

SURVEY REPORT

2005

GEODETTIC CONTROL DENSIFICATION
AND RESTORATION

of

JEFFERSON COUNTY, KENTUCKY

JUNE 2005

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SURVEYOR'S REPORT

Opening Statement:

This report provides an explanation of the methods used in the execution of this restoration and densification survey of the existing GPS network established by the Louisville/Jefferson County Information Consortium. Several other documents and exhibits are provided within this report which further elaborate the survey computations and procedures.

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Introduction:

Within the last few years the Louisville/Jefferson County Information Consortium (LOJIC) has put together an accurate GPS network throughout Jefferson County, Kentucky and portions of the surrounding counties. LOJIC has employed Jacobi, Toombs and Lanz, Inc. (JTL) to provide monument restoration in areas where monuments have been reported missing, and densification of the current GPS network.

Scope:

Curt Bynum, LOJIC GIS Coordinator and Project Administrator, requested the Contractor, JTL, to provide densification of the current Geodetic Control Network. This project required JTL to coordinate with LOJIC and define areas where restoration and densification were needed and set monuments where GPS observations could be taken.

Reference Datums:

All restored monuments were to be on the following datums:

Horizontal datum: North American Datum of 83 (NAD 83) tied to the NGS's High Accuracy Reference Network (HARN)

Vertical Datum: North American Vertical Datum of 1988 (NAVD88)

New Monument Installation:

All monuments were constructed with a 3½" standard survey disk set in a poured-in-place 10" diameter concrete cylinder to a depth of 40". These monuments were installed intervisible with the remaining station or azimuth mark.

Contractor's Responsibility:

The Contractor's responsibility was to compile reports of missing or disturbed monuments and then field verify whether these reports were accurate. In cases where the monument was no longer useable, a new monument was placed in the vicinity of the original monument and referenced with new control monument description sheets and digital photographs.

The Contractor's responsibility also included compiling information and determining areas where monument densification was needed. Factors in determining these areas were:

1. Evaluating where the existing monument spread was greatest (reducing the two-mile grid to a one-mile grid).
2. Population growth and development.
3. MSD capital improvement projects.

JTL was instructed to utilize any suitable existing MSD control monuments when available and to install new monuments. Digital photographs as well as new reference ties were completed for future recovery and update of the control sheets. All of the monuments were incorporated into the existing GPS network using proper GPS field procedures and reducing by Least Squares to compile coordinate values.

Project Areas:

Areas of Densification

- Area No. 1: This area is located on Bradbe Road between Taylorsville Lake Road and Routt Road
- Area No. 2: This area is located on Preston Highway just North of Miles Lane.
- Area No. 3: This area is located on Blevins Gap Road just North of Sawmill Road.
- Area No. 4: This area is located off Dixie Highway on Park Road at Shively Park.
- Area No. 5: This area is located on 28th Street just South of Broadway.
- Area No. 6: This area is located in Cherokee Park on Beargrass Creek Road.

Reconnaissance Report:

Densification

Once field reconnaissance was complete and all utilities in proposed areas were marked, new monuments were set at all six areas for the densification.

GPS Equipment and Procedures:

Three Trimble 5700 GPS receivers and one Trimble 4800 GPS receivers were used throughout the static network. Each session was a minimum of 20 minutes. At the end of each day the receivers were checked in and data entry logs were collected. Mission planning was utilized so GPS observations were taken at times when the Position Dilution of Precision (PDOP) was four or below. Once all of the sessions were complete, loop closures were calculated and evaluated.

Network design:

Once the new monuments were in place, existing LOJIC monuments were selected as project control. The control was selected in a configuration to optimize the stability of the GPS network both horizontally and vertically. Sufficient redundancy was incorporated in this network for quality control.

Evaluation/Comparison of Coordinate Values:

In any survey adjustment, a decision must be made on which monuments should be held or constrained. For Network #1 adjustment Louisville South Base, KY-05, and Bowman-Reset were constrained to horizontally. Then Louisville South Base, KY-05, and CA 20-01 were constrained to vertically. For Network #2 adjustment STA 049-2003 and AZI 8624-2001 were constrained to horizontally and vertically. Table 1 shows the differences between the published coordinates and the measurements produced by this network.

**TABLE 1
COMPARISON OF COORDINATE VALUES**

NAME	△ HORIZONTAL (FEET)	△ VERTICAL (FEET)	CONSTRAINED	
			HORIZONTAL	VERTICAL
Network #1				
Louisville South			✓	✓
Bowman-Reset		0.008	✓	
KY-05			✓	✓
STA 043-2001	0.019	0.009		
STA 044-2001	0.034	0.021		
GPS 86-43 Reset	0.024	0.064		
CA 20-01	0.058			✓
BS 30-02	0.041	0.044		
Network #2				
STA 049-2003			✓	✓
AZI 8624-2001			✓	✓
STA 029-2001	0.029	0.021		

As a result of the constrained network, all of the non-constrained points were within 0.01 to 0.06 feet of their published coordinates horizontally and were within 0.01 to 0.06 feet of their published coordinates vertically.

The Network Adjustment Report can be found in Appendix B and Appendix C which includes adjustment style settings, statistical summaries, Geoid model statistics, weighting strategies, and adjusted coordinates with corresponding statistical data.