

Contracting for a County-wide GPS Framework

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The most important part of creating a Geographic Information System (GIS) is creating the framework for the foundation; creating the ground control database. In Bartholomew County, Indiana, we are utilizing our section corners, and a Global Positioning System (GPS), to do just that. Global Positioning Systems utilize satellite receivers and a system of satellites that are currently orbiting the earth.

To begin a GPS program or project, you need to do some planning in the office and some field reconnaissance. You will also need to develop some specifications, and contract with a vendor that provides GPS services. I'm not saying that what we're doing in Bartholomew County is the only way to start a GPS database. What I'm saying is that this is working for us, and if you find something you can use in this presentation, then it's been well worth while.

One thing you need to realize is that a GPS receiver must maintain visibility to the orbiting satellites. You can't simply go into the midst of white pines or the middle of an alley and expect to bring GPS control in. You must have visibility to the satellites. We started, in Bartholomew County, by first determining our density needs. We used our presently monumented section corners whenever possible, in conjunction with a two mile grid. That grid had to be compromised because of accessibility of the monumentation and visibility, due to buildings and trees. We also looked at potential growth in Bartholomew County, which appears to be south and southwest. Plus, we looked at the city of Columbus, which is the largest metropolitan area in the county.

Existing NGS geodetic survey control monuments were field located and documented. Six-inch diameter, 30-inch long concrete monuments were set at section corners when needed. Each of our monuments had a station visibility diagram prepared for it. This was simply a matter of taking compass sightings and using a Suunto-clinometer to take the vertical angles to obstructions, including buildings, signs and trees.

Once the station Visibility Diagram was drafted, we charted for a given time of the year, the tracking of the satellites that would be visible. We utilized software programs in the surveyor's office that show us approximately what the satellites are doing at any particular time. This software is free.

Along with the visibility diagrams, we made sketches that showed where each of our monuments are located. Also, note on your sketches the distances to cross-roads. With the above information, the vendor can readily access each monument.

Pay attention to the possibility of trespassing. If your GPS consultant is working at night, you don't want him in the backyard of a residence. We tried to keep all of our GPS corners in the county right-of-way. Try to have some alternate station sites. If you need thirty new GPS points, find thirty-six. The GPS consultant may not be able to use all the stations you picked because of poor visibility.

Our specifications included an accuracy requirement of one in one hundred thousand and x, y, and z coordinates on Indiana State Plain Coordinate East Zone System. We said that delivery of GPS data shall be within forty-five days of the completion of the vendor's field observations. We also specified that Bartholomew County retain exclusive rights to any and all data information compiled. The general contents of the specifications also included liability and insurance requirements.

Some of the specifications pertained directly to the vendor. The vendor, or GPS consultant, had to give us daily updates as to his progress. We specified that all field work should be completed by the end of February. Should the contractor neglect, refuse or otherwise fail to complete the project on or before the specified date, the amount of \$50 per day past the target completion date would be deducted from any money due the contractor.

We sent requests for proposals to ten vendors across the country, and received eight proposals. We reviewed each of those proposals. The price quotations ranged from \$517 to \$1078. We did not take the low bid. Instead, we reviewed each proposal, including the vendor's background information and equipment list. A committee, that included myself and other Surveyor's office staff, negotiated the contract.

Pay particular attention to the time of day that you will have to occupy the stations, especially if you are in a high traffic area. In Bartholomew County, when the GPS people arrived, they worked from approximately midnight to six or seven in the morning. That may seem like harsh hours for the average individual, but they were pleased because those hours kept them out of traffic. Their work actually went faster.

This also gave us an opportune time to set up a base-line. We established two points, over one-half mile apart at the Columbus Municipal Airport. This provided us with a known distance between the two concrete monuments. The baseline also gave us an astronomic azimuth. Our field crews can now conduct solar or polaris observation exercises in determining true north.

In putting together our program and specifications, I talked to people in Dakota County, Minnesota, Dane County, Wisconsin and various individuals from NGS. The final contract was for thirty new GPS points. These were contracted for \$660 per point to a firm out of Boston. They actually occupied thirty-seven points. We already had about seven NGS and GPS points available. In doing their work, the contractor occupied the existing points and gave us a check on them.

The contractor arrived in the afternoon on January 25. We had compiled sufficient information through our office's pre-planning and field reconnaissance that they were able to begin making observations that night. They worked five additional nights before completing our project. Now, that's not all the GPS control we need in Bartholomew County. That was just a start. I would like approximately sixty more GPS points established. As in any project, we had to start somewhere, and with limited funding, we put it to the best use we could.