

## Post Processing ike data

### 1 Accuracy and Post Processing

Stand alone GPS accuracy is affected by:

- The satellite constellation (how many satellites your GPS can see and their relative position to each other),
- Atmospheric conditions (interference and delays in the GPS signal)
- The length of time spent acquiring a position (usually not that long as it is done in the field).

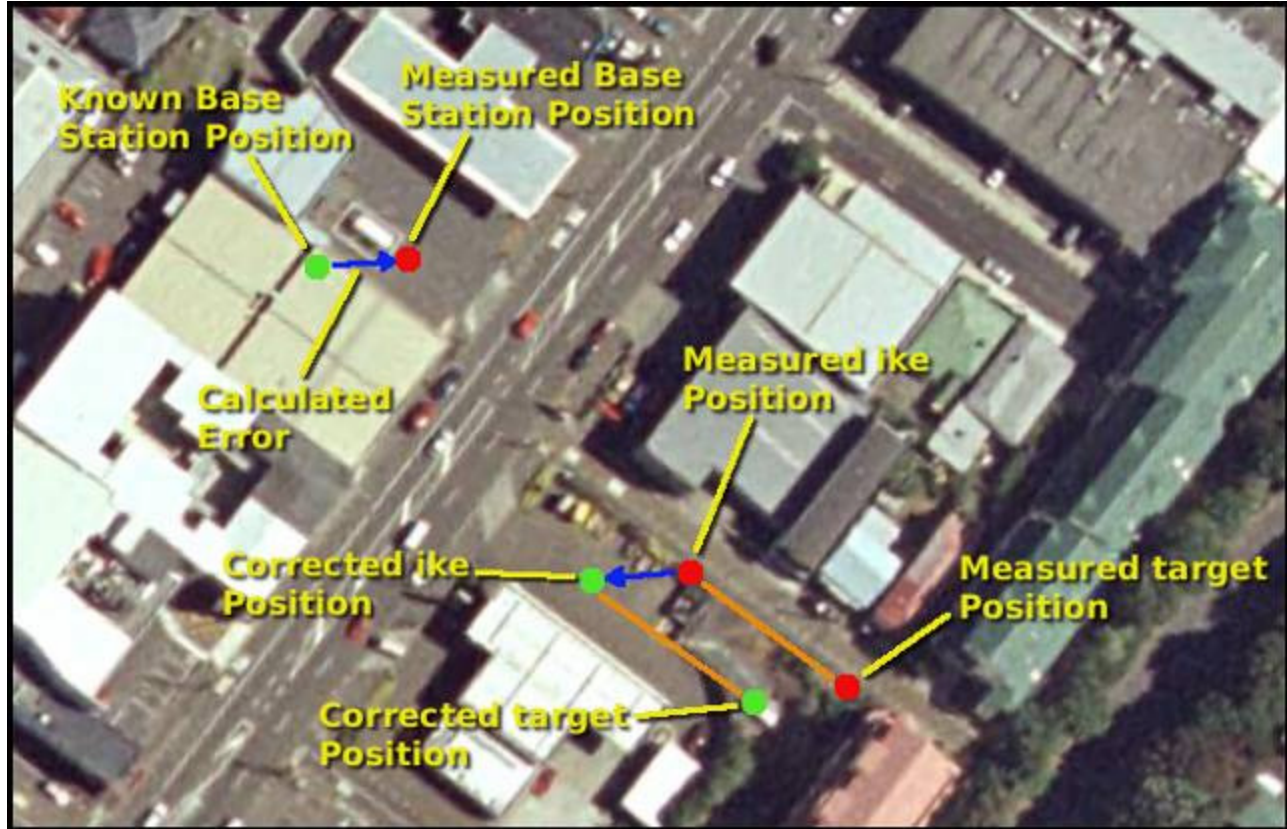
To minimise these effects, and improve accuracy, some form of correction may be applied. The best way to do this is through Differential GPS (DGPS) technologies.

### 2 DGPS Theory

All forms of Differential GPS are based on use of one or more Base Station GPS units, and a Remote GPS (e.g. ike). The accuracy improvement is obtained as follows:

- Reference a GPS Base Station with a well known position
- Measure the position of the Base Station at a given time
- Calculate the error between the measured Base Station position, and the known Base Station position.
  - *Note: This error is typically due to atmospheric conditions etc, and will be similar for different GPS units operating in the same geographic area.*
- Measure the position of the remote GPS (e.g. ike)
- Apply the inverse of the calculated error to the remote GPS position to eliminate errors due to atmospheric conditions etc, and determine the Corrected remote GPS position.
- When using ike, the Corrected target position must be calculated based on:
  - The Corrected ike position.
  - The original laser distance reading.
  - The original compass bearing and inclination.

The image overleaf illustrates this principle:



### 3 DGPS Technologies

Several different approaches are possible for DGPS post processing.

#### 3.1 RTCM

Messages are transmitted directly from the base station to the remote GPS in real time (e.g. via a radio link or wireless network). The signal format of these messages is defined by the industry standard RTCM-SC104.

#### 3.2 SBAS

Satellite Based Augmentation Systems use a network of ground based Base Stations that collect information, and transmit it to the GPS satellites. An SBAS capable GPS can receive this information, and apply DGPS corrections in real time.

#### 3.3 DGPS Post Processing

DGPS Post Processing occurs after data has been collected. Error information is recorded for both the Base Station, and the Remote GPS, and is later combined to factor out atmospheric errors and produce corrected positions for the remote GPS.

## 4 What is Required

To Post Process data from ike, it is necessary to have the following applications installed on the desktop:

1. ikeSync
2. Waypoint's GrafNav Lite software
3. A registered copy of ArcPad

The following Data sets are also required:

1. Raw GPS Data captured by ike
2. DGPS Log Data from ike
3. DGPS Log Data from a base station

### Notes:

- To be ensure maximum accuracy, GPS Data from ike needs to have a good carrier phase lock. This is indicated on the Data Capture screen in the AABDCA as Lk: X/Y, where X is the number of satellites with good carrier phase lock, and Y is the number of satellites being used to calculate the current position. A minimum number of satellites with good carrier phase lock can be enforced.
- In addition to capturing data about features, ike can also log DGPS information required for use in port processing. This feature needs to be enabled in the settings of the AABDCA or Standard DCA.
- The base station must be logging data at the same time as ike is capturing GPS Data and DGPS logs

## 5 ikeSync Features

ikeSync's main role is to transfer data between ike and the desktop. However, it also manages DGPS Post processing in conjunction with GrafNav. The steps involved include:

1. Download Raw Data and DGPS logs from ike
2. Start the post processing stage in ikeSync, which:
  - a. Launches Graf Nav
  - b. Sends the data downloaded from ike to Graf Nav
3. Process the Data using Graf Nav
4. ikeSync re-projects the processed data in ArcPad using calculated offsets collected in the field

## 6 GrafNav Features

Waypoint's GrafNav Lite is a powerful post processing tool with a number of useful features which can:

- Concatenate/splice/resample log files
- Convert standard GPS formats like Rinex to Waypoint's proprietary GPB format.
- Log DGPS Data from a base station

Basically, GrafNav corrects the raw data with an error value extracted by comparing the two DGPS Log files, from ike and the base station. The corrected data is then output as a CSV file for ikeSync to use.

### **6.1 Obtaining/importing Base station data**

Base Station Data can be obtained in a number of ways:

1. By utilising Graf Nav Lite's Download Service Data function which can acquire base station data from online FTP sites
2. From companies which offer online DGPS logging services
3. From a private base station

When obtaining base station data it is important to consider the Baseline, or distance between the base station and where the data was collected. A longer baseline means a less accurate result.