Analele Universităţii din Craiova, seria Agricultură – Montanologie – Cadastru (Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series) Vol. XLVIII/2018

DRAWING OF THE TECHNICAL DOCUMENTATION FOR THE COMMUNAL ROAD 151-DN 6- SECTIONN 1, DRĂGHICENI COMMUNE, OLT COUNTY, BY COMBINED GPS USE – TOTAL STATION

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Key words: total station, road, surveying, GPS

ABSTRACT

For drawing up the technical documentation of the Communal Road 151 – DN 6 –Section 1, located in the Drăghiceni commune area, Olt County, it was necessary the combined use of the modern GPS topography equipment – total station. The GPS technology was used to determine the points of the support network, and the total station to thicken it and raise the points on the ground.

The computational operations were performed based on the field data, thus obtaining the absolute coordinates of the points that delineate the studied land in the Stereographic Projection System 1970.

The drawing up of operations of the placement and delineation plan of the property body consist of representing the points that delineate the surface on a sheet of A3 format at a scale of 1:5000.

INTRODUCTION

Drăghiceni commune is an integral part of the Olt County, being located 7 kilometres from Caracal city and 45 kilometres from Craiova, the administrative centre of the county.

Drăghiceni commune consists of Drăghiceni – the commune's residence, Liiceni and Grozăveşti. The entire commune covers an area of 3200 hectares (www.primariadraghiceni.ro). The connection with neighbouring localities is made by means of the E 70 (DN 6) road.

WORK METOHDS

The documentation for the location and delimitation of the property bodies plans includes: a technical memo; topographical descriptions of stable points; the inventory with the coordinates of the old points used for the topographic lifting of the building, in Stereographic System 1970; inventory with the coordinates of points on the outline of the building; the location plan of the building.

In order to draw up the technical documentation of the real estate located in the Draghiceni commune, Olt County, measurements and calculation and reporting operations were carried out. The works were carried out in the Stereographic Projection System 1970 and the field measurements were made with a **Topcon GR-3 GPS** and a total station Sokkia 530R.

GPS technology was used to determine the points of the support network and the total station to thicken it and raise the points of detail.

The support and lifting network was made up of geodetic support points:

- Old Points:

- GPS S1 point - materialized by metallic picket;
- GPS S2 point - materialized by metallic picket.

- GPS S9 point - materialized by metallic picket;
- GPS S10 point - materialized by metallic picket;

- New Points:

S3, S4, S5, S6, S7, S8.

From the S1 point a sustained traction was traced, after which the following station points were obtained: S3, S4, S5, S6, S7, S8, with closing on the S9 point.

The planimetric details were taken from the station points by the radius method.

The computational operations were made based on the field data, thus obtaining the absolute coordinates in the Stereographic Projection System 1970, of the points that delimit the studied land (Croitoru A., et al., 2012).

The drawing up of the of the location and delimitation plan of the property body consist in representing the points that delineate the surface on a sheet of A3 format at a scale of 1: 5000.

RESULTS AND DISCUSSIONS

For the preparation of the technical documentation, it is necessary to carry out: documentation and preparation of the planimetric lifting project; field operations (actual field measurement of all elements required for planimetric lifting); computing and reporting operations (Călina A., et al., 2015, Croitoru A., et al., 2016).

When designing the work project, it was necessary to study an old plan or map, to perform the land recognition, to identify geodetic points in the area of interest, known coordinate points previously used in other works in the area, surface contours, support points, and lifting points in the plan.

From OCPI Olt was obtained a plan for framing in the area for the road sector in Draghiceni commune, Olt County (fig.1).

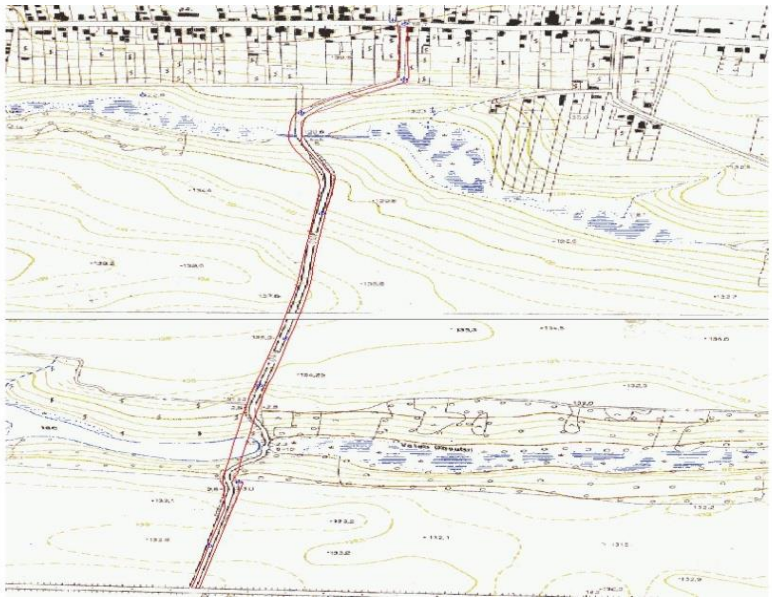

Fig.1. Plan to fit into the area

The GPS technology was used to determine the points of the support network and for thickening it with a supported roading. The raising of the points of detail was accomplished by the erasure method.

Four points were determined using the **Topcon GR-3 GPS**. The method used is RTK CINEMATIC IN REAL TIME

with double initialization. For receipt of corrections, the SLTN.2.3 permanent station was used.

Within the GPS network, the 4 points have the following coordinates (table 1):

Table 1.

Inventory of coordinates for old points

Point name	X (m)	Y (m)
GPS S1	292762.892	438219.051
GPS S2	292775.043	438202.046
GPS S9	291294.141	437962.723
GPS S10	291176.815	437940.466

For the support network, a supported roading was started from the S1 point, pointing S2 point through points S3, S4, S5, S6, S7, S8, the closing being made on the S9 point pointing the S10 point (Fig. 2.).

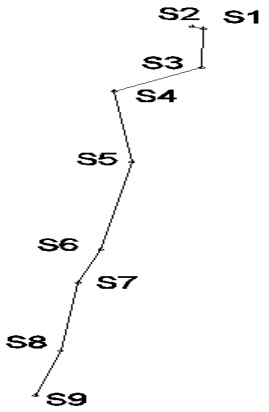

Fig.2. Sketch of the support network

The measurements were performed according to the technical regulations in force and were carried out with a Sokkia 530 R total station.

For the processing of data gathered by modern technology the observation files were downloaded, after which was made their conversion into special formats that can be loaded into calculation and compensation programs.

The calculations made with the TopoLT program determined the coordinates of the roading points (table 2).

Table 2

Inventory of coordinates for new points

Point no	X (m)	Y (m)
S3	292610.603	438220.8823
S4	292515.772	438087.469
S5	292231.839	438110.020
S6	291879.651	438062.943
S7	291747.009	438028.124
S8	291474.327	438001.502

The determination of the coordinates of the detail points was made by measuring the distances between the station point and the radiated point and their directions.

The details of the detail points are listed in table 3.

Table 3.

Inventory of coordinates for radiated points

Point no	X	Y	Point no	X	Y
1	292757.104	438224.607	42	292245.727	438116.494
2	292756.140	438223.200	43	292223.521	438113.756
3	292743.038	438222.576	44	292194.418	438110.476
4	292742.175	438222.271	45	292170.569	438107.948
5	292723.370	438222.054	46	292163.468	438106.264
6	292708.220	438221.886	47	292128.373	438102.630
7	292671.489	438222.115	48	292077.231	438098.102
8	292662.152	438222.097	49	292064.644	438098.335
9	292634.791	438223.015	50	292037.185	438095.196
10	292617.128	438223.759	51	292009.873	438092.159
11	292603.247	438220.814	52	291978.288	438086.719
12	292600.125	438220.365	53	291939.456	438079.435
13	292599.463	438213.852	54	291906.530	438073.109
14	292595.837	438209.011	55	291884.369	438068.609
15	292589.683	438200.499	56	291860.164	438063.777
16	292579.631	438184.516	57	291832.689	438058.282
17	292573.836	438175.840	58	291802.871	438051.932
18	292568.146	438165.724	59	291774.337	438045.595
19	292556.613	438154.917	60	291756.235	438040.952
20	292547.521	438142.201	61	291737.550	438036.290
21	292538.339	438130.285	62	291717.796	438032.420
22	292535.760	438126.896	63	291699.734	438029.375
23	292528.201	438117.626	64	291660.196	438022.467
24	292522.016	438108.750	65	291615.485	438016.106
25	292519.098	438104.504	66	291577.539	438010.344
26	292512.434	438096.047	67	291536.384	438004.466
27	292505.261	438090.097	68	291513.756	438000.998
28	292494.151	438086.809	69	291501.734	437999.880
29	292472.352	438083.814	70	291488.004	437995.518
30	292454.550	438083.726	71	291476.622	437993.518
31	292439.405	438083.064	72	291475.046	438007.075
32	292425.642	438085.616	73	291471.056	438006.792
33	292414.301	438090.354	76	291176.621	437950.161
34	292398.611	438097.205	84	291176.815	437940.466
35	292384.414	438103.898	85	291201.161	437944.409
36	292368.839	438110.856	86	291301.308	437963.524
37	292353.836	438116.374	87	291401.456	437982.640
38	292336.119	438127.741	88	291453.870	437981.920
39	292308.261	438125.032	89	291480.220	437980.235
40	292279.013	438120.980	90	291491.176	437980.738
41	292252.783	438117.256	91	291503.379	437982.691
92	291518.990	437985.294	124	292381.020	438089.373

93	291541.445	437988.736	125	292395.275	438082.653
94	291582.590	437994.613	126	292411.274	438075.668
95	291620.531	438000.374	127	292424.200	438070.268
96	291665.409	438006.759	128	292441.019	438067.149
97	291705.136	438013.700	129	292456.573	438067.418
98	291723.350	438016.770	130	292476.442	438067.949
99	291743.674	438020.752	131	292500.182	438071.212
100	291762.778	438025.519	132	292515.333	438075.695
101	291776.797	438028.569	133	292526.098	438084.624
102	291813.041	438036.337	134	292533.586	438094.219
103	291816.468	438037.072	135	292536.704	438098.755
104	291875.850	438049.799	136	292542.608	438107.227
105	291882.106	438051.140	137	292550.158	438113.229
106	291882.256	438051.172	138	292556.699	438123.450
107	291888.537	438052.518	139	292567.413	438142.449
108	291893.350	438053.550	140	292577.749	438160.192
109	291991.098	438071.011	141	292583.810	438169.834
110	291997.370	438072.131	142	292589.686	438179.031
111	292003.637	438073.251	143	292598.392	438193.221
112	292009.901	438074.370	144	292604.323	438201.600
113	292018.971	438075.990	145	292610.370	438206.609
114	292030.348	438077.308	146	292616.662	438208.420
115	292036.665	438078.039	147	292626.434	438209.212
116	292147.475	438090.875	148	292645.002	438209.704
117	292154.789	438091.535	149	292665.377	438210.430
118	292269.955	438104.240	150	292665.377	438211.216
119	292281.093	438104.996	151	292693.775	438209.929
120	292308.785	438107.197	152	292724.036	438210.800
121	292333.603	438105.706	153	292757.778	438209.460
122	292352.310	438101.114	154	292760.068	438207.990
123	292366.049	438096.061			

After determining the absolute coordinates of the points, they relate to a scale on a plan, after which they are merged according to the sketches on the ground, obtaining the ground plan that is the result of the planimetric elevations.

The location and delimitation plan operations were performed with AutoCad. Finally, the resulting plan was printed on a sheet of A3 paper, at a scale of 1:5000 (fig. 3).

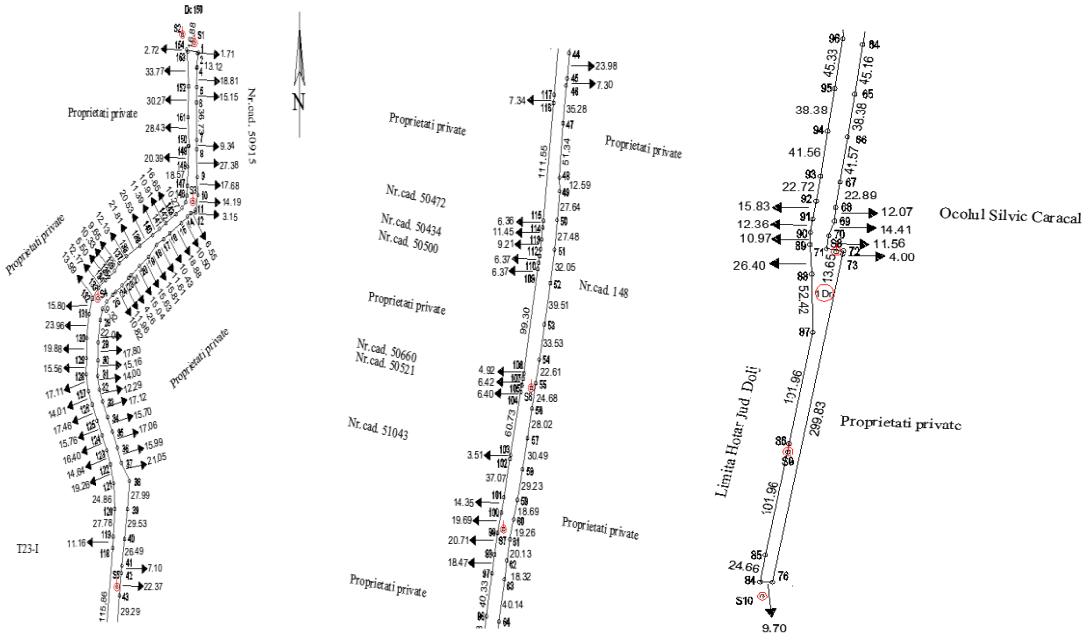

Fig.3. The location and delimitation plan

Having the absolute coordinates of the points, the property area was calculated by the *analytical method*, using one of the following calculation formulas:

$$2S = \sum_{n=1}^{n} X_n (Y_{n+1} - Y_{n-1}).$$

$$2S = \sum_{n=1}^{n} X_n (Y_{n+1} - Y_{n-1}).$$

$$2S = \sum_{n=1}^{n} Y_n (X_{n+1} - X_{n-1}) 2S = \sum_{n=1}^{n} Y_n (X_{n-1} - X_{n+1}).$$

The total measured area of the road section in Draghiceni commune, Olt County is of 25209 sqm.

CONCLUSIONS

In order to carry out topographical measurements to establish the boundaries of the real estate subject to the project, it was necessary to build a thickening and lifting network using GPS technology combined with measurements with the total station.

The topographic measurements were performed in the “Stereograph 1970” projection system using a Topcon GR-3 GPS with 72 channels and two operating frequencies and a total Sokkia 530 R station. Data processing was done at the office using specialized software.

The location and delineation plan operations consist of representing the points that delineate the surface on a sheet of A3 format at a scale of 1:5000.

The surfaces were determined from the rectangular coordinates of the contour points resulting from the processing of the field measurements, based on the coordinates of the geodetic points and the points that constituted the support network.

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