

Notes on Bathymetry Methodology

The Geoswath Plus system is a PC based, shallow water wide swath bathymetry system, designed to produce an accurate digital terrain map (DTM) of a survey area in water depths up to 50m (500kHz). Complete system accuracy depends on the combined error budget of all peripheral systems as well as the operating environment, typically the system will meet IHO special order accuracy out to 6 times water depth with coverage to 12 times water depth, to a maximum of 50m.

The hardware and software of the GeoSwath Plus (GS+) system form an acoustic measuring device. Each transducer contains one transmit element (stave) and four receive staves. The GS+ transmitters generate short pulses of acoustic energy which propagate out from the transducers at the speed of sound in water, insonifying a narrow strip of riverbed perpendicular to the boat track. The time taken for the signal to return is used to determine range, while the phase delays between the differently spaced receivers determine the return angle. Once the time and angle measurements have been corrected for speed of sound variations, accurate range and angle measurements can be derived relative to the transducer position.

To turn these relative positions into absolute positions, the three dimensional position and orientation of the transducers must be measured accurately using GPS RTK, six axis attitude sensor Motion Reference Unit (gyro), GPS compass, plus ancillary equipment/software. Due to the rapid nature of small boat movement, these corrections for heave, pitch, roll, navigation and heading are continuously input between 10 and 50Hz.

Once collection was complete, the data were then processed to 0.5m resolution using GS+ software and corrected to ellipsoid height. Positional data is derived from Hemisphere S320 GNSS receivers in PPP (Nrcan Precise Point Positioning), PPD (Post Process Differential), PPD rapid static, and RTK mode. GPS base stations were established line of sight to survey reaches on temporary bench marks derived from DGPS and/or PPP. EZSurv GNSS post-processing software was used for initial GPS processing followed by Precise Point Positioning (NRCan) and error checking using optically levelled water surface slope. Real-time GPS RTK data at 30Hz is required by the GeoSwath deck unit while collecting swath data.

In addition to the GS+ software, Surfer imaging and contour generation software is utilized for QA/QC, Geoid adjustment, data cropping, cross section extraction, and volumetric (time series) calculations.

Data naming convention and organization of files

Files are named according to their centre UTM northing, the month and year of data collection and whether or not the file is a full 2km stretch of river or a partial 2km grid (denoted by 'p'). For example the file named 6287000_7_12P is a 2km grid centred on northing 6287000 with data collected in July of 2012 and is a partial grid.

Under each 2km stretch of river there is a kmz file which gives a visual representation of the coverage of the file as well as the detailed grid file which contains the full x,y,z coordinates to 0.5m resolution.