

National Geodetic Survey

National Geodetic Survey

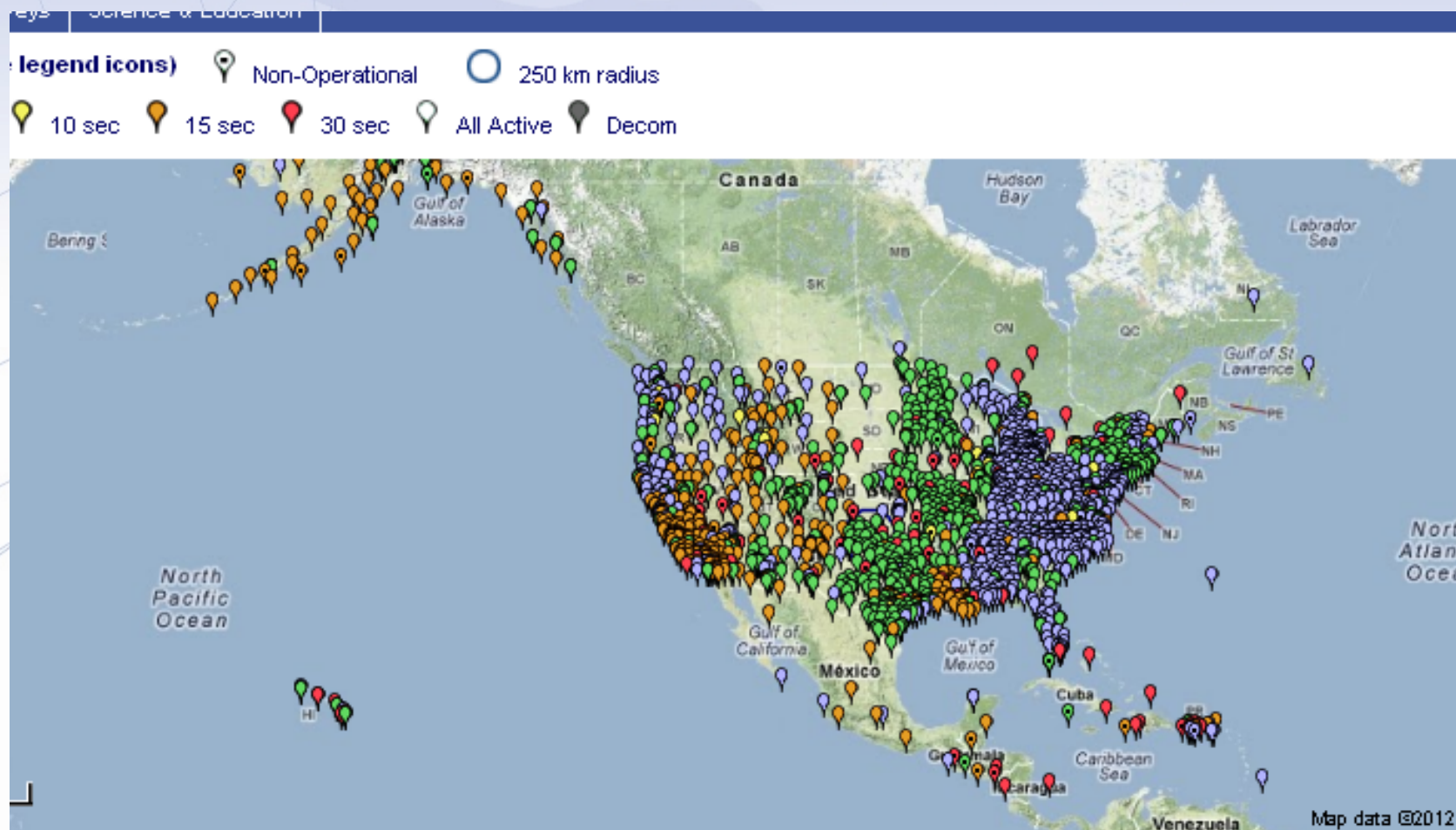
NSRS

OPUS




National Oceanic and Atmospheric Administration

CORS



Web: It

CORS



CORS

National Geodetic Survey

[NGS Home](#) | [About NGS](#) | [Data & Imagery](#) | [Tools](#) | [Surveys](#) | [Science & Education](#)

[Help](#)

Zoom to CORS:

Site ID: [Go](#)

Cursor Lat/Lon :
38.94232 , -88.15979

Three Nearest Sites :
KA14 59.95 km
VINU 62.00 km
INVI 64.88 km

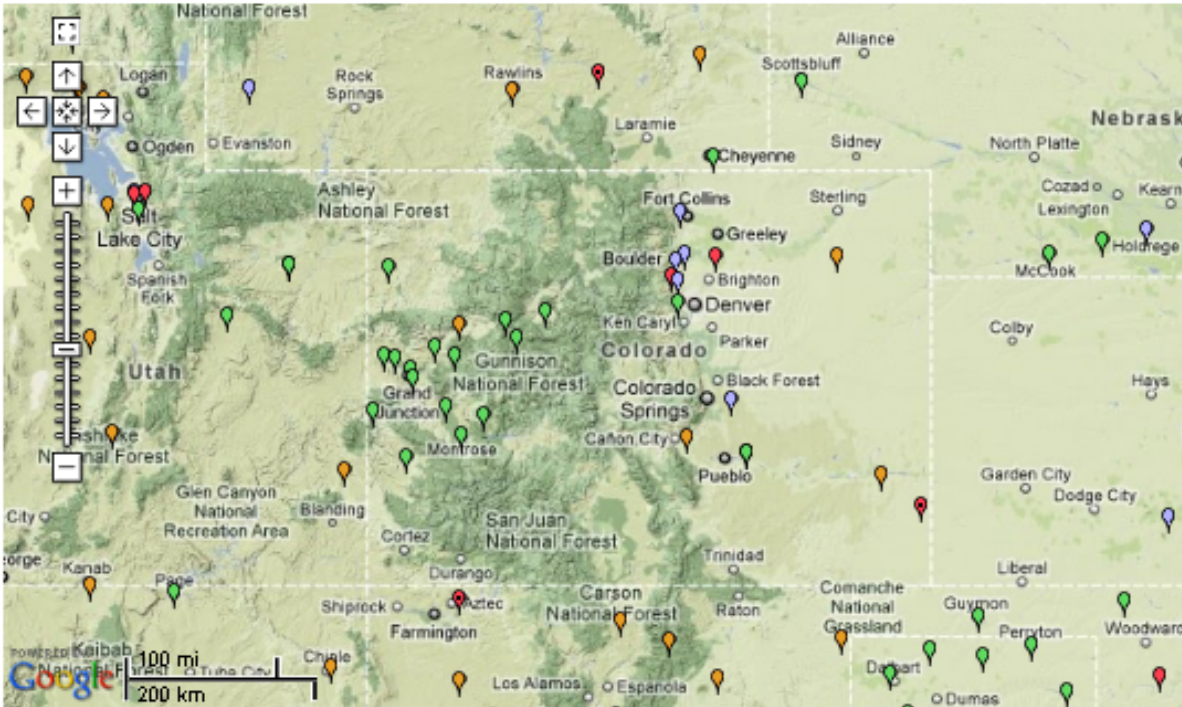
Enter a location [Go](#)

[Place X](#)

Sampling Rate (clickable legend icons)

1 sec 5 sec 10 sec 15 sec 30 sec All Active Decom

Non-Operational 250 km radius



[NGS Home](#) | [NGS Employees](#) | [Privacy Policy](#) | [Disclaimer](#) | [USA.gov](#) | [Real-time](#)

CORS "Data Products" Page



CORS

National Geodetic Survey

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CORS Data Products

GPS data collected at CORS sites are available to download for "post-processing."
Data Availability and Retention Policy

Methods of Obtaining NGS CORS Data

1. Customized User Friendly CORS (UFCORS)
2. Standard standard1.shtml
3. FTP <ftp://www.ngs.noaa.gov/cors/> - Directory Tree
See also alternate FTP <ftp://alt.ngs.noaa.gov/cors/> - Directory Tree

Obtain Static Data Files for CORS Here

CORS

Enter SiteID

Enter 4-char SiteID

Enter String

Enter partial string to find SiteID, Site Name, or City

CORS Home
Data Products
CORS Map
Newsletter
General Information
CORS Site Guidelines
GPS Links

NGS published Coordinates and Velocities Explained
Coordinates and Velocities
Predict horizontal displacements with HTDP

Metadata / Station Logs
Station/site log files contain all the historical equipment (receiver/antenna) used at that site, approximate location, owner and operating agency, etc. We must stress that the the position/coordinates listed in the log file like that in the RINEX header files should be considered APPROXIMATE. When a user downloads data they should at the same time download the official NGS position/coordinate and velocity file for that site. You can find that file [here](#).
Show Directory of All Logfiles

Antenna Calibrations

List and Sort Sites
CORS Site List (kml) The coordinates listed in this KML file are for reference frame ITRF00, epoch 1997.0

Provide Information about your Project

User Friendly CORS Version 3.5.9 - Windows Internet Explorer

http://www.ngs.noaa.gov/UFCORS/

File Edit View Favorites Tools Help

User Friendly CORS Version 3.5.9

User Friendly CORS

Version 3.5.9

This utility allows you to obtain a specific block of Global Positioning System (GPS) data for a continuously operating reference station (CORS) contained in the network of GPS sites managed by the National Geodetic Survey.

The GPS data will be in "receiver independent exchange" (RINEX) format, version 2.10.

[UFCORS Page Info](#) [Trimble Products Configuration](#) [UFCORS Problem/Comment Form](#)

Starting Day: Jul 14, 2011 - 195 [Get Older Data](#)

Start Time of the field observation: 00:00 [Day and Time Info](#)

Time Zone relative to observation location: UTC (GMT) [Time Zone Info](#)

Number of hours of data you wish to receive: 1 Please LIMIT requests for 1-second sampling rate data to 2 hours.

[CONTINUE](#) [CLEAR](#)

[NOS Home](#) | [Contact Us](#) | [Privacy Policy](#) | [Disclaimer](#) | [Document Viewers](#)

Web site owner: [National Geodetic Survey \(NGS\)](#), [National Oceanic & Atmospheric Administration \(NOAA\)](#)

Internet 100%

start 4 Microsof... WI Monthly... Microsoft P... Google Earth 4 Internet... Survey Software 1:34 PM

User Friendly CORS

Version 3.5.9

GPS data are available for the following sites for your specified time interval:

1lsu

[Site Info](#), [Site Map](#), [Data Availability](#), [Time Series](#)

This utility will [interpolate or decimate](#) the GPS data.

How many seconds do you want between individual data points?:

As Is

Please LIMIT requests for 1-second sampling rate data to 2 hours.

Would you like the corresponding files?

Coordinate File: no

[Coordinate File Info](#)

Met File: no

[Met File Info](#)

NGS data sheet: no

IGS Orbits in SP3 format: no

[Orbit File Info](#)

Please choose the compression format.

Files can be compressed using pkzip

[Compression Info](#)

Enter your custom requests

Processing will take place within a minute. A window will appear after processing that allows you to select where on your hard drive to save the transmitted files.

Also, a window displaying icons for several directories (folders) and files may appear. You may use this window to view the transmitted files. This feature is browser dependent and may not work on your browser.

SUBMIT

CLEAR

To Report [UFCORS Problem or Comment Form](#)

your
GPS data

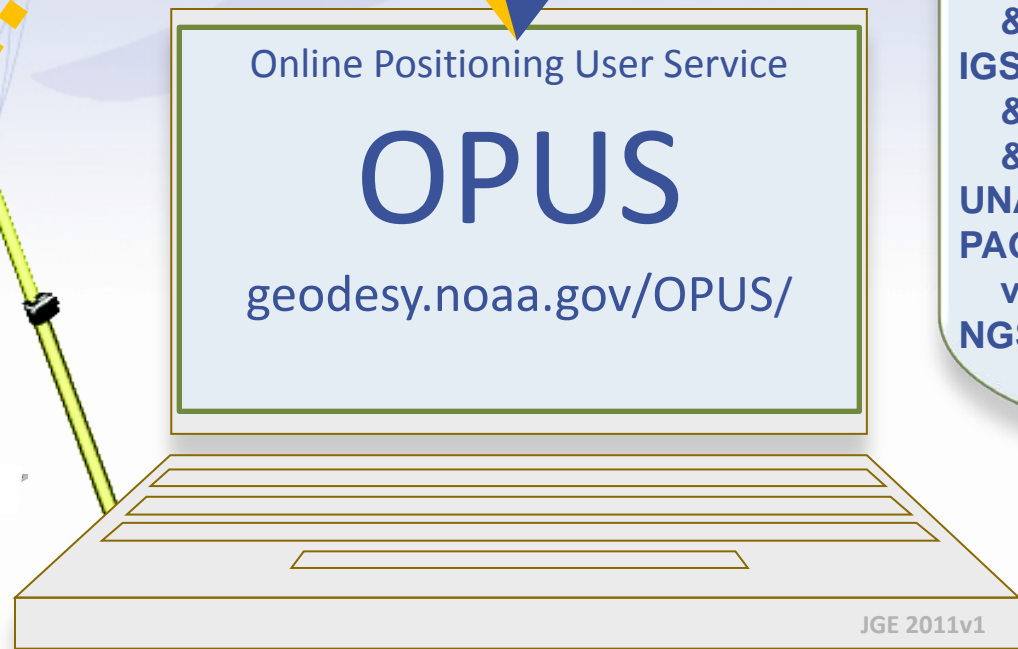
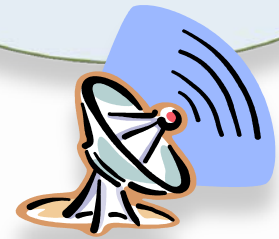
geodetic
standard data

Online Positioning User Service

OPUS

geodesy.noaa.gov/OPUS/

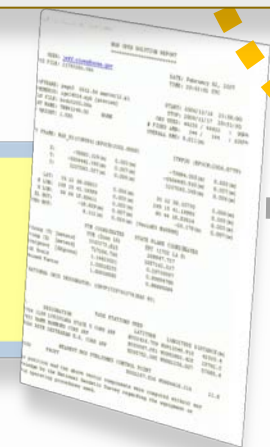
- IGS & NGS base stations & site information files
- IGS antenna calibrations & satellite orbits & reference frames
- UNAVCO teqc converter
- PAGES baseline processor
- var. geophysical models
- NGS geodetic toolkit



your
solution

options:
projects &
publishing

mark description



OPUS

- OPUS – S (2 hrs)
- OPUS – RS (15 minutes)
- OPUS – DB (Publish)
- OPUS – Projects (Network)



OPUS Menu

Upload

About OPUS

Projects DATA

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Contact OPUS

On September 6, 2011 NGS's CORS group released **revised coordinates** for all CORS sites. The new coordinates update both the global frame and the National Spatial Reference Frame as follows.

<u>New Frames</u>		<u>Previous Frames</u>	
IGS08	Epoch 2005.00	ITRF00	Epoch 1997.00
NAD 83(2011)	Epoch 2010.00	NAD 83(CORS96)	Epoch 2002.00
NAD 83(MA11)	Epoch 2010.00	NAD 83(MARP00)	Epoch 2002.00
NAD 83(PA11)	Epoch 2010.00	NAD 83(PACP00)	Epoch 2002.00

NGS is in the process of completing an **adjustment of the passive control network**. Until the adjustment is complete, OPUS will allow users to choose getting coordinates in either the new or previous reference frames. Once the passive network is adjusted to NAD 83(2011, MA11, PA11) then the OPUS support for ITRF00 and NAD 83(CORS96, MARP00, PACP00) will end.

Choose a frame to upload your data:

for new frames, click below:

NAD 83(2011,MA11,PA11)
Mexico(IGS08)
epoch 2010.00

International
IGS08
epoch of observation

for previous frames, click below:

NAD 83(CORS96,MARP00,PACP00)
epoch 2002.00

ITRF00

- **Q:** Which button/reference frame should I choose to get my solution?
 - **A:** Most users should start using the new reference frame, especially for users who are only interested in the global reference frame i.e. IGS08. Users who are in the middle of a project, will probably want to continue using their original reference frame.
- **Q:** How much will OPUS coordinates change if I use the new reference frame?
 - **A:** The biggest changes in the coordinates are caused by the change from relative to absolute antenna calibrations and the change in reference epoch as defined at the top of this page. OPUS coordinate changes should mimic those of the CORS namely: Difference of NAD 83(2011) epoch 2010.00 minus NAD 83(CORS96) epoch 2002.00: mean East 0.05±5.25 cm; North 2.12±6.08 cm; Up -0.66±2.24cm and median values of: East -0.12 cm; North 0.00 cm; Vertical -0.80 cm. For maps showing differences in CORS coordinates see this [FAQ](#).
- **Q:** Has the OPUS processor changed?
 - **A:** No. The OPUS processor simply points to the new set of CORS coordinates and absolute antenna calibrations.
- **Q:** Is GEOID09 compatible with solutions obtained using the new coordinates?
 - **A:** More or less. The GEOID09 model was built from CORS96-derived ellipsoid heights, therefore orthometric heights obtained will differ by at least the change in ellipsoid height. If orthometric heights are critical to your needs, we recommend that you submit a solution through both submission buttons and evaluate the differences. Shortly after the completion of the passive adjustment a new geoid will be created using the consistent set of new ellipsoid coordinates from both CORS and passive control.
- **Q:** Will OPUS published solutions use the new or old reference frames?
 - **A:** OPUS published solutions will be in whichever reference frame you selected to get a solution in. Once the passive adjustment is completed and OPUS no longer supports the old coordinates, all published solutions with old coordinates will be updated to the new reference frames, with the old coordinates retained as superseded values.

OPUS Submission Webpage

OPUS: the Online Positioning User Service, process your GNSS data in the National Spatial Refer - Windows Internet Explorer


http://www.ngs.noaa.gov/OPUS/

File Edit View Favorites Tools Help

OPUS: the Online Positioning User Service, process yo...

OPUS: Online Positioning User Service
National Geodetic Survey

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OPUS Menu

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- About OPUS
- Published Solutions

Contact OPUS

Upload your data file.

Tie your GPS observation to the National Spatial Reference System.
[What is OPUS?](#) [FAQs](#)

* Email address - your solution will be sent here.

* Data file of dual-frequency GPS observations. [sample](#)

no antenna selected

Antenna type - choosing wrong may degrade your accuracy.

meters above your mark.
Antenna height of your antenna's reference point.

to customize your solution.

for data > 15 min. < 2 hrs. for data > 2 hrs. < 48 hrs.

* required fields

Your email address

Location of your data file

Your antenna type

Antenna height


Customize your solution - details on next slide

Sample Solutions

Internet 100% 10:45 AM

Under the "OPTIONS" tab in OPUS

Options to customize your solution.

Solution formats	Add details to your report	standard solution
Base stations	Type in 4-char site IDs, or select from map, any CORS you wish to explicitly include or exclude from your solution Sample	Use: <input type="text"/> Exclude: <input type="text"/> Look up site IDs  browse map
State plane coordinates	Override your native SPCS zone	let OPUS choose
Geoid Model	Customize your orthometric height model	GEOID09
Contribute to a project	Enter the project identifier provided by your project manager.	
My profile	Customize OPUS defaults for future solutions	
Publish my solution	Share your solutions	No, don't publish

Upload to Rapid-Static **Upload to Static**

for data > 15 min. < 2 hrs. for data > 2 hrs. < 48 hrs.

Include-Exclude CORS here →

SPCS overrule →

Change Geoid Model →

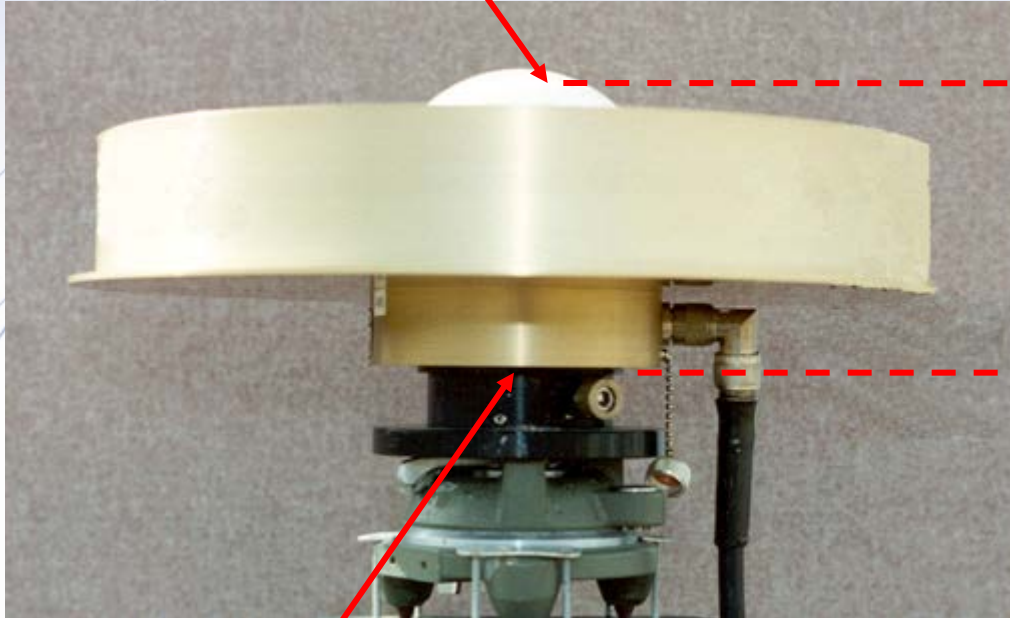
OPUS Projects ID →

Publish in OPUS-DB? →

Select one to start computation process

Why Do I Need the Antenna Type?

The antenna phase centers are located somewhere around here.



phase ctr.

The antenna offsets are the distance between the phase centers and the ARP

ARP

You do not need to know these offsets. They are passed to the processing software through the antenna type

The Antenna Reference Point (ARP) is almost always located in the center of the bottom surface of the antenna.

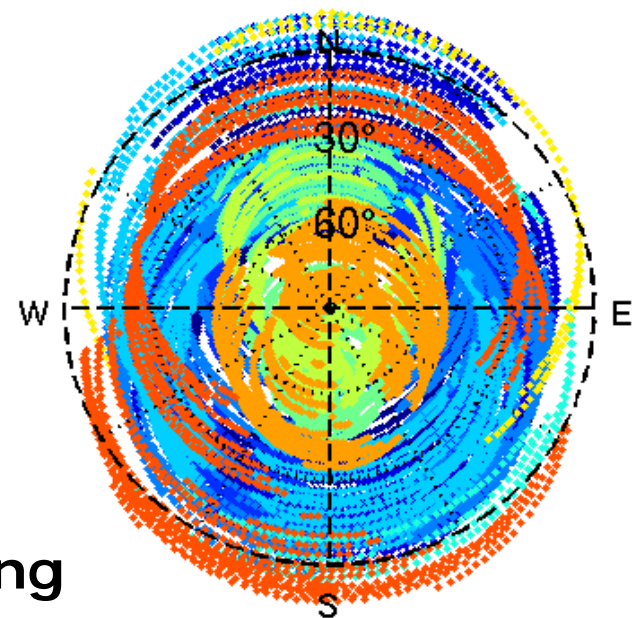
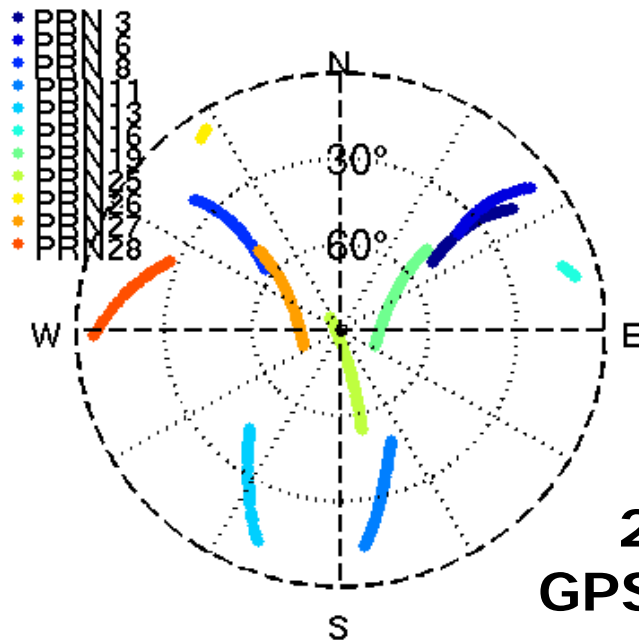
Incorrect or missing antenna type → big vertical errors

NGS Antenna Calibration – Relative vs. Absolute GNSS Antenna Calibration



static antenna

moving antenna

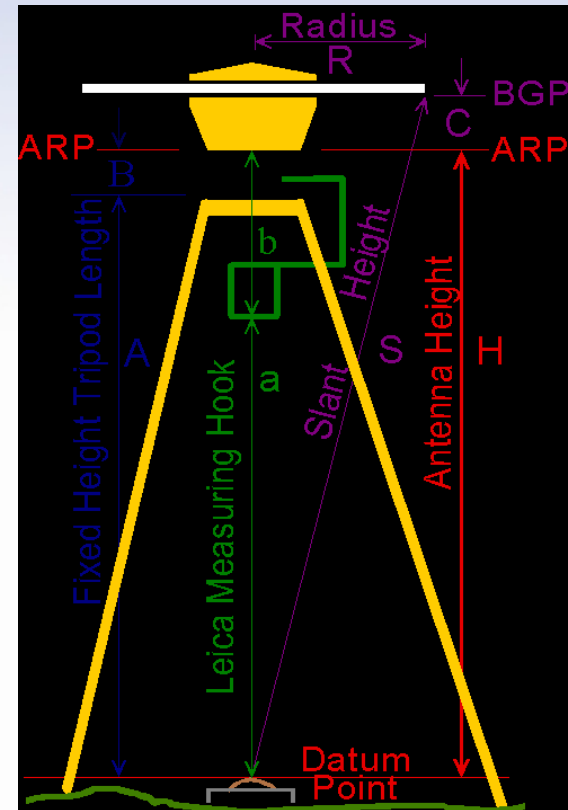
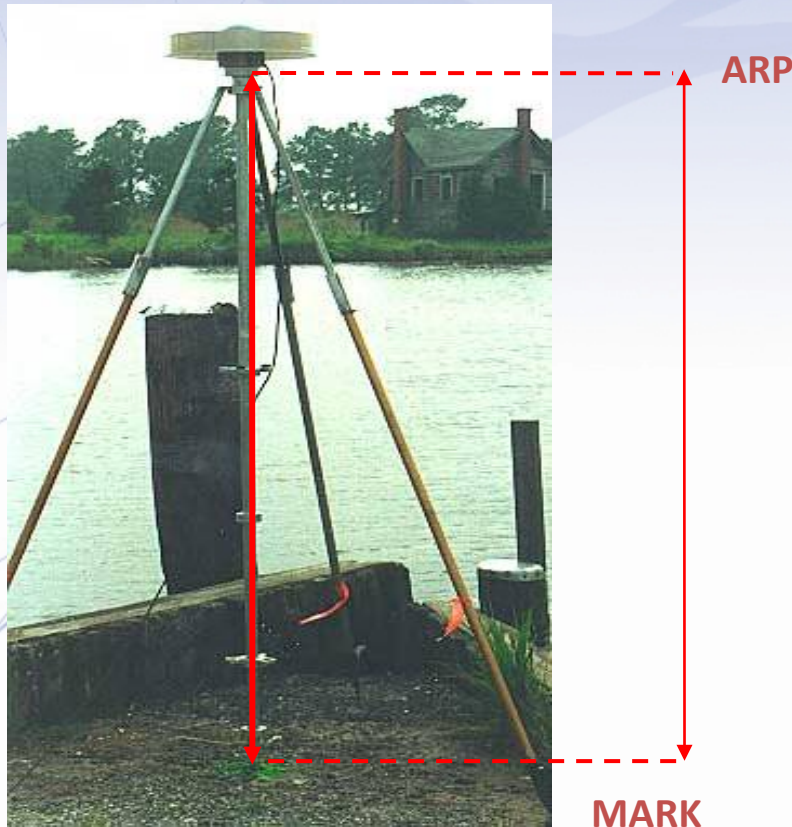


2 hours
GPS tracking

Antenna Type, height – easy, right?

- Type?
 - Verify by looking up in ANTCAL
 - Orient the antenna indicator to true north
 - Centered over the mark? (check plummet or bubble)
- Height?
 - Height to what? (antenna ARP, not L1-phase center)
 - Fixed-height tripods are easier than slip-legs.
 - Vertical, NOT slant-height.
 - Is your fixed-height tripod really fixed? (measure!)

How is the Antenna Height Measured?



- The height is measured vertically (NOT the slant height) from the mark to the ARP of the antenna.
- The height is measured in meters.
- The ARP is almost always the center of the bottom-most, permanently attached, surface of the antenna.
- See GPS Antenna Calibration for photo's and diagrams that show where the ARP is on most antennas:
<http://geodesy.noaa.gov/ANTCAL/>
- If the default height of 0.0000 is entered, OPUS will return the position of the ARP.

OPUS Static vs. Rapid Static

	Static	Rapid Static
Input (dual-frequency GPS)	2-48 hours	15 minutes-2 hours
Output	normal, extended, XML datasheet, project	normal, extended, XML
Accuracy (95%confidence)	1-2 cm horizontal 3-6 cm ellipsoidal height	1-2 cm horizontal 4-8 cm ellipsoidal height
Network geometry	3 CORS, preferably within 1000 km of rover	3-9 CORS, surrounding & within 250 km of rover
Availability	global	90% of CONUS (subject to CORS configuration)

4,000+ OPUS-Published Solutions

April 2012



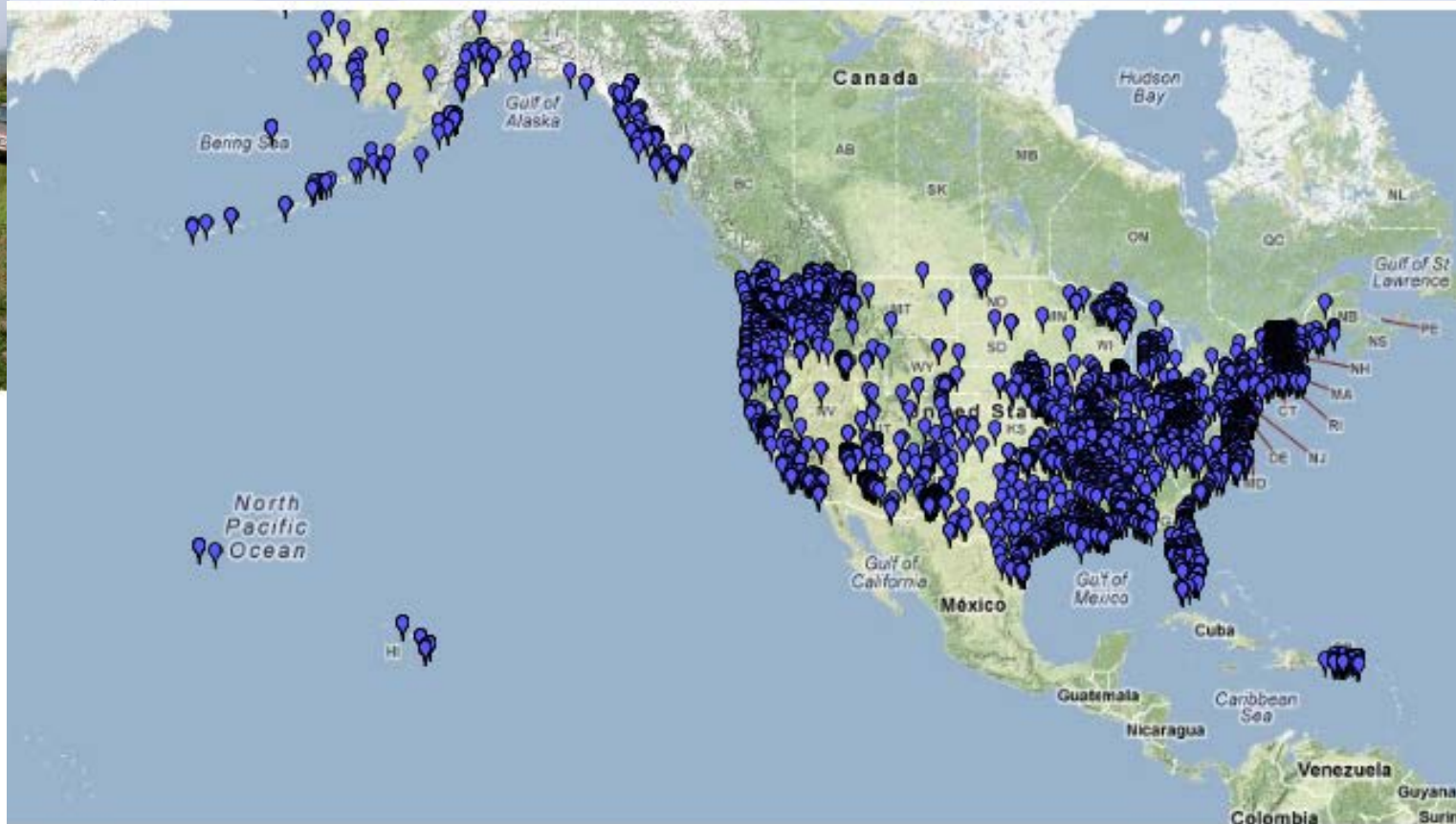
OPUS Menu

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OPUS-DB Published Solutions

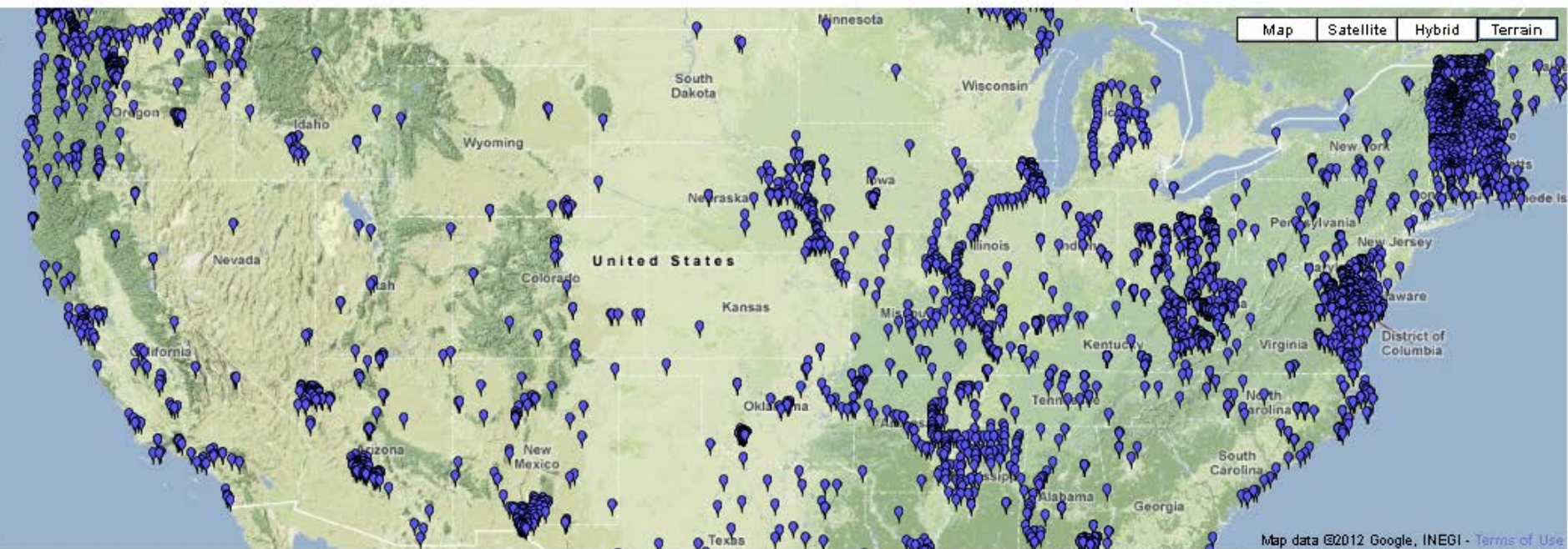
OPUS: Online Positioning User Service

National Geodetic Survey

Tools Surveys Science & Education

Search

Browse map to locate and access datasheets.

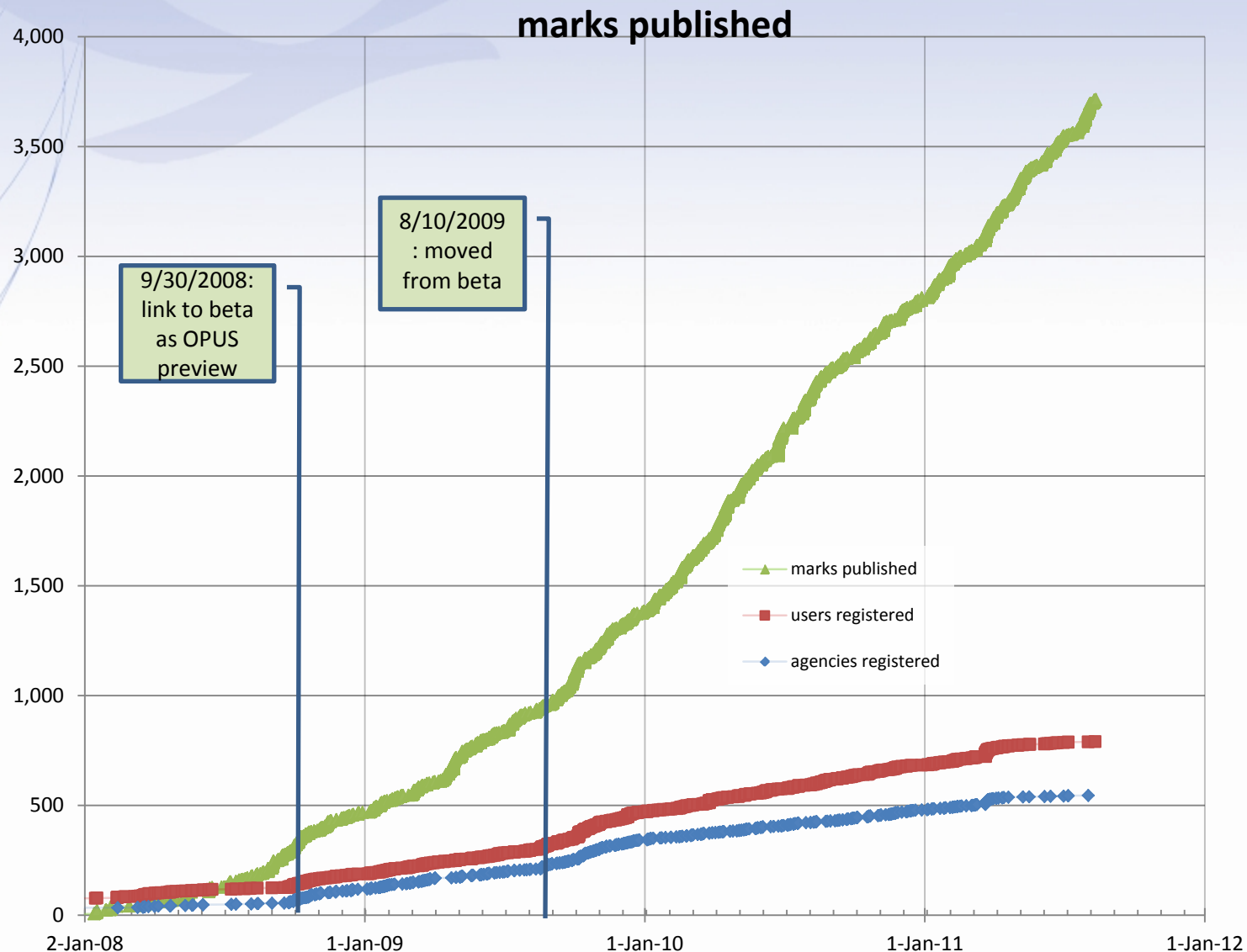


Why OPUS-DB

- A new easier way to capture data and have it in an NGS database
- Help populate Ellipsoidal Heights on Bench Marks, help with Geoid models and future vertical datums

Marks Published.

OPUS is showing steady growth in registered users and published marks.



NGS Data Sheets

Traditional blue booking

New OPUS-DB

```

SE = ,PROGRAM = datasheet, VERSION = 7.86
National Geodetic Survey, Retrieval Date = APRIL 20, 2011
*****
4 DESIGNATION - C 281
4 PID - DO0454
4 STATE/COUNTY- TX/THROCKMORTON
4 USGS QUAD - THROCKMORTON NE (1965)
4
4 *CURRENT SURVEY CONTROL
4
4 NAD 83(2007)- 33 11 10.75472(N) 099 06 11.86433(W) NO CHECK
4 NAVD 88 - 383.465 (meters) 1258.08 (feet) ADJUSTED
4
4 EPOCH DATE - 2002.00
4 X - -845,419.278 (meters) COMP
4 Y - -5,276,185.563 (meters) COMP
4 Z - 3,471,464.429 (meters) COMP
4 LAPLACE CORR- 0.24 (seconds) DEFLEC09
4 ELLIP HEIGHT- 353.943 (meters) (02/10/07) NO CHECK
4 GEOID HEIGHT- -28.98 (meters) GEOID09
4 DYNAMIC HT - 383.004 (meters) 1256.57 (feet) COMP
4
4 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
4 Type PID Designation North East Ellip
4 -----
4 NETWORK DO0454 C 281 1.10 1.47 2.14
4 -----
4 MODELED GRAV- 979,426.2 (mgal) NAVD 88
4
4 VERT ORDER - SECOND CLASS 0
4

```

SURVEY DATASHEET (Version 1.0)

PID: DO0454
Designation: C 281
Stamping: C 281 1934
Stability: Most reliable; expected to hold position well
Setting: In rock outcrop or ledge
Mark Condition: G
Description: Recovered as described by "Alpha Land Surveying, Inc."
Observed: 2006-09-28T22:19:00Z See Also [2006-09-28](#)
Source: OPUS - page 5 0810.20



Close-up View

REF FRAME	NAD_83(CORS96)	EPOCH	2002.0000	SOURCE	NAVD88 (Computed using GEOID03)	UNIT S	m	SET PROFILE	DETAILS
LAT:	33° 11' 10.78167"	± 0.010	m						
LLN:	-99° 6' 11.86387"	± 0.016	m						
ELL HT:	354.428	± 0.028	m						
X:	-845419.259	± 0.014	m						
Y:	-5276185.517	± 0.020	m						
Z:	3471465.389	± 0.023	m						
ORTHO HT:	383.464	± 0.070	m						
				UTM 14	SPC 4202(TXNC)				
				NORTHING:	3671948.370m	2168676.749m			
				EASTING:	490370.894m	543746.220m			
				CONVERGENCE:	-0.05654024°	-0.32903401°			
				POINT SCALE:	0.99960114	0.99987537			
				COMBINED FACTOR:	0.99954552	0.99981974			

CONTRIBUTED BY

[dopoutty](#)
☐ [Conrad Blucher Institute](#)



Horizon View



Map data ©2011 Google

The numerical values for this position solution have satisfied the quality control criteria of the National Geodetic Survey. The contributor has verified the information submitted is accurate and complete.

NGS Data Sheets

NGSIDB

- Passive control
- Episodically refined (NRA2011)
- Traditional surveying
- A lot of (important!) numbers and text

OPUS-DB

- Actively determined from CORS
- Constantly refined
- GPS Surveying
- A lot of numbers/text and some useful graphics/images

OPUS DB Requirements

Field Procedures

- GPS [data file](#) \geq 4 hour duration
- quality [mark setting](#)
- experienced observer
- fixed height tripod recommended
- brace tripod legs with sandbags or chain
- verify [antenna height](#) and plumb

OPUS DB Requirements

High-Quality OPUS Solution

- $\geq 70\%$ observations used
- $\geq 70\%$ ambiguities fixed
- ≤ 3 cm RMS
- ≤ 4 cm peak-to-peaks, lat. & lon.
- ≤ 8 cm peak-to-peak, el. hgt.
- properly identify [antenna type](#)
- precise or rapid orbits (avail. next day)

OPUS DB Requirements

Mark Attributes

- photos of mark & equipment
- details (name, type, stability, etc.)
- description to aid mark recovery
- preview [mark description form](#)
& [help file](#)

OPUS-DB Requirements



Help File: Mark Descriptions

National Geodetic Survey

A good description helps surveyors appraise a mark's fitness for use and aids in mark recovery. To help you in writing good descriptions, the primary metadata elements are illustrated below.

descriptive elements:	Publishing Methods:			
	DSWORLD [*]	Mark Recovery [*]	OPUS	
accuracy	†	†	automated	uses all these, & more
visibility	visibility	†	automated	
position	position	†	automated	
condition	condition	condition	condition	
notes	notes	notes	notes	
photos	photos	†	photos	
stamping	stamping	†	stamping	
designation	†	†	designation	
type	type	†	type	
setting	setting	†	setting	
rod depths	†	†	rod depths	
application	†	†	application	
magnetic	magnetic	†	magnetic	
stability	stability	†	stability	
equipment IDs	†	†	equipment IDs	

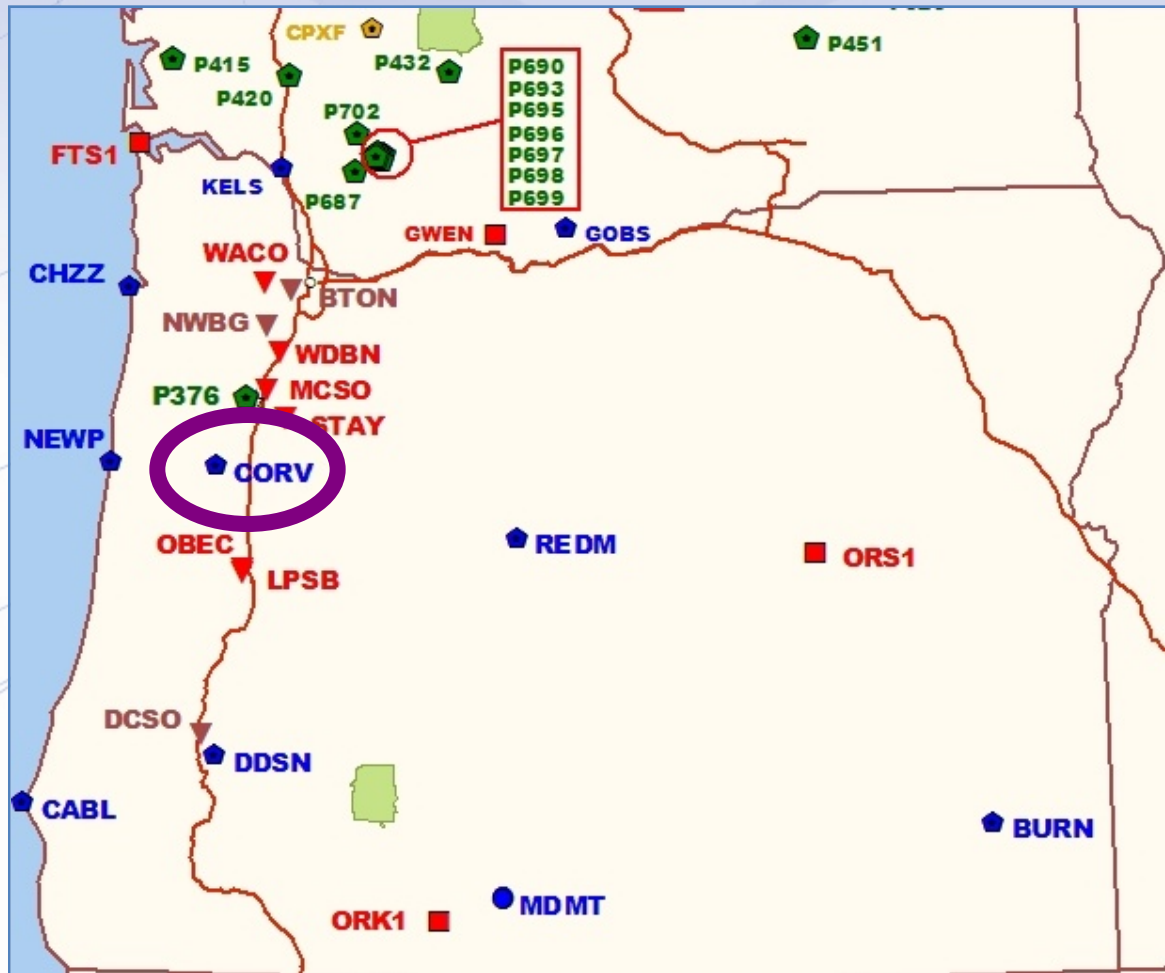
^{*} use these methods only for marks already published.
is mine published? **Search our database** to find out.

† to revise this element, use **WinDesc**.

Issues to Consider

- Site
 - instability, multi-path
 - mark ID (search database, check stamping)
- Weather
 - wild, local troposphere issues?
 - space weather: ionospheric issues?
- “Truth” (orbits, CORS, etc.)
 - Rapid (next-day) orbits required for publishing

A Quick Example



As an example, 2-hours of 2009-059 data from CORV, a PBO CORS in Oregon were submitted to OPUS-S.

A Quick Example

```

USER: mark.schenewerk@noaa.gov          DATE: March 31, 2010
RINEX FILE: corv059f.09o                TIME: 19:43:42 UTC

SOFTWARE: page5 0909.08 master40.pl 081023
EPHEMERIS: igs15206.eph [precise]
NAV FILE: brdc0590.09o

ANT NAME: ASH700936C_M  NONE
ARP HEIGHT: 1.521

START: 2009/02/28 05:00:00
STOP: 2009/02/28 06:59:00
OBS USED: 5984 / 6181 = 97%
# FIXED AMB: 31 / 31 : 100%
OVERALL RMS: 0.009(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)    ITRF00 (EPOCH:2009.1596)

      X:   -2498422.603(m)  0.011(m)   -2498423.344(m)  0.011(m)
      Y:   -3802821.159(m)  0.007(m)   -3802819.941(m)  0.007(m)
      Z:    4454736.661(m)  0.021(m)    4454736.734(m)  0.021(m)

      LAT:   44 35  7.91060      0.016(m)   44 35  7.92618      0.016(m)
      E LON:  236 41 43.48046     0.013(m)   236 41 43.42207     0.013(m)
      W LON:  123 18 16.51954     0.013(m)   123 18 16.57793     0.013(m)
      EL HGT:    106.011(m)  0.014(m)    105.627(m)  0.014(m)
      ORTHO HGT:   128.542(m)  0.020(m) [NAVD88 (Computed using GEOID09)]

      UTM COORDINATES      STATE PLANE COORDINATES
      UTM (Zone 10)        SPC (3601 OR N)
      Northing (Y) [meters] 4936954.909      105971.559
      Easting (X) [meters]  475821.304      2277335.367
      Convergence [degrees] -0.21381419     -1.98897513
      Point Scale          0.99960719      0.99994603
      Combined Factor      0.99959057      0.99992941

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)

      BASE STATIONS USED
      PID      DESIGNATION      LATITUDE  LONGITUDE  DISTANCE(m)
      DH4503 P376 EOLARESVR_OR2004 CORS ARP  N445628.313 W1230608.100  42648.2
      DE6258 MCSO MARION CNTY COOP CORS ARP  N445825.701 W1225720.639  51226.8
      DG5352 STAY STAYTON COOP CORS ARP      N444950.530 W1224915.036  47030.9
  
```

I apologize for stating the obvious, but ...

When reviewing your OPUS solution, double check that the information you provided is correct.

A Quick Example

```

USER: mark.schenewerk@noaa.gov          DATE: March 31, 2010
RINEX FILE: corv059f.09o                TIME: 19:43:42 UTC

SOFTWARE: page5 0909.08 master40.pl 081023  START: 2009/02/28 05:00:00
EPHEMERIS: igs15206.eph [precise]          STOP: 2009/02/28 06:59:00
NAV FILE: brdc0590.09n
ANT NAME: ASH700936C_M NONE
ARP HEIGHT: 1.521

OBS USED: 5984 / 6181 : 97%
# FIXED AMB: 31 / 31 : 100%
OVERALL RMS: 0.009(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)  ITRF00 (EPOCH:2009.1596)

X: -2498422.603(m) 0.011(m) -2498423.344(m) 0.011(m)
Y: -3802821.159(m) 0.007(m) -3802819.941(m) 0.007(m)
Z: 4454736.661(m) 0.021(m) 4454736.734(m) 0.021(m)

LAT: 44 35 7.91060 0.016(m) 44 35 7.92618 0.016(m)
E LON: 236 41 43.48046 0.013(m) 236 41 43.42207 0.013(m)
W LON: 123 18 16.51954 0.013(m) 123 18 16.57793 0.013(m)
EL HGT: 106.011(m) 0.014(m) 105.627(m) 0.014(m)
ORTHO HGT: 128.542(m) 0.020(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES      STATE PLANE COORDINATES
UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters] 4936954.909 105971.559
Easting (X) [meters] 475821.304 2277335.367
Convergence [degrees] -0.21381419 -1.98897513
Point Scale 0.99960719 0.99994603
Combined Factor 0.99959057 0.99992941

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)

BASE STATIONS USED
PID DESIGNATION LATITUDE LONGITUDE DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP N445628.313 W1230608.100 42648.2
DE6258 MCSO MARION CNTY COOP CORS ARP N445825.701 W1225720.639 51226.8
DG5352 STAY STAYTON COOP CORS ARP N444950.530 W1224915.036 47030.9

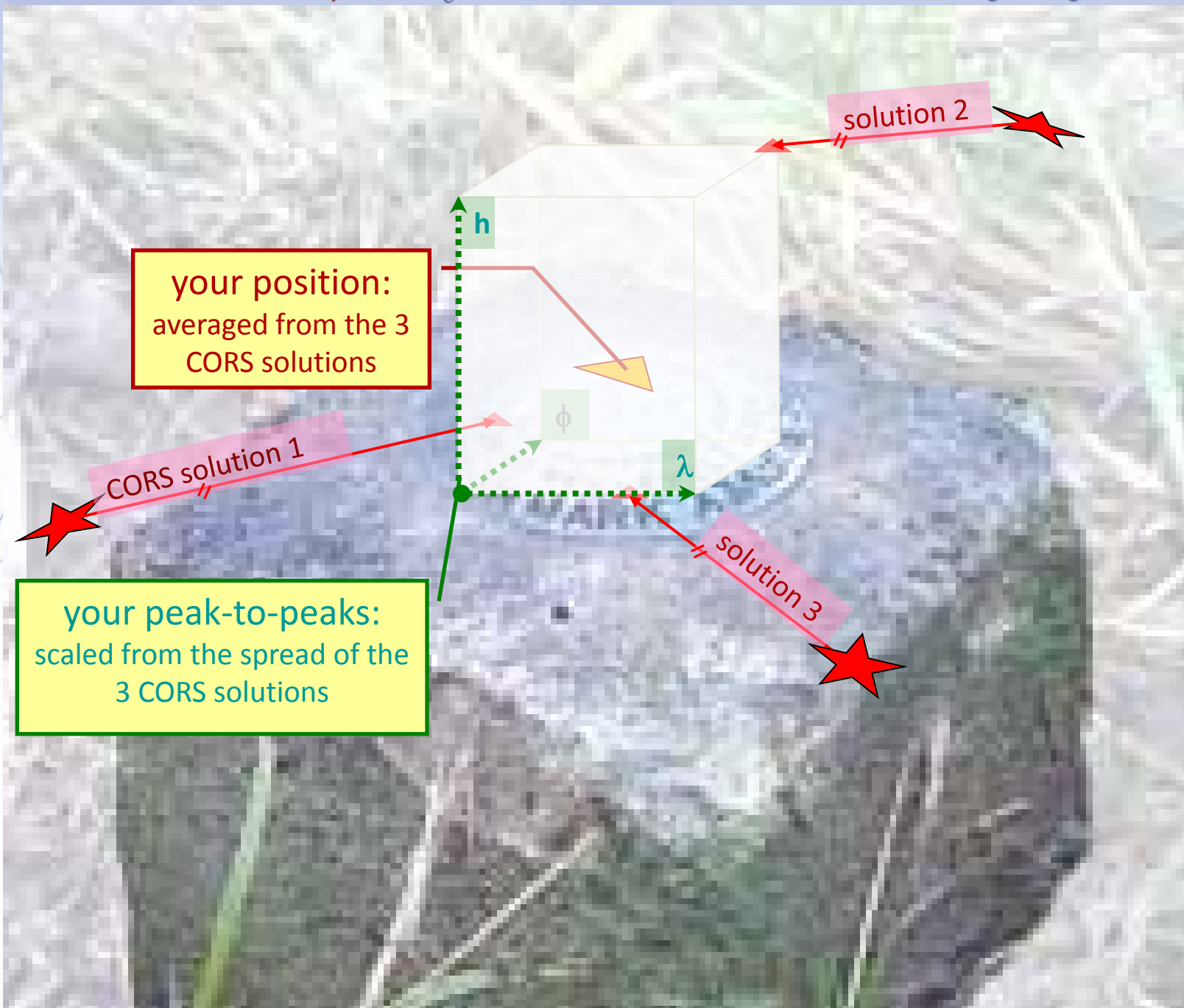
```

I apologize for stating the obvious, but ...

Check the quality control measures provided:

In this example, we have a





The Extended Report

BASE STATION INFORMATION

```
STATION NAME: p376 a 2 (EOLARESVR_OR2004; Salem, OR United States)
MONUMENT: NO DOMES NUMBER
XYZ -2469806.7634 -3788348.6049 4482853.4377 MON @ 1997.0000 (M)
XYZ -0.0141 0.0030 -0.0043 VEL (M/YR)
NEU -0.0000 0.0000 0.0083 MON TO ARP (M)
NEU 0.0009 0.0009 0.1068 ARP TO L1 PHASE CENTER (M)
NEU 0.0002 0.0017 0.1251 ARP TO L2 PHASE CENTER (M)
XYZ -0.1715 0.0365 -0.0523 VEL TIMES 12.1597 YRS
XYZ -0.0032 -0.0049 0.0059 MON TO ARP
XYZ -0.0402 -0.0633 0.0761 ARP TO L1 PHASE CENTER
XYZ -2469806.9782 -3788348.6366 4482853.4674 L1 PHS CEN @ 2009.1596
XYZ 0.0000 0.0000 0.0000 + XYZ ADJUSTMENTS
XYZ -2469806.9782 -3788348.6366 4482853.4674 NEW L1 PHS CEN @ 2009.1596
XYZ -2469806.9381 -3788348.5733 4482853.3913 NEW ARP @ 2009.1596
XYZ -2469806.9348 -3788348.5684 4482853.3855 NEW MON @ 2009.1596
LLH 44 56 28.32921 236 53 51.83975 180.9607 NEW L1 PHS CEN @ 2009.1596
LLH 44 56 28.32918 236 53 51.83971 180.8539 NEW ARP @ 2009.1596
LLH 44 56 28.32918 236 53 51.83971 180.8456 NEW MON @ 2009.1596
```

```
STATION NAME: mcso a 1 (MARION CNTY COOP; Salem, Oregon, U.S.A.)
MONUMENT: NO DOMES NUMBER
XYZ -2458668.9460 -3792427.4770 4485327.2930 MON @ 1997.0000 (M)
XYZ -0.0131 0.0018 -0.0047 VEL (M/YR)
NEU 0.0000 0.0000 0.0000 MON TO ARP (M)
NEU 0.0025 0.0013 0.1065 ARP TO L1 PHASE CENTER (M)
NEU -0.0007 0.0013 0.1254 ARP TO L2 PHASE CENTER (M)
XYZ -0.1593 0.0219 -0.0572 VEL TIMES 12.1597 YRS
XYZ 0.0000 0.0000 0.0000 MON TO ARP
XYZ -0.0389 -0.0624 0.0770 ARP TO L1 PHASE CENTER
XYZ -2458669.1442 -3792427.5176 4485327.3129 L1 PHS CEN @ 2009.1596
XYZ -0.0000 -0.0000 -0.0000 + XYZ ADJUSTMENTS
XYZ -2458669.1442 -3792427.5176 4485327.3129 NEW L1 PHS CEN @ 2009.1596
XYZ -2458669.1053 -3792427.4551 4485327.2358 NEW ARP @ 2009.1596
XYZ -2458669.1053 -3792427.4551 4485327.2358 NEW MON @ 2009.1596
LLH 44 58 25.71729 237 2 39.30118 52.9227 NEW L1 PHS CEN @ 2009.1596
LLH 44 58 25.71721 237 2 39.30112 52.8162 NEW ARP @ 2009.1596
LLH 44 58 25.71721 237 2 39.30112 52.8162 NEW MON @ 2009.1596
```

If the extended report option was selected, next you'll see the BASE STATION section.

Here, the components contributing to the base stations' coordinates are shown in detail. These and the following information are expressed in the ITRF currently in use.

The Extended Report

BASE STATION INFORMATION

STATION NAME: p376 a 2 (EOLARESVR_OR2004; Salem, OR United States)
 MONUMENT: NO DOMES NUMBER

XYZ	-2469806.7634	-3788348.6049	4482853.4377	MON @ 1997.0000 (M)
XYZ	-0.0141	0.0030	-0.0043	VEL (M/YR)
NEU	-0.0000	0.0000	0.0083	MON TO ARP (M)
NEU	0.0009	0.0009	0.1068	ARP TO L1 PHASE CENTER (M)
NEU	0.0002	0.0017	0.1251	ARP TO L2 PHASE CENTER (M)

XYZ	-0.0032	-0.0049	0.0059	MON TO ARP
XYZ	-0.0402	-0.0633	0.0761	ARP TO L1 PHASE CENTER
XYZ	-2469806.9782	-3788348.6366	4482853.4674	L1 PHS CEN @ 2009.1596
XYZ	0.0000	0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	-2469806.9782	-3788348.6366	4482853.4674	NEW L1 PHS CEN @ 2009.1596
XYZ	-2469806.9381	-3788348.5733	4482853.3913	NEW ARP @ 2009.1596
XYZ	-2469806.9348	-3788348.5684	4482853.3855	NEW MON @ 2009.1596
LLH	44 56 28.32921	236 53 51.83975	180.9607	NEW L1 PHS CEN @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8539	NEW ARP @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8456	NEW MON @ 2009.1596

STATION NAME: mcso a 1 (MARION CNTY COOP; Salem, Oregon, U.S.A.)
 MONUMENT: NO DOMES NUMBER

XYZ	-2458668.9460	-3792427.4770	4485327.2930	MON @ 1997.0000 (M)
XYZ	-0.0131	0.0018	-0.0047	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0025	0.0013	0.1065	ARP TO L1 PHASE CENTER (M)
NEU	-0.0007	0.0013	0.1254	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1593	0.0219	-0.0572	VEL TIMES 12.1597 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	-0.0389	-0.0624	0.0770	ARP TO L1 PHASE CENTER
XYZ	-2458669.1442	-3792427.5176	4485327.3129	L1 PHS CEN @ 2009.1596
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	-2458669.1442	-3792427.5176	4485327.3129	NEW L1 PHS CEN @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW ARP @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW MON @ 2009.1596
LLH	44 58 25.71729	237 2 39.30118	52.9227	NEW L1 PHS CEN @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW ARP @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW MON @ 2009.1596

This section includes
a priori information.

The Extended Report

BASE STATION INFORMATION

STATION NAME: p376 a 2 (EOLARESVR_OR2004; Salem, OR United States)

MONUMENT: NO DOMES NUMBER

XYZ	-2469806.7634	-3788348.6049	4482853.4377	MON @ 1997.0000 (M)
XYZ	-0.0141	0.0030	-0.0043	VEL (M/YR)
NEU	-0.0000	0.0000	0.0083	MON TO ARP (M)
NEU	0.0009	0.0009	0.1068	ARP TO L1 PHASE CENTER (M)
NEU	0.0002	0.0017	0.1251	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1715	0.0365	-0.0523	VEL TIMES 12.1597 YRS
XYZ	-0.0032	-0.0049	0.0059	MON TO ARP
XYZ	-0.0402	-0.0633	0.0761	ARP TO L1 PHASE CENTER
XYZ	-2469806.9782	-3788348.6366	4482853.4674	L1 PHS CEN @ 2009.1596
+ XYZ ADJUSTMENTS				
XYZ	-2469806.9782	-3788348.6366	4482853.4674	NEW L1 PHS CEN @ 2009.1596
XYZ	-2469806.9381	-3788348.5733	4482853.3913	NEW ARP @ 2009.1596
XYZ	-2469806.9348	-3788348.5684	4482853.3855	NEW MON @ 2009.1596
LLH	44 56 28.32921	236 53 51.83975	180.9607	NEW L1 PHS CEN @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8539	NEW ARP @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8456	NEW MON @ 2009.1596

STATION NAME: mcso a 1 (MARION CNTY COOP; Salem, Oregon, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ	-2458668.9460	-3792427.4770	4485327.2930	MON @ 1997.0000 (M)
XYZ	-0.0131	0.0018	-0.0047	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0025	0.0013	0.1065	ARP TO L1 PHASE CENTER (M)
NEU	-0.0007	0.0013	0.1254	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1593	0.0219	-0.0572	VEL TIMES 12.1597 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	-0.0389	-0.0624	0.0770	ARP TO L1 PHASE CENTER
XYZ	-2458669.1442	-3792427.5176	4485327.3129	L1 PHS CEN @ 2009.1596
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	-2458669.1442	-3792427.5176	4485327.3129	NEW L1 PHS CEN @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW ARP @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW MON @ 2009.1596
LLH	44 58 25.71729	237 2 39.30118	52.9227	NEW L1 PHS CEN @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW ARP @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW MON @ 2009.1596

Computation of the coordinates at the mean epoch of the data.

The Extended Report

BASE STATION INFORMATION

STATION NAME: p376 a 2 (EOLARESVR_OR2004; Salem, OR United States)
MONUMENT: NO DOMES NUMBER

XYZ	-2469806.7634	-3788348.6049	4482853.4377	MON @ 1997.0000 (M)
XYZ	-0.0141	0.0030	-0.0043	VEL (M/YR)
NEU	-0.0000	0.0000	0.0083	MON TO ARP (M)
NEU	0.0009	0.0009	0.1068	ARP TO L1 PHASE CENTER (M)
NEU	0.0002	0.0017	0.1251	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1715	0.0365	-0.0523	VEL TIMES 12.1597 YRS
XYZ	-0.0032	-0.0049	0.0059	MON TO ARP
XYZ	-0.0402	-0.0633	0.0761	ARP TO L1 PHASE CENTER
XYZ	-2469806.9782	-3788348.6366	4482853.4674	L1 PHS CEN @ 2009.1596
XYZ	0.0000	0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	-2469806.9782	-3788348.6366	4482853.4674	NEW L1 PHS CEN @ 2009.1596
XYZ	-2469806.9381	-3788348.5733	4482853.3913	NEW ARP @ 2009.1596
XYZ	-2469806.9348	-3788348.5684	4482853.3855	NEW MON @ 2009.1596
LLH	44 56 28.32921	236 53 51.83975	180.9607	NEW L1 PHS CEN @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8539	NEW ARP @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8456	NEW MON @ 2009.1596

And the coordinates at the mean epoch of the data.

STATION NAME: mcso a 1 (MARION CNTY COOP; Salem, Oregon, U.S.A.)
MONUMENT: NO DOMES NUMBER

XYZ	-2458668.9460	-3792427.4770	4485327.2930	MON @ 1997.0000 (M)
XYZ	-0.0131	0.0018	-0.0047	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0025	0.0013	0.1065	ARP TO L1 PHASE CENTER (M)
NEU	-0.0007	0.0013	0.1254	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1593	0.0219	-0.0572	VEL TIMES 12.1597 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	-0.0389	-0.0624	0.0770	ARP TO L1 PHASE CENTER
XYZ	-2458669.1442	-3792427.5176	4485327.3129	L1 PHS CEN @ 2009.1596
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	-2458669.1442	-3792427.5176	4485327.3129	NEW L1 PHS CEN @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW ARP @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW MON @ 2009.1596
LLH	44 58 25.71729	237 2 39.30118	52.9227	NEW L1 PHS CEN @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW ARP @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW MON @ 2009.1596

The Extended Report

BASE STATION INFORMATION

STATION NAME: p376 a 2 (EOLARESVR_OR2004; Salem, OR United States)

MONUMENT: NO DOMES NUMBER

XYZ	-2469806.7634	-3788348.6049	4482853.4377	MON @ 1997.0000 (M)
XYZ	-0.0141	0.0030	-0.0043	VEL (M/YR)
NEU	-0.0000	0.0000	0.0083	MON TO ARP (M)
NEU	0.0009	0.0009	0.1068	ARP TO L1 PHASE CENTER (M)
NEU	0.0002	0.0017	0.1251	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1715	0.0365	-0.0523	VEL TIMES 12.1597 YRS
XYZ	-0.0032	-0.0049	0.0059	MON TO ARP
XYZ	-0.0402	-0.0633	0.0761	ARP TO L1 PHASE CENTER
XYZ	-2469806.9782	-3788348.6366	4482853.4674	L1 PHS CEN @ 2009.1596
XYZ	0.0000	0.0000	0.0000	+ XYZ ADJUSTMENTS
XYZ	-2469806.9782	-3788348.6366	4482853.4674	NEW L1 PHS CEN @ 2009.1596
XYZ	-2469806.9381	-3788348.5733	4482853.3913	NEW ARP @ 2009.1596
XYZ	-2469806.9348	-3788348.5684	4482853.3855	NEW MON @ 2009.1596
LLH	44 56 28.32921	236 53 51.83975	180.9607	NEW L1 PHS CEN @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8539	NEW ARP @ 2009.1596
LLH	44 56 28.32918	236 53 51.83971	180.8456	NEW MON @ 2009.1596

STATION NAME: mcso a 1 (MARION CNTY COOP; Salem, Oregon, U.S.A.)

MONUMENT: NO DOMES NUMBER

XYZ	-2458668.9460	-3792427.4770	4485327.2930	MON @ 1997.0000 (M)
XYZ	-0.0131	0.0018	-0.0047	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0025	0.0013	0.1065	ARP TO L1 PHASE CENTER (M)
NEU	-0.0007	0.0013	0.1254	ARP TO L2 PHASE CENTER (M)
XYZ	-0.1593	0.0219	-0.0572	VEL TIMES 12.1597 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	-0.0389	-0.0624	0.0770	ARP TO L1 PHASE CENTER
XYZ	-2458669.1442	-3792427.5176	4485327.3129	L1 PHS CEN @ 2009.1596
XYZ	-0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	-2458669.1442	-3792427.5176	4485327.3129	NEW L1 PHS CEN @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW ARP @ 2009.1596
XYZ	-2458669.1053	-3792427.4551	4485327.2358	NEW MON @ 2009.1596
LLH	44 58 25.71729	237 2 39.30118	52.9227	NEW L1 PHS CEN @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW ARP @ 2009.1596
LLH	44 58 25.71721	237 2 39.30112	52.8162	NEW MON @ 2009.1596

So, if you add the
a priori coordinates
+ ARP TO L1,
+ MON TO ARP
+ VEL offsets,
you will get the
coordinates at the mean
epoch of the data, shown
here highlighted in
yellow, used in the
processing.

The Extended Report

REMOTE STATION INFORMATION

```

STATION NAME: corv      1
MONUMENT: NO DOMES NUMBER
XYZ  -2498423.7849  -3802820.9571  4454737.7025  MON @ 2009.1595 (M)
NEU   -0.0014      0.0010      1.5210  MON TO ARP (M)
NEU   0.0014      -0.0010      0.1089  ARP TO L1 PHASE CENTER (M)
NEU   0.0010      0.0005      0.1274  ARP TO L2 PHASE CENTER (M)
XYZ  -0.5945      -0.9067      1.0667  MON TO ARP
XYZ  -0.0429      -0.0635      0.0774  ARP TO L1 PHASE CENTER
XYZ  -2498424.4223  -3802821.9273  4454738.8466  L1 PHS CEN @ 2009.1596

```

```

BASELINE NAME: p376 corv
XYZ   0.4450      1.0132      -0.9754  + XYZ ADJUSTMENTS
XYZ  -2498423.9773  -3802820.9141  4454737.8713  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9344  -3802820.8506  4454737.7938  NEW ARP @ 2009.1596
XYZ  -2498423.3399  -3802819.9439  4454736.7271  NEW MON @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  107.2518  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92597  236 41 43.42234  107.1429  NEW ARP @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  105.6219  NEW MON @ 2009.1596

```

```

BASELINE NAME: mcso corv
XYZ   0.4343      1.0202      -0.9746  + XYZ ADJUSTMENTS
XYZ  -2498423.9880  -3802820.9071  4454737.8721  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9451  -3802820.8436  4454737.7946  NEW ARP @ 2009.1596
XYZ  -2498423.3506  -3802819.9369  4454736.7279  NEW MON @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  107.2523  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92599  236 41 43.42176  107.1434  NEW ARP @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  105.6224  NEW MON @ 2009.1596

```

```

BASELINE NAME: stay corv
XYZ   0.4437      1.0153      -0.9543  + XYZ ADJUSTMENTS
XYZ  -2498423.9786  -3802820.9120  4454737.8923  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9357  -3802820.8485  4454737.8149  NEW ARP @ 2009.1596
XYZ  -2498423.3412  -3802819.9418  4454736.7482  NEW MON @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  107.2658  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92648  236 41 43.42224  107.1569  NEW ARP @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  105.6359  NEW MON @ 2009.1596

```

Next are summaries of the solutions relative to each base station.

We'll discuss this a few minutes, but, for now, simply be aware that OPUS "solves" each baseline separately, then compares and averages these results to create the report.

The Extended Report

REMOTE STATION INFORMATION

```
STATION NAME: corv      1
MONUMENT: NO DOMES NUMBER
XYZ  -2498423.7849  -3802820.9571  4454737.7025  MON @ 2009.1595 (M)
NEU   -0.0014      0.0010      1.5210  MON TO ARP (M)
NEU    0.0014     -0.0010      0.1089  ARP TO L1 PHASE CENTER (M)
NEU    0.0010      0.0005      0.1274  ARP TO L2 PHASE CENTER (M)
XYZ   -0.5945     -0.9067      1.0667  MON TO ARP
XYZ   -0.0429     -0.0635      0.0774  ARP TO L1 PHASE CENTER
XYZ  -2498424.4223  -3802821.9273  4454738.8466  L1 PHS CEN @ 2009.1596
```

```
BASELINE NAME: p376 corv
XYZ    0.4450      1.0132      -0.9754  + XYZ ADJUSTMENTS
XYZ  -2498423.9773  -3802820.9141  4454737.8713  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9344  -3802820.8506  4454737.7938  NEW ARP @ 2009.1596
XYZ  -2498423.3399  -3802819.9439  4454736.7271  NEW MON @ 2009.1596
LLH 44 35  7.92601  236 41 43.42229  107.2518  NEW L1 PHS CEN @ 2009.1596
LLH 44 35  7.92597  236 41 43.42234  107.1429  NEW ARP @ 2009.1596
LLH 44 35  7.92601  236 41 43.42229  105.6219  NEW MON @ 2009.1596
```

```
BASELINE NAME: mcso corv
XYZ    0.4343      1.0202      -0.9746  + XYZ ADJUSTMENTS
XYZ  -2498423.9880  -3802820.9071  4454737.8721  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9451  -3802820.8436  4454737.7946  NEW ARP @ 2009.1596
XYZ  -2498423.3506  -3802819.9369  4454736.7279  NEW MON @ 2009.1596
LLH 44 35  7.92603  236 41 43.42171  107.2523  NEW L1 PHS CEN @ 2009.1596
LLH 44 35  7.92599  236 41 43.42176  107.1434  NEW ARP @ 2009.1596
LLH 44 35  7.92603  236 41 43.42171  105.6224  NEW MON @ 2009.1596
```

```
BASELINE NAME: stay corv
XYZ    0.4437      1.0153      -0.9543  + XYZ ADJUSTMENTS
XYZ  -2498423.9786  -3802820.9120  4454737.8923  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9357  -3802820.8485  4454737.8149  NEW ARP @ 2009.1596
XYZ  -2498423.3412  -3802819.9418  4454736.7482  NEW MON @ 2009.1596
LLH 44 35  7.92653  236 41 43.42219  107.2658  NEW L1 PHS CEN @ 2009.1596
LLH 44 35  7.92648  236 41 43.42224  107.1569  NEW ARP @ 2009.1596
LLH 44 35  7.92653  236 41 43.42219  105.6359  NEW MON @ 2009.1596
```

Here we see the best guess for “my” site’s a priori information. This is based upon the information I provided when I uploaded the data file to OPUS-S and a crude point position solution. Remember that these are also in the ITRF.

The Extended Report

REMOTE STATION INFORMATION

```

STATION NAME: corv      1
MONUMENT: NO DOMES NUMBER
XYZ  -2498423.7849  -3802820.9571  4454737.7025  MON @ 2009.1595 (M)
NEU   -0.0014      0.0010      1.5210  MON TO ARP (M)
NEU    0.0014     -0.0010     0.1089  ARP TO L1 PHASE CENTER (M)
NEU    0.0010     0.0005     0.1274  ARP TO L2 PHASE CENTER (M)
XYZ   -0.5945     -0.9067     1.0667  MON TO ARP
XYZ   -0.0429     -0.0635     0.0774  ARP TO L1 PHASE CENTER
XYZ  -2498424.4223  -3802821.9273  4454738.8466  L1 PHS CEN @ 2009.1596

```

```

BASELINE NAME:  p376  corv
XYZ    0.4450      1.0132      -0.9754  + XYZ ADJUSTMENTS
XYZ  -2498423.9773  -3802820.9141  4454737.8713  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9344  -3802820.8506  4454737.7938  NEW ARP @ 2009.1596
XYZ  -2498423.3399  -3802819.9439  4454736.7271  NEW MON @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  107.2518  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92597  236 41 43.42234  107.1429  NEW ARP @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  105.6219  NEW MON @ 2009.1596

```

```

BASELINE NAME:  mcso  corv
XYZ    0.4343      1.0202      -0.9746  + XYZ ADJUSTMENTS
XYZ  -2498423.9880  -3802820.9071  4454737.8721  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9451  -3802820.8436  4454737.7946  NEW ARP @ 2009.1596
XYZ  -2498423.3506  -3802819.9369  4454736.7279  NEW MON @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  107.2523  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92599  236 41 43.42176  107.1434  NEW ARP @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  105.6224  NEW MON @ 2009.1596

```

```

BASELINE NAME:  stay  corv
XYZ    0.4437      1.0153      -0.9543  + XYZ ADJUSTMENTS
XYZ  -2498423.9786  -3802820.9120  4454737.8923  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9357  -3802820.8485  4454737.8149  NEW ARP @ 2009.1596
XYZ  -2498423.3412  -3802819.9418  4454736.7482  NEW MON @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  107.2658  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92648  236 41 43.42224  107.1569  NEW ARP @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  105.6359  NEW MON @ 2009.1596

```

In the associated “blocks”, the estimated adjustment and resulting coordinates from each baseline solution are shown.

The Extended Report

REMOTE STATION INFORMATION

```
STATION NAME: corv      1
MONUMENT: NO DOMES NUMBER
XYZ  -2498423.7849  -3802820.9571  4454737.7025  MON @ 2009.1595 (M)
NEU   -0.0014      0.0010      1.5210  MON TO ARP (M)
NEU   0.0014      -0.0010      0.1089  ARP TO L1 PHASE CENTER (M)
NEU   0.0010      0.0005      0.1274  ARP TO L2 PHASE CENTER (M)
XYZ  -0.5945      -0.9067      1.0667  MON TO ARP
XYZ  -0.0429      -0.0635      0.0774  ARP TO L1 PHASE CENTER
```

```
XYZ  -2498424.4223  -3802821.9273  4454738.8466  L1 PHS CEN @ 2009.1596
```

```
BASELINE NAME: p376 corv
```

```
XYZ  0.4450      1.0132      -0.9754  + XYZ ADJUSTMENTS
XYZ  -2498423.9773  -3802820.9141  4454737.8713  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9344  -3802820.8506  4454737.7938  NEW ARP @ 2009.1596
XYZ  -2498423.3399  -3802819.9439  4454736.7271  NEW MON @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  107.2518  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92597  236 41 43.42234  107.1429  NEW ARP @ 2009.1596
LLH  44 35  7.92601  236 41 43.42229  105.6219  NEW MON @ 2009.1596
```

```
BASELINE NAME: mcso corv
```

```
XYZ  0.4343      1.0202      -0.9746  + XYZ ADJUSTMENTS
XYZ  -2498423.9880  -3802820.9071  4454737.8721  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9451  -3802820.8436  4454737.7946  NEW ARP @ 2009.1596
XYZ  -2498423.3506  -3802819.9369  4454736.7279  NEW MON @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  107.2523  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92599  236 41 43.42176  107.1434  NEW ARP @ 2009.1596
LLH  44 35  7.92603  236 41 43.42171  105.6224  NEW MON @ 2009.1596
```

```
BASELINE NAME: stay corv
```

```
XYZ  0.4437      1.0153      -0.9543  + XYZ ADJUSTMENTS
XYZ  -2498423.9786  -3802820.9120  4454737.8923  NEW L1 PHS CEN @ 2009.1596
XYZ  -2498423.9357  -3802820.8485  4454737.8149  NEW ARP @ 2009.1596
XYZ  -2498423.3412  -3802819.9418  4454736.7482  NEW MON @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  107.2658  NEW L1 PHS CEN @ 2009.1596
LLH  44 35  7.92648  236 41 43.42224  107.1569  NEW ARP @ 2009.1596
LLH  44 35  7.92653  236 41 43.42219  105.6359  NEW MON @ 2009.1596
```

Near the top, in light blue, you can see the pieces need to compute the estimated (NEW) L1 phase center.

Below, in light green, are the three estimates from the each baseline.

The Extended Report

G-FILES

```
Axx2009 228 9 228
B2009 228 5 0 9 228 659 1 page5 v0909.08IGS 226 1 2 27NGS 2010 7 9IFDDFX
Iant_info.003 NGS 20100616
C00090001 286164051 30 144713755 32 281166583 28 X0599ACORVX0599AP376
D 1 2 9032521 1 3 -2281991 2 3 -5618980

Axx2009 228 9 228
B2009 228 5 0 9 228 659 1 page5 v0909.08IGS 226 1 2 27NGS 2010 7 9IFDDFX
Iant_info.003 NGS 20100616
C00090002 397542453 32 103924818 30 305905079 27 X0599ACORVX0599AMCSO
D 1 2 8318045 1 3 -1709106 2 3 -6334467

Axx2009 228 9 228
B2009 228 5 0 9 228 659 1 page5 v0909.08IGS 226 1 2 27NGS 2010 7 9IFDDFX
Iant_info.003 NGS 20100616
C00090003 425824609 35 -48539879 22 193670380 18 X0599ACORVX0599ASTAY
D 1 2 6847311 1 3 -1553171 2 3 -7047523
```

Following the baseline information are some Bluebook records...

The Extended Report

POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	03	06	07	08	10	13	16	19
p376-corr	0.009	0.010	0.016	...	0.007	0.014	0.005	0.015	0.009
	20	23	25	27	28				
p376-corr	...	0.008	0.005	...	0.010				
	OVERALL	03	06	07	08	10	13	16	19
mcs0-corr	0.009	0.010	0.014	...	0.010	0.011	0.006	0.015	0.012
	20	23	25	27	28				
mcs0-corr	...	0.008	0.005	...	0.010				
	OVERALL	03	06	07	08	10	13	16	19
stay-corr	0.010	0.014	0.016	...	0.009	0.014	0.006	0.013	0.012
	20	23	25	27	28				
stay-corr	...	0.011	0.005	...	0.012				

OBS BY SATELLITE VS. BASELINE

	OVERALL	03	06	07	08	10	13	16	19
p376-corr	2000	238	237	...	238	169	238	99	187
	20	23	25	27	28				
p376-corr	...	227	238	...	129				
	OVERALL	03	06	07	08	10	13	16	19
mcs0-corr	1973	238	234	...	238	169	238	93	185
	20	23	25	27	28				
mcs0-corr	...	211	238	...	129				
	OVERALL	03	06	07	08	10	13	16	19
stay-corr	2011	238	238	...	238	169	238	99	199
	20	23	25	27	28				
stay-corr	...	229	238	...	125				

Following the Bluebook information are solution statistics and observation counts in tabular form ordered by satellite (rows) and baseline (columns)...

The Extended Report

These tables can be a challenge to read, especially for longer data spans, because the lines wrap in the standard 80-column format. Here's the same table without line-wrapping and with the extra header lines removed.

POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	03	06	07	08	10	13	16	19	20	23	25	27	28
p376-corr	0.009	0.010	0.016	...	0.007	0.014	0.005	0.015	0.009	...	0.008	0.005	...	0.010
mcso-corr	0.009	0.010	0.014	...	0.010	0.011	0.006	0.015	0.012	...	0.008	0.005	...	0.010
stay-corr	0.010	0.014	0.016	...	0.009	0.014	0.006	0.013	0.01	...	0.011	0.005	...	0.012

OBS BY SATELLITE VS. BASELINE

	OVERALL	03	06	07	08	10	13	16	19	20	23	25	27	28
p376-corr	2000	238	237	...	238	169	238	99	187	...	227	238	...	129
mcso-corr	1973	238	234	...	238	169	238	93	185	...	211	238	...	129
stay-corr	2011	238	238	...	238	169	238	99	199	...	229	238	...	125

The Extended Report

```
Covariance Matrix for the xyz OPUS Position (meters^2).  
0.0000069978    0.0000004873    -0.0000000972  
0.0000004873    0.0000053511    -0.0000002879  
-0.0000000972   -0.0000002879    0.0000040822
```

```
Covariance Matrix for the enu OPUS Position (meters^2).  
0.0000060540    0.0000007189    -0.0000006244  
0.0000007189    0.0000048712    -0.0000010998  
-0.0000006244   -0.0000010998    0.0000055059
```

```
Horizontal network accuracy =    0.00573 meters.  
Vertical network accuracy   =    0.00460 meters.
```

Next are covariance matrices for the XYZ and NEU vectors, and the network horizontal and vertical accuracy...

The network horizontal and vertical accuracies are a relatively new addition and will become the standard in the future.

Because of the way OPUS-S works (now), these values are derived from empirically determined relationships in the CORS network plus statistics from the individual baseline solutions.

The Extended Report.

Derivation of NAD 83 vector components

```

Position of reference station ARP in NAD_83(CORS96)(EPOCH:2002.0000).
      Xa(m)      Ya(m)      Za(m)
P376  -2469806.16816  -3788349.79220  4482853.31622  2002.00
MCSO   -2458668.34414  -3792428.66602  4485327.16392  2002.00
STAY   -2455840.11392  -3807675.15002  4474103.71103  2002.00

Position of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).
      Xr(m)      Yr(m)      Zr(m)
P376  -2469806.16496  -3788349.78730  4482853.31032  2002.00
MCSO   -2458668.34414  -3792428.66602  4485327.16392  2002.00
STAY   -2455840.11392  -3807675.15002  4474103.71103  2002.00

Velocity of reference station monument in NAD_83(CORS96)(EPOCH:2002.0000).
      Vx (m/yr)   Vy (m/yr)   Vz (m/yr)
P376    0.00440    0.00380    0.00560
MCSO    0.00550    0.00260    0.00520
STAY    0.00460    0.00290    0.00490

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)
P376   28616.43804  14471.37170   28116.64932  2002.00
MCSO   39754.25886  10392.49298   30590.50292  2002.00
STAY   42582.48908  -4853.99102   19367.05003  2002.00

```

Additional information related to the derivation of NAD_83(CORS96) vector components...

You'll see four "blocks": the reference sites' ARP and MON coordinates, their velocities and the solution vector components all expressed in the NAD 83(CORS96) frame.

The Extended Report

STATE PLANE COORDINATES - International Foot	
SPC (3601	OR N)
Northing (Y) [feet]	347675.719
Easting (X) [feet]	7471572.725
Convergence [degrees]	-1.98897513
Point Scale	0.99994603
Combined Factor	0.99992941

The state plane coordinates expressed using the international foot rather than meters ...

Back To Our Quick Example

If you're uncomfortable with your results (we're not, but speaking hypothetically), check your data first.

- Your hardware manufacturer may provide QC software.
- Use third-party software such as TEQC.

Estes and Meertens, "TEQC: The Multi-Purpose Toolkit for GPS/GLONASS Data", 1999, GPS Solutions, 3, 1, 42-49.

- Resubmit requesting the extended report.

If you're still uncomfortable, consider checking the CORS used in the OPUS processing. The performance of the CORS is reflected in your results.

Back To Our Quick Example

```

USER: mark.schenewerk@noaa.gov          DATE: March 31, 2010
RINEX FILE: corv059f.09o                TIME: 19:43:42 UTC

SOFTWARE: page5 0909.08 master40.pl 081023  START: 2009/02/28 05:00:00
EPHEMERIS: igs15206.eph [precise]          STOP: 2009/02/28 06:59:00
NAV FILE: brdc0590.09n                    OBS USED: 5984 / 6181 : 97%
ANT NAME: ASH700936C_M NONE                # FIXED AMB: 31 / 31 : 100%
ARP HEIGHT: 1.521                          OVERALL RMS: 0.009(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)  ITRF00 (EPOCH:2009.1596)

X: -2498422.603(m) 0.011(m) -2498423.344(m) 0.011(m)
Y: -3802821.159(m) 0.007(m) -3802819.941(m) 0.007(m)
Z: 4454736.661(m) 0.021(m) 4454736.734(m) 0.021(m)

LAT: 44 35 7.91060 0.016(m) 44 35 7.92618 0.016(m)
E LON: 236 41 43.48046 0.013(m) 236 41 43.42207 0.013(m)
W LON: 123 18 16.51954 0.013(m) 123 18 16.57793 0.013(m)
EL HGT: 106.011(m) 0.014(m) 105.627(m) 0.014(m)
ORTHO HGT: 128.542(m) 0.020(m) [NAVD88 (Computed using GEOID09)]

UTM COORDINATES      STATE PLANE COORDINATES
UTM (Zone 10)         SPC (3601 OR N)
Northing (Y) [meters] 4936954.909 105971.559
Easting (X) [meters] 475821.304 2277335.367
Convergence [degrees] -0.21381419 -1.98897513
Point Scale 0.99960719 0.99994603
Combined Factor 0.99959057 0.99992941

US NATIONAL GRID DESIGNATOR: 10TDQ7582136954(NAD 83)

```

```

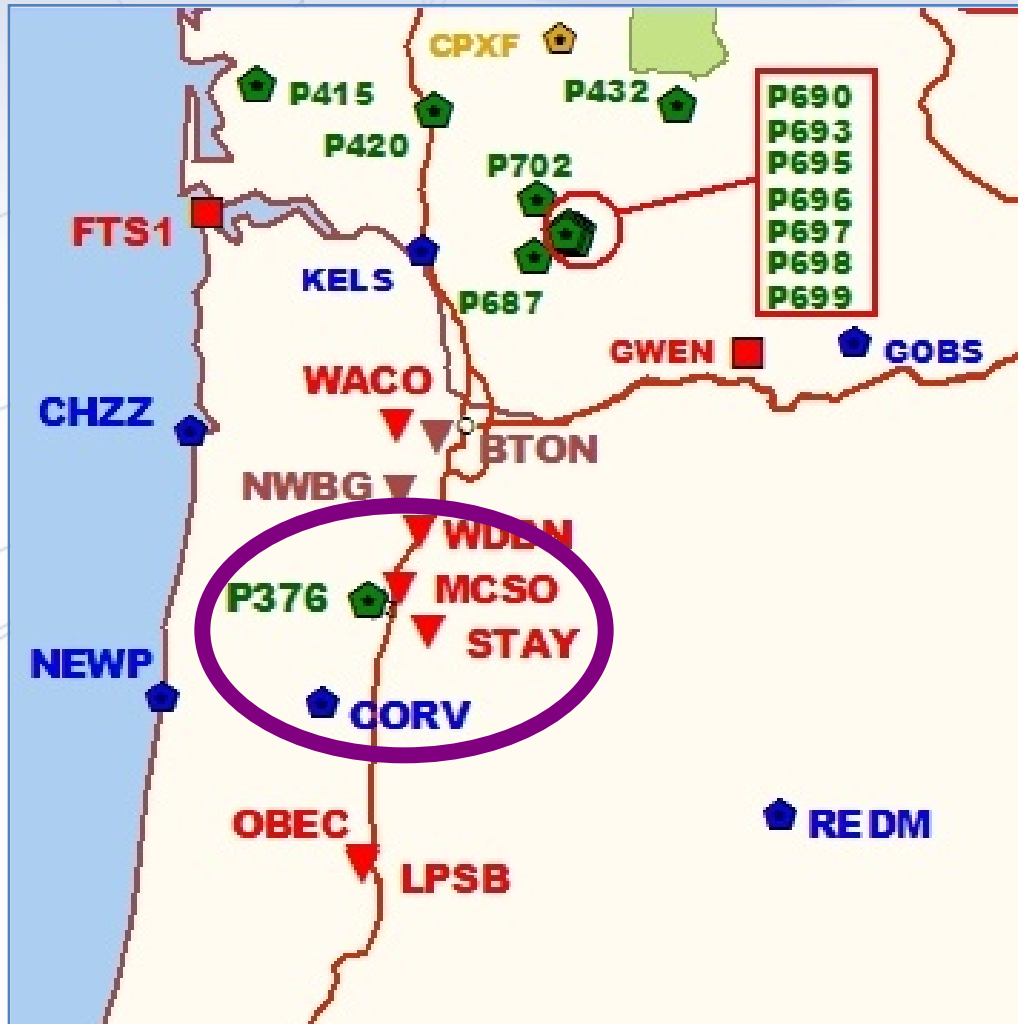
BASE STATIONS USED
PID      DESIGNATION      LATITUDE  LONGITUDE  DISTANCE(m)
DH4503 P376 EOLARESVR_OR2004 CORS ARP  N445628.313 W1230608.100 42648.2
DE6258 MCSO MARION CNTY COOP CORS ARP  N445825.701 W1225720.639 51226.8
DG5352 STAY STAYTON COOP CORS ARP      N444950.530 W1224915.036 47030.9

```

The CORS selected as reference sites are listed towards the bottom of the standard report.

OPUS examined the available sites and selected P376, MCSO and STAY.

Back To Our Quick Example



Shown are the positions of P376, MCSO and STAY relative to our “test” site, CORV.

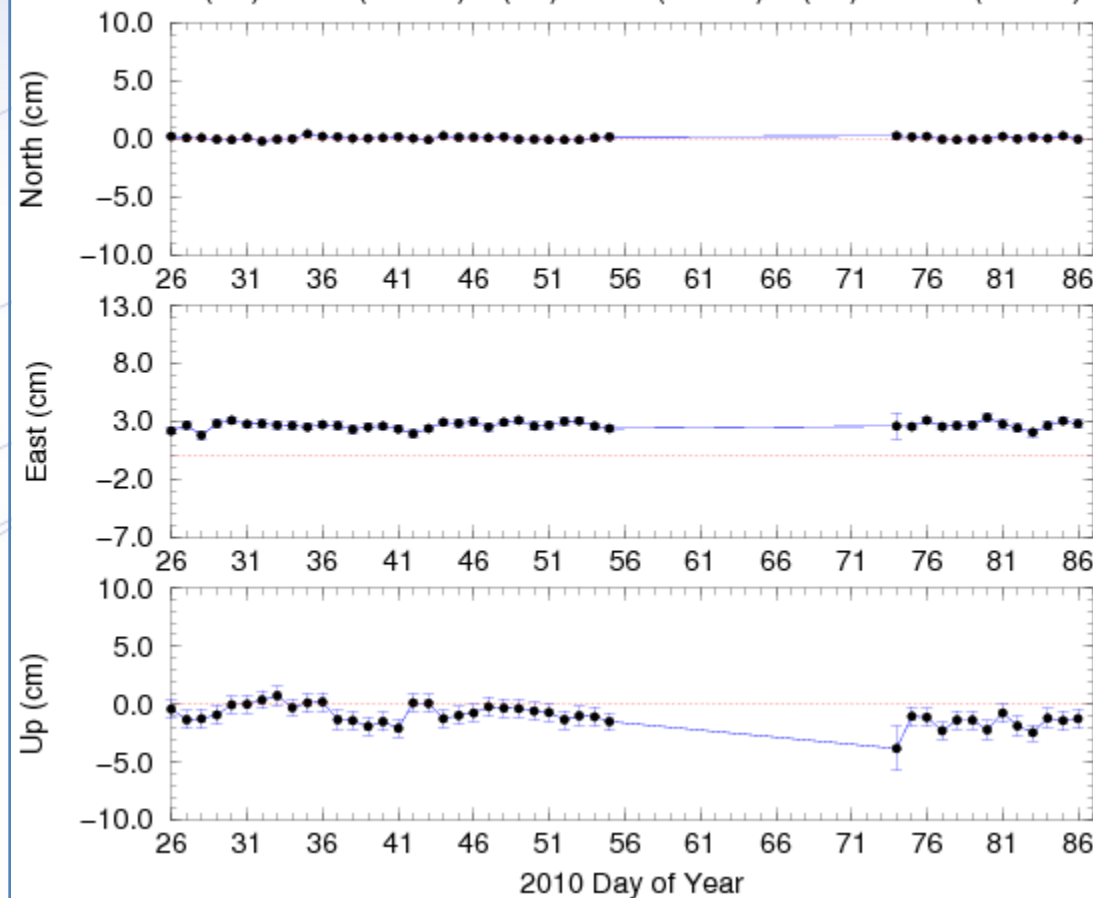
A similar, interactive map can be found under the CORS link at the NGS web site.

<http://geodesy.noaa.gov/CORS/>

Back To Our Quick Example

P376: Daily minus Published ITRF00 Position

$N(\text{cm}) = 0.10 (+/-0.12)$ $E(\text{cm}) = 2.70 (+/-0.31)$ $U(\text{cm}) = -0.94 (+/-0.78)$



Looking at the 60-day time-series for each CORS, we discover that the P376 data for the this day happens to be the last before an extended gap.

Back To Our Quick Example

Although this site and the results appears fine otherwise, we may want to consider digging a little deeper.

Possible next steps in evaluating this CORS are:

- Resubmit requesting the extended report.
- Review the P376 site log.
- Resubmit excluding P376.

Interface

The first step in publishing via OPUS is to submit data to OPUS.

The user completes the OPUS form normally, but must explicitly designate that the results should be published. This is done through the Options.

The “Submit to Data Base”, i.e. publish, option is near the bottom of the Options list.

8. Submit to Data Base

OPUS allows qualified users to submit results for publication in the NGS Data Base.

☐ Yes, publish. ☒ No, don't publish.

Interface

The user is taken to a new page where they designate the mark associated with their data as “new” or “recovered”.

An OPUS solution report is now being prepared. When complete, it will be e-mailed to you.

PUBLISHING

* Confused? [New and recovered marks are described here.](#)

OPUS ENTRIES

e-mail address: mschenewerk@generalpositioning.com Selected Antenna: [ASH700936C_M](#)
Uploaded File Name: [corv059f.09o](#) Antenna Height(m): [1.521](#)

OPTIONS

State Plane Code: [AUTO](#) User Selected Base Stations: [NONE](#)
Extended Output: [YES](#) User Excluded Stations: [NONE](#)
Submit to NGS Database: [YES](#) User Selected Project Name: [NONE](#)
Geoid Model: [Geoid09](#)

Interface

REQUIRED

Designation:

Stamping:

Type:

Setting:
specific setting(optional):

Descriptions:
(describe the mark, witness ties, etc., to enable future recoveries. Max. characters=500) 28

Close-up photo:

Horizon photo:

OPTIONAL

Stability:

Magnetic:

Application:

Antenna S/N:

Receiver S/N: Model Firmware

After making that selection, the user is offered the appropriate form for entering the meta-data.

In this example, we're following the "new" mark designation.

Interface

REQUIRED

Designation:

Stamping:

Type:

Setting:
specific setting (optional):

Descriptions:
(describe the mark, witness ties, etc., to enable future recoveries. Max. characters=500) 28

Close-up photo:

Horizon photo:

OPTIONAL

Stability:

Magnetic:

Application:

Antenna S/N:

Receiver S/N: Model: Firmware:

Many of you will recognize these fields as a subset of the information required to “blue book” a mark.

Interface

REQUIRED

Designation: CORV

Stamping:

Type: O = Other U = Concrete post (without other marks)

Setting: 7 = Set in top of concrete monument
specific setting (optional):

Descriptions: This is a PBO and CORS site.
(describe the mark, witness ties, etc., to enable future recoveries. Max. characters=500) 28

Close-up photo:

Horizon photo:

OPTIONAL

Stability: A = Most reliable; expected to hold position well

Magnetic: N = No magnetic material

Application: --- no special usage ---

Antenna S/N: CR1998490176

Receiver S/N: 4527253291 Model: MBLE NETRS Firmware: 1.1-0

This is not blue booking per se because the process is streamlined.

This is possible, in part, because some information is provided by the data processing itself.

Interface

As a last step, the user is given a chance to review the submission in the form of a mock-up of the datasheet for their submission.

If the meta-data is complete, the quality control restrictions are met and the user gives the “OK”, the submission is entered into the data base after review by NGS.

Interface



OPUS: Online Positioning User Service

National Geodetic Survey

- NGS Home
- About NGS
- Data & Imagery
- Tools
- Surveys
- Science & Education



OPUS Menu

- Upload
- About OPUS
- Published Solutions
- Contact OPUS

View published solutions.

Results from survey observations on passive marks are accessible below.

Retrieve Solutions via

Your **Search radius, County or ZIP code**
Mark **Designation or PID**
Observer **Email or Date**



These search pages retrieve OPUS Solutions only. See also **NGS Datasheets**
Want to add more? Explain **publishing**.

SURVEY DATASHEET (Version 1.0) - Microsoft Internet Explorer provided by National Geodetic Survey

http://www.ngs.noaa.gov/OPUS/getDdatasheet.jsp?PID=BBBH32&style=modern


File Edit View Favorites Tools Help

Favorites Yahoo!

National Geodetic Survey - ... SURVEY DATASHEET (... X Google

SURVEY DATASHEET (Version 1.0)

PID: BBBH32
Designation: 50106
Stamping: MONTGOMERY COUNTY
Stability: Monuments of questionable or unknown reliability
Setting: Object driven into ground
Description: IN GAITHERSBURG, MD. WASHINGTON GROVE NEIGHBORHOOD. ADC MAP 19 GRID H 10. WSSC GRID 223NW08. MARK IS NEAR OAKMONT ST, 33.2' NORTHEAST OF THE NEAR EDGE OF PAVEMENT. 76.4' SOUTHEAST OF THE SE EDGE OF SOUTHBOUND EDGE OF CSX PLATFORM. ~335 NORTH OF ELECTRIC POLE 748474-7411 ON SOUTHBOUND OAKMONT ST. HORIZON PHOTO INDICATES THE MARK IS ALSO ACROSS OAKMONT FROM HERSHEY RESTAURANT.
Observed: 2009-03-12T12:01:00Z
Source: OPUS - page5 0810.20




Close-up View

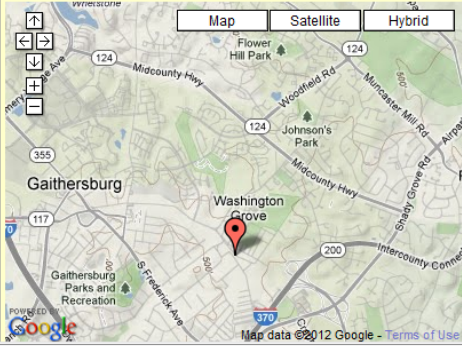
REF_FRAME	EPOCH	SOURCE	UNITS	SET PROFILE	DETAILS
NAD_83 (GCRS96)	2002.0000	NAVD88 (Computed using GEOID03)	m		

LAT: 39° 8' 9.67459"		UTM 18 SPC 1900(MD)	
± 0.010 m		NORTHING: 4334128.718m	163121.023m
LON: -77° 10' 38.63482"		EASTING: 311807.460m 384662.688m	
± 0.018 m		CONVERGENCE: -1.37469763° -0.11134139°	
ELL HT: 126.513	± 0.023 m	POINT SCALE: 1.00003610 0.99996013	
X: 1099436.491	± 0.018 m	COMBINED FACTOR: 1.00001625 0.99994028	
Y: -4830367.301	± 0.014 m		
Z: 4004120.938	± 0.022 m		
ORTHO HT: 158.212	± 0.039 m		

CONTRIBUTED BY
[edward glawe](#)
[MONTGOMERY COUNTY MD DOT](#)



Horizon View




Map Satellite Hybrid

Map data ©2012 Google - Terms of Use

Interface

This is part of a published data sheet.

Note the “See Also” highlight. This provides access to other data base and IDB entries for this mark.

PID: QE1114 Designation: C 590 Stamping: C 590 1965 Stability: May hold commonly subject to ground movement Setting: Mat foundation or concrete slab other than pavement Mark Condition: G			
Description: The primary bench mark is a disk set in the top of the SW corner of the Oregon State University Marine Science Center cement pier, 2.13 m (7.0 ft) west of the centerline of the dock, 0.30 m (1.0 ft) north of the junction of the blacktop road and the concrete pier, and 0.30 (1.0 ft) east of the west edge of the pier.		Observed: 2006-08-11T21:16:00Z Source: OPUS - page 5 0908.13	
See Also 2007-09-04		Close-up View	

REF_FRAME: NAD_83(CORS96)	EPOCH: 2002.0000	SOURCE: NAVD88 (Computed using GEOID03)	UNITS: m	SET PROFILE	DETAILS
LAT: 44° 37' 30.96052" ± 0.008 m LON: -124° 2' 42.84324" ± 0.029 m ELL HT: -19.362 ± 0.041 m X: -2545584.501 ± 0.032 m Y: -3767564.728 ± 0.026 m Z: 4457792.399 ± 0.023 m ORTHO HT: 4.478 ± 0.053 m		UTM 10 SPC 3601(OR N) NORTHING: 4941854.974m 112693.348m EASTING: 417084.278m 2218760.816m CONVERGENCE: -0.73428422° -2.51423054° POINT SCALE: 0.99968454 0.99993927 COMBINED FACTOR: 0.99968758 0.99994231			

GPS Field Notes: Observer Checklist for OPUS

example
files:

data file, close-up photo, horizon photo

Optional:
record your antenna S/N, receiver model, S/N, firmware

email address _____

data file name _____

start date/time 03/19/2011 17:00 UTC

end (or duration) 4+ hours

antenna type _____

antenna height _____ meters
= vertical distance to your Antenna's Reference Point (ARP)

Is this a permanent mark of public interest? Upload to geodesy.noaa.gov/OPUS/
with Options = *Publish my Solution* or = *Contribute to Project ID*

Is your mark new? No PID?

added details are required, below

stamping _____

type

☐ disk
☐ other
☐ rod

record lengths of rod and slant, if known

setting _____

stability of mark

- ☐ A = most reliable; expected to hold position well
- ☐ B = monument will probably hold position well
- ☐ C = may hold, commonly subject to ground movement
- ☐ D = monuments of questionable or unknown reliability

magnetic property of mark

- ☐ unknown
- ☐ no magnetic material
- ☐ steel rod / pipe / spike / bar magnet, if known, adjacent to or imbedded in monument or drill hole

application (if any, beyond survey control)

- ☐ PLSS corner
- ☐ tidal station
- ☐ fault monitoring site
- ☐ see description

PID? _____

find your mark's PID on the NGS database, if any

photos

☐ new close-up & horizon photos required

condition

- ☐ good
- ☐ poor: disturbed, rusted, unstable

description _____

or recovery _____

notes _____

More advice at
geodesy.noaa.gov/OPUS/publish/



National Geodetic Survey (JGE 2011.06)
for observer's use only; discard after upload

OPUS Solutions

helps maintain local ties to the National Spatial Reference
linking observations, strengthens the models used to
modern and legacy mapping products.

your data file using the *publish* or *projects* options
and below:

Field Procedures

height, and plumb verified
pod recommended, legs braced w/ sandbags or chain
field log

Permanent Mark of Public Interest

clear-sky view
photos to aid future recovery
description form & help file

Quality OPUS Solution

upload GPS data file
stations used
coordinates fixed

WGS84 peak, lat. & lon.
WGS84 peak, ellipsoid height

NOTE: these criteria are relaxed for data contributed via **projects**

OPUS – Datasheet Publishing

Publishing Criteria:

- NGS-calibrated GPS antenna
- > 4 hour data span
- > 70% observations used
- > 70% fixed ambiguities
- < 0.04m H peak-to-peak
- < 0.08m V peak-to-peak

Uses:

- GPS on BMs
- PLSS / GCDB
- Data archive
- Data sharing

PID: BBOD57

Designation: FOUR CORNERS 2010

Stamping: COLORADO UTAH ARIZONA NEW MEXICO 1992

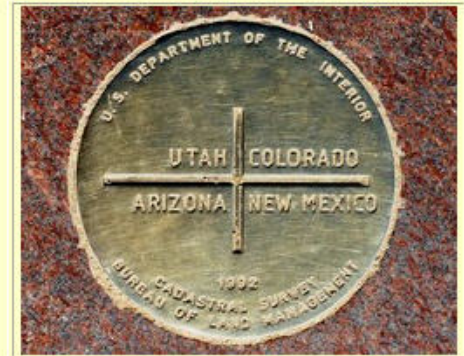
Stability: Monument will probably hold position well

Setting: Mat foundation or concrete slab other than pavement

Description: THE STATION IS THE CENTER OF AN 8-INCH DIAMETER BRASS USDO/BLM DISK MARKING THE POINT COMMON TO COLORADO, UTAH, ARIZONA, AND NEW MEXICO. IT IS LOCATED AT THE NAVAJO NATION'S FOUR CORNERS MONUMENT, MANAGED BY THE NAVAJO PARKS AND RECREATION DEPARTMENT, TEL: 928-871-6647. THE FOUR CORNERS MONUMENT INSTALLED IN 1992 (NGS PID: AD9256, NOW CONSIDERED DESTROYED) WAS REMOVED AND THE DISK RESET IN 2010 DURING RECONSTRUCTION OF THE MONUMENT AND VISITOR PLAZA. THE DISK WILL EVENTUALLY BE STAMPED "2010."

Observed: 2010-07-07T22:39:00Z

Source: OPUS - page5 1009.28



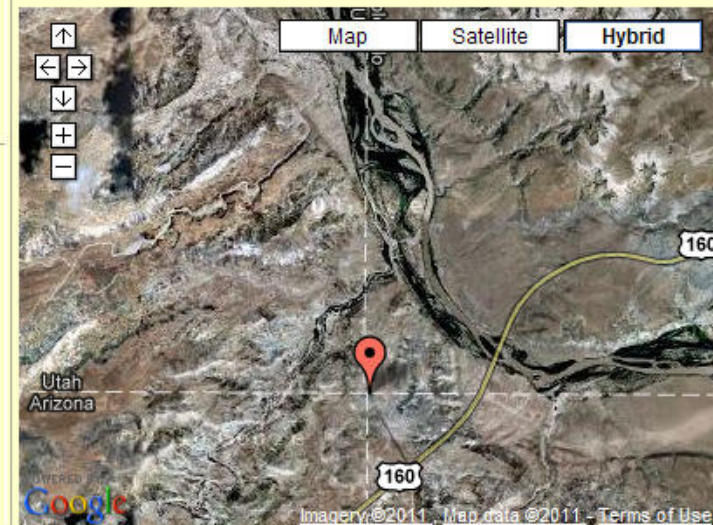
Close-up View

REF_FRAME: (CORS96)	EPOCH: 2002.0000	SOURCE: NAVD88 (Computed using GEOID09)	UNITS: m	SET PROFILE	DETAILS
LAT: 36° 59' 56.31568" ± 0.027 m		UTM 12 SPC 3003(NM W)			
LON: -109° 2' 42.62051" ± 0.011 m		NORTHING: 4096544.982m 666054.142m			
ELL HT: 1460.802 ± 0.003 m		EASTING: 673944.597m 722137.487m			
X: -1664599.638 ± 0.015 m		CONVERGENCE: 1.17671173° -0.72935591°			
Y: -4821995.076 ± 0.009 m		POINT SCALE: 0.99997275 1.00005994			
Z: 3818181.565 ± 0.023 m		COMBINED FACTOR: 0.99974356 0.99983074			
ORTHO HT: 1481.544 ± 0.016 m					

CONTRIBUTED BY

[william.stone](#)


Horizon View



SURVEY DATASHEET (Version 1.0)

PID: SU0288

Designation: Z 101

Stamping: Z 101 1934

Stability: May hold commonly subject to ground movement

Setting: Set in top of concrete monument

Mark G

Condition:

Description: THE 1934 STATION DESCRIPTION WAS ACCURATE FOR THIS STATION. THE RECOVERY NOTE IN 1964 MAY BE FROM A NEW HIGHWAY BUILT BETWEEN 1934 AND 1964. THE 1934 OLD HWY.28 IS A DIRT TRAIL NOW AND IS APPROXIMATELY 600 FEET WEST OF THE NEW HWY.28. THE RECORD LATITUDE AND LONGITUDE PLACES THIS STATION AS IF SCALED FROM THE NEW HWY.28. THE STATION WAS FOUND 29 FEET EAST OF THE 1934 HIGHWAY AND 4 FEET NORTH OF AN EAST-WEST FENCE. THE STATION WAS FOUND IN GOOD CONDITION AND PROJECTING 0.10 FEET ABOVE THE GROUND.

Observed: 2010-04-16T16:59:00Z

See Also 1934

Source: OPUS - page5 0909.08



Close-up View

REF_FRAME:	EPOCH:	SOURCE:	UNITS:	SET	DETAILS
NAD_83 (CORS96)	2002.0000	NAVD88 (Computed using GEOID09)	m	PROFILE	

LAT: 47° 48' 28.59045" ± 0.012 m
 LON: -114° 36' 28.65962" ± 0.016 m
 ELL HT: 856.056 ± 0.031 m
 X: -1787276.989 ± 0.002 m
 Y: -3902318.894 ± 0.033 m
 Z: 4703194.956 ± 0.015 m
 ORTHO HT: 871.800 ± 0.032 m

UTM 11 SPC 2500(MT)
 NORTHING: 5297724.684m 407816.168m
 EASTING: 679091.592m 217870.414m
 CONVERGENCE: 1.77272494° -3.73649495°
 POINT SCALE: 0.99999414 0.99948911
 COMBINED FACTOR: 0.99985999 0.99935502

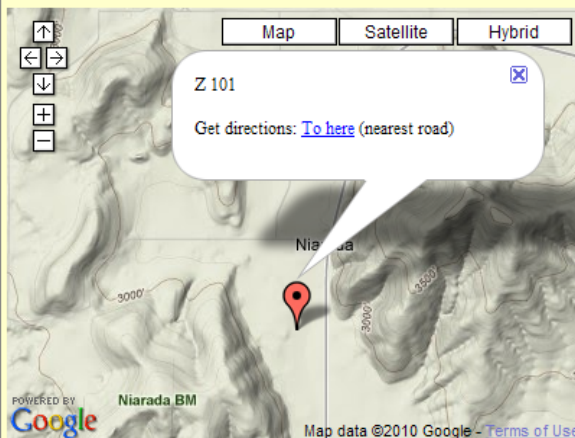
CONTRIBUTED BY

jturner

Montana Department of Transportation



Horizon View



The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

DATABASE = ,PROGRAM = datasheet, VERSION = 7.85

1 National Geodetic Survey, Retrieval Date = JANUARY 4, 2011

```

SU0288 *****
SU0288 DESIGNATION - Z 101
SU0288 PID - SU0288
SU0288 STATE/COUNTY- MT/SANDERS
SU0288 USGS QUAD - NIARADA (1964)
SU0288
SU0288 *CURRENT SURVEY CONTROL
SU0288
SU0288* NAD 83(1986)- 47 48 23. (N) 114 36 14. (W) SCALED
SU0288* NAVD 88 - 871.746 (meters) 2860.05 (feet) ADJUSTED
SU0288
SU0288 GEOID HEIGHT- -15.74 (meters) GEOID09
SU0288 DYNAMIC HT - 871.730 (meters) 2860.00 (feet) COMP
SU0288 MODELED GRAV- 980,564.8 (mgal) NAVD 88
SU0288
SU0288 VERT ORDER - SECOND CLASS 0
SU0288
SU0288 The horizontal coordinates were scaled from a topographic map and have
SU0288 an estimated accuracy of +/- 6 seconds.
SU0288
SU0288 The orthometric height was determined by differential leveling and
SU0288 adjusted in June 1991.
SU0288
SU0288 The geoid height was determined by GEOID09.
SU0288
SU0288 The dynamic height is computed by dividing the NAVD 88
SU0288 geopotential number by the normal gravity value computed on the
SU0288 Geodetic Reference System of 1980 (GRS 80) ellipsoid at 45
SU0288 degrees latitude (g = 980.6199 gals.).
SU0288
SU0288 The modeled gravity was interpolated from observed gravity values.
SU0288
SU0288: North East Units Estimated Accuracy
SU0288: SPC MT - 407,620. 218,160. MT (+/- 180 meters Scaled)
SU0288
  
```

Orthometric Height Comparison
871.746 m Published NAVD88
871.800 m OPUS GEOID09
0.054 m (0.18 ft) Difference

Why OPUS-DB

- A new easier way to capture data and have it in an NGS database
 - Help populate Ellipsoidal Heights on Bench Marks, help with Geoid models and future vertical datums
- To the extent (?) they've bluebooked in the past, they can continue into the future more easily.
 - If they are running RTK, this would help determine base station position and document where it was used, assuming they left a permanent mark.
 - Changeover to new datums; either we maintain the data or user does for highest accuracy, but models will be available for bringing old coordinates forward.

OPUS Projects



OPUS-Projects BETA

National Geodetic Survey

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OPUS-Projects gives users web-based access to simple management and processing tools for projects involving multiple sites and multiple occupations.

- Data uploading through OPUS.
- Customizable data processing via the PAGES software suite.
- Visualization and management aids.

Create a new project.

RESTRICTED to trained project managers

Create

After completing OPUS-Projects training, you are registered and may create a new project.

Configure, edit, and process individual network sessions.

Project Identifier:

Session

Session Keyword:

Your Email:

Manage, edit, process, and publish the project.

Project Identifier:

Manage

Manager Keyword:

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