

# SURVEY REPORT

## 2008 GEODETIC CONTROL RESTORATION

of

JEFFERSON COUNTY, KENTUCKY

OCTOBER, 2007

Jacobi, Toombs and Lanz, Inc.  
401 West Main Street, Suite 600  
Louisville, Kentucky 40202



# SURVEYOR'S REPORT

## Opening Statement:

This report provides an explanation of the methods used in the execution of this restoration 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 from the current GPS network.

**Scope:**

Curt Bynum, LOJIC GIS Coordinator and Project Administrator, requested the Contractor, JTL, to provide restoration of the current Geodetic Control Network. This project required JTL to coordinate with LOJIC and define areas where restoration was 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 intervisable 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. 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 Restoration***

- Area No. 1: LOJIC monument GPS86-8 located in New Albany along West 10<sup>th</sup> Street just south of a service road for treatment plant was reported damaged.
- Area No. 2: LOJIC monument STA024-2001 located along Gene Snyder Freeway just south of Highway 42 was reported damaged.
- Area No. 3: LOJIC monument AZI037-2001 located at the intersection of Aiken Road and Old Aiken Road was reported damaged.
- Area No. 4: LOJIC monument BP35-03 located along Watterson Trail 0.2 miles south of Ferndale Road was reported damaged.
- Area No. 5: LOJIC monument GPS86-20 located at the corner of Thixton Road and Cedar Creek Road was reported damaged.
- Area No. 6: LOJIC monument AZI8620-2001 located along Thixton Road 0.1 miles east of the Cedar Creek Road was reported damaged.
- Area No. 7: LOJIC monument AZI8616-2001, located along Katherine Street 0.29 miles southeast of Dixie Highway was reported damaged.

## **Reconnaissance Report:**

### ***Restoration***

- Area No. 1: The monument was destroyed due to recent construction; a new GPS86-8 RESET monument was set in this area.
- Area No. 2: The monument was destroyed due to recent construction; a new STA024-2001 RESET monument was set in this area.
- Area No. 3: The monument was destroyed due to recent construction: a new AZI037-2001 RESET monument was set in this area.
- Area No. 4: The monument was destroyed due to recent construction: a new BP35-03 RESET monument was set in this area.
- Area No. 5: The monument was destroyed due to recent construction; a new GPS86-20 RESET monument was set in this area.
- Area No. 6: The monument was destroyed due to recent construction: a new AZI8620-2001 RESET monument was set in this area.
- Area No. 7: The monument was destroyed due to recent utility installation: a new AZI8616-2001 RESET monument was set in this area.

### **GPS Equipment and Procedures:**

Four Trimble 5700 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, Trimble Geomatics Office software was used to calculate and evaluate loop closures, and perform the network adjustment.

### **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. A significant amount of 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 Edward 2 and GPS86-7 were constrained to horizontally. Then Edward 2, GPS86-7, and STA043-2001 were constrained to vertically. For Network #2 adjustment GPS86-3, STA047-2003, and STA023-2001 were constrained to horizontally and vertically. For Network #3 adjustment STA039-2001, GPS-#47, and AZI8627-2001 were constrained to horizontally and vertically. For Network #4 adjustment BL32-01, AZI8637-2001, and BS30-01 were constrained to horizontally and vertically. For Network #5 adjustment Louisville South Base, Snow Rm A Reset, and Ky 13 were constrained to horizontally. Then Louisville South Base, GPS86-16, and STA013-2001 were constrained to vertically. Table 1 shows the differences between the published coordinates and the measurements produced by this network.

**TABLE 1  
COMPARISON OF COORDINATE VALUES**

NAME	Δ HORIZONTAL (FEET)	Δ VERTICAL (FEET)	CONSTRAINED	
			HORIZONTAL	VERTICAL
<b>Network #1</b>				
Louisville South			✓	✓
GPS86-7			✓	✓
STA043-2001	0.008			✓
<b>Network#2</b>				
GPS86-3			✓	✓
STA047-2003			✓	✓
STA023-2001			✓	✓
AZI024-2001	0.008	0.023		
<b>Network #3</b>				
STA039-2001			✓	✓
GPS-#47			✓	✓
AZI8627-2001			✓	✓
STA037-2001	0.030	0.102		
<b>Network #4</b>				
AZI8637-2001			✓	✓
BL32-01			✓	✓
BS30-01			✓	✓
BP35-2	0.018	0.012		
<b>Network #5</b>				
LOUISVILLE S B			✓	✓
SNOW RM A RESET		N/A	✓	
KY 13		N/A	✓	
GPS86-16	0.001			✓
STA013-2001	0.014			✓
STA012-2001	0.023	-0.012		
GPS86-15		-0.067		
31K ECC RESET	N/A	0.002		

As a result of the constrained network, all but two of the non-constrained points were within 0.03 feet of their published coordinates horizontally and within 0.05 feet vertically. The two exceptions were point GPS86-15 that was 0.067 feet vertically from its published coordinates and STA037-2001 that was 0.10 feet vertically from its published coordinates.

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