday, March 02, 2007 2:42:57 PM

Attachments:

FILE: R2_1218b.tps 000087089

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1352s.06o TIME: 19:26:30 UTC

SOFTWARE: page5 0612.06 master11.pl START: 2006/12/18 18:24:00
EPHEMERIS: igs14061.eph [precise] STOP: 2006/12/18 20:55:30
NAV FILE: brdc3520.06n OBS USED: 4517 / 4887 : 92%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 44 / 44 : 100%
ARP HEIGHT: 1.345 OVERALL RMS: 0.018(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9639)

X:	1557441.707(m)	0.042(m)	1557440.981(m)	0.042(m)
Y:	-4371819.550(m)	0.032(m)	-4371818.125(m)	0.032(m)
Z:	4360478.863(m)	0.007(m)	4360478.808(m)	0.007(m)

LAT:	43 24 26.66750	0.028(m)	43 24 26.70152	0.028(m)
E LON:	289 36 29.59278	0.039(m)	289 36 29.58364	0.039(m)
W LON:	70 23 30.40722	0.039(m)	70 23 30.41636	0.039(m)
EL HGT:	-22.036(m)	0.019(m)	-23.226(m)	0.019(m)
ORTHO HGT:	4.181(m)	0.032(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4806998.968	63799.321

Easting (X) [meters]	387310.068	881766.406
Convergence [degrees]	-0.95650559	-0.15469398
Point Scale	0.99975621	0.99997075
Combined Factor	0.99975966	0.99997421

US NATIONAL GRID DESIGNATOR: 19TCJ8731006999(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	98637.1
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	64519.0
AH8904	PNB1 PENOBSCOT 1 CORS ARP	N442706.177	W0684620.162	174276.7

NEAREST NGS PUBLISHED CONTROL POINT

OC2042	CURTIS COVE 1868	N432424.490	W0702345.279	340.8

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1763	-0.0189	0.0438	VEL TIMES 9.9628 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9639
XYZ	0.0001	-0.0001	-0.0001	+ XYZ ADJUSTMENTS
XYZ	1481594.9387	-4342107.9260	4416102.1719	NEW L1 PHS CEN @ 2006.9639
XYZ	1481594.9215	-4342107.8757	4416102.1204	NEW ARP @ 2006.9639
XYZ	1481594.9215	-4342107.8757	4416102.1204	NEW MON @ 2006.9639
LLH	44 5 56.71848	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9639
LLH	44 5 56.71848	288 50 25.58926	139.6279	NEW ARP @ 2006.9639
LLH	44 5 56.71848	288 50 25.58926	139.6279	NEW MON @ 2006.9639

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0428 VEL TIMES 9.9628 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2450 L1 PHS CEN @ 2006.9639
XYZ 0.0001 0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9639
XYZ 1578685.0183 -4324849.9708 4399278.1842 NEW ARP @ 2006.9639
XYZ 1578685.0183 -4324849.9708 4399278.1842 NEW MON @ 2006.9639
LLH 43 53 23.34023 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9639
LLH 43 53 23.34023 290 3 12.32627 1.9144 NEW ARP @ 2006.9639
LLH 43 53 23.34023 290 3 12.32627 1.9144 NEW MON @ 2006.9639

STATION NAME: pnb1 a 3 (Penobscot 1; Penobscot, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=16034
XYZ 1651242.9738 -4251054.4532 4444083.2680 MON @ 1997.0000 (M)
XYZ -0.0173 -0.0026 0.0039 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1724 -0.0259 0.0389 VEL TIMES 9.9628 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0227 -0.0584 0.0614 ARP TO L1 PHASE CENTER
XYZ 1651242.8241 -4251054.5375 4444083.3683 L1 PHS CEN @ 2006.9639
XYZ 0.0001 0.0001 0.0001 + XYZ ADJUSTMENTS
XYZ 1651242.8242 -4251054.5374 4444083.3684 NEW L1 PHS CEN @ 2006.9639
XYZ 1651242.8015 -4251054.4790 4444083.3069 NEW ARP @ 2006.9639
XYZ 1651242.8015 -4251054.4790 4444083.3069 NEW MON @ 2006.9639
LLH 44 27 6.21239 291 13 39.82946 32.6494 NEW L1 PHS CEN @ 2006.9639
LLH 44 27 6.21239 291 13 39.82946 32.5617 NEW ARP @ 2006.9639
LLH 44 27 6.21239 291 13 39.82946 32.5617 NEW MON @ 2006.9639

REMOTE STATION INFORMATION

STATION NAME: r2_1 1

```
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1557441.4907 -4371818.6806  4360479.3262  MON @ 2006.9637 (M)
NEU       0.0000      -0.0000       1.3450  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.3279      -0.9205       0.9243  MON TO ARP
XYZ       0.0258      -0.0725       0.0728  ARP TO L1 PHASE CENTER
XYZ  1557441.8445 -4371819.6736  4360480.3233  L1 PHS CEN @ 2006.9639

BASELINE NAME:  barn  r2_1
XYZ      -0.5263       0.5701      -0.5132  + XYZ ADJUSTMENTS
XYZ  1557441.3181 -4371819.1035  4360479.8101  NEW L1 PHS CEN @ 2006.9639
XYZ  1557441.2923 -4371819.0309  4360479.7373  NEW ARP @ 2006.9639
XYZ  1557440.9644 -4371818.1105  4360478.8130  NEW MON @ 2006.9639
LLH  43 24 26.70207  289 36 29.58316    -21.7859  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.70207  289 36 29.58316    -21.8919  NEW ARP @ 2006.9639
LLH  43 24 26.70207  289 36 29.58316    -23.2369  NEW MON @ 2006.9639

BASELINE NAME:  bru1  r2_1
XYZ      -0.4845       0.5597      -0.5205  + XYZ ADJUSTMENTS
XYZ  1557441.3600 -4371819.1139  4360479.8028  NEW L1 PHS CEN @ 2006.9639
XYZ  1557441.3341 -4371819.0414  4360479.7300  NEW ARP @ 2006.9639
XYZ  1557441.0062 -4371818.1209  4360478.8057  NEW MON @ 2006.9639
LLH  43 24 26.70137  289 36 29.58476    -21.7735  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.70137  289 36 29.58476    -21.8795  NEW ARP @ 2006.9639
LLH  43 24 26.70137  289 36 29.58476    -23.2245  NEW MON @ 2006.9639

BASELINE NAME:  pnb1  r2_1
XYZ      -0.5185       0.5378      -0.5198  + XYZ ADJUSTMENTS
XYZ  1557441.3260 -4371819.1358  4360479.8035  NEW L1 PHS CEN @ 2006.9639
XYZ  1557441.3001 -4371819.0632  4360479.7307  NEW ARP @ 2006.9639
XYZ  1557440.9722 -4371818.1428  4360478.8064  NEW MON @ 2006.9639
LLH  43 24 26.70118  289 36 29.58301    -21.7664  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.70118  289 36 29.58301    -21.8724  NEW ARP @ 2006.9639
LLH  43 24 26.70118  289 36 29.58301    -23.2174  NEW MON @ 2006.9639

                    G-FILES

Axx20061218  61218
B200612181824  612182055 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
```

C00090001 -758460428 15 297102347 31 556233074 31
X3526AR2_1X3526ABARN
D 1 2 -7340116 1 3 4547319 2 3 -8707172

Axx20061218 61218
B200612181824 612182055 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 212440120 15 469681501 40 387993785 35
X3526AR2_1X3526ABRU1
D 1 2 -7503461 1 3 8324364 2 3 -8142314

Axx20061218 61218
B200612181824 612182055 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 938018293 12 1207636637 31 836045005 28
X3526AR2_1X3526APNB1
D 1 2 -6444613 1 3 7776883 2 3 -8662658

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 10 11 12 13
barn-r2_1| 0.017 0.016 ... 0.023 0.022 ... 0.018 0.019 0.019
17 20 23 24 28
barn-r2_1| 0.010 0.020 0.022 0.015 0.016

OVERALL 02 04 05 09 10 11 12 13
bru1-r2_1| 0.021 0.022 ... 0.019 0.024 ... 0.018 0.024 ...
17 20 23 24 28
bru1-r2_1| 0.021 0.018 0.021 0.023 0.017

OVERALL 02 04 05 09 10 11 12 13
pnb1-r2_1| 0.014 0.014 ... 0.019 0.016 ... 0.020 0.017 ...
17 20 23 24 28
pnb1-r2_1| 0.009 0.015 0.021 0.012 0.011

OBS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 10 11 12 13
barn-r2_1| 1557 206 ... 141 89 ... 62 132 46
17 20 23 24 28

```
barn-r2_1|  297   248    34   124   178
       OVERALL    02    04    05    09    10    11    12    13
bru1-r2_1|  1519   192   ...   142    89   ...    59   154   ...
         17    20    23    24    28
bru1-r2_1|  302   239    22   133   187
       OVERALL    02    04    05    09    10    11    12    13
pnb1-r2_1|  1441   196   ...    91    78   ...    59   132   ...
         17    20    23    24    28
pnb1-r2_1|  302   238    57   103   185
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000013200   -0.0000002292    0.0000002022
-0.0000002292    0.0000078267   -0.0000006064
 0.0000002022   -0.0000006064    0.0000066000
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000019079    0.0000012774   -0.0000013786
 0.0000012774    0.0000062617   -0.0000002790
-0.0000013786   -0.0000002790    0.0000075771
```

Horizontal network accuracy = 0.00522 meters.
Vertical network accuracy = 0.00540 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

BRU1	0.00360	-0.00070	-0.00040
PNB1	0.00050	-0.00070	-0.00110

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-75846.05849	29710.26075	55623.30822	2002.00
BRU1	21244.02114	46968.16151	38799.37294	2002.00
PNB1	93801.82365	120763.65507	83604.49015	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.15469398
Point Scale	0.99997075
Combined Factor	0.99997421

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Adel M. Shahin, P.E.

From: opus@ngs.noaa.gov
Sent: Friday, March 02, 2007 9:22 AM
To: Adel M. Shahin, P.E.
Subject: OPUS solution : R2_1208a.tps 000086742

FILE: R2_1208a.tps 000086742

NGS OPUS SOLUTION REPORT
==========

USER: Ashahin@greenintl.com DATE: March 02, 2007
RINEX FILE: r2_1342q.06o TIME: 14:21:53 UTC

SOFTWARE: page5 0612.06 master4.pl START: 2006/12/08 16:02:00
EPHEMERIS: igs14045.eph [precise] STOP: 2006/12/08 18:33:30
NAV FILE: brdc3420.06n OBS USED: 2969 / 3620 : 82%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 24 / 27 : 89%
ARP HEIGHT: 1.45 OVERALL RMS: 0.021(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9362)

X:	1542775.763(m)	0.040(m)	1542775.039(m)	0.040(m)
Y:	-4403471.127(m)	0.028(m)	-4403469.699(m)	0.028(m)
Z:	4333942.017(m)	0.036(m)	4333941.957(m)	0.036(m)

LAT:	43 4 46.19395	0.008(m)	43 4 46.22766	0.008(m)
E LON:	289 18 29.29352	0.029(m)	289 18 29.28419	0.029(m)
W LON:	70 41 30.70648	0.029(m)	70 41 30.71581	0.029(m)
EL HGT:	-21.511(m)	0.053(m)	-22.712(m)	0.053(m)
ORTHO HGT:	5.044(m)	0.058(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4771032.060	27479.905
Easting (X) [meters]	362275.585	857231.627
Convergence [degrees]	-1.15574459	-0.35872100
Point Scale	0.99983334	0.99998916
Combined Factor	0.99983672	0.99999253

US NATIONAL GRID DESIGNATOR: 19TCH6227671032(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	119409.3
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	22294.9
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	108348.6

NEAREST NGS PUBLISHED CONTROL POINT

OC2212	RED HILL	N430459.889	W0704115.343	547.5

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577
XYZ 1481595.0978 -4342107.8567 4416102.0767 MON @ 1997.0000 (M)
XYZ -0.0177 -0.0019 0.0044 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0740 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0703 ARP TO L2 PHASE CENTER (M)
XYZ -0.1759 -0.0189 0.0437 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0172 -0.0503 0.0515 ARP TO L1 PHASE CENTER
XYZ 1481594.9391 -4342107.9259 4416102.1719 L1 PHS CEN @ 2006.9362
XYZ -0.0003 -0.0001 -0.0000 + XYZ ADJUSTMENTS
XYZ 1481594.9389 -4342107.9260 4416102.1719 NEW L1 PHS CEN @ 2006.9362
XYZ 1481594.9217 -4342107.8757 4416102.1204 NEW ARP @ 2006.9362
XYZ 1481594.9217 -4342107.8757 4416102.1204 NEW MON @ 2006.9362
LLH 44 5 56.71848 288 50 25.58927 139.7019 NEW L1 PHS CEN @ 2006.9362
LLH 44 5 56.71848 288 50 25.58927 139.6279 NEW ARP @ 2006.9362
LLH 44 5 56.71848 288 50 25.58927 139.6279 NEW MON @ 2006.9362

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1729 -0.0189 0.0447 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5354 -4405922.5791 4339076.5774 L1 PHS CEN @ 2006.9362
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5354 -4405922.5791 4339076.5774 NEW L1 PHS CEN @ 2006.9362
XYZ 1521218.5184 -4405922.5299 4339076.5286 NEW ARP @ 2006.9362
XYZ 1521218.5184 -4405922.5299 4339076.5286 NEW MON @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9845 NEW L1 PHS CEN @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9131 NEW ARP @ 2006.9362
LLH 43 8 33.21317 289 2 53.12702 7.9131 NEW MON @ 2006.9362

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1391 -0.0258 0.0427 VEL TIMES 9.9351 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0403 -4324850.0301 4399278.2449 L1 PHS CEN @ 2006.9362
XYZ -0.0000 -0.0001 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0402 -4324850.0302 4399278.2449 NEW L1 PHS CEN @ 2006.9362
XYZ 1578685.0186 -4324849.9708 4399278.1841 NEW ARP @ 2006.9362
XYZ 1578685.0186 -4324849.9708 4399278.1841 NEW MON @ 2006.9362
LLH 43 53 23.34022 290 3 12.32629 2.0021 NEW L1 PHS CEN @ 2006.9362
LLH 43 53 23.34022 290 3 12.32629 1.9144 NEW ARP @ 2006.9362

LLH 43 53 23.34022 290 3 12.32629 1.9144 NEW MON @ 2006.9362

REMOTE STATION INFORMATION

STATION NAME: r2_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1542778.8636 -4403470.7700 4333942.4177 MON @ 2006.9361 (M)
NEU 0.0000 -0.0000 1.4500 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3502 -0.9995 0.9904 MON TO ARP
XYZ 0.0256 -0.0731 0.0724 ARP TO L1 PHASE CENTER
XYZ 1542779.2394 -4403471.8426 4333943.4805 L1 PHS CEN @ 2006.9362

BASELINE NAME: barn r2_1
XYZ -3.8450 1.0812 -0.4716 + XYZ ADJUSTMENTS
XYZ 1542775.3943 -4403470.7613 4333943.0089 NEW L1 PHS CEN @ 2006.9362
XYZ 1542775.3687 -4403470.6883 4333942.9365 NEW ARP @ 2006.9362
XYZ 1542775.0186 -4403469.6888 4333941.9461 NEW MON @ 2006.9362
LLH 43 4 46.22777 289 18 29.28348 -21.1751 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 46.22777 289 18 29.28348 -21.2811 NEW ARP @ 2006.9362
LLH 43 4 46.22777 289 18 29.28348 -22.7311 NEW MON @ 2006.9362

BASELINE NAME: nhun r2_1
XYZ -3.8244 1.0786 -0.4733 + XYZ ADJUSTMENTS
XYZ 1542775.4150 -4403470.7640 4333943.0071 NEW L1 PHS CEN @ 2006.9362
XYZ 1542775.3894 -4403470.6910 4333942.9347 NEW ARP @ 2006.9362
XYZ 1542775.0392 -4403469.6914 4333941.9444 NEW MON @ 2006.9362
LLH 43 4 46.22752 289 18 29.28431 -21.1694 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 46.22752 289 18 29.28431 -21.2754 NEW ARP @ 2006.9362
LLH 43 4 46.22752 289 18 29.28431 -22.7254 NEW MON @ 2006.9362

BASELINE NAME: bru1 r2_1
XYZ -3.8047 1.0536 -0.4370 + XYZ ADJUSTMENTS
XYZ 1542775.4347 -4403470.7890 4333943.0435 NEW L1 PHS CEN @ 2006.9362
XYZ 1542775.4091 -4403470.7159 4333942.9711 NEW ARP @ 2006.9362
XYZ 1542775.0589 -4403469.7164 4333941.9807 NEW MON @ 2006.9362
LLH 43 4 46.22771 289 18 29.28476 -21.1226 NEW L1 PHS CEN @ 2006.9362
LLH 43 4 46.22771 289 18 29.28476 -21.2286 NEW ARP @ 2006.9362
LLH 43 4 46.22771 289 18 29.28476 -22.6786 NEW MON @ 2006.9362

G-FILES

Axx200612 8 612 8
B200612 816 1 612 81833 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090001 -611800969 23 613618131 59 821601743 50 X3426AR2_1X3426ABARN
D 1 2 -8892839 1 3 7562101 2 3 -9008446

Axx200612 8 612 8
B200612 816 1 612 81833 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -215565208 35 -24528384 64 51345842 64 X3426AR2_1X3426ANHUN
D 1 2 -7866766 1 3 7301693 2 3 -9685850

Axx200612 8 612 8
B200612 816 1 612 81833 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090003 359099597 28 786197456 59 653362034 64 X3426AR2_1X3426ABRU1

D 1 2 -7319028 1 3 7762017 2 3 -8538951

POST-FIT RMS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   11   17   19   20   27
barn-r2_1|  0.019 0.036  ... 0.016  ... 0.033 0.016 0.025 0.014
        28
barn-r2_1|  0.016

      OVERALL   03   04   08   11   17   19   20   27
nhun-r2_1|  0.018  ...  ... 0.018  ... 0.033 0.015 0.017 0.015
        28
nhun-r2_1|   ...

      OVERALL   03   04   08   11   17   19   20   27
bru1-r2_1|  0.024  ...  ... 0.023  ... 0.025 0.023 0.025 0.020
        28
bru1-r2_1|  0.028
```

OBS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   11   17   19   20   27
barn-r2_1|  1119   10  ...  280  ...   83  150  112  187
        28
barn-r2_1|   297
      OVERALL   03   04   08   11   17   19   20   27
nhun-r2_1|   770  ...  ...  252  ...   55  161  105  197
        28
nhun-r2_1|   ...
      OVERALL   03   04   08   11   17   19   20   27
bru1-r2_1|  1080  ...  ...  262  ...   48  162  116  195
        28
bru1-r2_1|   297
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000056400   -0.0000009284    0.0000008658
 -0.0000009284    0.0000245733   -0.0000021887
  0.0000008658   -0.0000021887    0.0000237600
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000071305    0.0000035956   -0.0000037337
  0.0000035956    0.0000211009    0.0000005109
 -0.0000037337    0.0000005109    0.0000257419
```

Horizontal network accuracy = 0.00962 meters.
Vertical network accuracy = 0.00995 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

```
          Xa(m)         Ya(m)         Za(m)
   BARN  1481595.64851 -4342109.28925  4416102.17122   2002.00
   NHUN  1521219.24202 -4405923.95539  4339076.58831   2002.00
   BRU1  1578685.72814 -4324851.38849  4399278.23594   2002.00
```

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument
in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-61180.11449	61361.83775	82160.15422	2002.00
NHUN	-21556.52098	-2452.82839	5134.57131	2002.00
BRU1	35909.96514	78619.73851	65336.21894	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.35872100
Point Scale	0.99998916
Combined Factor	0.99999253

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

P2

Emily Caruso

From: opus@ngs.noaa.gov
Sent: Friday, May 25, 2007 11:15 AM
To: Emily Caruso
Subject: OPUS solution : R2_1208b.tps 000139079

FILE: R2_1208b.tps 000139079

NGS OPUS SOLUTION REPORT
==========

USER: ecaruso@greenintl.com DATE: May 25, 2007
RINEX FILE: r2_1342t.06o TIME: 15:14:35 UTC

SOFTWARE: page5 0612.06 master11.pl START: 2006/12/08 19:25:00
EPHEMERIS: igs14045.eph [precise] STOP: 2006/12/08 22:06:30
NAV FILE: brdc3420.06n OBS USED: 3329 / 5450 : 61%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 66 / 82 : 80%
ARP HEIGHT: 1.44 OVERALL RMS: 0.027(m)

REF FRAME:	NAD_83(CORS96)(EPOCH:2002.0000)		ITRF00 (EPOCH:2006.9366)	
X:	1541417.916(m)	0.242(m)	1541417.192(m)	0.242(m)
Y:	-4403753.564(m)	0.263(m)	-4403752.137(m)	0.263(m)
Z:	4334144.966(m)	0.123(m)	4334144.906(m)	0.123(m)
LAT:	43 4 55.03051	0.135(m)	43 4 55.06420	0.135(m)
E LON:	289 17 28.51299	0.141(m)	289 17 28.50362	0.141(m)
W LON:	70 42 31.48701	0.141(m)	70 42 31.49638	0.141(m)
EL HGT:	-15.981(m)	0.323(m)	-17.180(m)	0.323(m)
ORTHO HGT:	10.591(m)	0.324(m)	[Geoid03 NAVD88]	

	UTM COORDINATES UTM (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4771332.518	27761.335
Easting (X) [meters]	360906.729	855858.512
Convergence [degrees]	-1.16733515	-0.37027013
Point Scale	0.99983800	0.99999063
Combined Factor	0.99984051	0.99999313

US NATIONAL GRID DESIGNATOR: 19TCH6090771333(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF9215	ZBW1 BOSTON WAAS 1 CORS ARP	N424408.559	W0712849.518	73827.0
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	20905.0
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	108888.9

NEAREST NGS PUBLISHED CONTROL POINT

OC2242	APEX	N430454.318	W0704233.227	45.1

BASE STATION INFORMATION

STATION NAME: zbw1 a 2 (BOSTON WAAS 1; Nashua, New Hampshire, U.S.A.)
ANTENNA: NOV_WAAS_600 NONE S/N=UNKNOWN
XYZ 1490299.3919 -4448982.8359 4306010.1266 MON @ 1997.0000 (M)

```
XYZ        -0.0173        -0.0019         0.0044  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.3930  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.3975  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1719        -0.0189         0.0437  VEL TIMES 9.9355 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0917        -0.2737         0.2667  ARP TO L1 PHASE CENTER
XYZ   1490299.3117 -4448983.1285   4306010.4370  L1 PHS CEN @ 2006.9366
XYZ        -0.0000        -0.0000        -0.0000  + XYZ ADJUSTMENTS
XYZ   1490299.3117 -4448983.1285   4306010.4370  NEW L1 PHS CEN @ 2006.9366
XYZ   1490299.2200 -4448982.8548   4306010.1703  NEW ARP @ 2006.9366
XYZ   1490299.2200 -4448982.8548   4306010.1703  NEW MON @ 2006.9366
LLH  42 44  8.59263  288 31 10.47130     39.0662  NEW L1 PHS CEN @ 2006.9366
LLH  42 44  8.59263  288 31 10.47130     38.6732  NEW ARP @ 2006.9366
LLH  42 44  8.59263  288 31 10.47130     38.6732  NEW MON @ 2006.9366

STATION NAME: nhun  a    2 (University of New Hampsh; Town of Durham, New Hamp
 ANTENNA: TRM41249.00     NONE                                 S/N=12475400
XYZ   1521218.6913 -4405922.5110   4339076.4839  MON @ 1997.0000 (M)
XYZ        -0.0174        -0.0019         0.0045  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0714  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0682  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1729        -0.0189         0.0447  VEL TIMES 9.9355 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0170        -0.0492         0.0488  ARP TO L1 PHASE CENTER
XYZ   1521218.5354 -4405922.5791   4339076.5774  L1 PHS CEN @ 2006.9366
XYZ        -0.0000        -0.0000         0.0000  + XYZ ADJUSTMENTS
XYZ   1521218.5354 -4405922.5791   4339076.5774  NEW L1 PHS CEN @ 2006.9366
XYZ   1521218.5184 -4405922.5299   4339076.5286  NEW ARP @ 2006.9366
XYZ   1521218.5184 -4405922.5299   4339076.5286  NEW MON @ 2006.9366
LLH  43  8 33.21317  289  2 53.12702      7.9845  NEW L1 PHS CEN @ 2006.9366
LLH  43  8 33.21317  289  2 53.12702      7.9131  NEW ARP @ 2006.9366
LLH  43  8 33.21317  289  2 53.12702      7.9131  NEW MON @ 2006.9366

STATION NAME: bru1  a    6 (Brunswick 1; Brunswick, Maine  USA)
 ANTENNA: ASH700829.3     SNOW                                 S/N=11098
XYZ   1578685.1577 -4324849.9449   4399278.1414  MON @ 1997.0000 (M)
XYZ        -0.0140        -0.0026         0.0043  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0877  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0598  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1391        -0.0258         0.0427  VEL TIMES 9.9355 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0217        -0.0594         0.0608  ARP TO L1 PHASE CENTER
XYZ   1578685.0403 -4324850.0301   4399278.2449  L1 PHS CEN @ 2006.9366
XYZ        -0.0001        -0.0001        -0.0001  + XYZ ADJUSTMENTS
XYZ   1578685.0402 -4324850.0302   4399278.2448  NEW L1 PHS CEN @ 2006.9366
XYZ   1578685.0185 -4324849.9709   4399278.1840  NEW ARP @ 2006.9366
XYZ   1578685.0185 -4324849.9709   4399278.1840  NEW MON @ 2006.9366
LLH  43 53 23.34022  290  3 12.32628      2.0021  NEW L1 PHS CEN @ 2006.9366
LLH  43 53 23.34022  290  3 12.32628      1.9144  NEW ARP @ 2006.9366
LLH  43 53 23.34022  290  3 12.32628      1.9144  NEW MON @ 2006.9366

                        REMOTE STATION INFORMATION

STATION NAME: r2_1       1
 ANTENNA: TPSHIPER_GD     NONE                                 S/N=UNKNOWN
XYZ   1541419.8319 -4403752.8585   4334145.7206  MON @ 2006.9365 (M)
NEU         0.0000        -0.0000         1.4400  MON TO ARP (M)
NEU        -0.0000         0.0000         0.1060  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.1012  ARP TO L2 PHASE CENTER (M)
XYZ         0.3475        -0.9927         0.9836  MON TO ARP
XYZ         0.0256        -0.0731         0.0724  ARP TO L1 PHASE CENTER
XYZ   1541420.2049 -4403753.9243   4334146.7766  L1 PHS CEN @ 2006.9366

BASELINE NAME:    zbw1  r2_1
```

```
XYZ        -2.6030         0.6823        -0.7792  + XYZ ADJUSTMENTS
XYZ   1541417.6020  -4403753.2419   4334145.9974  NEW L1 PHS CEN @ 2006.9366
XYZ   1541417.5764  -4403753.1689   4334145.9250  NEW ARP @ 2006.9366
XYZ   1541417.2289  -4403752.1762   4334144.9414  NEW MON @ 2006.9366
LLH  43  4 55.06395  289 17 28.50459    -15.5743  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 55.06395  289 17 28.50459    -15.6803  NEW ARP @ 2006.9366
LLH  43  4 55.06395  289 17 28.50459    -17.1203  NEW MON @ 2006.9366

BASELINE NAME:   nhun  r2_1
XYZ        -2.5381         0.6097        -0.7705  + XYZ ADJUSTMENTS
XYZ   1541417.6668  -4403753.3146   4334146.0061  NEW L1 PHS CEN @ 2006.9366
XYZ   1541417.6412  -4403753.2415   4334145.9337  NEW ARP @ 2006.9366
XYZ   1541417.2938  -4403752.2488   4334144.9501  NEW MON @ 2006.9366
LLH  43  4 55.06216  289 17 28.50623    -15.5026  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 55.06216  289 17 28.50623    -15.6086  NEW ARP @ 2006.9366
LLH  43  4 55.06216  289 17 28.50623    -17.0486  NEW MON @ 2006.9366

BASELINE NAME:   bru1  r2_1
XYZ        -2.7798         0.8724        -0.8933  + XYZ ADJUSTMENTS
XYZ   1541417.4252  -4403753.0518   4334145.8833  NEW L1 PHS CEN @ 2006.9366
XYZ   1541417.3996  -4403752.9788   4334145.8109  NEW ARP @ 2006.9366
XYZ   1541417.0521  -4403751.9861   4334144.8273  NEW MON @ 2006.9366
LLH  43  4 55.06651  289 17 28.49999    -15.8259  NEW L1 PHS CEN @ 2006.9366
LLH  43  4 55.06651  289 17 28.49999    -15.9319  NEW ARP @ 2006.9366
LLH  43  4 55.06651  289 17 28.49999    -17.3719  NEW MON @ 2006.9366
```

G-FILES

```
Axx200612 8   612 8
B200612 81925   612 822 6 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090001 -511180089   26 -452306786   69 -281347711   60 X3426AR2_1X3426AZBW1
D  1  2 -6784489  1  3  7490194  2  3 -8819936

Axx200612 8   612 8
B200612 81925   612 822 6 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090002 -201987754   27  -21702811   70   49315785   69 X3426AR2_1X3426ANHUN
D  1  2 -5767510  1  3  4643673  2  3 -9079774

Axx200612 8   612 8
B200612 81925   612 822 6 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090003  372679664   26  789020152   82  651333567   64 X3426AR2_1X3426ABRU1
D  1  2 -8060757  1  3  8651331  2  3 -8300352
```

POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	02	04	05	09	10	11	12	13
zbw1-r2_1|	0.029	0.024	...	0.029	0.024	...	...	...	0.034
	17	20	23	24	28	30			
zbw1-r2_1|	0.033	0.032	0.043	0.024	0.021	0.011			

	OVERALL	02	04	05	09	10	11	12	13
nhun-r2_1|	0.024	0.024	...	0.024	0.016	0.027	...	...	0.020
	17	20	23	24	28	30			
nhun-r2_1|	0.023	0.022	0.036	0.025	...	...			

	OVERALL	02	04	05	09	10	11	12	13
bru1-r2_1|	0.028	0.025	...	0.033	0.022	0.026	...	0.028	...
	17	20	23	24	28	30			
bru1-r2_1|	0.028	0.030	0.059	0.024	0.026	0.019			

OBS BY SATELLITE VS. BASELINE

	OVERALL	02	04	05	09	10	11	12	13
zbw1-r2_1|	1150	185	...	114	35	...	...	...	35

	17	20	23	24	28	30				
zbw1-r2_1|	258	167	24	189	140	3				
	OVERALL	02	04	05	09	10	11	12	13	
nhun-r2_1|	991	213	...	155	21	22	...	...	8	
	17	20	23	24	28	30				
nhun-r2_1|	244	165	5	158	...	...				
	OVERALL	02	04	05	09	10	11	12	13	
bru1-r2_1|	1188	200	...	91	28	31	...	164	...	
	17	20	23	24	28	30				
bru1-r2_1|	244	148	18	124	137	3				

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000046244	-0.0000008946	0.0000007718
-0.0000008946	0.0000364111	-0.0000027540
0.0000007718	-0.0000027540	0.0000276822

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000075359	0.0000061370	-0.0000068730
0.0000061370	0.0000275303	-0.0000026908
-0.0000068730	-0.0000026908	0.0000336516

Horizontal network accuracy = 0.01092 meters.
Vertical network accuracy = 0.01137 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
ZBW1	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
ZBW1	-51117.97426	-45230.71882	-28134.73083	2002.00
NHUN	-20198.67398	-2170.39139	4931.62231	2002.00
BRU1	37267.81214	78902.17551	65133.26994	2002.00

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Adel M. Shahin, P.E.

From: opus@ngs.noaa.gov
Sent: Friday, March 02, 2007 9:56 AM
To: Adel M. Shahin, P.E.
Subject: OPUS solution : R1_1211a.tps 000086773

FILE: R1_1211a.tps 000086773

NGS OPUS SOLUTION REPORT
==========

USER: Ashahin@greenintl.com DATE: March 02, 2007
RINEX FILE: r1_1345p.06o TIME: 14:55:46 UTC

SOFTWARE: page5 0612.06 master22.pl START: 2006/12/11 15:45:00
EPHEMERIS: igs14051.eph [precise] STOP: 2006/12/11 19:15:00
NAV FILE: brdc3450.06n OBS USED: 4972 / 5289 : 94%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 36 / 36 : 100%
ARP HEIGHT: 1.44 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9445)

X:	1545169.712(m)	0.035(m)	1545168.987(m)	0.035(m)
Y:	-4387386.841(m)	0.027(m)	-4387385.415(m)	0.027(m)
Z:	4349288.371(m)	0.018(m)	4349288.314(m)	0.018(m)

LAT:	43 16 7.72765	0.024(m)	43 16 7.76153	0.024(m)
E LON:	289 24 5.30807	0.025(m)	289 24 5.29875	0.025(m)
W LON:	70 35 54.69193	0.025(m)	70 35 54.70125	0.025(m)
EL HGT:	-9.636(m)	0.037(m)	-10.830(m)	0.037(m)
ORTHO HGT:	16.805(m)	0.045(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4791907.280	48468.038
Easting (X) [meters]	370275.206	864940.858
Convergence [degrees]	-1.09581711	-0.29600862
Point Scale	0.99980701	0.99998178
Combined Factor	0.99980852	0.99998329

US NATIONAL GRID DESIGNATOR: 19TCH7027591907(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	102741.4
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	31961.4
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	86792.8

NEAREST NGS PUBLISHED CONTROL POINT

OC0460	43.8	N431615.	W0703552.	232.9

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577
XYZ 1481595.0978 -4342107.8567 4416102.0767 MON @ 1997.0000 (M)
XYZ -0.0177 -0.0019 0.0044 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0740 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0703 ARP TO L2 PHASE CENTER (M)
XYZ -0.1760 -0.0189 0.0438 VEL TIMES 9.9433 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0172 -0.0503 0.0515 ARP TO L1 PHASE CENTER
XYZ 1481594.9390 -4342107.9259 4416102.1719 L1 PHS CEN @ 2006.9445
XYZ -0.0001 -0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1481594.9389 -4342107.9259 4416102.1720 NEW L1 PHS CEN @ 2006.9445
XYZ 1481594.9217 -4342107.8756 4416102.1205 NEW ARP @ 2006.9445
XYZ 1481594.9217 -4342107.8756 4416102.1205 NEW MON @ 2006.9445
LLH 44 5 56.71849 288 50 25.58927 139.7019 NEW L1 PHS CEN @ 2006.9445
LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW ARP @ 2006.9445
LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW MON @ 2006.9445

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1730 -0.0189 0.0447 VEL TIMES 9.9433 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5353 -4405922.5791 4339076.5775 L1 PHS CEN @ 2006.9445
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5353 -4405922.5791 4339076.5775 NEW L1 PHS CEN @ 2006.9445
XYZ 1521218.5183 -4405922.5299 4339076.5286 NEW ARP @ 2006.9445
XYZ 1521218.5183 -4405922.5299 4339076.5286 NEW MON @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9445
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9445

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9433 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0402 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9445
XYZ -0.0001 -0.0002 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0401 -4324850.0303 4399278.2448 NEW L1 PHS CEN @ 2006.9445
XYZ 1578685.0184 -4324849.9709 4399278.1840 NEW ARP @ 2006.9445
XYZ 1578685.0184 -4324849.9709 4399278.1840 NEW MON @ 2006.9445
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9445
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9445

LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9445

REMOTE STATION INFORMATION

STATION NAME: r1_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1545172.4935 -4387386.6479 4349288.7010 MON @ 2006.9443 (M)
NEU 0.0000 -0.0000 1.4400 MON TO ARP (M)
NEU -0.0000 -0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3483 -0.9890 0.9870 MON TO ARP
XYZ 0.0256 -0.0728 0.0727 ARP TO L1 PHASE CENTER
XYZ 1545172.8674 -4387387.7097 4349289.7607 L1 PHS CEN @ 2006.9445

BASELINE NAME: barn r1_1
XYZ -3.5202 1.2391 -0.3805 + XYZ ADJUSTMENTS
XYZ 1545169.3473 -4387386.4706 4349289.3801 NEW L1 PHS CEN @ 2006.9445
XYZ 1545169.3216 -4387386.3978 4349289.3075 NEW ARP @ 2006.9445
XYZ 1545168.9733 -4387385.4088 4349288.3205 NEW MON @ 2006.9445
LLH 43 16 7.76192 289 24 5.29827 -9.2875 NEW L1 PHS CEN @ 2006.9445
LLH 43 16 7.76192 289 24 5.29827 -9.3935 NEW ARP @ 2006.9445
LLH 43 16 7.76192 289 24 5.29827 -10.8335 NEW MON @ 2006.9445

BASELINE NAME: nhun r1_1
XYZ -3.5138 1.2426 -0.3984 + XYZ ADJUSTMENTS
XYZ 1545169.3537 -4387386.4671 4349289.3622 NEW L1 PHS CEN @ 2006.9445
XYZ 1545169.3280 -4387386.3943 4349289.2896 NEW ARP @ 2006.9445
XYZ 1545168.9797 -4387385.4053 4349288.3026 NEW MON @ 2006.9445
LLH 43 16 7.76152 289 24 5.29859 -9.3006 NEW L1 PHS CEN @ 2006.9445
LLH 43 16 7.76152 289 24 5.29859 -9.4066 NEW ARP @ 2006.9445
LLH 43 16 7.76152 289 24 5.29859 -10.8466 NEW MON @ 2006.9445

BASELINE NAME: bru1 r1_1
XYZ -3.4856 1.2156 -0.3813 + XYZ ADJUSTMENTS
XYZ 1545169.3818 -4387386.4941 4349289.3794 NEW L1 PHS CEN @ 2006.9445
XYZ 1545169.3562 -4387386.4213 4349289.3067 NEW ARP @ 2006.9445
XYZ 1545169.0079 -4387385.4323 4349288.3197 NEW MON @ 2006.9445
LLH 43 16 7.76115 289 24 5.29937 -9.2634 NEW L1 PHS CEN @ 2006.9445
LLH 43 16 7.76115 289 24 5.29937 -9.3694 NEW ARP @ 2006.9445
LLH 43 16 7.76115 289 24 5.29937 -10.8094 NEW MON @ 2006.9445

G-FILES

Axx20061211 61211
B200612111545 612111915 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090001 -635740516 10 452775331 22 668138000 21 X3456AR1_1X3456ABARN
D 1 2 -8463319 1 3 6329445 2 3 -8848846

Axx20061211 61211
B200612111545 612111915 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -239504615 14 -185371246 33 -102117739 31 X3456AR1_1X3456ANHUN
D 1 2 -7994891 1 3 8298157 2 3 -9393624

Axx20061211 61211
B200612111545 612111915 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090003 335160105 15 625354614 39 499898643 36 X3456AR1_1X3456ABRU1

D 1 2 -7652472 1 3 8393606 2 3 -8839302

POST-FIT RMS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   09   11   17   19   20
barn-r1_1| 0.013 0.016 0.013 0.011 0.022 0.010 0.011 0.015 0.015
        27   28
barn-r1_1| 0.013   ...

      OVERALL   03   04   08   09   11   17   19   20
nhun-r1_1| 0.014 0.025 0.020 0.011 0.020 0.018 0.013 0.012 0.014
        27   28
nhun-r1_1| 0.015   ...

      OVERALL   03   04   08   09   11   17   19   20
bru1-r1_1| 0.022   ... 0.019 0.019 0.030 0.022 0.022 0.020 0.025
        27   28
bru1-r1_1| 0.022   ...
```

OBS BY SATELLITE VS. BASELINE

```
      OVERALL   03   04   08   09   11   17   19   20
barn-r1_1|  1853   30  141  298   44  411  344  179  202
        27   28
barn-r1_1|  204   ...
      OVERALL   03   04   08   09   11   17   19   20
nhun-r1_1|  1338   19   59  278   32   22  331  179  210
        27   28
nhun-r1_1|  208   ...
      OVERALL   03   04   08   09   11   17   19   20
bru1-r1_1|  1781   ...  140  299   32  409  330  180  193
        27   28
bru1-r1_1|  198   ...
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000011578   -0.0000002229    0.0000002103
-0.0000002229    0.0000068756   -0.0000005802
 0.0000002103   -0.0000005802    0.0000059956
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000016490    0.0000011090   -0.0000011778
 0.0000011090    0.0000055612   -0.0000001525
-0.0000011778   -0.0000001525    0.0000068187
```

Horizontal network accuracy = 0.00491 meters.
Vertical network accuracy = 0.00512 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

```
        Xa(m)          Ya(m)          Za(m)
  BARN  1481595.64851  -4342109.28925  4416102.17122   2002.00
  NHUN  1521219.24202  -4405923.95539  4339076.58831   2002.00
  BRU1  1578685.72814  -4324851.38849  4399278.23594   2002.00
```

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument
in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-63574.06349	45277.55175	66813.80022	2002.00
NHUN	-23950.46998	-18537.11439	-10211.78269	2002.00
BRU1	33516.01614	62535.45251	49989.86494	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.29600862
Point Scale	0.99998178
Combined Factor	0.99998329

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Emily Caruso

From: opus@ngs.noaa.gov
Sent: Friday, May 25, 2007 10:30 AM
To: Emily Caruso
Subject: OPUS solution : R1_1211b.tps 000138922

FILE: R1_1211b.tps 000138922

NGS OPUS SOLUTION REPORT
========================

USER: ECARUSO@GREENINTL.COM
RINEX FILE: r1_1345t.06o
DATE: May 25, 2007
TIME: 14:29:30 UTC

SOFTWARE: page5 0612.06 master28.pl
EPHEMERIS: igs14051.eph [precise]
NAV FILE: brdc3450.06n
ANT NAME: TPSHIPER_GD NONE
ARP HEIGHT: 1.454
START: 2006/12/11 19:25:00
STOP: 2006/12/11 21:55:00
OBS USED: 4976 / 5244 : 95%
FIXED AMB: 38 / 38 : 100%
OVERALL RMS: 0.018(m)

REF FRAME:	NAD_83(CORS96)(EPOCH:2002.0000)		ITRF00 (EPOCH:2006.9448)	
X:	1545985.911(m)	0.041(m)	1545985.186(m)	0.041(m)
Y:	-4387174.032(m)	0.049(m)	-4387172.606(m)	0.049(m)
Z:	4349192.518(m)	0.064(m)	4349192.461(m)	0.064(m)
LAT:	43 16 3.90061	0.019(m)	43 16 3.93449	0.019(m)
E LON:	289 24 42.58006	0.030(m)	289 24 42.57076	0.030(m)
W LON:	70 35 17.41994	0.030(m)	70 35 17.42924	0.030(m)
EL HGT:	-24.015(m)	0.087(m)	-25.209(m)	0.087(m)
ORTHO HGT:	2.417(m)	0.091(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4791773.201	48345.647
Easting (X) [meters]	371113.177	865780.767
Convergence [degrees]	-1.08869632	-0.28890632
Point Scale	0.99980435	0.99998107
Combined Factor	0.99980811	0.99998483

US NATIONAL GRID DESIGNATOR: 19TCH7111391773(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
DF9215	ZBW1 BOSTON WAAS 1 CORS ARP	N424408.559	W0712849.518	93734.4
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	32669.2
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	86382.7

NEAREST NGS PUBLISHED CONTROL POINT

OC0460	43.8	N431615.	W0703552.	850.9

BASE STATION INFORMATION

STATION NAME: zbw1 a 2 (BOSTON WAAS 1; Nashua, New Hampshire, U.S.A.)
ANTENNA: NOV_WAAS_600 NONE S/N=UNKNOWN
XYZ 1490299.3919 -4448982.8359 4306010.1266 MON @ 1997.0000 (M)

```
XYZ        -0.0173        -0.0019         0.0044  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.3930  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.3975  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1720        -0.0189         0.0438  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0917        -0.2737         0.2667  ARP TO L1 PHASE CENTER
XYZ   1490299.3116 -4448983.1285   4306010.4370  L1 PHS CEN @ 2006.9448
XYZ        -0.0001        -0.0001        -0.0000  + XYZ ADJUSTMENTS
XYZ   1490299.3114 -4448983.1286   4306010.4370  NEW L1 PHS CEN @ 2006.9448
XYZ   1490299.2197 -4448982.8549   4306010.1703  NEW ARP @ 2006.9448
XYZ   1490299.2197 -4448982.8549   4306010.1703  NEW MON @ 2006.9448
LLH   42 44  8.59263  288 31 10.47129     39.0662  NEW L1 PHS CEN @ 2006.9448
LLH   42 44  8.59263  288 31 10.47129     38.6732  NEW ARP @ 2006.9448
LLH   42 44  8.59263  288 31 10.47129     38.6732  NEW MON @ 2006.9448

STATION NAME: nhun  a    2 (University of New Hampsh; Town of Durham, New Hamp
 ANTENNA: TRM41249.00     NONE                                 S/N=12475400
XYZ   1521218.6913 -4405922.5110   4339076.4839  MON @ 1997.0000 (M)
XYZ        -0.0174        -0.0019         0.0045  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0714  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0682  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1730        -0.0189         0.0447  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0170        -0.0492         0.0488  ARP TO L1 PHASE CENTER
XYZ   1521218.5353 -4405922.5791   4339076.5775  L1 PHS CEN @ 2006.9448
XYZ         0.0000         0.0000         0.0000  + XYZ ADJUSTMENTS
XYZ   1521218.5353 -4405922.5791   4339076.5775  NEW L1 PHS CEN @ 2006.9448
XYZ   1521218.5183 -4405922.5299   4339076.5286  NEW ARP @ 2006.9448
XYZ   1521218.5183 -4405922.5299   4339076.5286  NEW MON @ 2006.9448
LLH   43  8 33.21317  289  2 53.12701      7.9845  NEW L1 PHS CEN @ 2006.9448
LLH   43  8 33.21317  289  2 53.12701      7.9131  NEW ARP @ 2006.9448
LLH   43  8 33.21317  289  2 53.12701      7.9131  NEW MON @ 2006.9448

STATION NAME: brul  a    6 (Brunswick 1; Brunswick, Maine  USA)
 ANTENNA: ASH700829.3     SNOW                                 S/N=11098
XYZ   1578685.1577 -4324849.9449   4399278.1414  MON @ 1997.0000 (M)
XYZ        -0.0140        -0.0026         0.0043  VEL (M/YR)
NEU         0.0000         0.0000         0.0000  MON TO ARP (M)
NEU        -0.0000         0.0000         0.0877  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.0598  ARP TO L2 PHASE CENTER (M)
XYZ        -0.1392        -0.0259         0.0428  VEL TIMES 9.9437 YRS
XYZ         0.0000         0.0000         0.0000  MON TO ARP
XYZ         0.0217        -0.0594         0.0608  ARP TO L1 PHASE CENTER
XYZ   1578685.0402 -4324850.0301   4399278.2450  L1 PHS CEN @ 2006.9448
XYZ         0.0000         0.0000        -0.0001  + XYZ ADJUSTMENTS
XYZ   1578685.0402 -4324850.0301   4399278.2449  NEW L1 PHS CEN @ 2006.9448
XYZ   1578685.0185 -4324849.9707   4399278.1841  NEW ARP @ 2006.9448
XYZ   1578685.0185 -4324849.9707   4399278.1841  NEW MON @ 2006.9448
LLH   43 53 23.34022  290  3 12.32629      2.0020  NEW L1 PHS CEN @ 2006.9448
LLH   43 53 23.34022  290  3 12.32629      1.9143  NEW ARP @ 2006.9448
LLH   43 53 23.34022  290  3 12.32629      1.9143  NEW MON @ 2006.9448

                        REMOTE STATION INFORMATION

STATION NAME: r1_1       1
 ANTENNA: TPSHIPER_GD     NONE                                 S/N=UNKNOWN
XYZ   1545987.8078 -4387172.7221   4349192.3635  MON @ 2006.9447 (M)
NEU         0.0000        -0.0000         1.4540  MON TO ARP (M)
NEU        -0.0000         0.0000         0.1060  ARP TO L1 PHASE CENTER (M)
NEU        -0.0000         0.0000         0.1012  ARP TO L2 PHASE CENTER (M)
XYZ         0.3519        -0.9986         0.9966  MON TO ARP
XYZ         0.0257        -0.0728         0.0727  ARP TO L1 PHASE CENTER
XYZ   1545988.1853 -4387173.7935   4349193.4327  L1 PHS CEN @ 2006.9448

BASELINE NAME:    zbw1  r1_1
```

```
XYZ        -2.6342          0.1393          0.0761  + XYZ ADJUSTMENTS
XYZ   1545985.5512  -4387173.6542   4349193.5088  NEW L1 PHS CEN @ 2006.9448
XYZ   1545985.5255  -4387173.5814   4349193.4362  NEW ARP @ 2006.9448
XYZ   1545985.1736  -4387172.5828   4349192.4396  NEW MON @ 2006.9448
LLH  43 16  3.93456  289 24 42.57058    -23.6822  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  3.93456  289 24 42.57058    -23.7882  NEW ARP @ 2006.9448
LLH  43 16  3.93456  289 24 42.57058    -25.2422  NEW MON @ 2006.9448

BASELINE NAME:   nhun  r1_1
XYZ        -2.6357          0.1185          0.0760  + XYZ ADJUSTMENTS
XYZ   1545985.5496  -4387173.6749   4349193.5088  NEW L1 PHS CEN @ 2006.9448
XYZ   1545985.5240  -4387173.6021   4349193.4361  NEW ARP @ 2006.9448
XYZ   1545985.1721  -4387172.6036   4349192.4395  NEW MON @ 2006.9448
LLH  43 16  3.93414  289 24 42.57021    -23.6684  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  3.93414  289 24 42.57021    -23.7744  NEW ARP @ 2006.9448
LLH  43 16  3.93414  289 24 42.57021    -25.2284  NEW MON @ 2006.9448

BASELINE NAME:   bru1  r1_1
XYZ        -2.5943          0.0906          0.1404  + XYZ ADJUSTMENTS
XYZ   1545985.5910  -4387173.7028   4349193.5731  NEW L1 PHS CEN @ 2006.9448
XYZ   1545985.5654  -4387173.6300   4349193.5005  NEW ARP @ 2006.9448
XYZ   1545985.2135  -4387172.6315   4349192.5039  NEW MON @ 2006.9448
LLH  43 16  3.93477  289 24 42.57153    -23.5951  NEW L1 PHS CEN @ 2006.9448
LLH  43 16  3.93477  289 24 42.57153    -23.7011  NEW ARP @ 2006.9448
LLH  43 16  3.93477  289 24 42.57153    -25.1551  NEW MON @ 2006.9448
```

G-FILES

```
Axx20061211   61211
B200612111925   612112154 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090001 -556859539   13 -618102721   33 -431822693   30 X3456AR1_1X3456AZBW1
D  1  2 -6608561  1  3  8026056  2  3 -8621466

Axx20061211   61211
B200612111925   612112154 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090002 -247666538   10 -187499263   25 -101159109   24 X3456AR1_1X3456ANHUN
D  1  2 -6516779  1  3  7285904  2  3 -8706635

Axx20061211   61211
B200612111925   612112154 1 page5 v0612.06IGS     222 1 2 27NGS   2007 525IFDDFX
Iant_info.003        NGS   20070320
C00090003  326998050   13  623226608   39  500856802   33 X3456AR1_1X3456ABRU1
D  1  2 -7007230  1  3  8462738  2  3 -8074399
```

POST-FIT RMS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     12     13     17
zbw1-r1_1|  0.015  0.012    ...  0.017  0.025  0.020    ...  0.018  0.010
              20     23     24     28     30
zbw1-r1_1|  0.014  0.016  0.013  0.019    ...

           OVERALL     02     04     05     09     10     12     13     17
nhun-r1_1|  0.012  0.011    ...  0.012  0.018  0.018    ...  0.013  0.008
              20     23     24     28     30
nhun-r1_1|  0.012  0.015  0.012    ...    ...

           OVERALL     02     04     05     09     10     11     12     13
bru1-r1_1|  0.024  0.021    ...  0.022  0.025  0.022    ...  0.021  0.020
              17     20     23     24     28     30
bru1-r1_1|  0.030  0.019  0.021  0.025  0.032  0.020
```

OBS BY SATELLITE VS. BASELINE

```
           OVERALL     02     04     05     09     10     12     13     17
zbw1-r1_1|   1585    252    ...    191     31     63    ...     88    298
```

	20	23	24	28	30				
zbw1-r1_1|	178	140	220	124	...				
	OVERALL	02	04	05	09	10	12	13	17
nhun-r1_1|	1520	241	...	206	47	58	...	109	298
	20	23	24	28	30				
nhun-r1_1|	192	145	224	...	...				
	OVERALL	02	04	05	09	10	11	12	13
bru1-r1_1|	1871	269	...	206	42	66	...	210	82
	17	20	23	24	28	30			
bru1-r1_1|	298	193	122	231	122	30			

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000009733	-0.0000001782	0.0000001891
-0.0000001782	0.0000071889	-0.0000005367
0.0000001891	-0.0000005367	0.0000057000

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000015482	0.0000012358	-0.0000013218
0.0000012358	0.0000055586	-0.0000004178
-0.0000013218	-0.0000004178	0.0000067554

Horizontal network accuracy = 0.00491 meters.
Vertical network accuracy = 0.00510 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
ZBW1	1490299.94174	-4448984.28282	4306010.23517	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
ZBW1	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument
in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
ZBW1	-55685.96926	-61810.25082	-43182.28283	2002.00
NHUN	-24766.66898	-18749.92339	-10115.92969	2002.00
BRU1	32699.81714	62322.64351	50085.71794	2002.00

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1212a.tps 000086881

Date: Friday, March 02, 2007 11:57:22 AM

Attachments:

FILE: R2_1212a.tps 000086881

NGS OPUS SOLUTION REPORT
==========

USER: sabedi@greenintl.com DATE: March 02, 2007
RINEX FILE: r2_1346p.06o TIME: 16:50:27 UTC

SOFTWARE: page5 0612.06 master2.pl START: 2006/12/12 15:15:00
EPHEMERIS: igs14052.eph [precise] STOP: 2006/12/12 17:47:00
NAV FILE: brdc3460.06n OBS USED: 3882 / 3921 : 99%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 20 / 20 : 100%
ARP HEIGHT: 1.42 OVERALL RMS: 0.013(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9471)

X:	1551778.878(m)	0.036(m)	1551778.153(m)	0.036(m)
Y:	-4378900.215(m)	0.018(m)	-4378898.790(m)	0.018(m)
Z:	4355422.721(m)	0.012(m)	4355422.665(m)	0.012(m)

LAT:	43 20 41.29415	0.028(m)	43 20 41.32809	0.028(m)
E LON:	289 30 47.25045	0.028(m)	289 30 47.24125	0.028(m)
W LON:	70 29 12.74955	0.028(m)	70 29 12.75875	0.028(m)
EL HGT:	-22.968(m)	0.014(m)	-24.160(m)	0.014(m)
ORTHO HGT:	3.373(m)	0.029(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4800179.284	56869.459

Easting (X) [meters]	379486.350	874037.244
Convergence [degrees]	-1.02069442	-0.21978805
Point Scale	0.99977865	0.99997496
Combined Factor	0.99978226	0.99997856

US NATIONAL GRID DESIGNATOR: 19TCJ7948600179(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	99806.1
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	43947.4
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	74622.8

NEAREST NGS PUBLISHED CONTROL POINT

OC2026	KENNEBUNK PORT LIGHTHOUSE	N432045.730	W0702833.548	892.2

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1760	-0.0189	0.0438	VEL TIMES 9.9460 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9389	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9471
XYZ	-0.0000	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9389	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9471
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW ARP @ 2006.9471
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW MON @ 2006.9471
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9471
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9471

LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW MON @ 2006.9471

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1731 -0.0189 0.0448 VEL TIMES 9.9460 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5352 -4405922.5791 4339076.5775 L1 PHS CEN @ 2006.9471
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5352 -4405922.5791 4339076.5775 NEW L1 PHS CEN @ 2006.9471
XYZ 1521218.5182 -4405922.5299 4339076.5286 NEW ARP @ 2006.9471
XYZ 1521218.5182 -4405922.5299 4339076.5286 NEW MON @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9471
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9471

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9460 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9471
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0401 -4324850.0302 4399278.2449 NEW L1 PHS CEN @ 2006.9471
XYZ 1578685.0185 -4324849.9708 4399278.1841 NEW ARP @ 2006.9471
XYZ 1578685.0185 -4324849.9708 4399278.1841 NEW MON @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9471
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9471

REMOTE STATION INFORMATION

```
STATION NAME: r2_1      1
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1551781.2956 -4378899.2789  4355423.0082  MON @ 2006.9469 (M)
NEU      -0.0000      -0.0000       1.4200  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.3449      -0.9734       0.9747  MON TO ARP
XYZ       0.0257      -0.0727       0.0728  ARP TO L1 PHASE CENTER
XYZ  1551781.6663 -4378900.3249  4355424.0556  L1 PHS CEN @ 2006.9471

BASELINE NAME:   barn  r2_1
XYZ      -3.1594       0.4975      -0.3358  + XYZ ADJUSTMENTS
XYZ  1551778.5069 -4378899.8274  4355423.7198  NEW L1 PHS CEN @ 2006.9471
XYZ  1551778.4811 -4378899.7548  4355423.6471  NEW ARP @ 2006.9471
XYZ  1551778.1362 -4378898.7814  4355422.6724  NEW MON @ 2006.9471
LLH  43 20 41.32858  289 30 47.24067    -22.6386  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 41.32858  289 30 47.24067    -22.7446  NEW ARP @ 2006.9471
LLH  43 20 41.32858  289 30 47.24067    -24.1646  NEW MON @ 2006.9471

BASELINE NAME:   nhun  r2_1
XYZ      -3.1446       0.4901      -0.3478  + XYZ ADJUSTMENTS
XYZ  1551778.5216 -4378899.8348  4355423.7078  NEW L1 PHS CEN @ 2006.9471
XYZ  1551778.4959 -4378899.7622  4355423.6350  NEW ARP @ 2006.9471
XYZ  1551778.1510 -4378898.7888  4355422.6604  NEW MON @ 2006.9471
LLH  43 20 41.32803  289 30 47.24118    -22.6382  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 41.32803  289 30 47.24118    -22.7442  NEW ARP @ 2006.9471
LLH  43 20 41.32803  289 30 47.24118    -24.1642  NEW MON @ 2006.9471

BASELINE NAME:   bru1  r2_1
XYZ      -3.1234       0.4794      -0.3464  + XYZ ADJUSTMENTS
XYZ  1551778.5428 -4378899.8455  4355423.7092  NEW L1 PHS CEN @ 2006.9471
XYZ  1551778.5171 -4378899.7729  4355423.6364  NEW ARP @ 2006.9471
XYZ  1551778.1722 -4378898.7995  4355422.6618  NEW MON @ 2006.9471
LLH  43 20 41.32768  289 30 47.24191    -22.6248  NEW L1 PHS CEN @ 2006.9471
LLH  43 20 41.32768  289 30 47.24191    -22.7308  NEW ARP @ 2006.9471
LLH  43 20 41.32768  289 30 47.24191    -24.1508  NEW MON @ 2006.9471

                    G-FILES

Axx20061212  61212
B200612121514  612121747 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
```

2IFDDFX
Iant_info.003 NGS 20070226
C00090001 -701832144 10 367909058 23 606794481 22
X3466AR2_1X3466ABARN
D 1 2 -8226652 1 3 6358627 2 3 -9172088

Axx20061212 61212
B200612121514 612121747 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -305596327 13 -270237411 30 -163461317 30
X3466AR2_1X3466ANHUN
D 1 2 -7301722 1 3 7476416 2 3 -9330048

Axx20061212 61212
B200612121514 612121747 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 269068463 14 540488287 39 438555224 38
X3466AR2_1X3466ABRU1
D 1 2 -7467712 1 3 8155969 2 3 -9048281

POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	03	08	11	17	19	20	27	28
barn-r2_1	0.010	0.017	...	0.006	0.011	0.010	0.019	0.008	0.007

	OVERALL	03	08	11	17	19	20	27	28
nhun-r2_1	0.012	0.017	...	0.010	0.014	0.010	0.026	0.010	...

	OVERALL	03	08	11	17	19	20	27	28
bru1-r2_1	0.017	0.021	...	0.019	0.018	0.018	0.028	0.013	0.015

OBS BY SATELLITE VS. BASELINE

	OVERALL	03	08	11	17	19	20	27	28
barn-r2_1	1399	83	...	301	175	229	52	257	302

	OVERALL	03	08	11	17	19	20	27	28
nhun-r2_1	1072	81	...	299	175	231	25	261	...

	OVERALL	03	08	11	17	19	20	27	28
bru1-r2_1	1411	84	...	303	173	234	56	258	303

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000010333	-0.0000001959	0.0000001923
-0.0000001959	0.0000065556	-0.0000005877
0.0000001923	-0.0000005877	0.0000062844

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000015261	0.0000010740	-0.0000011676
0.0000010740	0.0000055638	0.0000001504
-0.0000011676	0.0000001504	0.0000067834

Horizontal network accuracy = 0.00489 meters.
Vertical network accuracy = 0.00511 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-70183.22949	36790.92575	60679.45022	2002.00
NHUN	-30559.63598	-27023.74039	-16346.13269	2002.00
BRU1	26906.85014	54048.82651	43855.51494	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.21978805
Point Scale	0.99997496
Combined Factor	0.99997856

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1212b.tps 000086884

Date: Friday, March 02, 2007 11:58:12 AM

Attachments:

FILE: R1_1212b.tps 000086884

NGS OPUS SOLUTION REPORT
==========

USER: sabedi@greenintl.com DATE: March 02, 2007
RINEX FILE: r1_1346s.06o TIME: 17:01:41 UTC

SOFTWARE: page5 0612.06 master30.pl START: 2006/12/12 18:40:00
EPHEMERIS: igs14052.eph [precise] STOP: 2006/12/12 21:11:00
NAV FILE: brdc3460.06n OBS USED: 3540 / 3813 : 93%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 29 / 31 : 94%
ARP HEIGHT: 1.36 OVERALL RMS: 0.019(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9475)

X:	1547826.035(m)	0.005(m)	1547825.310(m)	0.005(m)
Y:	-4377456.775(m)	0.111(m)	-4377455.350(m)	0.111(m)
Z:	4358275.260(m)	0.039(m)	4358275.204(m)	0.039(m)
LAT:	43 22 48.11480	0.049(m)	43 22 48.14876	0.049(m)
E LON:	289 28 23.15223	0.041(m)	289 28 23.14297	0.041(m)
W LON:	70 31 36.84777	0.041(m)	70 31 36.85703	0.041(m)
EL HGT:	-12.625(m)	0.099(m)	-13.815(m)	0.099(m)
ORTHO HGT:	13.775(m)	0.102(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4804150.199	60796.380

Easting (X) [meters]	376313.632	870808.691
Convergence [degrees]	-1.04886126	-0.24742381
Point Scale	0.99978818	0.99997714
Combined Factor	0.99979016	0.99997912

US NATIONAL GRID DESIGNATOR: 19TCJ7631404150(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	94762.1
DI0876	ACU5 ACUSHNET 5 CORS ARP	N414436.796	W0705313.027	184168.4
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	73490.7

NEAREST NGS PUBLISHED CONTROL POINT

OC0380	W 5	N432300.	W0703142.	385.3

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9464 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9389	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9475
XYZ	-0.0000	-0.0001	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9389	-4342107.9259	4416102.1719	NEW L1 PHS CEN @ 2006.9475
XYZ	1481594.9217	-4342107.8757	4416102.1204	NEW ARP @ 2006.9475
XYZ	1481594.9217	-4342107.8757	4416102.1204	NEW MON @ 2006.9475
LLH	44 5 56.71848	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9475
LLH	44 5 56.71848	288 50 25.58927	139.6279	NEW ARP @ 2006.9475
LLH	44 5 56.71848	288 50 25.58927	139.6279	NEW MON @ 2006.9475

STATION NAME: acu5 a 2 (ACUSHNET 5; Acushnet, Massachusetts USA)
ANTENNA: TRM41249USCG SCIT S/N=60052145
XYZ 1560550.6359 -4503284.5346 4224398.0248 MON @ 1997.0000 (M)
XYZ -0.0170 -0.0019 0.0046 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0813 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0689 ARP TO L2 PHASE CENTER (M)
XYZ -0.1691 -0.0189 0.0458 VEL TIMES 9.9464 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0199 -0.0573 0.0541 ARP TO L1 PHASE CENTER
XYZ 1560550.4867 -4503284.6108 4224398.1247 L1 PHS CEN @ 2006.9475
XYZ -0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1560550.4867 -4503284.6108 4224398.1247 NEW L1 PHS CEN @ 2006.9475
XYZ 1560550.4668 -4503284.5535 4224398.0706 NEW ARP @ 2006.9475
XYZ 1560550.4668 -4503284.5535 4224398.0706 NEW MON @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.3219 NEW L1 PHS CEN @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.2406 NEW ARP @ 2006.9475
LLH 41 44 36.82970 289 6 46.96366 5.2406 NEW MON @ 2006.9475

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1392 -0.0259 0.0428 VEL TIMES 9.9464 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9475
XYZ -0.0001 0.0000 0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0301 4399278.2450 NEW L1 PHS CEN @ 2006.9475
XYZ 1578685.0184 -4324849.9707 4399278.1842 NEW ARP @ 2006.9475
XYZ 1578685.0184 -4324849.9707 4399278.1842 NEW MON @ 2006.9475
LLH 43 53 23.34023 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9475
LLH 43 53 23.34023 290 3 12.32628 1.9144 NEW ARP @ 2006.9475
LLH 43 53 23.34023 290 3 12.32628 1.9144 NEW MON @ 2006.9475

REMOTE STATION INFORMATION

STATION NAME: r1_1 1

ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1547827.1935 -4377457.7128 4358276.2869 MON @ 2006.9473 (M)
NEU 0.0000 -0.0000 1.3600 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3295 -0.9319 0.9341 MON TO ARP
XYZ 0.0257 -0.0726 0.0728 ARP TO L1 PHASE CENTER
XYZ 1547827.5487 -4377458.7174 4358277.2938 L1 PHS CEN @ 2006.9475

BASELINE NAME: barn r1_1
XYZ -1.8866 2.3284 -1.0671 + XYZ ADJUSTMENTS
XYZ 1547825.6621 -4377456.3889 4358276.2267 NEW L1 PHS CEN @ 2006.9475
XYZ 1547825.6364 -4377456.3163 4358276.1539 NEW ARP @ 2006.9475
XYZ 1547825.3069 -4377455.3844 4358275.2198 NEW MON @ 2006.9475
LLH 43 22 48.14843 289 28 23.14233 -12.3157 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 48.14843 289 28 23.14233 -12.4217 NEW ARP @ 2006.9475
LLH 43 22 48.14843 289 28 23.14233 -13.7817 NEW MON @ 2006.9475

BASELINE NAME: acu5 r1_1
XYZ -1.8825 2.3247 -1.0750 + XYZ ADJUSTMENTS
XYZ 1547825.6662 -4377456.3927 4358276.2188 NEW L1 PHS CEN @ 2006.9475
XYZ 1547825.6405 -4377456.3201 4358276.1460 NEW ARP @ 2006.9475
XYZ 1547825.3110 -4377455.3881 4358275.2119 NEW MON @ 2006.9475
LLH 43 22 48.14814 289 28 23.14244 -12.3176 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 48.14814 289 28 23.14244 -12.4236 NEW ARP @ 2006.9475
LLH 43 22 48.14814 289 28 23.14244 -13.7836 NEW MON @ 2006.9475

BASELINE NAME: bru1 r1_1
XYZ -1.8812 2.4359 -1.1064 + XYZ ADJUSTMENTS
XYZ 1547825.6675 -4377456.2814 4358276.1874 NEW L1 PHS CEN @ 2006.9475
XYZ 1547825.6418 -4377456.2088 4358276.1146 NEW ARP @ 2006.9475
XYZ 1547825.3123 -4377455.2769 4358275.1805 NEW MON @ 2006.9475
LLH 43 22 48.14972 289 28 23.14415 -12.4151 NEW L1 PHS CEN @ 2006.9475
LLH 43 22 48.14972 289 28 23.14415 -12.5211 NEW ARP @ 2006.9475
LLH 43 22 48.14972 289 28 23.14415 -13.8811 NEW MON @ 2006.9475

G-FILES

Axx20061212 61212
B200612121840 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226

C00090001 -662303852 18 353475087 34 578269006 30
X3466AR1_1X3466ABARN
D 1 2 -8491497 1 3 5079599 2 3 -8326355

Axx20061212 61212
B200612121840 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 127251558 13-1258291653 33-1338771413 27
X3466AR1_1X3466AACU5
D 1 2 -8629127 1 3 7307428 2 3 -8014932

Axx20061212 61212
B200612121840 612122110 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 308597061 24 526053061 82 410030038 58
X3466AR1_1X3466ABRU1
D 1 2 -7747013 1 3 7997789 2 3 -8991153

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 11 12 13 17
barn-r1_1| 0.016 0.014 ... ... 0.018 ... ... 0.012
20 23 24 28
barn-r1_1| 0.018 0.031 0.015 0.016

OVERALL 02 04 05 09 11 12 13 17
acu5-r1_1| 0.013 0.014 ... ... 0.017 ... ... 0.009
20 23 24 28
acu5-r1_1| 0.014 0.020 0.013 0.015

OVERALL 02 04 05 09 11 12 13 17
bru1-r1_1| 0.025 0.026 ... ... 0.024 ... ... 0.024
20 23 24 28
bru1-r1_1| 0.027 0.027 0.021 0.022

OBS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 11 12 13 17
barn-r1_1| 1186 190 ... ... 60 300
20 23 24 28

```
barn-r1_1|  263    24   150   199
       OVERALL    02    04    05    09    11    12    13    17
acu5-r1_1| 1194   193   ...   ...   ...    53   ...   ...   301
          20    23    24    28
acu5-r1_1|  269    22   150   206
       OVERALL    02    04    05    09    11    12    13    17
bru1-r1_1| 1160   189   ...   ...   ...    63   ...   ...   301
          20    23    24    28
bru1-r1_1|  259    25   124   199
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000023756   -0.0000005366    0.0000003654
-0.0000005366    0.0000199311   -0.0000012977
 0.0000003654   -0.0000012977    0.0000110956
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000039893    0.0000034264   -0.0000037790
 0.0000034264    0.0000131357   -0.0000035187
-0.0000037790   -0.0000035187    0.0000162773
```

Horizontal network accuracy = 0.00763 meters.
Vertical network accuracy = 0.00791 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

ACU5	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-66230.38649	35347.48575	57826.91122	2002.00
ACU5	12725.15144	-125829.22083	-133877.11695	2002.00
BRU1	30859.69314	52605.38651	41002.97594	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.24742381
Point Scale	0.99997714
Combined Factor	0.99997912

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1214a.tps 000087004

Date: Friday, March 02, 2007 1:44:09 PM

Attachments:

FILE: R1_1214a.tps 000087004

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1348o.06o TIME: 18:47:39 UTC

SOFTWARE: page5 0612.06 master30.pl START: 2006/12/14 14:49:00
EPHEMERIS: igs14054.eph [precise] STOP: 2006/12/14 17:28:00
NAV FILE: brdc3480.06n OBS USED: 4000 / 4224 : 95%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 21 / 23 : 91%
ARP HEIGHT: 1.35 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9525)

X:	1555001.648(m)	0.056(m)	1555000.923(m)	0.056(m)
Y:	-4375530.584(m)	0.045(m)	-4375529.159(m)	0.045(m)
Z:	4357643.370(m)	0.030(m)	4357643.314(m)	0.030(m)

LAT:	43 22 20.28039	0.017(m)	43 22 20.31435	0.017(m)
E LON:	289 33 52.17530	0.068(m)	289 33 52.16615	0.068(m)
W LON:	70 26 7.82470	0.068(m)	70 26 7.83385	0.068(m)
EL HGT:	-23.571(m)	0.038(m)	-24.762(m)	0.038(m)
ORTHO HGT:	2.707(m)	0.045(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4803160.039	59909.481

Easting (X) [meters]	383702.402	878212.049
Convergence [degrees]	-0.98592464	-0.18462301
Point Scale	0.99976637	0.99997250
Combined Factor	0.99977007	0.99997620

US NATIONAL GRID DESIGNATOR: 19TCJ8370203160(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	99613.5
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	49089.1
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	69733.6

NEAREST NGS PUBLISHED CONTROL POINT

OC2015	CAPE PORPOISE CHURCH SPIRE	N432217.983	W0702616.734	212.5

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9514 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9388	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9525
XYZ	-0.0000	0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9388	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9525
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW ARP @ 2006.9525
XYZ	1481594.9217	-4342107.8756	4416102.1205	NEW MON @ 2006.9525
LLH	44 5 56.71849	288 50 25.58927	139.7019	NEW L1 PHS CEN @ 2006.9525
LLH	44 5 56.71849	288 50 25.58927	139.6279	NEW ARP @ 2006.9525

LLH 44 5 56.71849 288 50 25.58927 139.6279 NEW MON @ 2006.9525

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 -0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 -0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1732 -0.0189 0.0448 VEL TIMES 9.9514 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5351 -4405922.5792 4339076.5775 L1 PHS CEN @ 2006.9525
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5351 -4405922.5792 4339076.5775 NEW L1 PHS CEN @ 2006.9525
XYZ 1521218.5181 -4405922.5299 4339076.5287 NEW ARP @ 2006.9525
XYZ 1521218.5181 -4405922.5299 4339076.5287 NEW MON @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9845 NEW L1 PHS CEN @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW ARP @ 2006.9525
LLH 43 8 33.21317 289 2 53.12701 7.9131 NEW MON @ 2006.9525

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1393 -0.0259 0.0428 VEL TIMES 9.9514 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0401 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9525
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9525
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW ARP @ 2006.9525
XYZ 1578685.0184 -4324849.9708 4399278.1842 NEW MON @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 2.0021 NEW L1 PHS CEN @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW ARP @ 2006.9525
LLH 43 53 23.34022 290 3 12.32628 1.9144 NEW MON @ 2006.9525

REMOTE STATION INFORMATION

```
STATION NAME: r1_1      1
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1555004.1794 -4375529.7368  4357643.9258  MON @ 2006.9524 (M)
NEU      -0.0000      -0.0000       1.3500  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.3286      -0.9247       0.9271  MON TO ARP
XYZ       0.0258      -0.0726       0.0728  ARP TO L1 PHASE CENTER
XYZ  1555004.5338 -4375530.7341  4357644.9257  L1 PHS CEN @ 2006.9525

BASELINE NAME:  barn  r1_1
XYZ      -3.2848       0.5632      -0.5970  + XYZ ADJUSTMENTS
XYZ  1555001.2490 -4375530.1708  4357644.3287  NEW L1 PHS CEN @ 2006.9525
XYZ  1555001.2232 -4375530.0982  4357644.2559  NEW ARP @ 2006.9525
XYZ  1555000.8946 -4375529.1736  4357643.3288  NEW MON @ 2006.9525
LLH  43 22 20.31461  289 33 52.16474    -23.2928  NEW L1 PHS CEN @ 2006.9525
LLH  43 22 20.31461  289 33 52.16474    -23.3988  NEW ARP @ 2006.9525
LLH  43 22 20.31461  289 33 52.16474    -24.7488  NEW MON @ 2006.9525

BASELINE NAME:  nhun  r1_1
XYZ      -3.2283       0.6081      -0.6274  + XYZ ADJUSTMENTS
XYZ  1555001.3056 -4375530.1260  4357644.2983  NEW L1 PHS CEN @ 2006.9525
XYZ  1555001.2798 -4375530.0533  4357644.2255  NEW ARP @ 2006.9525
XYZ  1555000.9511 -4375529.1287  4357643.2984  NEW MON @ 2006.9525
LLH  43 22 20.31441  289 33 52.16778    -23.3306  NEW L1 PHS CEN @ 2006.9525
LLH  43 22 20.31441  289 33 52.16778    -23.4366  NEW ARP @ 2006.9525
LLH  43 22 20.31441  289 33 52.16778    -24.7866  NEW MON @ 2006.9525

BASELINE NAME:  bru1  r1_1
XYZ      -3.2564       0.5632      -0.6117  + XYZ ADJUSTMENTS
XYZ  1555001.2774 -4375530.1709  4357644.3140  NEW L1 PHS CEN @ 2006.9525
XYZ  1555001.2516 -4375530.0983  4357644.2412  NEW ARP @ 2006.9525
XYZ  1555000.9230 -4375529.1736  4357643.3141  NEW MON @ 2006.9525
LLH  43 22 20.31405  289 33 52.16593    -23.2959  NEW L1 PHS CEN @ 2006.9525
LLH  43 22 20.31405  289 33 52.16593    -23.4019  NEW ARP @ 2006.9525
LLH  43 22 20.31405  289 33 52.16593    -24.7519  NEW MON @ 2006.9525

                    G-FILES

Axx20061214  61214
B200612141449  612141727 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
```

```
2IFDDFX
Iant_info.003       NGS   20070226
C00090001 -734059729   14  334212980   31  584587917   29
X3486AR1_1X3486ABARN
D  1  2 -8350333  1  3  6827954  2  3 -9349162

Axx20061214   61214
B200612141449   612141727 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090002 -337824330   29 -303934012   45 -185667698   43
X3486AR1_1X3486ANHUN
D  1  2 -8432801  1  3  7379702  2  3 -9199578

Axx20061214   61214
B200612141449   612141727 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090003  236840954   18  506792028   47  416348701   46
X3486AR1_1X3486ABRU1
D  1  2 -7637300  1  3  8408089  2  3 -9030953

            POST-FIT RMS BY SATELLITE VS. BASELINE

        OVERALL    03    08    11    13    17    19    20    27
barn-r1_1| 0.013  0.018   ...  0.010   ...  0.019  0.011  0.019  0.011
          28
barn-r1_1| 0.012

        OVERALL    03    08    11    13    17    19    20    27
nhun-r1_1| 0.014  0.017   ...  0.012   ...  0.019  0.011   ...  0.013
          28
nhun-r1_1|   ...

        OVERALL    03    08    11    13    17    19    20    27
bru1-r1_1| 0.021  0.022   ...  0.020   ...  0.025  0.021  0.037  0.017
          28
bru1-r1_1| 0.020

                OBS BY SATELLITE VS. BASELINE

        OVERALL    03    08    11    13    17    19    20    27
```

```
barn-r1_1|  1449   119   ...   317   ...   138   258    29   279
          28
barn-r1_1|   309
       OVERALL    03    08    11    13    17    19    20    27
nhun-r1_1|  1088   116   ...   311   ...   118   266   ...   277
          28
nhun-r1_1|   ...
       OVERALL    03    08    11    13    17    19    20    27
bru1-r1_1|  1463   120   ...   317   ...   138   251    35   294
          28
bru1-r1_1|   308
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
  0.0000030244   -0.0000004687    0.0000004208
 -0.0000004687    0.0000115444   -0.0000010162
  0.0000004208   -0.0000010162    0.0000106800
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
  0.0000036841    0.0000016318   -0.0000016568
  0.0000016318    0.0000096796   -0.0000000325
 -0.0000016568   -0.0000000325    0.0000118852
```

Horizontal network accuracy = 0.00657 meters.
Vertical network accuracy = 0.00676 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-73405.99949	33421.29475	58458.80122	2002.00
NHUN	-33782.40598	-30393.37139	-18566.78169	2002.00
BRU1	23684.08014	50679.19551	41634.86594	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.18462301
Point Scale	0.99997250
Combined Factor	0.99997620

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov
To: Sean Abedi;
CC:
Subject: OPUS solution : R1_1214b.tps 000087007
Date: Friday, March 02, 2007 1:45:35 PM
Attachments:

FILE: R1_1214b.tps 000087007

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1348r.06o TIME: 18:49:07 UTC

SOFTWARE: page5 0612.06 master30.pl START: 2006/12/14 17:46:00
EPHEMERIS: igs14054.eph [precise] STOP: 2006/12/14 20:15:00
NAV FILE: brdc3480.06n OBS USED: 4065 / 4217 : 96%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 33 / 34 : 97%
ARP HEIGHT: 1.40 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9529)

X:	1553136.357(m)	0.032(m)	1553135.632(m)	0.032(m)
Y:	-4378583.373(m)	0.015(m)	-4378581.948(m)	0.015(m)
Z:	4355261.155(m)	0.020(m)	4355261.099(m)	0.020(m)

LAT:	43 20 34.03963	0.020(m)	43 20 34.07357	0.020(m)
E LON:	289 31 48.75606	0.034(m)	289 31 48.74688	0.034(m)
W LON:	70 28 11.24394	0.034(m)	70 28 11.25312	0.034(m)
EL HGT:	-21.146(m)	0.011(m)	-22.337(m)	0.011(m)
ORTHO HGT:	5.175(m)	0.027(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4799930.958	56640.413

Easting (X) [meters]	380867.185	875421.690
Convergence [degrees]	-1.00892580	-0.20805326
Point Scale	0.99977458	0.99997409
Combined Factor	0.99977790	0.99997741

US NATIONAL GRID DESIGNATOR: 19TCH8086799931(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	100747.5
DI0876	ACU5 ACUSHNET 5 CORS ARP	N414436.796	W0705313.027	180916.7
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	74009.4

NEAREST NGS PUBLISHED CONTROL POINT

OC2010	BREAKWATER COURT CUPOLA	N432050.647	W0702819.257	544.3

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1761	-0.0189	0.0438	VEL TIMES 9.9517 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9388	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9529
XYZ	-0.0001	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9388	-4342107.9260	4416102.1720	NEW L1 PHS CEN @ 2006.9529
XYZ	1481594.9216	-4342107.8757	4416102.1205	NEW ARP @ 2006.9529
XYZ	1481594.9216	-4342107.8757	4416102.1205	NEW MON @ 2006.9529
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9529

LLH 44 5 56.71849 288 50 25.58926 139.6279 NEW ARP @ 2006.9529
LLH 44 5 56.71849 288 50 25.58926 139.6279 NEW MON @ 2006.9529

STATION NAME: acu5 a 2 (ACUSHNET 5; Acushnet, Massachusetts USA)
ANTENNA: TRM41249USCG SCIT S/N=60052145
XYZ 1560550.6359 -4503284.5346 4224398.0248 MON @ 1997.0000 (M)
XYZ -0.0170 -0.0019 0.0046 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0813 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0689 ARP TO L2 PHASE CENTER (M)
XYZ -0.1692 -0.0189 0.0458 VEL TIMES 9.9517 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0199 -0.0573 0.0541 ARP TO L1 PHASE CENTER
XYZ 1560550.4866 -4503284.6108 4224398.1247 L1 PHS CEN @ 2006.9529
XYZ 0.0001 0.0001 0.0001 + XYZ ADJUSTMENTS
XYZ 1560550.4867 -4503284.6107 4224398.1248 NEW L1 PHS CEN @ 2006.9529
XYZ 1560550.4668 -4503284.5534 4224398.0707 NEW ARP @ 2006.9529
XYZ 1560550.4668 -4503284.5534 4224398.0707 NEW MON @ 2006.9529
LLH 41 44 36.82971 289 6 46.96366 5.3219 NEW L1 PHS CEN @ 2006.9529
LLH 41 44 36.82971 289 6 46.96366 5.2406 NEW ARP @ 2006.9529
LLH 41 44 36.82971 289 6 46.96366 5.2406 NEW MON @ 2006.9529

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1393 -0.0259 0.0428 VEL TIMES 9.9517 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0400 -4324850.0301 4399278.2450 L1 PHS CEN @ 2006.9529
XYZ -0.0001 -0.0001 -0.0001 + XYZ ADJUSTMENTS
XYZ 1578685.0400 -4324850.0302 4399278.2449 NEW L1 PHS CEN @ 2006.9529
XYZ 1578685.0183 -4324849.9709 4399278.1841 NEW ARP @ 2006.9529
XYZ 1578685.0183 -4324849.9709 4399278.1841 NEW MON @ 2006.9529
LLH 43 53 23.34022 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9529
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW ARP @ 2006.9529
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW MON @ 2006.9529

REMOTE STATION INFORMATION

STATION NAME: r1_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1553136.1365 -4378582.6067 4355261.6001 MON @ 2006.9527 (M)
NEU -0.0000 -0.0000 1.4000 MON TO ARP (M)
NEU -0.0000 -0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 -0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3404 -0.9596 0.9609 MON TO ARP
XYZ 0.0258 -0.0727 0.0728 ARP TO L1 PHASE CENTER
XYZ 1553136.5026 -4378583.6389 4355262.6338 L1 PHS CEN @ 2006.9529

BASELINE NAME: barn r1_1
XYZ -0.5192 0.6551 -0.4893 + XYZ ADJUSTMENTS
XYZ 1553135.9834 -4378582.9839 4355262.1445 NEW L1 PHS CEN @ 2006.9529
XYZ 1553135.9577 -4378582.9112 4355262.0717 NEW ARP @ 2006.9529
XYZ 1553135.6173 -4378581.9516 4355261.1108 NEW MON @ 2006.9529
LLH 43 20 34.07389 289 31 48.74621 -20.8244 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.07389 289 31 48.74621 -20.9304 NEW ARP @ 2006.9529
LLH 43 20 34.07389 289 31 48.74621 -22.3304 NEW MON @ 2006.9529

BASELINE NAME: acu5 r1_1
XYZ -0.5061 0.6521 -0.5094 + XYZ ADJUSTMENTS
XYZ 1553135.9966 -4378582.9869 4355262.1244 NEW L1 PHS CEN @ 2006.9529
XYZ 1553135.9708 -4378582.9142 4355262.0516 NEW ARP @ 2006.9529
XYZ 1553135.6304 -4378581.9546 4355261.0907 NEW MON @ 2006.9529
LLH 43 20 34.07325 289 31 48.74671 -20.8329 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.07325 289 31 48.74671 -20.9389 NEW ARP @ 2006.9529
LLH 43 20 34.07325 289 31 48.74671 -22.3389 NEW MON @ 2006.9529

BASELINE NAME: bru1 r1_1
XYZ -0.4871 0.6675 -0.5035 + XYZ ADJUSTMENTS
XYZ 1553136.0155 -4378582.9714 4355262.1303 NEW L1 PHS CEN @ 2006.9529
XYZ 1553135.9898 -4378582.8988 4355262.0575 NEW ARP @ 2006.9529
XYZ 1553135.6494 -4378581.9392 4355261.0966 NEW MON @ 2006.9529
LLH 43 20 34.07357 289 31 48.74773 -20.8349 NEW L1 PHS CEN @ 2006.9529
LLH 43 20 34.07357 289 31 48.74773 -20.9409 NEW ARP @ 2006.9529
LLH 43 20 34.07357 289 31 48.74773 -22.3409 NEW MON @ 2006.9529

G-FILES

Axx20061214 61214
B200612141746 612142015 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3

```
2IFDDFX
Iant_info.003       NGS   20070226
C00090001 -715406957   15  364740760   27  608410097   26
X3486AR1_1X3486ABARN
D  1  2 -8645609  1  3  6243653  2  3 -8719903

Axx20061214   61214
B200612141746   612142015 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090002   74148364   13-1247025987   28-1308630200   24
X3486AR1_1X3486AACU5
D  1  2 -9001805  1  3  8191882  2  3 -8223242

Axx20061214   61214
B200612141746   612142015 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
C00090003  255493689   20  537319683   46  440170875   39
X3486AR1_1X3486ABRU1
D  1  2 -8480282  1  3  8877582  2  3 -8547131

                POST-FIT RMS BY SATELLITE VS. BASELINE

        OVERALL    02    04    05    08    09    11    12    17
barn-r1_1| 0.012  0.016  0.009  0.018  0.015  0.018  0.012  0.017    ...
          20    24    28
barn-r1_1| 0.010  0.016  0.011

        OVERALL    02    04    05    08    09    11    12    17
acu5-r1_1| 0.012  0.016  0.011  0.014  0.019  0.025  0.011    ...    ...
          20    24    28
acu5-r1_1| 0.010  0.017  0.009

        OVERALL    02    04    05    08    09    11    12    17
bru1-r1_1| 0.021  0.023  0.024  0.020  0.020  0.026  0.022  0.015    ...
          20    24    28
bru1-r1_1| 0.017  0.021  0.019

                OBS BY SATELLITE VS. BASELINE

        OVERALL    02    04    05    08    09    11    12    17
```

```
barn-r1_1|  1402    97   278    30    31   138   168    29   ...
          20    24    28
barn-r1_1|   293    44   294
        OVERALL    02    04    05    08    09    11    12    17
acu5-r1_1|  1299    97   288    21    36    61   163   ...   ...
          20    24    28
acu5-r1_1|   297    46   290
        OVERALL    02    04    05    08    09    11    12    17
bru1-r1_1|  1364    80   284    30    33   110   151    41   ...
          20    24    28
bru1-r1_1|   297    43   295
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000017644   -0.0000003240    0.0000002648
-0.0000003240    0.0000080644   -0.0000005996
 0.0000002648   -0.0000005996    0.0000061622
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000022644    0.0000012213   -0.0000012310
 0.0000012213    0.0000061659   -0.0000006575
-0.0000012310   -0.0000006575    0.0000075608
```

Horizontal network accuracy = 0.00525 meters.
Vertical network accuracy = 0.00539 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
ACU5	1560551.18644	-4503285.99583	4224398.14305	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
ACU5	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-71540.70849	36474.08375	60841.01622	2002.00
ACU5	7414.82944	-124702.62283	-130863.01195	2002.00
BRU1	25549.37114	53731.98451	44017.08094	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.20805326
Point Scale	0.99997409
Combined Factor	0.99997741

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1219a.tps 000087040

Date: Friday, March 02, 2007 2:04:32 PM

Attachments:

FILE: R2_1219a.tps 000087040

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1353n.06o TIME: 18:48:03 UTC

SOFTWARE: page5 0612.06 master12.pl START: 2006/12/19 13:53:00
EPHEMERIS: igs14062.eph [precise] STOP: 2006/12/19 16:26:00
NAV FILE: brdc3530.06n OBS USED: 4088 / 4194 : 97%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 22 / 23 : 96%
ARP HEIGHT: 1.295 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9661)

X:	1555841.783(m)	0.031(m)	1555841.057(m)	0.031(m)
Y:	-4363714.813(m)	0.022(m)	-4363713.389(m)	0.022(m)
Z:	4369102.313(m)	0.053(m)	4369102.259(m)	0.053(m)
LAT:	43 30 51.61720	0.028(m)	43 30 51.65129	0.028(m)
E LON:	289 37 23.58565	0.035(m)	289 37 23.57650	0.035(m)
W LON:	70 22 36.41435	0.035(m)	70 22 36.42350	0.035(m)
EL HGT:	-21.549(m)	0.047(m)	-22.736(m)	0.047(m)
ORTHO HGT:	4.651(m)	0.053(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4818854.399	75675.918

Easting (X) [meters]	388720.772	883011.175
Convergence [degrees]	-0.94806090	-0.14467217
Point Scale	0.99975232	0.99997022
Combined Factor	0.99975570	0.99997359

US NATIONAL GRID DESIGNATOR: 19TCJ8872118854(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	90489.1
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	62304.7
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	54247.6

NEAREST NGS PUBLISHED CONTROL POINT

OC1918	OLD ORCHARD HOTEL FLAGPOLE HAR	N433057.135	W0702241.098	200.4

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1764	-0.0189	0.0438	VEL TIMES 9.9650 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9661
XYZ	-0.0001	0.0001	0.0001	+ XYZ ADJUSTMENTS
XYZ	1481594.9385	-4342107.9258	4416102.1722	NEW L1 PHS CEN @ 2006.9661
XYZ	1481594.9213	-4342107.8755	4416102.1207	NEW ARP @ 2006.9661
XYZ	1481594.9213	-4342107.8755	4416102.1207	NEW MON @ 2006.9661
LLH	44 5 56.71849	288 50 25.58925	139.7019	NEW L1 PHS CEN @ 2006.9661
LLH	44 5 56.71849	288 50 25.58925	139.6279	NEW ARP @ 2006.9661

LLH 44 5 56.71849 288 50 25.58925 139.6279 NEW MON @ 2006.9661

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp
ANTENNA: TRM41249.00 NONE S/N=12475400
XYZ 1521218.6913 -4405922.5110 4339076.4839 MON @ 1997.0000 (M)
XYZ -0.0174 -0.0019 0.0045 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0714 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0682 ARP TO L2 PHASE CENTER (M)
XYZ -0.1734 -0.0189 0.0448 VEL TIMES 9.9650 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0170 -0.0492 0.0488 ARP TO L1 PHASE CENTER
XYZ 1521218.5349 -4405922.5792 4339076.5776 L1 PHS CEN @ 2006.9661
XYZ 0.0000 0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1521218.5349 -4405922.5792 4339076.5776 NEW L1 PHS CEN @ 2006.9661
XYZ 1521218.5179 -4405922.5299 4339076.5287 NEW ARP @ 2006.9661
XYZ 1521218.5179 -4405922.5299 4339076.5287 NEW MON @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9845 NEW L1 PHS CEN @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9131 NEW ARP @ 2006.9661
LLH 43 8 33.21317 289 2 53.12700 7.9131 NEW MON @ 2006.9661

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0428 VEL TIMES 9.9650 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2450 L1 PHS CEN @ 2006.9661
XYZ -0.0001 -0.0001 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0398 -4324850.0303 4399278.2450 NEW L1 PHS CEN @ 2006.9661
XYZ 1578685.0181 -4324849.9709 4399278.1842 NEW ARP @ 2006.9661
XYZ 1578685.0181 -4324849.9709 4399278.1842 NEW MON @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW ARP @ 2006.9661
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW MON @ 2006.9661

REMOTE STATION INFORMATION

STATION NAME: r2_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1555841.7859 -4363713.3241 4369101.5131 MON @ 2006.9660 (M)
NEU 0.0000 -0.0000 1.2950 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3154 -0.8846 0.8917 MON TO ARP
XYZ 0.0258 -0.0724 0.0730 ARP TO L1 PHASE CENTER
XYZ 1555842.1271 -4363714.2811 4369102.4777 L1 PHS CEN @ 2006.9661

BASELINE NAME: barn r2_1
XYZ -0.7453 -0.0779 0.7775 + XYZ ADJUSTMENTS
XYZ 1555841.3819 -4363714.3590 4369103.2552 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.3560 -4363714.2866 4369103.1822 NEW ARP @ 2006.9661
XYZ 1555841.0406 -4363713.4020 4369102.2906 NEW MON @ 2006.9661
LLH 43 30 51.65188 289 37 23.57562 -21.3080 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.65188 289 37 23.57562 -21.4140 NEW ARP @ 2006.9661
LLH 43 30 51.65188 289 37 23.57562 -22.7090 NEW MON @ 2006.9661

BASELINE NAME: nhun r2_1
XYZ -0.7261 -0.0555 0.7250 + XYZ ADJUSTMENTS
XYZ 1555841.4010 -4363714.3366 4369103.2028 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.3752 -4363714.2642 4369103.1298 NEW ARP @ 2006.9661
XYZ 1555841.0598 -4363713.3796 4369102.2381 NEW MON @ 2006.9661
LLH 43 30 51.65098 289 37 23.57675 -21.3548 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.65098 289 37 23.57675 -21.4608 NEW ARP @ 2006.9661
LLH 43 30 51.65098 289 37 23.57675 -22.7558 NEW MON @ 2006.9661

BASELINE NAME: bru1 r2_1
XYZ -0.7139 -0.0627 0.7359 + XYZ ADJUSTMENTS
XYZ 1555841.4132 -4363714.3438 4369103.2136 NEW L1 PHS CEN @ 2006.9661
XYZ 1555841.3874 -4363714.2714 4369103.1406 NEW ARP @ 2006.9661
XYZ 1555841.0720 -4363713.3868 4369102.2490 NEW MON @ 2006.9661
LLH 43 30 51.65099 289 37 23.57716 -21.3395 NEW L1 PHS CEN @ 2006.9661
LLH 43 30 51.65099 289 37 23.57716 -21.4455 NEW ARP @ 2006.9661
LLH 43 30 51.65099 289 37 23.57716 -22.7405 NEW MON @ 2006.9661

G-FILES

Axx20061219 61219
B200612191353 612191626 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3

2IFDDFX
Iant_info.003 NGS 20070226
C00090001 -742461193 14 216055265 31 469998301 34
X3536AR2_1X3536ABARN
D 1 2 -7451011 1 3 6081417 2 3 -9460926

Axx20061219 61219
B200612191353 612191626 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -346225418 13 -422091504 30 -300257094 33
X3536AR2_1X3536ANHUN
D 1 2 -7396326 1 3 7835255 2 3 -9062796

Axx20061219 61219
B200612191353 612191626 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 228439461 15 388634159 38 301759353 38
X3536AR2_1X3536ABRU1
D 1 2 -7307579 1 3 8348406 2 3 -8991068

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 16 17 19 27
barn-r2_1| 0.013 0.014 ... 0.013 0.023 ... 0.018 0.012 0.009
28
barn-r2_1| 0.013

OVERALL 03 08 11 13 16 17 19 27
nhun-r2_1| 0.013 0.015 ... ... 0.020 ... 0.022 0.011 0.010
28
nhun-r2_1| 0.011

OVERALL 03 08 11 13 16 17 19 27
bru1-r2_1| 0.019 0.019 ... 0.019 0.024 ... 0.024 0.020 0.015
28
bru1-r2_1| 0.022

OBS BY SATELLITE VS. BASELINE

OVERALL 03 08 11 13 16 17 19 27

barn-r2_1| 1410 172 ... 274 79 ... 66 289 293
28
barn-r2_1| 237
OVERALL 03 08 11 13 16 17 19 27
nhun-r2_1| 1178 189 ... ... 65 ... 60 305 305
28
nhun-r2_1| 254
OVERALL 03 08 11 13 16 17 19 27
bru1-r2_1| 1500 192 ... 299 80 ... 66 305 305
28
bru1-r2_1| 253

Covariance Matrix for the xyz OPUS Position (meters^2).

0.0000013111	-0.0000002285	0.0000002448
-0.0000002285	0.0000073444	-0.0000007095
0.0000002448	-0.0000007095	0.0000081978

Covariance Matrix for the enu OPUS Position (meters^2).

0.0000018470	0.0000011824	-0.0000012650
0.0000011824	0.0000067946	0.0000007373
-0.0000012650	0.0000007373	0.0000082117

Horizontal network accuracy = 0.00539 meters.
Vertical network accuracy = 0.00562 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-74246.13449	21605.52375	46999.85822	2002.00
NHUN	-34622.54098	-42209.14239	-30025.72469	2002.00
BRU1	22843.94514	38863.42451	30175.92294	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.14467217
Point Scale	0.99997022
Combined Factor	0.99997359

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1219b.tps 000087043

Date: Friday, March 02, 2007 2:05:53 PM

Attachments:

FILE: R2_1219b.tps 000087043

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1353r.06o TIME: 18:58:57 UTC

SOFTWARE: page5 0612.06 master2.pl START: 2006/12/19 17:12:00
EPHEMERIS: igs14062.eph [precise] STOP: 2006/12/19 19:43:00
NAV FILE: brdc3530.06n OBS USED: 3648 / 3880 : 94%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 27 / 28 : 96%
ARP HEIGHT: 1.48 OVERALL RMS: 0.016(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9665)

X:	1554694.730(m)	0.046(m)	1554694.004(m)	0.046(m)
Y:	-4362518.260(m)	0.007(m)	-4362516.837(m)	0.007(m)
Z:	4370725.884(m)	0.032(m)	4370725.830(m)	0.032(m)
LAT:	43 32 3.50642	0.016(m)	43 32 3.54051	0.016(m)
E LON:	289 36 53.36293	0.041(m)	289 36 53.35374	0.041(m)
W LON:	70 23 6.63707	0.041(m)	70 23 6.64626	0.041(m)
EL HGT:	0.054(m)	0.038(m)	-1.132(m)	0.038(m)
ORTHO HGT:	26.276(m)	0.046(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES SPC (1802 ME W)
Northing (Y) [meters]	4821083.450	77896.234

Easting (X) [meters]	388079.149	882338.209
Convergence [degrees]	-0.95419311	-0.15050783
Point Scale	0.99975408	0.99997050
Combined Factor	0.99975407	0.99997049

US NATIONAL GRID DESIGNATOR: 19TCJ8807921083(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	88425.1
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	53005.6
AH8904	PNB1 PENOBSCOT 1 CORS ARP	N442706.177	W0684620.162	164702.3

NEAREST NGS PUBLISHED CONTROL POINT

OC0073	C 162	N433116.	W0702212.	1912.7

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1764	-0.0189	0.0438	VEL TIMES 9.9654 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9665
XYZ	-0.0000	-0.0001	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9386	-4342107.9260	4416102.1720	NEW L1 PHS CEN @ 2006.9665
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW ARP @ 2006.9665
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW MON @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9665
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW MON @ 2006.9665

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0429 VEL TIMES 9.9654 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2451 L1 PHS CEN @ 2006.9665
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0399 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9665
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW ARP @ 2006.9665
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW MON @ 2006.9665
LLH 43 53 23.34022 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9665
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW ARP @ 2006.9665
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW MON @ 2006.9665

STATION NAME: pnb1 a 3 (Penobscot 1; Penobscot, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=16034
XYZ 1651242.9738 -4251054.4532 4444083.2680 MON @ 1997.0000 (M)
XYZ -0.0173 -0.0026 0.0039 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1724 -0.0259 0.0389 VEL TIMES 9.9654 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0227 -0.0584 0.0614 ARP TO L1 PHASE CENTER
XYZ 1651242.8241 -4251054.5375 4444083.3683 L1 PHS CEN @ 2006.9665
XYZ -0.0001 -0.0001 -0.0001 + XYZ ADJUSTMENTS
XYZ 1651242.8240 -4251054.5376 4444083.3682 NEW L1 PHS CEN @ 2006.9665
XYZ 1651242.8013 -4251054.4792 4444083.3068 NEW ARP @ 2006.9665
XYZ 1651242.8013 -4251054.4792 4444083.3068 NEW MON @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.6493 NEW L1 PHS CEN @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.5616 NEW ARP @ 2006.9665
LLH 44 27 6.21239 291 13 39.82945 32.5616 NEW MON @ 2006.9665

REMOTE STATION INFORMATION

STATION NAME: r2_1 1

```
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1554694.6361 -4362517.3804  4370726.5064  MON @ 2006.9663 (M)
NEU     -0.0000      -0.0000       1.4800  MON TO ARP (M)
NEU     -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU     -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ      0.3602      -1.0107       1.0194  MON TO ARP
XYZ      0.0258      -0.0724       0.0730  ARP TO L1 PHASE CENTER
XYZ  1554695.0221 -4362518.4635  4370727.5988  L1 PHS CEN @ 2006.9665

BASELINE NAME:  barn  r2_1
XYZ     -0.6455       0.5422      -0.6687  + XYZ ADJUSTMENTS
XYZ  1554694.3766 -4362517.9213  4370726.9301  NEW L1 PHS CEN @ 2006.9665
XYZ  1554694.3508 -4362517.8489  4370726.8571  NEW ARP @ 2006.9665
XYZ  1554693.9906 -4362516.8382  4370725.8377  NEW MON @ 2006.9665
LLH  43 32  3.54076  289 36 53.35316     0.4573  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.54076  289 36 53.35316     0.3513  NEW ARP @ 2006.9665
LLH  43 32  3.54076  289 36 53.35316    -1.1287  NEW MON @ 2006.9665

BASELINE NAME:  bru1  r2_1
XYZ     -0.6023       0.5397      -0.6637  + XYZ ADJUSTMENTS
XYZ  1554694.4198 -4362517.9238  4370726.9351  NEW L1 PHS CEN @ 2006.9665
XYZ  1554694.3940 -4362517.8514  4370726.8621  NEW ARP @ 2006.9665
XYZ  1554694.0338 -4362516.8407  4370725.8427  NEW MON @ 2006.9665
LLH  43 32  3.54051  289 36 53.35494     0.4730  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.54051  289 36 53.35494     0.3670  NEW ARP @ 2006.9665
LLH  43 32  3.54051  289 36 53.35494    -1.1130  NEW MON @ 2006.9665

BASELINE NAME:  pnb1  r2_1
XYZ     -0.6487       0.5468      -0.6960  + XYZ ADJUSTMENTS
XYZ  1554694.3734 -4362517.9167  4370726.9028  NEW L1 PHS CEN @ 2006.9665
XYZ  1554694.3476 -4362517.8443  4370726.8298  NEW ARP @ 2006.9665
XYZ  1554693.9874 -4362516.8336  4370725.8104  NEW MON @ 2006.9665
LLH  43 32  3.54025  289 36 53.35310     0.4346  NEW L1 PHS CEN @ 2006.9665
LLH  43 32  3.54025  289 36 53.35310     0.3286  NEW ARP @ 2006.9665
LLH  43 32  3.54025  289 36 53.35310    -1.1514  NEW MON @ 2006.9665

                    G-FILES

Axx20061219  61219
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2IFDDFX
Iant_info.003       NGS   20070226
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C00090001 -730990692 16 204089626 29 453762829 29
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D 1 2 -8331529 1 3 6329902 2 3 -9085992

Axx20061219 61219
B200612191712 612191942 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 239909844 21 376668699 45 285523416 40
X3536AR2_1X3536ABRU1
D 1 2 -8122165 1 3 8845670 2 3 -8776140

Axx20061219 61219
B200612191712 612191942 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 965488139 15 1114623543 33 733574963 30
X3536AR2_1X3536APNB1
D 1 2 -7738529 1 3 8216451 2 3 -9035601

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 08 09 11 12 17
barn-r2_1| 0.012 0.019 0.011 ... 0.018 0.021 0.012 ... ...
20 24 28
barn-r2_1| 0.010 ... 0.009

OVERALL 02 04 05 08 09 11 12 17
bru1-r2_1| 0.021 0.024 0.020 ... 0.018 0.027 0.020 ... ...
20 24 28
bru1-r2_1| 0.020 ... 0.020

OVERALL 02 04 05 08 09 11 12 17
pnb1-r2_1| 0.013 0.018 0.011 ... 0.021 0.031 0.013 ... ...
20 24 28
pnb1-r2_1| 0.011 ... 0.010

OBS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 08 09 11 12 17
barn-r2_1| 1250 68 260 ... 58 85 189 ... ...
20 24 28

```
barn-r2_1|   294   ...   296
        OVERALL    02    04    05    08    09    11    12    17
bru1-r2_1|  1228    64   253   ...    59    62   190   ...   ...
          20    24    28
bru1-r2_1|   300   ...   300
        OVERALL    02    04    05    08    09    11    12    17
pnb1-r2_1|  1170    63   255   ...    54    26   189   ...   ...
          20    24    28
pnb1-r2_1|   283   ...   300
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000020489   -0.0000003416    0.0000003126
-0.0000003416    0.0000087889   -0.0000007196
 0.0000003126   -0.0000007196    0.0000074244
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000025924    0.0000013196   -0.0000013213
 0.0000013196    0.0000070297   -0.0000003645
-0.0000013213   -0.0000003645    0.0000086401
```

Horizontal network accuracy = 0.00560 meters.
Vertical network accuracy = 0.00576 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

BRU1	0.00360	-0.00070	-0.00040
PNB1	0.00050	-0.00070	-0.00110

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-73099.08149	20408.97075	45376.28722	2002.00
BRU1	23990.99814	37666.87151	28552.35194	2002.00
PNB1	96548.80065	111462.36507	73357.46915	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.15050783
Point Scale	0.99997050
Combined Factor	0.99997049

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R2_1218a.tps 000087086

Date: Friday, March 02, 2007 2:41:25 PM

Attachments:

FILE: R2_1218a.tps 000087086

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r2_1352p.06o TIME: 19:24:58 UTC

SOFTWARE: page5 0612.06 master10.pl START: 2006/12/18 15:30:00
EPHEMERIS: igs14061.eph [precise] STOP: 2006/12/18 18:08:00
NAV FILE: brdc3520.06n OBS USED: 3726 / 3868 : 96%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 17 / 21 : 81%
ARP HEIGHT: 1.39 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9636)

X:	1559408.618(m)	0.105(m)	1559407.892(m)	0.105(m)
Y:	-4368233.374(m)	0.044(m)	-4368231.949(m)	0.044(m)
Z:	4363347.206(m)	0.028(m)	4363347.151(m)	0.028(m)

LAT:	43 26 34.69121	0.012(m)	43 26 34.72526	0.012(m)
E LON:	289 38 45.50907	0.113(m)	289 38 45.49997	0.113(m)
W LON:	70 21 14.49093	0.113(m)	70 21 14.50003	0.113(m)
EL HGT:	-23.698(m)	0.027(m)	-24.888(m)	0.027(m)
ORTHO HGT:	2.461(m)	0.037(m)	[Geoid03 NAVD88]	

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4810898.095	67742.617

Easting (X) [meters]	390431.189	884833.309
Convergence [degrees]	-0.93116375	-0.12883405
Point Scale	0.99974767	0.99996950
Combined Factor	0.99975139	0.99997321

US NATIONAL GRID DESIGNATOR: 19TCJ9043110898(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	97572.6
DI1075	NHUN U NEW HAMPSHIRE CORS ARP	N430833.179	W0705706.863	58890.3
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	59536.9

NEAREST NGS PUBLISHED CONTROL POINT

OC0256	T 98	N432636.	W0702111.	88.2

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1763	-0.0189	0.0438	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9636
XYZ	-0.0000	-0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	1481594.9386	-4342107.9259	4416102.1720	NEW L1 PHS CEN @ 2006.9636
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW ARP @ 2006.9636
XYZ	1481594.9214	-4342107.8756	4416102.1206	NEW MON @ 2006.9636
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9636
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9636
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW MON @ 2006.9636

STATION NAME: nhun a 2 (University of New Hampsh; Town of Durham, New Hamp

ANTENNA: TRM41249.00 NONE S/N=12475400

XYZ	1521218.6913	-4405922.5110	4339076.4839	MON @ 1997.0000 (M)
XYZ	-0.0174	-0.0019	0.0045	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0714	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0682	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1733	-0.0189	0.0448	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0170	-0.0492	0.0488	ARP TO L1 PHASE CENTER
XYZ	1521218.5350	-4405922.5792	4339076.5776	L1 PHS CEN @ 2006.9636
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1521218.5349	-4405922.5792	4339076.5775	NEW L1 PHS CEN @ 2006.9636
XYZ	1521218.5179	-4405922.5299	4339076.5287	NEW ARP @ 2006.9636
XYZ	1521218.5179	-4405922.5299	4339076.5287	NEW MON @ 2006.9636
LLH	43 8 33.21317	289 2 53.12700	7.9845	NEW L1 PHS CEN @ 2006.9636
LLH	43 8 33.21317	289 2 53.12700	7.9131	NEW ARP @ 2006.9636
LLH	43 8 33.21317	289 2 53.12700	7.9131	NEW MON @ 2006.9636

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)

ANTENNA: ASH700829.3 SNOW S/N=11098

XYZ	1578685.1577	-4324849.9449	4399278.1414	MON @ 1997.0000 (M)
XYZ	-0.0140	-0.0026	0.0043	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0877	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0598	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1395	-0.0259	0.0428	VEL TIMES 9.9624 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0217	-0.0594	0.0608	ARP TO L1 PHASE CENTER
XYZ	1578685.0399	-4324850.0302	4399278.2450	L1 PHS CEN @ 2006.9636
XYZ	-0.0000	-0.0001	-0.0001	+ XYZ ADJUSTMENTS
XYZ	1578685.0399	-4324850.0302	4399278.2450	NEW L1 PHS CEN @ 2006.9636
XYZ	1578685.0182	-4324849.9709	4399278.1842	NEW ARP @ 2006.9636
XYZ	1578685.0182	-4324849.9709	4399278.1842	NEW MON @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	2.0021	NEW L1 PHS CEN @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	1.9144	NEW ARP @ 2006.9636
LLH	43 53 23.34022	290 3 12.32627	1.9144	NEW MON @ 2006.9636

REMOTE STATION INFORMATION

STATION NAME: r2_1 1
ANTENNA: TPSHIPER_GD NONE S/N=UNKNOWN
XYZ 1559411.3951 -4368233.1701 4363347.6384 MON @ 2006.9634 (M)
NEU 0.0000 -0.0000 1.3900 MON TO ARP (M)
NEU -0.0000 0.0000 0.1060 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.1012 ARP TO L2 PHASE CENTER (M)
XYZ 0.3393 -0.9505 0.9558 MON TO ARP
XYZ 0.0259 -0.0725 0.0729 ARP TO L1 PHASE CENTER
XYZ 1559411.7603 -4368234.1931 4363348.6671 L1 PHS CEN @ 2006.9636

BASELINE NAME: barn r2_1
XYZ -3.5395 1.2023 -0.4727 + XYZ ADJUSTMENTS
XYZ 1559408.2208 -4368232.9908 4363348.1944 NEW L1 PHS CEN @ 2006.9636
XYZ 1559408.1949 -4368232.9183 4363348.1215 NEW ARP @ 2006.9636
XYZ 1559407.8556 -4368231.9678 4363347.1657 NEW MON @ 2006.9636
LLH 43 26 34.72548 289 38 45.49817 -23.3776 NEW L1 PHS CEN @ 2006.9636
LLH 43 26 34.72548 289 38 45.49817 -23.4836 NEW ARP @ 2006.9636
LLH 43 26 34.72548 289 38 45.49817 -24.8736 NEW MON @ 2006.9636

BASELINE NAME: nhun r2_1
XYZ -3.5352 1.2161 -0.5004 + XYZ ADJUSTMENTS
XYZ 1559408.2251 -4368232.9770 4363348.1667 NEW L1 PHS CEN @ 2006.9636
XYZ 1559408.1992 -4368232.9045 4363348.0939 NEW ARP @ 2006.9636
XYZ 1559407.8599 -4368231.9540 4363347.1380 NEW MON @ 2006.9636
LLH 43 26 34.72509 289 38 45.49855 -23.4050 NEW L1 PHS CEN @ 2006.9636
LLH 43 26 34.72509 289 38 45.49855 -23.5110 NEW ARP @ 2006.9636
LLH 43 26 34.72509 289 38 45.49855 -24.9010 NEW MON @ 2006.9636

BASELINE NAME: bru1 r2_1
XYZ -3.4345 1.2461 -0.4900 + XYZ ADJUSTMENTS
XYZ 1559408.3258 -4368232.9469 4363348.1771 NEW L1 PHS CEN @ 2006.9636
XYZ 1559408.2999 -4368232.8744 4363348.1043 NEW ARP @ 2006.9636
XYZ 1559407.9606 -4368231.9240 4363347.1484 NEW MON @ 2006.9636
LLH 43 26 34.72521 289 38 45.50322 -23.3938 NEW L1 PHS CEN @ 2006.9636
LLH 43 26 34.72521 289 38 45.50322 -23.4998 NEW ARP @ 2006.9636
LLH 43 26 34.72521 289 38 45.50322 -24.8898 NEW MON @ 2006.9636

G-FILES

Axx20061218 61218
B200612181530 6121818 7 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226

C00090001 -778129342 14 261240922 27 527549549 26
X3526AR2_1X3526ABARN
D 1 2 -7865470 1 3 6008415 2 3 -9171456

Axx20061218 61218
B200612181530 6121818 7 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090002 -381893419 15 -376905759 39 -242706093 38
X3526AR2_1X3526ANHUN
D 1 2 -7448093 1 3 7840116 2 3 -9256730

Axx20061218 61218
B200612181530 6121818 7 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3 2IFDDFX
Iant_info.003 NGS 20070226
C00090003 192770576 17 433819531 55 359310357 52
X3526AR2_1X3526ABRU1
D 1 2 -7133444 1 3 7679234 2 3 -8460585

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 03 04 08 09 11 17 19 20
barn-r2_1| 0.012 ... 0.017 0.010 ... ... 0.011 0.014 0.018
27 28
barn-r2_1| 0.013 0.010

OVERALL 03 04 08 11 17 19 20 27
nhun-r2_1| 0.014 ... 0.023 0.012 ... 0.013 0.014 0.018 0.013
28
nhun-r2_1| ...

OVERALL 03 04 08 11 17 19 20 27
bru1-r2_1| 0.022 ... 0.018 0.018 ... 0.020 0.027 0.031 0.016
28
bru1-r2_1| 0.023

OBS BY SATELLITE VS. BASELINE

OVERALL 03 04 08 09 11 17 19 20
barn-r2_1| 1350 ... 63 255 ... ... 259 154 138
27 28
barn-r2_1| 177 304
OVERALL 03 04 08 11 17 19 20 27

```
nhun-r2_1|  1004   ...    50   219   ...   261   152   140   182
          28
nhun-r2_1|   ...
       OVERALL    03    04    08    11    17    19    20    27
bru1-r2_1|  1372   ...    57   272   ...   263   139   146   180
          28
bru1-r2_1|   315
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000015778   -0.0000003111    0.0000002988
-0.0000003111    0.0000117222   -0.0000009856
 0.0000002988   -0.0000009856    0.0000107200
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000025274    0.0000019995   -0.0000021985
 0.0000019995    0.0000097179    0.0000000365
-0.0000021985    0.0000000365    0.0000117747
```

Horizontal network accuracy = 0.00645 meters.
Vertical network accuracy = 0.00673 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
NHUN	1521219.24202	-4405923.95539	4339076.58831	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000
NHUN	0.00000	-0.00000	0.00000
BRU1	0.00360	-0.00070	-0.00040

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-77812.96949	26124.08475	52754.96522	2002.00
NHUN	-38189.37598	-37690.58139	-24270.61769	2002.00
BRU1	19277.11014	43381.98551	35931.02994	2002.00

STATE PLANE COORDINATES - International Foot

SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.12883405
Point Scale	0.99996950
Combined Factor	0.99997321

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

From: opus@ngs.noaa.gov

To: Sean Abedi;

CC:

Subject: OPUS solution : R1_1218b.tps 000087087

Date: Friday, March 02, 2007 2:42:20 PM

Attachments:

FILE: R1_1218b.tps 000087087

NGS OPUS SOLUTION REPORT
==========

USER: SABEDI@GREENINTL.COM DATE: March 02, 2007
RINEX FILE: r1_1352s.06o TIME: 19:41:41 UTC

SOFTWARE: page5 0612.06 master22.pl START: 2006/12/18 18:25:00
EPHEMERIS: igs14061.eph [precise] STOP: 2006/12/18 20:56:00
NAV FILE: brdc3520.06n OBS USED: 4407 / 4762 : 93%
ANT NAME: TPSHIPER_GD NONE # FIXED AMB: 36 / 37 : 97%
ARP HEIGHT: 1.47 OVERALL RMS: 0.017(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000) ITRF00 (EPOCH:2006.9639)

X:	1557432.421(m)	0.038(m)	1557431.695(m)	0.038(m)
Y:	-4371816.127(m)	0.031(m)	-4371814.702(m)	0.031(m)
Z:	4360485.332(m)	0.006(m)	4360485.277(m)	0.006(m)

LAT:	43 24 26.96098	0.025(m)	43 24 26.99500	0.025(m)
E LON:	289 36 29.25506	0.039(m)	289 36 29.24592	0.039(m)
W LON:	70 23 30.74494	0.039(m)	70 23 30.75408	0.039(m)
EL HGT:	-22.197(m)	0.019(m)	-23.387(m)	0.019(m)
ORTHO HGT:	4.020(m)	0.031(m) [Geoid03 NAVD88]		

	UTM COORDINATES (Zone 19)	STATE PLANE COORDINATES (1802 ME W)
Northing (Y) [meters]	4807008.148	63808.398

Easting (X) [meters]	387302.623	881758.832
Convergence [degrees]	-0.95657151	-0.15475868
Point Scale	0.99975623	0.99997076
Combined Factor	0.99975971	0.99997424

US NATIONAL GRID DESIGNATOR: 19TCJ8730307008(NAD 83)

BASE STATIONS USED

PID	DESIGNATION	LATITUDE	LONGITUDE	DISTANCE(m)
AJ1830	BARN BARTLETT CORS ARP	N440556.684	W0710934.400	98625.3
AF9487	BRU1 BRUNSWICK 1 CORS ARP	N435323.306	W0695647.665	64515.7
AH8904	PNB1 PENOBSCOT 1 CORS ARP	N442706.177	W0684620.162	174276.2

NEAREST NGS PUBLISHED CONTROL POINT

OC2042	CURTIS COVE 1868	N432424.490	W0702345.279	335.3

BASE STATION INFORMATION

STATION NAME: barn a 5 (Bartlett; Bartlett, New Hampshire USA)
ANTENNA: TRM33429.00+GP NONE S/N=0220132577

XYZ	1481595.0978	-4342107.8567	4416102.0767	MON @ 1997.0000 (M)
XYZ	-0.0177	-0.0019	0.0044	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0000	0.0000	0.0740	ARP TO L1 PHASE CENTER (M)
NEU	-0.0000	0.0000	0.0703	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1763	-0.0189	0.0438	VEL TIMES 9.9628 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0172	-0.0503	0.0515	ARP TO L1 PHASE CENTER
XYZ	1481594.9386	-4342107.9259	4416102.1720	L1 PHS CEN @ 2006.9639
XYZ	-0.0000	-0.0001	-0.0001	+ XYZ ADJUSTMENTS
XYZ	1481594.9386	-4342107.9260	4416102.1720	NEW L1 PHS CEN @ 2006.9639
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW ARP @ 2006.9639
XYZ	1481594.9214	-4342107.8757	4416102.1205	NEW MON @ 2006.9639
LLH	44 5 56.71849	288 50 25.58926	139.7019	NEW L1 PHS CEN @ 2006.9639
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW ARP @ 2006.9639
LLH	44 5 56.71849	288 50 25.58926	139.6279	NEW MON @ 2006.9639

STATION NAME: bru1 a 6 (Brunswick 1; Brunswick, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=11098
XYZ 1578685.1577 -4324849.9449 4399278.1414 MON @ 1997.0000 (M)
XYZ -0.0140 -0.0026 0.0043 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1395 -0.0259 0.0428 VEL TIMES 9.9628 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0217 -0.0594 0.0608 ARP TO L1 PHASE CENTER
XYZ 1578685.0399 -4324850.0302 4399278.2450 L1 PHS CEN @ 2006.9639
XYZ 0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ 1578685.0399 -4324850.0302 4399278.2450 NEW L1 PHS CEN @ 2006.9639
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW ARP @ 2006.9639
XYZ 1578685.0182 -4324849.9708 4399278.1842 NEW MON @ 2006.9639
LLH 43 53 23.34022 290 3 12.32627 2.0021 NEW L1 PHS CEN @ 2006.9639
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW ARP @ 2006.9639
LLH 43 53 23.34022 290 3 12.32627 1.9144 NEW MON @ 2006.9639

STATION NAME: pnb1 a 3 (Penobscot 1; Penobscot, Maine USA)
ANTENNA: ASH700829.3 SNOW S/N=16034
XYZ 1651242.9738 -4251054.4532 4444083.2680 MON @ 1997.0000 (M)
XYZ -0.0173 -0.0026 0.0039 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU -0.0000 0.0000 0.0877 ARP TO L1 PHASE CENTER (M)
NEU -0.0000 0.0000 0.0598 ARP TO L2 PHASE CENTER (M)
XYZ -0.1724 -0.0259 0.0389 VEL TIMES 9.9628 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ 0.0227 -0.0584 0.0614 ARP TO L1 PHASE CENTER
XYZ 1651242.8241 -4251054.5375 4444083.3683 L1 PHS CEN @ 2006.9639
XYZ -0.0001 -0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ 1651242.8241 -4251054.5375 4444083.3683 NEW L1 PHS CEN @ 2006.9639
XYZ 1651242.8014 -4251054.4791 4444083.3069 NEW ARP @ 2006.9639
XYZ 1651242.8014 -4251054.4791 4444083.3069 NEW MON @ 2006.9639
LLH 44 27 6.21239 291 13 39.82945 32.6494 NEW L1 PHS CEN @ 2006.9639
LLH 44 27 6.21239 291 13 39.82945 32.5617 NEW ARP @ 2006.9639
LLH 44 27 6.21239 291 13 39.82945 32.5617 NEW MON @ 2006.9639

REMOTE STATION INFORMATION

STATION NAME: r1_1 1

```
 ANTENNA: TPSHIPER_GD    NONE                    S/N=UNKNOWN
XYZ  1557432.1597 -4371815.4591  4360485.9696  MON @ 2006.9637 (M)
NEU       0.0000      -0.0000       1.4700  MON TO ARP (M)
NEU      -0.0000       0.0000       0.1060  ARP TO L1 PHASE CENTER (M)
NEU      -0.0000       0.0000       0.1012  ARP TO L2 PHASE CENTER (M)
XYZ       0.3584      -1.0060       1.0102  MON TO ARP
XYZ       0.0258      -0.0725       0.0728  ARP TO L1 PHASE CENTER
XYZ  1557432.5439 -4371816.5376  4360487.0526  L1 PHS CEN @ 2006.9639

BASELINE NAME:  barn  r1_1
XYZ      -0.4793       0.7696      -0.6891  + XYZ ADJUSTMENTS
XYZ  1557432.0646 -4371815.7681  4360486.3635  NEW L1 PHS CEN @ 2006.9639
XYZ  1557432.0388 -4371815.6955  4360486.2906  NEW ARP @ 2006.9639
XYZ  1557431.6804 -4371814.6895  4360485.2805  NEW MON @ 2006.9639
LLH  43 24 26.99545  289 36 29.24549    -21.8211  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.99545  289 36 29.24549    -21.9271  NEW ARP @ 2006.9639
LLH  43 24 26.99545  289 36 29.24549    -23.3971  NEW MON @ 2006.9639

BASELINE NAME:  bru1  r1_1
XYZ      -0.4410       0.7632      -0.6953  + XYZ ADJUSTMENTS
XYZ  1557432.1029 -4371815.7744  4360486.3573  NEW L1 PHS CEN @ 2006.9639
XYZ  1557432.0771 -4371815.7019  4360486.2845  NEW ARP @ 2006.9639
XYZ  1557431.7187 -4371814.6959  4360485.2743  NEW MON @ 2006.9639
LLH  43 24 26.99488  289 36 29.24700    -21.8117  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.99488  289 36 29.24700    -21.9177  NEW ARP @ 2006.9639
LLH  43 24 26.99488  289 36 29.24700    -23.3877  NEW MON @ 2006.9639

BASELINE NAME:  pnb1  r1_1
XYZ      -0.4739       0.7389      -0.6943  + XYZ ADJUSTMENTS
XYZ  1557432.0701 -4371815.7988  4360486.3583  NEW L1 PHS CEN @ 2006.9639
XYZ  1557432.0442 -4371815.7262  4360486.2854  NEW ARP @ 2006.9639
XYZ  1557431.6858 -4371814.7202  4360485.2753  NEW MON @ 2006.9639
LLH  43 24 26.99464  289 36 29.24526    -21.8024  NEW L1 PHS CEN @ 2006.9639
LLH  43 24 26.99464  289 36 29.24526    -21.9084  NEW ARP @ 2006.9639
LLH  43 24 26.99464  289 36 29.24526    -23.3784  NEW MON @ 2006.9639

                    G-FILES

Axx20061218  61218
B200612181825  612182056 1 page5 v0612.06IGS    222 1 2 27NGS   2007 3
2IFDDFX
Iant_info.003       NGS   20070226
```

C00090001 -758367589 15 297068138 32 556168400 32
X3526AR1_1X3526ABARN
D 1 2 -7587636 1 3 4672992 2 3 -8612022

Axx20061218 61218
B200612181825 612182056 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090002 212532995 15 469647251 42 387929099 35
X3526AR1_1X3526ABRU1
D 1 2 -7551443 1 3 8267991 2 3 -8123478

Axx20061218 61218
B200612181825 612182056 1 page5 v0612.06IGS 222 1 2 27NGS 2007 3
2IFDDFX
Iant_info.003 NGS 20070226
C00090003 938111156 11 1207602411 27 835980316 25
X3526AR1_1X3526APNB1
D 1 2 -6477687 1 3 7815422 2 3 -8618062

POST-FIT RMS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 10 11 12 13
barn-r1_1| 0.017 0.013 ... 0.021 0.028 ... ... 0.016 0.022
17 20 23 24 28
barn-r1_1| 0.011 0.020 0.027 0.013 0.014

OVERALL 02 04 05 09 10 11 12 13
bru1-r1_1| 0.020 0.020 ... 0.027 0.023 ... ... 0.024 ...
17 20 23 24 28
bru1-r1_1| 0.020 0.017 0.024 0.020 0.016

OVERALL 02 04 05 09 10 11 12 13
pnb1-r1_1| 0.013 0.010 ... 0.015 0.024 ... ... 0.013 ...
17 20 23 24 28
pnb1-r1_1| 0.010 0.014 0.021 0.009 0.013

OBS BY SATELLITE VS. BASELINE

OVERALL 02 04 05 09 10 11 12 13
barn-r1_1| 1542 210 ... 142 102 ... ... 133 42
17 20 23 24 28

```
barn-r1_1|  296   248    45   143   181
        OVERALL    02    04    05    09    10    11    12    13
bru1-r1_1|  1468   207   ...   132    87   ...   ...   155   ...
          17    20    23    24    28
bru1-r1_1|  301   239    22   140   185
        OVERALL    02    04    05    09    10    11    12    13
pnb1-r1_1|  1397   201   ...    92    66   ...   ...   133   ...
          17    20    23    24    28
pnb1-r1_1|  301   257    45   118   184
```

Covariance Matrix for the xyz OPUS Position (meters^2).

```
 0.0000012689   -0.0000002294    0.0000001941
-0.0000002294    0.0000078156   -0.0000005906
 0.0000001941   -0.0000005906    0.0000063867
```

Covariance Matrix for the enu OPUS Position (meters^2).

```
 0.0000018611    0.0000012842   -0.0000013893
 0.0000012842    0.0000061587   -0.0000003788
-0.0000013893   -0.0000003788    0.0000074513
```

Horizontal network accuracy = 0.00518 meters.
Vertical network accuracy = 0.00535 meters.

Derivation of NAD 83 vector components

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).

	Xa(m)	Ya(m)	Za(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr(m)	Yr(m)	Zr(m)	
BARN	1481595.64851	-4342109.28925	4416102.17122	2002.00
BRU1	1578685.72814	-4324851.38849	4399278.23594	2002.00
PNB1	1651243.53065	-4251055.89493	4444083.35315	2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
BARN	0.00000	-0.00000	0.00000

BRU1	0.00360	-0.00070	-0.00040
PNB1	0.00050	-0.00070	-0.00110

Vectors from unknown station monument to reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
BARN	-75836.77249	29706.83775	55616.83922	2002.00
BRU1	21253.30714	46964.73851	38792.90394	2002.00
PNB1	93811.10965	120760.23207	83598.02115	2002.00

STATE PLANE COORDINATES - International Foot
SPC (1802 ME W)

Northing (Y) [feet]	0.000
Easting (X) [feet]	0.000
Convergence [degrees]	-0.15475868
Point Scale	0.99997076
Combined Factor	0.99997424

This position and the above vector components were computed without any knowledge by the National Geodetic Survey regarding the equipment or field operating procedures used.

Drawing Name: checkpoints_york
Project Name: Checkpoints Survey
Project Path: F:\Projects\2320\2320016 york me\Survey\Checkpoints Survey\
Username: sshahin

Number	Northing	Easting	Elevation	Raw Desc
1000	90034.0755	2812336.0671	9.40	CONC.NAIL
1001	90144.8973	2812458.2194	15.17	CONC.NAIL
1002	90153.2157	2812466.4643	15.54	OS@EDGEOFROAD
1003	90172.8390	2812442.3771	17.51	OS@EDGEOFROAD
1004	90196.9621	2812474.5158	15.95	OS@WOODS
1005	90236.9906	2812471.3075	17.61	OS@WOODS
1006	90121.3569	2812487.6478	13.57	OS@EDGEOFROAD
1007	90145.6318	2812418.4377	16.04	OS@EDGEOFDRIVE
1008	90098.5601	2812402.8355	11.83	OS@EDGEOFDRIVE
1009	90083.9427	2812461.4639	10.99	OS@GRASS
1010	89996.0558	2812318.6495	8.27	OS@GRASS
1011	89919.0398	2812321.6290	7.44	OS@GRASS
1012	89876.1665	2812268.6103	6.63	OS@GRASS
1013	89898.0004	2812224.3229	7.10	OS@GRASS
1014	89962.9469	2812263.7713	7.84	OS@GRASS
1015	89936.5116	2812354.6448	7.29	OS@WOODS
1016	90112.2737	2812396.1030	12.81	OS@EDGEOFROAD
1017	90199.7150	2812393.3293	22.52	OS@EDGEOFROAD
1018	90226.4309	2812374.3859	26.05	OS@EDGEOFROAD
1019	90178.2562	2812371.0951	23.28	OS@INSIDEWOODS
1020	90090.3489	2812353.7032	16.29	OS@INSIDEWOODS
1022	91092.3293	2807950.1548	35.07	PK
1023	90848.5769	2807881.4399	31.46	PK
1024	90933.5923	2807880.5281	29.46	OS@GRASS
1025	90872.5712	2807865.3436	28.99	OS@GRASS
1026	90863.6542	2807933.8287	31.52	OS@GRASS
1027	90897.1434	2807976.5920	31.22	OS@GRASS
1028	90945.6289	2807940.5994	30.97	OS@GRASS
1029	90863.7813	2807912.4314	31.74	OS@GRASS
1030	90943.0854	2807878.0377	31.86	OS@GRASS
1031	91058.4716	2807924.3371	35.16	OS@BIT
1032	91111.0614	2807884.9132	35.34	OS@BIT
1033	91139.1604	2807915.9375	34.92	OS@WOODS
1034	91123.2900	2807955.1425	34.68	OS@WOODS
1035	91112.1373	2807961.3757	35.58	OS@BIT
1036	91053.3830	2807940.2916	34.18	OS@GRASS
1037	91080.3074	2807929.0660	34.94	PKKR2
1038	90911.4665	2807922.7560	31.22	PKKR1
1040	90156.9656	2812434.0117	16.59	PKKR2
1041	89913.9383	2812245.9669	7.52	PKKR1
1042	158993.6220	2837713.5421	53.28	TACK
1043	159008.4490	2837606.0297	57.01	TACK
1044	159019.8396	2837588.0535	57.07	R2
1045	159015.5550	2837726.7980	55.02	R1
1046	159067.6148	2837689.3725	55.77	OS@GRAVELPARKING
1047	159078.7004	2837743.2841	56.37	OS@BIT
1048	159014.5646	2837748.0366	54.73	OS@BIT
1049	159008.8572	2837753.2529	54.80	OS@GRASS
1050	158989.4478	2837751.4824	52.38	OS@GRASS
1051	158954.4543	2837746.8657	51.40	OS@BIT
1052	158959.7580	2837702.0555	53.54	OS@BIT
1053	158975.9875	2837657.7706	55.63	OS@BIT
1054	159024.7298	2837661.6234	55.87	OS@GRAVELPARKING
1055	159027.1365	2837627.6035	56.54	OS@WOOD
1056	159057.5798	2837633.9176	55.73	OS@WOOD
1057	159054.5074	2837608.7993	55.84	OS@WOOD
1058	159022.6506	2837615.7654	56.93	OS@GRASS
1059	159010.1735	2837612.8437	57.07	OS@GRASS

Number	Northing	Easting	Elevation	Raw Desc
1060	158961.1000	2837585.6746	57.92	OS@GRASS
1061	158977.0033	2837531.8833	58.06	OS@BIT
1062	159019.4682	2837529.5243	57.84	OS@BIT
1063	159042.8705	2837546.7552	57.62	OS@GRASS
1064	159059.6856	2837575.6441	57.35	OS@GRASS
1065	158531.8500	2840472.8026	8.21	TACK
1066	158434.1991	2840433.8859	8.24	TACK
1067	158503.3532	2840531.7450	10.07	R2
1068	158613.9940	2840482.3870	7.85	R1
1069	158664.7227	2840492.3204	7.48	OS@BIT
1070	158674.7323	2840457.5107	7.40	OS@GRASS
1071	158595.2887	2840432.3524	7.49	OS@GRASS
1072	158576.8803	2840471.8786	7.96	OS@BIT
1073	158553.2099	2840545.6882	9.27	OS@BIT
1074	158628.4208	2840554.2015	8.08	OS@BIT
1075	158665.2911	2840509.9613	7.39	OS@BIT
1076	158489.2315	2840579.8100	10.13	OS@BIT
1077	158495.3740	2840547.8309	10.52	OS@GRASS
1078	158480.7205	2840517.8735	9.81	OS@GRASS
1079	158431.5729	2840524.4343	9.69	OS@BIT
1080	158414.4712	2840540.8764	9.74	OS@GRASS
1081	158475.2896	2840481.1650	8.84	OS@BIT
1082	158523.2494	2840501.2426	8.79	OS@BIT
1083	158551.2111	2840433.5151	7.82	OS@BIT
1084	186584.4095	2867541.1076	11.12	TACK
1085	186660.6940	2867506.4096	10.89	TACK
1086	186579.2270	2867570.5199	11.07	PKR-2
1087	186710.8180	2867502.6380	10.98	H/TR-1
1088	186757.9328	2867504.6194	10.47	OS@GRASS
1089	186751.8921	2867451.1837	10.14	OS@GRASS
1090	186704.0737	2867441.3381	10.87	OS@GRASS
1091	186661.0575	2867537.3532	11.34	OS@GRASS
1092	186635.3907	2867561.4771	11.21	OS@GRASS
1093	186596.3491	2867621.3963	12.43	OS@BIT
1094	186633.4952	2867609.0762	11.21	OS@BIT
1095	186613.6535	2867478.4806	10.80	OS@BIT
1096	186645.3397	2867476.8411	10.81	OS@BIT
1097	186577.3490	2867514.4842	8.14	OS@BEACH
1098	186548.6259	2867565.7623	8.54	OS@BEACH
1100	199420.0806	2856966.0616	43.07	TACK
1101	199404.8554	2857025.4562	43.33	HUB/R-2
1102	199462.7818	2856978.1871	45.19	PK/R-1
1103	199487.2250	2857017.4383	48.70	OS@BIT
1104	199521.7204	2857013.1480	48.81	OS@BIT
1105	199479.2865	2856979.2096	46.08	FT
1106	199458.9110	2856937.7357	44.26	OS@BIT
1107	199479.8475	2856949.5317	44.31	OS@GRAS
1108	199506.7767	2856976.1413	47.34	OS@GRAS
1109	199467.2437	2857022.5788	47.95	OS@GRAS
1110	199419.1154	2857042.0650	43.66	OS@GRAS
1111	199408.5609	2857093.3991	43.20	OS@GRAS
1112	199375.0990	2857082.6015	42.06	OS@GRAS
1113	199377.5772	2857044.5523	42.27	OS@GRAS
1114	199388.6961	2856999.3355	42.33	OS@GRAS
1115	199408.7346	2856999.0626	42.86	OS@GRAS
1116	199431.3662	2856962.1066	43.61	OS@GRAS
1118	196466.5560	2881163.9437	8.03	SPK
1119	196212.5291	2881151.0283	7.55	SPK
1120	196553.0220	2881267.3640	8.91	PK/R/1
1121	196510.0761	2881221.7014	7.79	OS@BIT
1122	196593.3856	2881304.2308	8.61	OS@BIT
1123	196576.1928	2881259.1077	9.16	OS@BIT

Number	Northing	Easting	Elevation	Raw Desc
1124	196548.5202	2881226.0877	8.67	OS@BIT
1125	196553.8773	2881189.7579	8.99	OS@GRASS
1126	196619.7852	2881225.3887	10.09	OS@GRASS
1127	196612.2800	2881278.2606	9.87	OS@GRASS
1128	196325.8139	2881146.5185	8.68	OS@PARKING/DIRT
1129	196270.9165	2881156.6684	7.27	OS@GRASS
1130	196239.4197	2881125.5269	7.69	OS@GRASS
1131	196217.4079	2881080.3619	8.45	OS@GRASS
1132	196179.0290	2881071.9973	8.16	OS@GRASS
1133	196183.9896	2881113.7609	7.61	OS@GRASS
1134	196170.1832	2881159.1620	7.61	OS@GRASS
1135	196224.7365	2881165.5255	7.03	OS@GRASS
1136	196246.3257	2881150.3085	7.62	SPK/R-2
1138	185869.0037	2872044.1968	18.57	SPK
1139	185827.7500	2872112.6610	16.98	PK/R-1
1140	185904.5492	2872055.2966	19.11	HUB/R-2
1141	185926.0297	2871997.5499	20.42	OS@BIT
1142	185891.4300	2872015.8572	19.33	OS@BIT
1143	185864.2435	2872064.1885	18.07	OS@BIT
1144	185883.9725	2872112.0061	17.91	OS@BIT
1145	185892.3690	2872089.5099	18.16	OS@GRASS
1146	185929.7935	2872036.6449	21.17	OS@GRASS
1147	185946.1784	2872076.1357	21.20	OS@GRASS
1148	185847.7496	2872125.7987	17.05	OS@BIT
1149	185807.3028	2872163.6958	16.56	OS@BIT
1150	185819.4356	2872188.2412	18.20	OS@GRASS
1151	185785.9006	2872156.9768	15.79	OS@BIT
1152	185812.1832	2872085.5800	16.93	OS@MARSH
1153	185846.0905	2872044.6377	19.16	OS@MARSH
1154	185888.1363	2872015.7086	19.97	OS@BITSIDEWALK
1171	222226.7044	2902931.2962	7.49	SPK
1172	222285.7760	2902870.8180	7.63	HUB/R-1
1173	222318.6095	2902894.6082	8.01	OS@GRASS
1174	222364.5089	2902869.2424	5.69	OS@MARSH
1175	222325.4360	2902821.2722	5.43	OS@MARASH
1176	222266.4819	2902802.8689	5.38	OS@MARASH
1177	222266.8586	2902848.7528	6.08	OS@GRASS
1178	222303.5903	2902855.7723	6.18	OS@GRASS
1179	222302.7784	2902910.9214	8.16	OS@GRASS
1180	222252.1796	2902889.8636	6.84	OS@GRASS
1181	222206.0017	2902943.0725	7.62	OS@BIT
1182	222227.1682	2902981.5871	8.13	OS@BIT
1183	222236.6910	2903035.3708	8.53	OS@BIT
1184	222286.0165	2903050.0892	8.20	OS@BIT
1185	222285.1918	2902995.8888	7.93	OS@BIT
1186	222258.2839	2902963.8010	7.57	OS@GRASS
1187	209368.1986	2892919.2943	13.00	SPK
1188	209314.9207	2892928.6323	13.66	SPK/R-2
1189	209344.7190	2892903.7680	13.19	PK/R-1
1190	209342.5497	2892876.8193	13.41	OS@BIT
1191	209358.5106	2892889.7213	13.20	OS@BIT
1192	209352.5445	2892929.0732	13.33	OS@BIT
1193	209383.9504	2892946.1060	13.49	OS@BIT
1194	209411.1798	2892929.4242	12.69	OS@GRASS
1195	209389.0285	2892889.3229	13.29	OS@GRASS
1196	209390.0348	2892918.0912	12.34	OS@GRAVELDR.
1197	209370.9646	2892888.1169	12.94	OS@GRAVELDR.
1198	209338.7072	2892881.7869	13.83	OS@GRASS.
1199	209339.2593	2892916.0793	13.42	OS@GRASS.
1200	209319.4158	2892901.6989	13.34	OS@GRASS.
1201	209305.2129	2892957.4704	14.11	OS@GRASS.
1202	209338.7426	2892939.0689	13.40	OS@GRASS.

Number	Northing	Easting	Elevation	Raw Desc
1203	209365.7907	2892951.8631	13.41	OS@WOODS.
1204	209385.1021	2892977.2059	14.98	OS@WOODS.
1205	222252.2360	2902990.6100	8.08	PK/R-2.
1206	248245.4859	2897046.5144	13.91	SPK
1207	248280.0865	2897012.5000	15.34	CONCNAIL/R-2
1208	248236.6720	2897002.2410	14.37	SPK/R-1
1209	248288.7900	2897069.5982	15.28	OS@GRASS
1210	248302.7231	2897029.0053	15.95	OS@GRASS
1211	248326.1396	2896975.7845	15.99	OS@GRASS
1212	248298.9622	2896936.1694	15.83	OS@BIT
1213	248235.5738	2896912.4979	15.80	OS@BIT
1214	248206.0459	2896962.2637	15.30	OS@BIT
1215	248179.3901	2896991.7774	13.12	OS@GRASS
1216	248220.6924	2897030.9804	13.28	OS@GRASS
1217	248244.3878	2896986.9654	15.22	OS@BIT
1218	248172.9674	2897038.9681	12.43	OS@BIT
1219	248226.1368	2897083.8814	13.42	OS@BIT
1220	248285.8294	2897099.1451	14.51	OS@BIT
1221	255582.4264	2894780.2020	86.58	SPK
1222	255562.8480	2894821.8220	87.30	SPK/R-1
1223	255564.5607	2894804.6103	86.21	PK/R-2
1224	255545.2577	2894763.5543	87.55	OS@BIT
1225	255498.6423	2894743.5571	88.95	OS@BIT
1226	255541.8482	2894786.1642	87.22	OS@BIT
1227	255616.3587	2894783.9854	85.42	OS@BIT
1228	255622.3438	2894814.6100	85.06	OS@BIT
1229	255636.5671	2894852.4335	84.17	OS@BIT
1230	255605.3162	2894831.9497	85.17	OS@BIT
1231	255587.6852	2894864.3979	86.46	OS@GRASS
1232	255530.5418	2894863.7623	88.58	OS@GRASS
1233	255489.8726	2894828.0216	90.12	OS@GRASS
1234	255520.1979	2894791.5065	89.10	OS@GRASS
1235	255527.7740	2894780.4381	87.39	OS@BIT
1236	255540.8016	2894747.9230	87.30	OS@GRASS
1237	255565.9652	2894731.4069	85.94	OS@GRASS
1238	255597.7691	2894751.4773	85.53	OS@GRASS
1500	196553.0220	2881267.3640	8.88	R1a(P7)
1501	196246.3400	2881150.3140	7.62	R2a(G7)
1502	159015.5550	2837726.7980	55.02	R1a(P3)
1503	158613.9940	2840482.3870	7.85	R1b(P4)
1504	159019.8390	2837588.0720	57.07	R2a(G3)
1505	158503.3710	2840531.7370	10.07	R2b(G4)

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