

## **OVERVIEW**

The City of Garland geodetic control network (“GCN”) was established in 1990. Since that time, there have been two additional iterations or adjustments of the network. The first in 1996 corrected gross vertical errors and some horizontal data. The second adjustment in June of 2002 was done in conjunction with the City aerial photogrammetry and to tighten the data with the aid of NGS’ OPUS service. A summary of this adjustment is included herein. The GCN does not use a City-wide combined scale factor. As in traditional geodesy, each point has its’ own unique combined scale factor.

While it is an optimal condition that the network data remain static, there may be adjustments or corrections to it at various times for various reasons. Therefore it is incumbent upon the user of the data to ensure that they have the latest values for any monument by checking with the City Surveyor or the City website (which may not be current). Additional monuments, including replacement monuments, are currently being set at various locations around the City. These points will be added to the network in the future.

The City of Garland makes no warranties, express or implied as to the accuracy, correctness or precision of the GCN and it is the user’s responsibility to verify the accuracy of any data used.

## **DATUM**

The GCN horizontal datum is NAD83 (CORS96), Texas Coordinate System of 1983, North Central Zone (4202). The vertical datum is reported as NAVD88. Note that the vertical data may have been obtained via Static GPS (most monuments), RTK GPS, or differential leveling, depending upon which monument it may be. Some monuments (work in progress) do have NGVD29 elevations as determined by differential leveling by the City Surveyor. If available, the NGVD29 elevations will be published on the datasheets at the City website or as an electronic file. When possible, vertical data should be obtained from established NGS benchmarks/control stations and checked against the GCN values. Note that some FEMA benchmarks/RMs were published in error on the FEMA map panels. Therefore, FEMA no longer references RMs and only references NGS control stations, some of which have been destroyed. Where possible, and as part of on-going project, the GCN monuments are being tied to NGS control stations with differential leveling and the data published on the data sheet for each monument.

## **MONUMENT TYPES**

The original primary control monuments set in 1990 were 3-1/4” aluminum discs housed in 6-inch PVC with a hinged access cover. Since that time, several have been destroyed and replaced by 2-inch brass discs in various concrete structures (inlet tops, median noses, headwalls, etc.).



1947, Richard 1949, and OR2 were the three stations used for the project. Buckner was the single vertical monument utilized.

The second report was completed by United Aerial Mapping in the summer of 1996. United Aerial is an aerial mapping firm based in San Antonio. The main purpose of this survey and report was to establish Azimuth monuments near the original control monuments. The azimuths were set at all fifty of the original control points. Original monument numbers 1, 14, 24, and 47 were moved during this survey due to sight constraints or changes in GPS availability. The GPS observations were done using static methods. The original control monuments were used as the base stations. The final report from United Aerial references ties to FEMA vertical datum and a vertical adjustment using that datum.

### **BW2 SURVEY 2002**

BW2 Engineers, Inc. (BW2), (formerly known as GBW Engineers, Inc.) performed a GPS survey using a combination of Static and Real Time Kinematic (RTK) methods on the fifty original control and azimuth marks. BW2 also surveyed and reset control and azimuth monuments that had been obliterated. These were set at new locations near the original. The datum used was NAD '83, Texas North Central State Plane Coordinates, Zone 4202. Primary control monuments used for the survey were established by the Texas Department of Transportation (TxDOT). The use of this monumentation was selected for the City of Garland since TxDOT has surrounded the city with control along IH-635 and the George Bush Tollway. Recently, TxDOT set control monuments for an aerial control project in all of the counties in District 18. Furthermore, TxDOT maintains an easily accessible database of its monuments throughout the district, and they propose establishing a network of Continuously Operating Reference Stations (CORS) with differential correction base stations in each county.

The initial primary control survey was performed by GBW on January 2, 2002, using eleven Trimble 4700 receivers and antennas. A session was run in the morning from 8:50 AM to 11:10 AM and a second session was run the same day from 12:50 PM to 3:10 PM. In addition to the eleven receivers operating in the area, the information from two existing CORS monuments was incorporated into the GPS calibration.

The precision on the primary control was verified by additional occupations of more than two hours using OPUS, which is a service provided by the National Geodetic Survey.

The primary control monuments were established to surround the City plus additional areas that were scheduled for aerial photography. The primary control monuments were used for an RTK survey of the original and reestablished monuments. All monuments were occupied using fixed height rods. The occupation time varied from two minutes to ten minutes with a precision of 0.03 feet set as the maximum accepted horizontal and vertical deviation.

## **FINDINGS**

The coordinates found in the BW2 survey differ from both the 1990 survey and the 1996 survey. This difference was generally consistent in latitude and departure for all points, and it is consistent with the difference between the original published data and the superceded data for the NGS monument named "Buckner".

## **MONUMENTATION**

The control monumentation consists of the remaining 50 original control monuments established in 1990 for the Garland control system. These monuments are iron rods with an aluminum disk set inside a 6" PVC sleeve with a hinged access cover. The azimuth points established in 1996 are two inch brass caps set on existing structures.

BW2 also set two inch brass monuments on existing structures at points where the original control monument or azimuth point had been destroyed. In addition to the missing points, we established six additional sets of control and azimuth monuments as dictated by the City Surveyor in areas where control was sparse or in areas with unusual growth potential.

## **SYSTEM**

The horizontal coordinates provided in this report are based on NAD '83 in feet. They are on the Texas North Central State Plane Coordinate System, Zone 4202. The conversion factor to surface is 1.000136506 (*see scale factor note in overview*) about 0,0. This is the factor used by TxDOT for Dallas County.

The vertical datum is NAVD 1988.

## **PRECISION**

A site calibration was completed using nine of the monuments established in the primary control survey. This calibration produced a maximum horizontal error of 0.07 feet and a maximum vertical error of 0.03 feet.