NEW COORDINATE ADJUSTMENT
FOR COLORADO

The National Geodetic Survey (NGS) has recently completed the final adjustment of the Colorado High Accuracy Reference Network (HARN). Consisting of 170 stations, 110 new (53 were existing bench marks with no horizontal position) and 60 existing horizontal control stations spaced at approximately 14 to 90 kilometer (9 to 56 mile) intervals (Diagram), the network was observed to A and B-Order accuracy standards (5 mm + 1:10,000,000 and 8 mm + 1:1,000,000) as defined by the Federal Geodetic Control Committee.

Project implementation and coordination were directed by Richard Cohen, NGS Geodetic Advisor to Colorado, with the assistance of Carl O'Loughlin of the Colorado Department of Transportation (CODOT). Field operations were conducted between May and December, 1991, by NGS/CODOT surveyors using Trimble 4000SST dual frequency GPS receivers. Most observations far exceeded the 1:1,000,000 proportional accuracy required for the B-Order adjustment. A majority of lines exceed 1:10,000,000!

In addition to adjusting the GPS data to fiducial stations of the Very Long Baseline Interferometry (VLBI) and Cooperative International GPS Network (CIGNET) systems, all existing horizontal control in the State was readjusted to provide consistency between the HARN and the existing horizontal network. The readjustment extended into the bordering states to the extent required to maintain consistency of the National Geodetic Reference System (NGRS). The new coordinate values are referred to as North American Datum of 1983, Adjustment of 1992, and are designated NAD 83 (1992). This designation is necessary to distinguish between the original NAD 83 Adjustment of 1986, or NAD 83 (1986). Coordinate values should be properly labeled to eliminate confusion. Positional changes due to the network improvement vary across the State, but are generally less than 1 meter (3.2 feet).

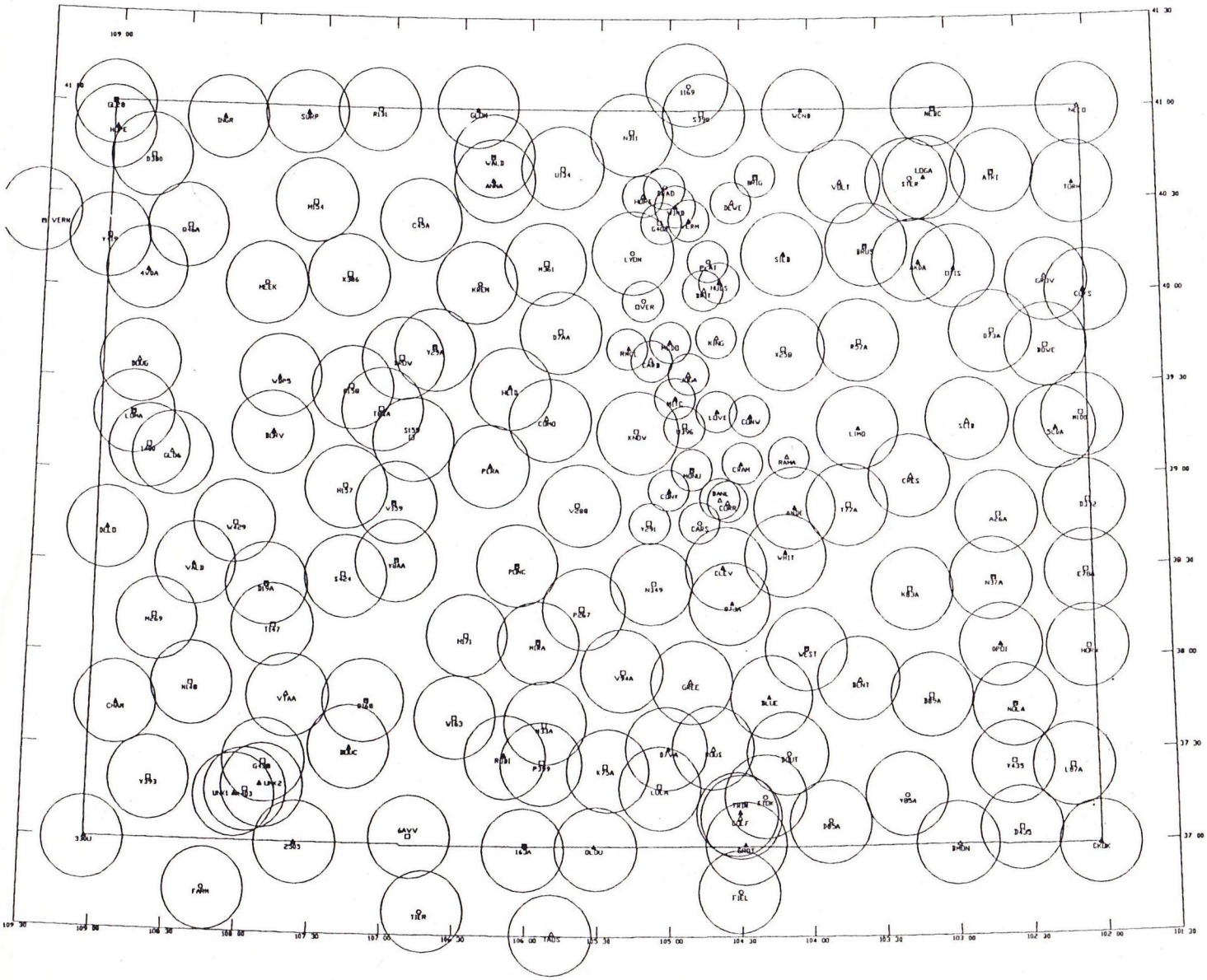
Orthometric heights for the HARN were determined by occupying 61 published bench marks referenced to the North American Vertical Datum of 1988 (NAVD 88). Accuracy of ellipsoidal heights determined by the GPS observations are less than third order, and orthometric heights are considered to be equivalent to those obtained by conventional vertical angle observations (0.1 meter/0.3 foot).

All GPS surveys performed prior to this readjustment, and not submitted to NGS ("Blue Booked") should be readjusted from original observations to maintain consistency with NGRS. Lower order coordinate information (e.g. cadastral survey, photogrammetry) can be transformed from NAD 83 (1986) to NAD 83 (1992) using a new version (2.10) of the NADCON software supplied by NGS, with special transformation grids for the Colorado adjustment (COHPGN.LAS and COHPGN.LOS). The

transformation grids have been tested by NGS and should provide transformation values accurate to an average of 0.05 meter +/- 0.06 meter (0.16 +/- 0.20 feet) across the state. Updated coordinate information, and the NADCON software can be obtained from the NGS Information Center, 301-443-8631.

Questions concerning the HARN and state-wide readjustment or coordinate transformations should be directed to Richard Cohen/ Carl O'Loughlin, 303-757-9856, or Dave Doyle, 301-443-8684.

COLORADO HARN



25 km

12 km

LEGEND

- HORIZONTAL CONTROL
- VERTICAL CONTROL
- HORIZONTAL & VERTICAL
- DOPPLER STATION
- VLBI STATION
- NEW STATION
- EXISTING GPS STATION

0 20 40 60 80 100 120 140 km

0 25.0 50.0 75.0 100.0 mi

NOAA; NOS; C&GS; NGS
SPACE & PHYSICAL GEODESY Br.
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