

NGS POLICY 01-1998



Readjustment of the NSRS Policy

National Geodetic Survey

Approved by the Executive Steering Committee

28 October 1998

This policy has been retired and is no longer in effect

**National Geodetic Survey (NGS) Policy for the
North American Datum of 1983 Readjustment
of the Horizontal and Ellipsoid Height Components
of the National Spatial Reference System**

Background

In order to meet NGS' responsibility to improve and maintain the National Spatial Reference System (NSRS), the existing coordinate reference frame must be continually evaluated to provide the accessibility and high accuracy required for use with the Global Positioning System (GPS).

Between 1987 and 1997, NGS has been aggressively updating the horizontal and ellipsoid height components of NSRS through the development and implementation of the statewide High Accuracy Reference Networks (HARNs). The addition of Continuously Operating Reference Stations (CORS) to NSRS since 1995 has enhanced the quality of recent HARNs and highlighted areas of remaining horizontal network distortions as large as 10 cm and ellipsoid height distortions that exceed 20 cm in some networks observed prior to 1995.

- With the completion in 1997 of the last state-wide HARN, NGS can now provide a unified National adjustment of all GPS observations in NSRS, independent of the conventional triangulation network, consisting of:
 1. Continuously Operating Reference Stations (CORS)
 2. Federal Base Network (FBN)
 3. Cooperative Base Network (CBN)
 4. Eastern Strain Network surveys
 5. Area Navigation Approach (ANA) airport surveys
 6. Federal Base Network (FBN) Height Modernization reobservations
 7. User Densification Network (UDN) GPS surveys

- The implementation of a national readjustment must be based on the following considerations:
 1. The national FBN reobservation program is designed to support the maintenance of FBN with specific emphasis on improving ellipsoid heights under the Height Modernization effort.

2. Given current NGS field resources, NGS should be able to complete the reobservations in approximately 4 years (by 2002).
3. An analysis of the 1996 Eastern Strain Network and subsequent readjustment of part of the Atlantic coast area indicates that there are areas of the country with significant (5-7 cm) differences between the current horizontal positions of the HARN and CORS network.
4. Ellipsoid heights at the FBN/CBN stations are the most suspect component of the position elements.

While it would be preferable to wait until all the FBN reobservations are completed prior to any readjustments, that may not be practical due to technical or political considerations. It is recognized that to readjust significant portions of FBN immediately following the reobservations and then readjust them again when all FBN reobservations are completed (in approximately 2002) would create confusion and would be unacceptable to most users.

Policy: For "interim" state-wide/area-wide NAD 83 readjustments

The policy is to evaluate each state/region immediately following the FBN reobservations and readjust only that component of any station (horizontal position or ellipsoid height) that changes by more than 5 cm. This may result in a significant number of ellipsoid height changes, but a minimal number of horizontal position changes. All readjustments will be done in consultation with interested state agencies that are providing NGS with significant cooperative network support. In addition, any new FBN or CBN stations determined in the FBN reobservations will be adjusted to be consistent with the current HARN in that state [e.g., new CBN stations in Oregon will be adjusted to NAD 83 (1991)].

Due to active tectonic conditions, California must be considered separately from other states/regions. The California FBN reobservations will result in an immediate readjustment to be labeled with a new NAD 83-epoch date.

Policy: For a "nation-wide" NAD 83 readjustment

Upon completion of the reobservations in the 48 contiguous states and the District of Columbia, a comprehensive readjustment of NAD 83 will be completed in cooperation with the Geodetic Survey Division of Canada (GSDC). Areas outside the contiguous United States (e.g., Alaska, American Samoa, Guam, Hawaii, Puerto Rico, Virgin Islands, etc.) will be included, as resources permit their reobservations. The readjustment will use only the CORS/FBN/CBN/ANA and "Blue Booked" UDN GPS data. The adjustment will be constrained only to CORS. This implies that the horizontal coordinates and ellipsoid heights of ALL non-CORS stations WILL change regardless of the statistical significance (e.g.,

0.00001 seconds in latitude or longitude/0.001 meter in height). It is anticipated that the changes in the NAD 83 coordinates at FBN/CBN/ANA/UDN stations should be small (1-4 cm). The adjustment framework will be the International Terrestrial Reference Frame (ITRF) coordinates of the CORS network, at an epoch accepted by both NGS and GSDC transformed to NAD 83 by a 7-parameter solution adopted by both agencies. A complete set of ITRF coordinates will be generated and published along with the updated NAD 83 values.

Details of the structure of the adjustment are currently being developed. Subsequently, all stations will be labeled NAD 83 (NSRS). NAD 83 (NSRS) will be consistent with the plans of GSDC to label the Canadian Base Network (CBN), which is equivalent to our FBN, as NAD 83 (CSRS).

Other Aspects Currently under Development

NGS will compute a scientific adjustment of the combined FBN/CBN GPS vector data set collected through July 1998 on both NAD 83 and ITRF. This adjustment will be used as a reference solution for analysis of FBN reobservation surveys and for evaluation of older GPS data sets. NGS will publish the ITRF values resulting from the scientific adjustment, but will not publish NAD 83 coordinates except as described by "Policy for interim state-wide/area-wide NAD 83."

Following the completion of the readjustment, a national transformation model will be developed. NGS may consider a solution that is different than the current NADCON format (e.g., a 7-parameter transformation). Publication of transformed NAD 83 (NSRS) coordinates for older stations determined by "classical" non-GPS survey methods are still being considered. A final decision will be made after having additional discussions with spatial data users.