NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

SUBJECT: WGS 84 G1762 Geodetic Control Network Upgrade for Areas of White Sands Missile Range and Holloman AFB, NM

1. Effective Date of NGA/SNSH & NGA/SNSW Implementation

Both offices will implement the new WGS 84 G1762 realization for all published geodetic survey results from 6 January 2014 forward. The below transformation tables provide the customer with the capability to transform/correlate WGS 84 geodetic survey results between the three latest NGA WGS 84 realizations G1150, G1674 and now G1762. Note that relative accuracy results for already existing surveys still meet/exceed original program requirements when not combined with other WGS 84 realizations (i.e. multiple). Customers desiring to use a combination of coordinates from multiple WGS 84 realizations should either contact the NGA New Mexico Range Support office handling their particular geodetic survey test program requirement for further assistance/technical support (recommended) OR utilize the provided transformation values from the below tables (less recommended). See more specific details below.

2. WGS 84 G1762 Refinement

The NGA/SNSH office maintains a permanent GPS tracking station mounted on the rooftop of Building 1160 on Holloman AFB, referred to as GPS station 100246. Subject station is held fixed in each component (latitude φ, longitude λ, ellipsoid height h) in the New Mexico Range Support Office's geodetic survey control network.

On 8 February 2012, GPS week 1674, NGA implemented the realization of the World Geodetic System 1984 (WGS 84) G1674, bringing WGS 84 into alignment with the International Terrestrial Reference Frame of 2008 (ITRF08). Also, on 26 February 2012, GPS week 1677, NGA replaced its Orbit Mensuration and Navigation Improvement System (OMNIS) with a new Kalman filter process in determining GPS precise ephemerides, referred to as Estimation of Precise Orbits and Clock to High Accuracy (EPOCHA). During 2nd Quarter, FY12, NGA's NM Range Support offices upgraded the WGS 84 geodetic survey control network. This upgrade took advantage of the latest improvements to the WGS 84.

Thirteen 24-hr recording sessions, spanning 26 February through 9 March 2012, were downloaded for absolute Precise Point Positioning (PPP). Data was processed using NGA's PPP software GPS/RINEX ARL:UT PPP Estimator (GRAPE) v.4.3, developed by the Applied Research Laboratory University of Texas, Austin (ARL/UT). The previous WGS 84 realization for reference station 100246 (G1150 reference epoch 2001.0) has 'moved' 0.165 meter west-southwest and 'raised' 0.006 meter relative to the center of the WGS 84 reference frame.

The following table lists transformation values from G1150 to G1674 in Earth-centered Earth-fixed Cartesian coordinates (X,Y,Z) and geodetic coordinates (φ,λ,h). Estimated accuracies: 0.05 meter, each component, relative to WGS 84 G1674 Epoch 2012.2.

ΔX	ΔY	ΔZ	$\Delta\varphi$	$\Delta\lambda$	Δh
meter	**meter**	**meter**	**arc sec**	**arc sec**	**meter**
-0.1564	0.0022	-0.0528	-0.0022	0.0058	0.006

G1150 to G1674 Transformations

On 16 October 2013, GPS week 1762, NGA implemented the newest realization of the World Geodetic System 1984 (WGS 84) G1762, bringing WGS 84 into further alignment with ITRF08 and IGb08. IGb08 is an update of the International GNSS Service (IGS) terrestrial reference frame IGS08. This implementation was undertaken by the U.S. Air Force GPS Operations Control Segment and NGA. Any survey data collected thereafter when using the NGA ephemeris has the designation WGS 84 (G1762). The current GPS Operations Control Segment conforms to International Earth Rotation and Reference Systems Service (IERS) Conventions 1996 Technical Notes 21. Beginning in February 2014, NGA's EPOCHA will start to utilize IERS Conventions 2010 Technical Notes 36. **During 1st Quarter, FY14, NGA's NM Range Support offices upgraded the WGS 84 geodetic survey control network from GPS week 1674 (G1674) to GPS week 1762 (G1762). This upgrade takes advantage of the latest improvements to the WGS 84 and is hereinafter designated as WGS 84 G1762.**

Twelve 24-hr recording sessions, spanning 1-12 November 2013, were downloaded from GPS station 100246 and submitted for absolute Precise Point Positioning (PPP) via the WGS 84 & ITRF Precise Positioning Service (WIPPS). WIPPS is an online service that implements PPP methods to produce very precise absolute position estimates, given multiple hours of GPS observation data. Results are generated using NGA's post-processed satellite clock and orbit products, yielding a true WGS 84 solution. Users may also elect to receive results generated using the International GNSS Service (IGS) clock and orbit products, yielding a solution in the International Terrestrial Reference Frame (ITRF). The previous WGS 84 realization for reference station 100246 (G1674 reference epoch 2012.2) has 'moved' 0.020 meter west-northwest and 'raised' 0.003 meter relative to the center of the WGS 84 reference frame.

The following table lists transformation values from G1674 to G1762 (NGA's current WGS 84 realization) in Earth-centered Earth-fixed Cartesian coordinates (X,Y,Z) and geodetic coordinates (φ,λ,h). Estimated accuracies: 0.05 meter, each component, relative to WGS 84 G1762 Epoch 2013.85.

ΔX	ΔY	ΔZ	Δφ	Δλ	Δh
meter	meter	meter	arc sec	arc sec	meter
-0.0191	0.0055	0.0050	0.0001	0.0008	0.003

G1674 to G1762 Transformations

WGS 84 is an Earth-centered, Earth-fixed terrestrial reference system and geodetic datum. WGS 84 is based on a consistent set of constants and model parameters that describe the Earth's size, shape, and gravity and geomagnetic fields. WGS 84 is the standard U.S. Department of Defense definition of a global reference system for geospatial information and is the reference system for the Global Positioning System (GPS). It is compatible with the International Terrestrial Reference System (ITRS).

3. Contact NGA

If you have any questions, please contact either of the following at the National Geospatial-Intelligence Agency, New Mexico Range Support Offices (NGA/SNSH & NGA/SNSW).

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