GPS Standards and Guidelines for Legal Surveying

Introduction

There are a number of GPS observation methods and processing procedures which will produce results that are acceptable for legal surveys. These guidelines will outline some basic surveying practices which should be followed when using GPS for legal surveying. However the responsibility of performing the survey and ensuring it meets the acceptable standards is that of the Land Surveyor.

Some of the observing techniques being used in GPS surveying include Static, Rapid Static, Post-Processed Kinematic (PPK) Positioning and Real-time Kinematic(RTK) Positioning. These specifications will focus Real-time Kinematic(RTK) and Static positioning.

Real - Time Kinematic (RTK) Positioning

General

A RTK GPS survey consist of a data transfer link and at least one GPS receiver over a known point usually a Control Survey Marker which remains stationary and a rover which moves from point to point
In a RTK survey shots are taken from a fixed base station to a rover station, which then transfers the corrections to the rover
Occupation times for the rover are generally a few seconds to a few minutes
Effective for areas with a clear view of the horizon

RTK Surveys - Base/Rover Requirements

Geodetic grade receiver capable of logging observables while broadcasting corrections
Must be capable of containing;

- A Map projection
- Ellipsoidal model
- Geoid Model

RTK Field Survey Procedures

The base station must occupy a provincial control survey marker or another point which has been surveyed by a static survey.
A mask angle of 10 degrees or higher above the horizon shall be used
A check must be observed to another Control Survey Marker by the rover immediately after the base station is setup and before the station is taken down.
Property corners measured by RTK must be checked by one of the following methods:

- positions measured from two different base stations

- independent measurement by conventional survey method
- comparison with previous survey
- point re-occupation (use an antenna dump and reinitialize between observations)

Users of stake-out routines should record the measured point position

Acceptable RTK Surveys

Measurements to Control Survey Markers must have less than 5 centimeters discrepancy
Measurements to duplicate points must not exceed 3 centimeters

Static Positioning

General

Static positioning uses a network of multiple baselines consisting of combinations of multiple receivers, multiple baselines, multiple observations and multiple sessions. This method provides the highest accuracy and requires long observation times. This method requires post processing software and a least squares adjustment of the observations

Static Survey - GPS Receiver Requirements

Must be capable of observing carrier phase measurements
Must be capable of logging data for processing

Static Field Survey Procedures

Dual frequency receivers shall be used on baselines longer than 20 kilometers
Single frequency receivers maybe used on baseline less than 20 kilometers
All points shall be measured by two independent baselines as to provide enough redundancy to perform a least squares adjustment
A mask angle of 10 degrees above the horizon shall be used

Acceptable Static Survey

A least squares adjustment shall be performed with the minimum relative error ellipses between stations not exceeding 200 ppm.

Tie to Control Survey Marker

A Control Survey Marker shall be deemed acceptable if;

The site is clear from obstructions such as trees, buildings, radio towers or anything that might cause signal interference

The monument has been identified as being apart of the Provincial Control Referencing System

The survey shall be referenced to the Provincial Control Network where possible.

Surveyors Report

A report must be submitted with each survey which includes

- Make and model of GPS receivers
- Antenna and related equipment
- List of processing and adjustment software
- A summary of RTK operations including system checks and duplicate points occupied
- A diagram showing the survey configuration
- A report showing the processing and adjustment results
- List of Control Survey Markers used
- Any problems or variations from these guidelines