PERFORMANCES IN THE DRAWING HIGHWAYS BY RTK

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Abstract: *The survey has been carried out on the trail axis projected on a strip of 50 m on both sides of the shaft with enlargements in the topographic artwork and of intersections, so that the project can develop. The survey has been developed in 70 STEREO system, based on support points whose coordinates were obtained from the National Agency for Cadastre and Real Estate Advertising Arad. On the entire route designed, for a length of about 12 km, five A type terminals and six type B terminals were located. Terminals were located in protected areas, easily accessible by car, being located outside the areas of private property For determining, three references of three fixed points were used, measuring the three vectors for each point. They used six dual frequency GPS receivers, three fixed references, and three mobile rovers. For determining transformation parameters from 84 WGS in 1970 Stereographic in the work area, STATIC GPS, GPS measurements were made using the STATIC method, and using the support points of first order national geodetic network. To obtain more accurate results and to ensure stability and confidence in solutions, specialized software was used in GPS data processing, namely Leica Geo Office. The RTK topographic surveys were accomplished by using 5 Leica GPS 1200 receivers – I reference station and rovers. For every RTK session, after assembling the reference station on a type A landmark, a type B landmark was occupied by a rover receiver in order to compare the new obtained RTK coordinates of the landmark with the previous coordinates, determined STATICALLY. The difference between the coordinates were maximum of 2 cm per after maximum 10 seconds of occupancy*

Key words: *RTK survey, static measurement, reference station.*

INTRODUCTION

The direction Bypass Arad begins from 552 Km +154 DN 7/E 68 Bucharest – Deva – Arad - Budapest

MATERIAL AND METHODS

The topographical surveys for Arad Bypass were divided into several phases: GPS measurements for determining the transformation parameters from WGS 1984 to Stereographic 1970; benchmark placement; static measurements for determining new point coordinates; RTK survey.

In order to determine the transformation parameters from WGS 1984 to Stereographic 1970 for the work area, GPS STATIC method measurements have been conducted using national geodetic network 1st rank points.

After conducting GPS measurements on national geodetic points, 6 points were used for the transformation parameters: CALACEA, TISA NOUĂ, VARIAŞU MARE, CURTICI, MOŞNIȚA and DEALUL PĂZIT. (Figure 1)

Two polygons were formed from these points, and three measurement sessions were conducted for each polygon, in three different days. The polygons have CALACEA – TISA NOUĂ as common starting point.

The collected data were processed using LEICA GEO OFFICE Version.3.0 Software, thus obtaining the transformation parameters *for the entire polygon*.

RESULTS AND DICUSSIONS

Benchmark placement**.** After an on site reconnaissance, the positions for the benchmark placement were identified taking into consideration all the conditions provided in „Methodology topographical works" (the absence of magnetic fields or reflecting surfaces, the absence of obstacles in order to receive the signal starting at a minimum height of 20^o „cut angle", the benchmarks were placed at cadastral limits etc.).

The surveys for the main (type A) and secondary (type B) polygonal benchmarks

were carried out by STATIC GPS method – therefore type A and type B benchmarks have the same accuracy – occupying 6 points – 3 points simultaneously from the main STEREO 70 network, and 3 benchmarks (type A or B) with Raw Data Logging capability enabled.

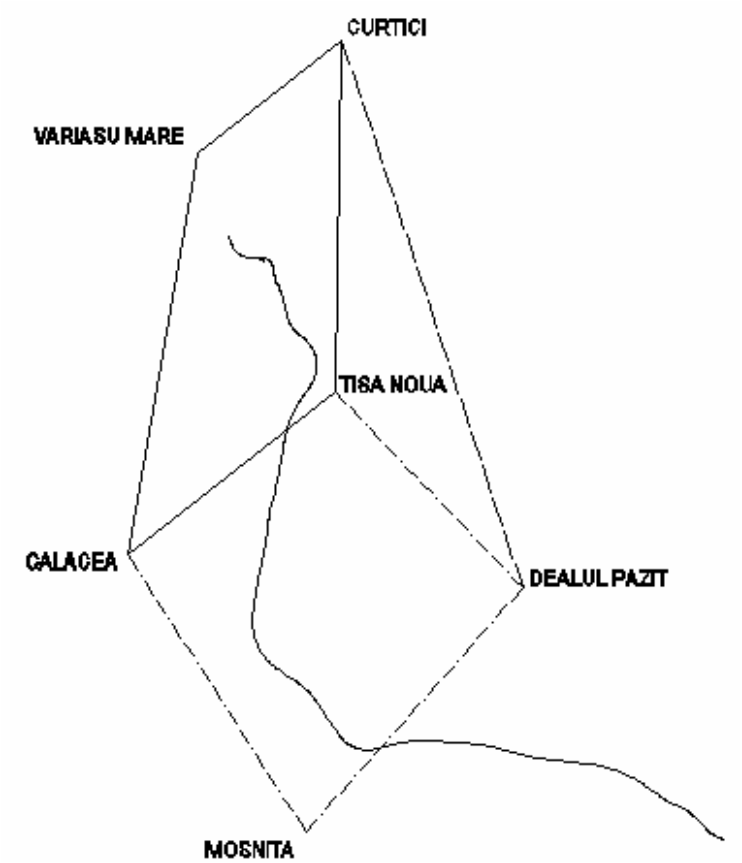

Figure 1: The national geodesic points

After the data processing, using Leica Geo Office Version 3.00 Software, the coordinates of the 5 Type A and 6 Type B benchmarks were calculated and compensated (Leica Geo Office, "Network Adjustment"). Survey for the main and secondary polygonal benchmarks.

The surveys were carried out using 5 Leica GPS 1200 and one Leica Smartstation..(figure. 2)

Table 1

Transformation parameters

ELLIPSOID A	WGS 1984
ELLIPSOID B	Krassowski
Height Mode	Orthometric
Model	Bursa Wolf
Dx	102,4110
Dy	-281,5579
Dz	103,5538
Rx	8,48984
Ry	1,99565
Rz	-10,74588
Scale factor	-0,465

Table 2

Compensated Coordinates:

Point ID.	Northing	Easting	Height
A1	530436.277	209034.996	107.873
A2	528164.542	210275.148	109.051
A3	526333.819	213459.418	110.344
A4	523792.261	213416.951	109.708
A5	520395.508	214571.500	121.912
B1	529366.544	208920.928	105.859
B2	528186.991	209149.456	107.376
B3	526109.796	210143.919	107.378
B4	524571.109	214130.226	110.418
B5	521794.006	215055.154	115.621
B6	520182.072	216074.937	126.238

Real-Time Kinematic (RTK) GPS detailed survey

RTK surveys were conducted using 5 Leica GPS 1200 receivers – 1 reference Sation and 4 rover receivers.

For each RTK session, after setting up the reference station on a Type A benchmark, a Type B benchmark was occupied with the rover receiver, in order to compare the newly obtained RTK coordinates of the benchmark with its previously determined STATIC coordinates. The coordinate differences were at most 2 cm on X, Y, Z, after a maximum 10 seconds of occupation time (usually it is 5 seconds).

All 4 rover receivers had the motorway axis and survey limit line graphically displayed onscreen, so that the surveyor knew his exact position towards these elements.(figure 3)

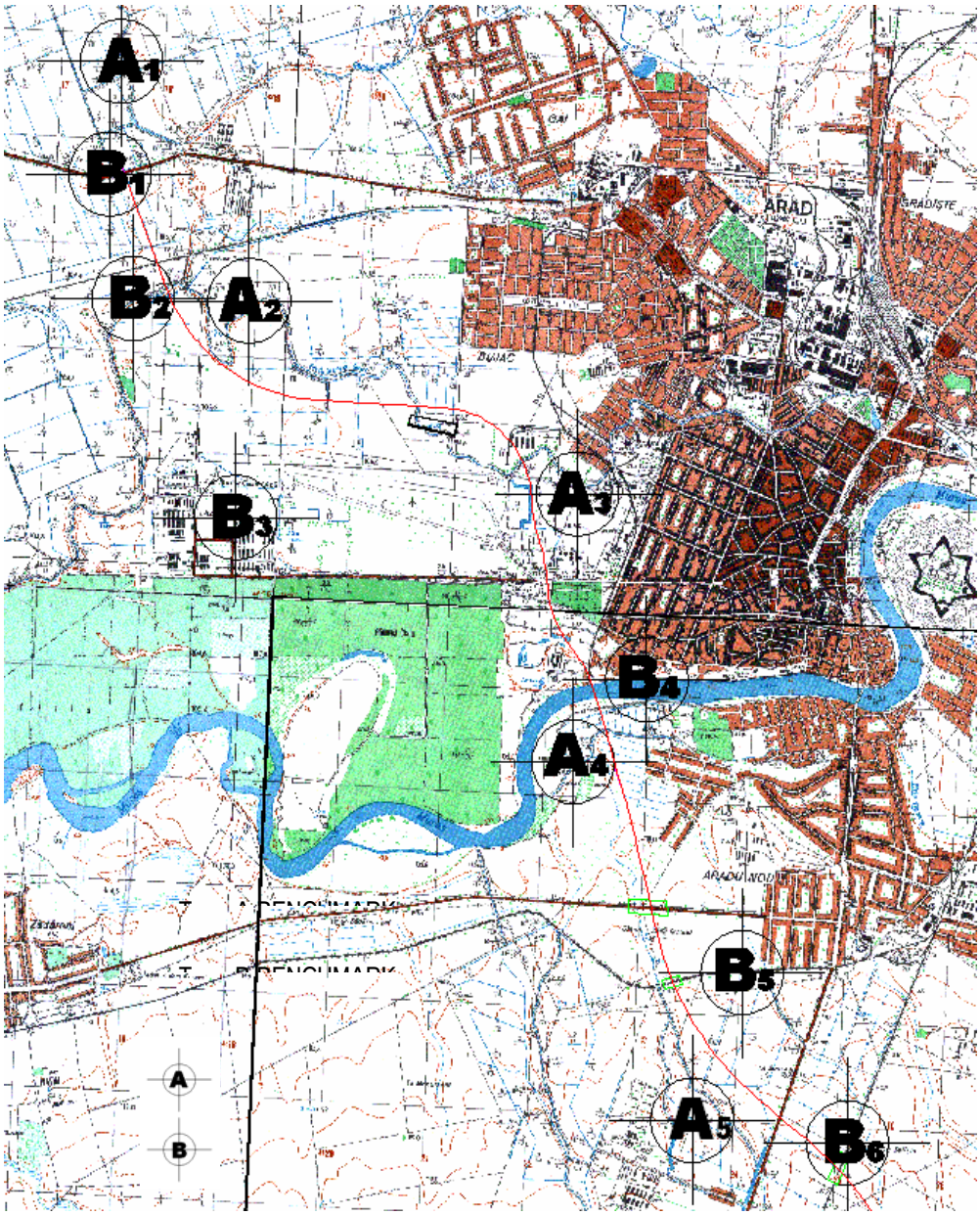

Figure 2: Benchmark placement

All the rover receivers were configured with a Coordinate Quality (CQ) of 0.05 m. A warning is displayed if the limit is exceeded.

CONCLUSIONS

The RTK topographic surveys were accomplished by using 5 Leica GPS 1200

receivers – I reference station and rovers.

For every RTK session, after assembling the reference station on a type A landmark, a type B landmark was occupied by a rover receiver in order to compare the new obtained RTK coordinates of the landmark with the previous coordinates, determined STATICALLY. The difference between the coordinates were maximum of 2 cm per after maximum 10 seconds of occupancy.

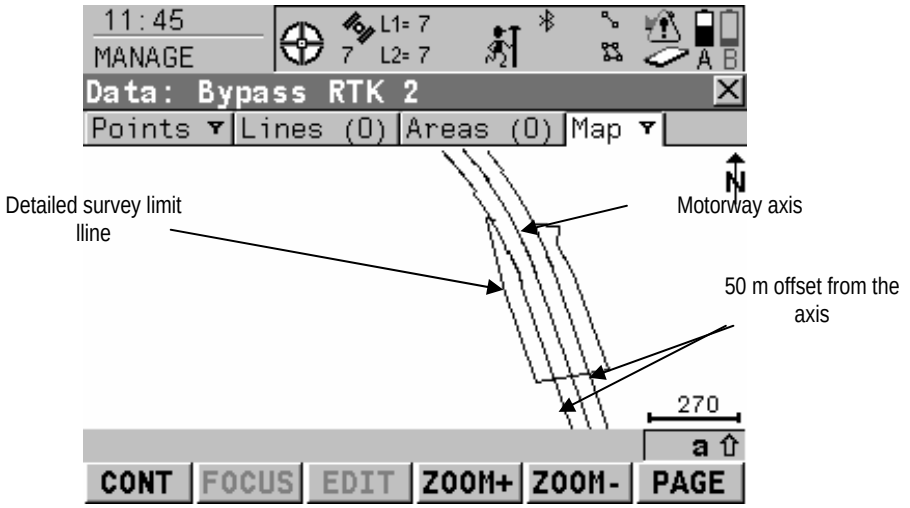

Figure 3: Motorway axis and survey limit line

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