

**Subject:** OPUS solution : 31\_\_GPS\_DH\_L\_071604.18o OP1525776322086

**From:** opus <opus@ngs.noaa.gov>

**Date:** 5/8/2018 6:46 AM

**To:** kellybellis@gwi.net

FILE: 31\_\_GPS\_DH\_L\_071604.18o OP1525776322086

2005 NOTE: The IGS precise and IGS rapid orbits were not available  
 2005 at processing time. The IGS ultra-rapid orbit was/will be used to  
 2005 process the data.  
 2005

NGS OPUS SOLUTION REPORT  
 =====

All computed coordinate accuracies are listed as peak-to-peak values.  
 For additional information: <https://www.ngs.noaa.gov/OPUS/about.jsp#accuracy>

USER: [kellybellis@gwi.net](mailto:kellybellis@gwi.net) DATE: May 08, 2018  
 RINEX FILE: 31\_\_1271.18o TIME: 10:46:29 UTC

SOFTWARE: page5 1603.24 master93.pl 160321 START: 2018/05/07 11:16:00  
 EPHEMERIS: igu20001.eph [ultra-rapid] STOP: 2018/05/07 14:53:00  
 NAV FILE: brdc1270.18n OBS USED: 10211 / 10712 : 95%  
 ANT NAME: JAVTRIUMPH\_2A NONE # FIXED AMB: 54 / 57 : 95%  
 ARP HEIGHT: 2.025 OVERALL RMS: 0.015(m)

REF FRAME: NAD\_83(2011)(EPOCH:2010.0000) IGS08 (EPOCH:2018.3467)

X:	1707583.415(m)	0.010(m)	1707582.492(m)	0.010(m)
Y:	-4230924.127(m)	0.003(m)	-4230922.712(m)	0.003(m)
Z:	4441997.552(m)	0.010(m)	4441997.589(m)	0.010(m)

LAT:	44 25 31.98612	0.003(m)	44 25 32.02457	0.003(m)
E LON:	291 58 43.67431	0.008(m)	291 58 43.65955	0.008(m)
W LON:	68 1 16.32569	0.008(m)	68 1 16.34045	0.008(m)
EL HGT:	19.571(m)	0.012(m)	18.413(m)	0.012(m)
ORTHO HGT:	43.327(m)	0.022(m)	[NAVD88 (Computed using GEOID12B)]	

	UTM COORDINATES	STATE PLANE COORDINATES
	UTM (Zone 19)	SPC (1801 ME E)
Northing (Y) [meters]	4919605.552	84425.171
Easting (X) [meters]	577911.306	338123.249
Convergence [degrees]	0.68517552	0.33515425
Point Scale	0.99967465	0.99991787
Combined Factor	0.99967158	0.99991480

US NATIONAL GRID DESIGNATOR: 19TEK7791119605(NAD 83)

		BASE STATIONS USED	
PID	DESIGNATION	LATITUDE	LONGITUDE DISTANCE(m)

DK4436	PNB6	PENOBSCOT 6	CORS ARP	N442707.247	W0684619.958	59862.0
DO2058	MEWA	WALDO	CORS ARP	N442715.192	W0690549.489	85710.5
AH5044	BARH	BAR HARBOR	CORS ARP	N442342.137	W0681318.079	16325.1

## NEAREST NGS PUBLISHED CONTROL POINT

PE0214	V 69	N442535.	W0680108.	206.3
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## BASE STATION INFORMATION

STATION NAME: pnb6 a 2 (Penobscot 6; Penobscot, Maine USA)

MONUMENT: NO DOMES NUMBER

XYZ	1651238.5996	-4251031.1000	4444106.7053	MON @ 2005.0000 (M)
XYZ	-0.00160	-0.00014	0.0049	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	-0.0028	-0.0023	0.0631	ARP TO L1 PHASE CENTER (M)
NEU	-0.0038	-0.0021	0.0612	ARP TO L2 PHASE CENTER (M)
XYZ	-0.2130	-0.0184	0.0651	VEL TIMES 13.3461 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0149	-0.0447	0.0422	ARP TO L1 PHASE CENTER
XYZ	1651238.4016	-4251031.1631	4444106.8126	L1 PHS CEN @ 2018.3467
XYZ	0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1651238.4016	-4251031.1631	4444106.8126	NEW L1 PHS CEN @ 2018.3467
XYZ	1651238.3866	-4251031.1184	4444106.7704	NEW ARP @ 2018.3467
XYZ	1651238.3866	-4251031.1184	4444106.7704	NEW MON @ 2018.3467
LLH	44 27 7.28523	291 13 40.02578	32.3712	NEW L1 PHS CEN @ 2018.3467
LLH	44 27 7.28532	291 13 40.02589	32.3080	NEW ARP @ 2018.3467
LLH	44 27 7.28532	291 13 40.02589	32.3080	NEW MON @ 2018.3467

STATION NAME: mewa a 1 (Waldo; Waldo, Maine USA)

MONUMENT: NO DOMES NUMBER

XYZ	1627051.7451	-4260176.3523	4444293.8494	MON @ 2005.0000 (M)
XYZ	-0.00159	-0.00014	0.0045	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)
NEU	0.0013	-0.0002	0.0667	ARP TO L1 PHASE CENTER (M)
NEU	0.0004	0.0006	0.0577	ARP TO L2 PHASE CENTER (M)
XYZ	-0.2122	-0.0187	0.0601	VEL TIMES 13.3461 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0165	-0.0437	0.0477	ARP TO L1 PHASE CENTER
XYZ	1627051.5494	-4260176.4147	4444293.9571	L1 PHS CEN @ 2018.3467
XYZ	0.0000	0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1627051.5494	-4260176.4147	4444293.9571	NEW L1 PHS CEN @ 2018.3467
XYZ	1627051.5329	-4260176.3710	4444293.9095	NEW ARP @ 2018.3467
XYZ	1627051.5329	-4260176.3710	4444293.9095	NEW MON @ 2018.3467
LLH	44 27 15.23091	290 54 10.49467	49.6084	NEW L1 PHS CEN @ 2018.3467
LLH	44 27 15.23087	290 54 10.49467	49.5417	NEW ARP @ 2018.3467
LLH	44 27 15.23087	290 54 10.49467	49.5417	NEW MON @ 2018.3467

STATION NAME: barh a 2 (Bar Harbor, USA)

MONUMENT: 49927S001

XYZ	1693644.8457	-4239067.5704	4439567.2390	MON @ 2005.0000 (M)
XYZ	-0.00159	-0.00015	0.0051	VEL (M/YR)
NEU	0.0000	0.0000	0.0000	MON TO ARP (M)

NEU	0.0016	-0.0005	0.0634	ARP TO L1 PHASE CENTER (M)
NEU	-0.0012	0.0002	0.0621	ARP TO L2 PHASE CENTER (M)
XYZ	-0.2119	-0.0206	0.0684	VEL TIMES 13.3461 YRS
XYZ	0.0000	0.0000	0.0000	MON TO ARP
XYZ	0.0159	-0.0412	0.0455	ARP TO L1 PHASE CENTER
XYZ	1693644.6498	-4239067.6323	4439567.3530	L1 PHS CEN @ 2018.3467
XYZ	0.0000	-0.0000	-0.0000	+ XYZ ADJUSTMENTS
XYZ	1693644.6498	-4239067.6323	4439567.3530	NEW L1 PHS CEN @ 2018.3467
XYZ	1693644.6339	-4239067.5911	4439567.3075	NEW ARP @ 2018.3467
XYZ	1693644.6339	-4239067.5911	4439567.3075	NEW MON @ 2018.3467
LLH	44 23 42.17573	291 46 41.90566	6.8195	NEW L1 PHS CEN @ 2018.3467
LLH	44 23 42.17567	291 46 41.90569	6.7561	NEW ARP @ 2018.3467
LLH	44 23 42.17567	291 46 41.90569	6.7561	NEW MON @ 2018.3467

## REMOTE STATION INFORMATION

STATION NAME: 31\_\_ 1

MONUMENT: NO DOMES NUMBER

XYZ	1707582.5778	-4230922.8736	4441997.7085	MON @ 2018.3465 (M)
NEU	-0.0028	0.0005	2.0250	MON TO ARP (M)
NEU	0.0028	-0.0005	0.0503	ARP TO L1 PHASE CENTER (M)
NEU	-0.0032	0.0019	0.0356	ARP TO L2 PHASE CENTER (M)
XYZ	0.5425	-1.3427	1.4155	MON TO ARP
XYZ	0.0122	-0.0317	0.0372	ARP TO L1 PHASE CENTER
XYZ	1707583.1325	-4230924.2480	4441999.1612	L1 PHS CEN @ 2018.3467

BASELINE NAME: pnb6 31\_\_

XYZ	-0.0816	0.1602	-0.1141	+ XYZ ADJUSTMENTS
XYZ	1707583.0509	-4230924.0878	4441999.0471	NEW L1 PHS CEN @ 2018.3467
XYZ	1707583.0387	-4230924.0561	4441999.0099	NEW ARP @ 2018.3467
XYZ	1707582.4962	-4230922.7134	4441997.5944	NEW MON @ 2018.3467
LLH	44 25 32.02462	291 58 43.65972	20.4945	NEW L1 PHS CEN @ 2018.3467
LLH	44 25 32.02453	291 58 43.65975	20.4442	NEW ARP @ 2018.3467
LLH	44 25 32.02462	291 58 43.65972	18.4192	NEW MON @ 2018.3467

BASELINE NAME: mewa 31\_\_

XYZ	-0.0851	0.1608	-0.1197	+ XYZ ADJUSTMENTS
XYZ	1707583.0474	-4230924.0871	4441999.0415	NEW L1 PHS CEN @ 2018.3467
XYZ	1707583.0352	-4230924.0555	4441999.0043	NEW ARP @ 2018.3467
XYZ	1707582.4927	-4230922.7128	4441997.5888	NEW MON @ 2018.3467
LLH	44 25 32.02453	291 58 43.65959	20.4892	NEW L1 PHS CEN @ 2018.3467
LLH	44 25 32.02445	291 58 43.65961	20.4389	NEW ARP @ 2018.3467
LLH	44 25 32.02453	291 58 43.65959	18.4139	NEW MON @ 2018.3467

BASELINE NAME: barh 31\_\_

XYZ	-0.0917	0.1636	-0.1239	+ XYZ ADJUSTMENTS
XYZ	1707583.0408	-4230924.0844	4441999.0372	NEW L1 PHS CEN @ 2018.3467
XYZ	1707583.0286	-4230924.0527	4441999.0001	NEW ARP @ 2018.3467
XYZ	1707582.4861	-4230922.7100	4441997.5846	NEW MON @ 2018.3467
LLH	44 25 32.02455	291 58 43.65936	20.4826	NEW L1 PHS CEN @ 2018.3467
LLH	44 25 32.02446	291 58 43.65938	20.4323	NEW ARP @ 2018.3467
LLH	44 25 32.02455	291 58 43.65936	18.4073	NEW MON @ 2018.3467

## G-FILES

Axx2018 5 7 18 5 7  
 B2018 5 71115 18 5 71453 1 page5 v1603.24IGS 126 1 2 27NGS 2018 5 8IFDDPX  
 IIGS08\_1930 IGS 20170101  
 C00090002 -563441096 10 -201084050 17 21091760 18 X1278A31\_\_X1278APNB6  
 D 1 2 -6595639 1 3 6769835 2 3 -9323879

Axx2018 5 7 18 5 7  
 B2018 5 71115 18 5 71453 1 page5 v1603.24IGS 126 1 2 27NGS 2018 5 8IFDDPX  
 IIGS08\_1930 IGS 20170101  
 C00090001 -805309598 10 -292536582 17 22963207 18 X1278A31\_\_X1278AMEWA  
 D 1 2 -6743187 1 3 7000030 2 3 -9360698

Axx2018 5 7 18 5 7  
 B2018 5 71115 18 5 71453 1 page5 v1603.24IGS 126 1 2 27NGS 2018 5 8IFDDPX  
 IIGS08\_1930 IGS 20170101  
 C00090004 -139378523 9 -81448811 17 -24302771 17 X1278A31\_\_X1278ABARH  
 D 1 2 -6680655 1 3 7533376 2 3 -9183736

# POST-FIT RMS BY SATELLITE VS. BASELINE

	OVERALL	01	03	09	10	12	14	16	18
pnb6-31__	0.015	0.017	0.016	0.022	0.015	0.021	0.013	0.014	...
	22	23	25	26	27	29	31	32	
pnb6-31__	0.014	0.019	0.016	0.012	0.019	0.020	...	0.013	
	22	23	25	26	27	29	31	32	
mewa-31__	0.015	0.016	0.015	0.024	0.015	0.020	0.013	0.014	...
	22	23	25	26	27	29	31	32	
mewa-31__	0.013	0.019	0.016	0.012	0.018	0.020	...	0.014	
	22	23	25	26	27	29	31	32	
barh-31__	0.014	0.016	0.015	0.024	0.016	0.018	0.018	0.011	0.014
	23	25	26	27	29	31	32		
barh-31__	0.014	0.014	0.010	0.020	0.019	0.011	0.013		

# OBS BY SATELLITE VS. BASELINE

	OVERALL	01	03	09	10	12	14	16	18
pnb6-31__	3422	28	376	71	96	88	429	301	...
	22	23	25	26	27	29	31	32	
pnb6-31__	368	257	268	428	75	329	...	308	
	22	23	25	26	27	29	31	32	
mewa-31__	3391	28	393	73	100	81	432	294	...
	22	23	25	26	27	29	31	32	
mewa-31__	364	254	246	418	93	296	...	319	
	22	23	25	26	27	29	31	32	
barh-31__	3398	28	394	62	90	88	51	285	367
	23	25	26	27	29	31	32		
barh-31__	257	271	406	93	308	377	321		

ITRF position of 31\_\_ as determined by individual baselines

	X	Y	Z
pnb6	1707582.496	-4230922.713	4441997.594
mewa	1707582.493	-4230922.713	4441997.589

barh      1707582.486      -4230922.710      4441997.585

Residuals of position determined by individual baselines from the final position

	X	Y	Z	East	North	Up
pnb6	0.005	-0.001	0.005	0.004	0.002	
0.006						
mewa	0.001	-0.001	-0.000	0.001	-0.001	
0.000						
barh	-0.006	0.002	-0.005	-0.004	-0.001	
-0.006						

Covariance Matrix for the xyz OPUS Position (meters<sup>2</sup>).

0.0000009444	-0.0000001129	0.0000001052
-0.0000001129	0.0000025644	-0.0000002429
0.0000001052	-0.0000002429	0.0000027200

Covariance Matrix for the enu OPUS Position (meters<sup>2</sup>).

0.0000010930	0.0000003402	-0.0000003400
0.0000003402	0.0000023075	0.0000001591
-0.0000003400	0.0000001591	0.0000028284

Horizontal network accuracy = 0.00327 meters.

Vertical network accuracy = 0.00330 meters.

#### Derivation of NAD 83 vector components

Position of reference station ARP in NAD\_83(2011)(EPOCH:2010.0000).

	Xa(m)	Ya(m)	Za(m)	
PNB6	1651239.30774	-4251032.53018	4444106.73621	2010.00
MEWA	1627052.45315	-4260177.78121	4444293.87961	2010.00
BARH	1693645.55489	-4239069.00391	4439567.26929	2010.00

Position of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

	Xr(m)	Yr(m)	Zr(m)	
PNB6	1651239.30774	-4251032.53018	4444106.73621	2010.00
MEWA	1627052.45315	-4260177.78121	4444293.87961	2010.00
BARH	1693645.55489	-4239069.00391	4439567.26929	2010.00

Velocity of reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

	Vx (m/yr)	Vy (m/yr)	Vz (m/yr)
PNB6	-0.01600	-0.00140	0.00490
MEWA	0.00210	0.00030	-0.00190
BARH	0.00210	0.00020	-0.00150

Vectors from unknown station monument to reference station monument in NAD\_83(2011)(EPOCH:2010.0000).

	Xr-X= DX(m)	Yr-Y= DY(m)	Zr-Z= DZ(m)	
PNB6	-56344.10726	-20108.40318	2109.18421	2010.00
MEWA	-80530.96185	-29253.65421	2296.32761	2010.00
BARH	-13937.86011	-8144.87691	-2430.28271	2010.00

STATE PLANE COORDINATES - U.S. Survey Foot

SPC (1801 ME E)

Northing (Y) [feet]	276984.915
Easting (X) [feet]	1109326.026
Convergence [degrees]	0.33515425
Point Scale	0.99991787
Combined Factor	0.99991480

\*\*\*\*\* New Reference Frame Preview \*\*\*\*\*

We are replacing the nation's NAD 83 and NAVD 88 datums, to improve access and accuracy of the National Spatial Reference System. More at <https://geodesy.noaa.gov/datums/newdatums/>

Below are approximate coordinates for this solution in the new frames:

APPROX ORTHO HGT: 42.977 (m) [PROTOTYPE (Computed using xGeoid17B,GRS80,IGS08)]

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.