

# High Precision Single Frequency GPS Network Adjustment

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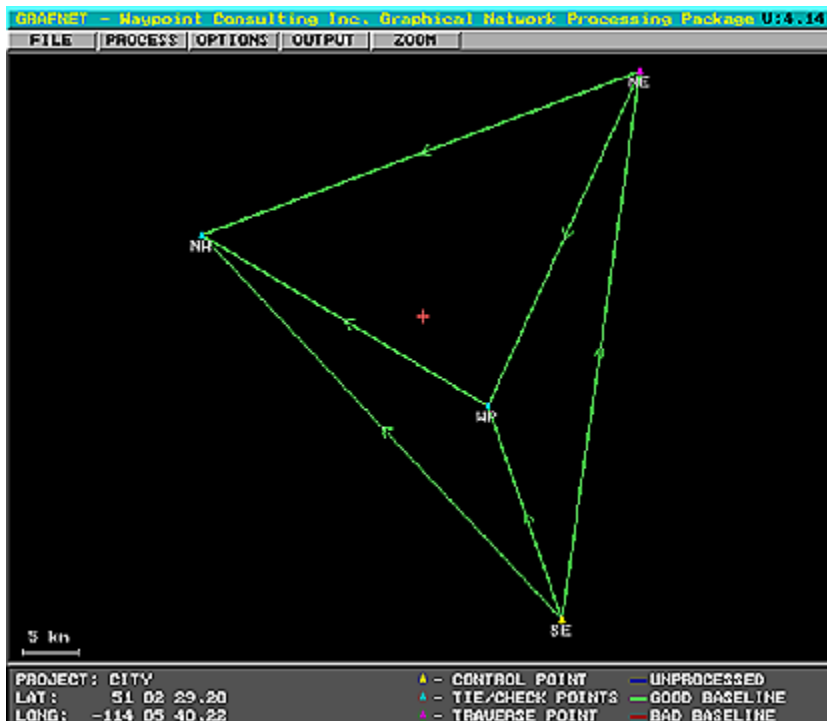
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## Introduction

This report describes a static network adjustment performed on part of the City of Calgary fiducial network using two 10-channel single frequency NovAtel 2151R receivers and a Navstar 12-channel XR5M receiver. The survey was performed by Matai Surveys of Calgary and processed using Waypoints GrafNet baseline processor/network adjustment package. Average baseline length was approximately 30 km. Baseline distances ranged from 20 km to 45 km, and fixed static solutions were performed on all baselines.

## The Survey

Two NovAtel 2151 narrow correlator code/phase receivers were used in this survey as rovers, while one Navstar XR5M receiver logged data at a fixed location (WP). The two NovAtel receivers were placed on monuments at the Northwest, Northeast and Southeast corners of the city of Calgary, and they logged data for approximately 1.5 hours at each of the remote locations, while the Navstar logged data continuously. Following the survey, the data was processed using the Waypoint GrafNet package. This software, as shown, plots the location of each point in the network, processes the baselines, and then performs a weighted least squares adjustment on the points in the network.



The network results of this survey are presented below:

Baseline Distance			Residuals			
From Sta	To Sta	Km	Dx (m)	Dy (m)	Dz (m)	PPM
NE	WP	28.9	-0.0003	0.0020	-0.0026	0.1
NE	NW	40.7	0.0007	0.0374	-0.0054	0.9
WP	NW	28.5	-0.0013	-0.0109	0.0113	0.6
SE	WP	17.6	0.0006	-0.0054	0.0053	0.4
SE	NE	42.5	0.0169	0.0482	-0.0235	1.3
SE	NW	43.5	-0.0040	0.0147	-0.0050	0.4

Results of City Survey Baselines observed for approximately 1-5 hours each

In this adjustment, the monument at the Southeast (SE) corner of the city was held fixed, and ties were made to both the Northwest (NW) and Northeast (NE) city fiducial monuments. Comparison of the adjusted coordinates with the published coordinates at these points confirm the 1 ppm nature of this survey. Horizontal closures with respect to the known data were at the level of 0.025 m while vertical closures vertically at the level of 0.035 m over the 45 km length of the network.

## Conclusions

Three single frequency receivers, two NovAtel 2151's and one Navstar XR5M were used in a network of six baselines ranging from 20 km to 45 km in length in a survey conducted by Matai Surveys of Calgary. The average occupation time at the remote locations was about 1.5 hours. The results were computed using Waypoint's GrafNet post processing package, and they indicate that these receivers are readily capable of performing baseline surveys at the 1 ppm level.