



INACCURACIES IN AREA OBJECTS TRANSFERRED FROM THE MAP OF THE RESTORED PROPERTY TO THE CADASTRAL MAP

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ABSTRACT: *The cadastral map and cadastral registers are created under conditions of maximum use of the existing map of the restored property and the current cadastral plans of the settlements. In the practice of the Geodesy, Cartography and Cadastre Agency - in the process of creating a cadastral map and cadastral registers and maintaining the already approved cadastral map and cadastral registers in an up-to-date state, discrepancies are found in the non-urbanized territory, which are transferred to the cadastral map and cadastral registers registers from the restored property map.*

KEYWORDS: *inaccuracies, cadastral map, map of the restored property*

1. Introduction

After the change of the socio-economic system in Bulgaria after 1944, the laws adopted until then were repealed and the cadastre acquired a different meaning. It is used for the overall planning and construction of the socialist society. The boundaries of properties in urbanized areas are primarily defined. Outside of them, the labor-cooperative farms are created and state farms, where the territories belong to the state, and it should be noted that therefore no expropriation measures were carried out, in other words the land always belonged to the owners.

After the abolition of the socialist regime in Bulgaria, the XXXVI National Assembly adopted a number of restitution laws, which restored social justice in relation to the former owners, violated by the People's Power after September 9, 1944. Two of these laws are the Law on the Ownership and Use of Agricultural Lands and Law on restoration of ownership of forests and lands from the forest fund.

In the procedures for restoring the ownership of agricultural lands and lands and forests from the forest fund, land division plans, maps of the properties in existing or recoverable old real boundaries and plans of forests and lands from the forest fund were created for the entire non-urban territory of the country with registers to them. Plans, maps and registers are created, used and maintained digitally through specialized software. From the content of these plans and maps, a unified graphic product called the restored property map for the agricultural and forest territories with registers was subsequently created in digital form. [3]

In 2015, a Concept for accelerated creation of a cadastral map and cadastral registers and acceleration of the process of creating a property register was adopted.

The purpose of the concept is to speed up the process of creating a cadastral map and cadastral registers for the territory of the entire country, by creating a cadastral map and cadastral registers for the non-urbanized territory, using the data from the map of the restored property.

When maintaining the cadastral map and cadastral registers, discrepancies in the non-urbanized territory are found incidentally - on the occasion of specific applications from individual interested parties. In most cases, the identified discrepancies are inaccurately reflected or missing topographic objects of natural or artificial origin - rivers, ravines, roads, technical infrastructure. [4]

The maps of the reclaimed property created after 1990 contain numerous errors that were carried over from the existing large-scale topographic maps. Large-scale topographic maps created in the years 1964-1968 were directly used to create maps of the restored property, without repeated aerial photography and deciphering of the objects.

2. Results of experimental studies on inaccuracies of area objects transferred from the map of the restored property to the cadastral map and cadastral registers

The differences between the areas of several objects in the north-eastern part of Bulgaria in the 1970 coordinate system, BGS2005 and geodetic measurements were studied and analyzed.

The permissible errors in the repeated (control) measurement of the area of the land property are:

$$(2.1.) \quad mP_{per.} = 2 \partial S \sqrt{P}$$

The permissible values of ΔS and ∂S for non-urbanized areas are:

1. For points of permanently materialized boundaries of land properties, massive buildings and facilities of the technical infrastructure $\Delta S \leq 60$ cm and $\partial S \leq 40$ cm;

2. For points of non-permanently materialized borders of land properties $\Delta S \leq 120$ cm and $\partial S \leq 80$ cm. [5]

For the purposes of the present analysis and evaluation, land data from the digital model of the cadastral map for some of the cities and villages in the different zones in the CS 1970 were used. The BGSTrans software was used to perform the transformation from the CS 1970 to the Cadastral System 2005. Data from CS 1970 were entered into Mcad and software options were used to calculate land areas in CS 1970 and in the cadastral system.

The coordinates of the corner points of the objects in the BGS 2005 Cadastral coordinate system were calculated from the cadastral map. Using the reported coordinates and the coordinates obtained by direct geodetic measurements, the areas of all objects were calculated.

- The differences in the coordinates and in the absolute position for the first object, sanitary-security zone belt "A" with identifier 51158.33.368, located in the land of Naum village, Kaolinovo municipality, Shumen region (fig. 1.), are given in Table 1. , and the area differences are given in Table 2.

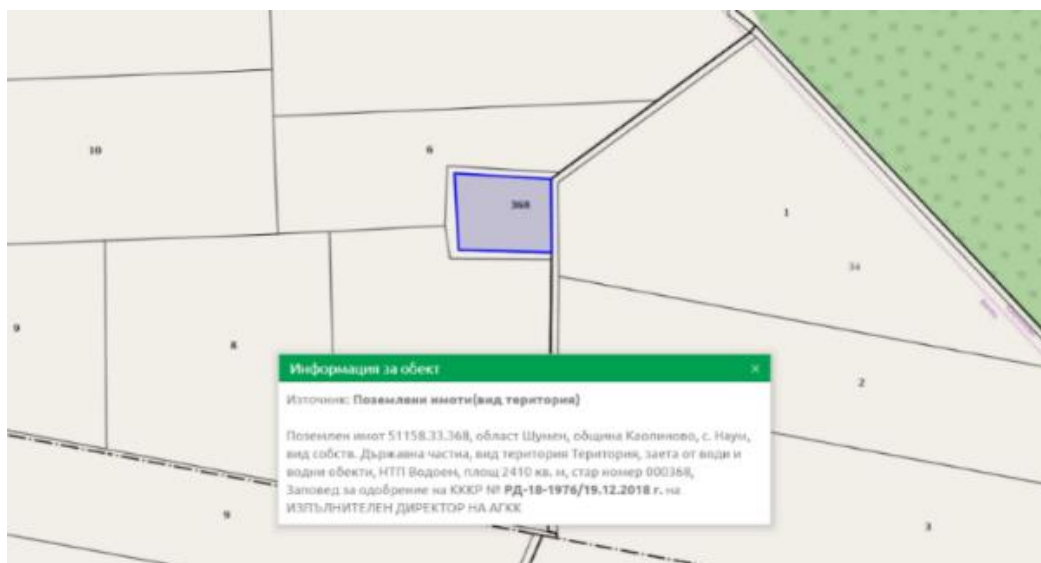


Fig. 1. Sanitary and security zone belt "A" with identifier 51158.33.36, located in the village of Naum

Table 1
Differences in coordinates and in the absolute position of the points

№ on the CRners of the property	Reported coordinates BGS 2005		Measured coordinates BGS 2005		Differences		
	X (m)	Y (m)	X (m)	Y (m)	dx (m)	dy (m)	ds (m)
1	4830274,980	622205,000	4830252,190	622190,572	-22,794	-14,428	26,977
2	4830278,410	622149,000	4830256,176	622151,905	-22,230	2,905	22,419
3	4830233,730	622151,000	4830224,151	622151,003	-9,576	0,003	9,576
4	4830232,280	622206,000	4830219,696	622187,232	-12,585	-18,768	22,597

Table 2
Differences in area

Area			Differences		
1970 y. (m ²)	BGS 2005 Cadastral map (m ²)	BGS 2005 Geodetic measurements (m ²)	1 (1-2) (m ²)	2 (3-2) (m ²)	3 (3-1) (m ²)
1	2	3	4	5	6
2409,340	2410,000	1216,989	-0,660	-1193,010	-1192,350

The difference 1 in column 4 of table 2.2 is obtained by subtracting column 1 minus column 2, the difference in column 5 of table 2.2 is obtained by subtracting column 3 minus column 2, the difference in column 6 of the same table 2.2 is obtained by subtracting column 3 minus column 1.

Using formula (2.1.), the permissible differences were calculated:

$$mP_{per} = 2\Delta S\sqrt{P} = 2 * 1.20 * \sqrt{1216,989} = 83,725 \text{ m}^2$$

The permissible value for the first object is obtained 83.725 m², the difference obtained in the area after geodetic measurements is 1193.01 m², which is significantly greater than the permissible value.

- The differences in the coordinates and in the absolute position for the second object, sanitary-security zone belt "A" with identifier 32562.3.612, located in the land of Izgrev village, Venets municipality, Shumen district (fig. 2.), are given in Table 3 , and the area differences are given in Table 4.

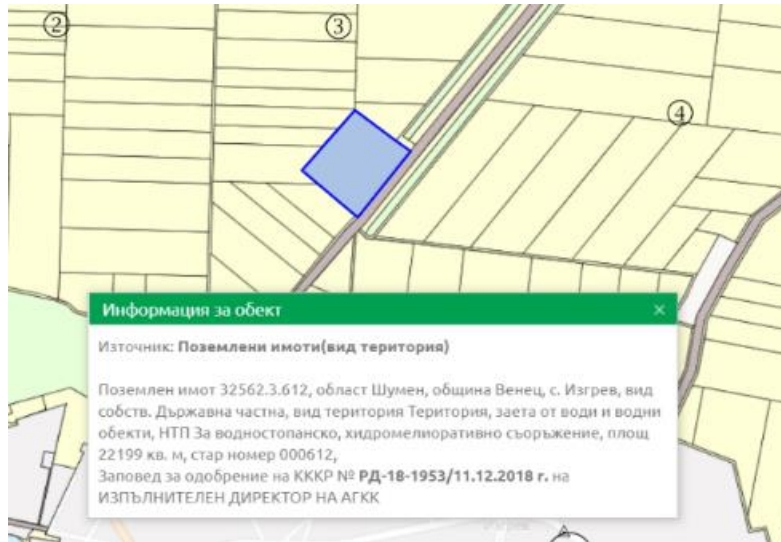


Fig. 2. Sanitary and security zone belt "A" with identifier 32562.3.612, located in the village of Izgrev

Table 3
Differences in coordinates and in the absolute position of the points

№ on the CRners of the property	Reported coordinates BGS 2005		Measured coordinates BGS 2005		Differences		
	X (m)	Y (m)	X (m)	Y (m)	dx (m)	dy (m)	ds (m)
1	4830223,250	620224,000	4830225,947	620233,481	2,696	9,481	9,857
2	4830352,633	620327,000	4830344,877	620330,274	-7,756	3,274	8,419
3	4830432,320	620219,000	4830429,927	620225,218	-2,393	6,218	6,662
4	4830314,836	620115,000	4830315,012	620127,255	0,176	12,255	12,256

Table 4
Differences in area

Area			Differences		
1970 y. (m ²)	BGS 2005 Cadastral map (m ²)	BGS 2005 Geodetic measurements (m ²)	1 (1-2) (m ²)	2 (3-2) (m ²)	3 (3-1) (m ²)
1	2	3	4	5	6
22196,29	22242,38	20829,295	-46,09	-1413,085	-1366,995

Using formula (2.1.), the permissible differences were calculated:

$$P_{per} = 2\Delta S\sqrt{P} = 2 * 1,20 * \sqrt{20829,295} = 346,377 m^2$$

The permissible value for the object sanitary-security zone belt "A" with identifier 32562.3.612 is 346,377 m², and the difference obtained in the area after geodetic measurements is 1413,085 m², which is significantly greater than the permissible value.

- The differences in the coordinates and in the absolute position for the third object, the sanitary-security zone of the field "A" with the identifier 72401.23.813, located in the land of the village of Timarevo, the municipality of Khitrino, the district of Shumen (fig.3.), are given in Table 5, and area differences are given in Table 6.

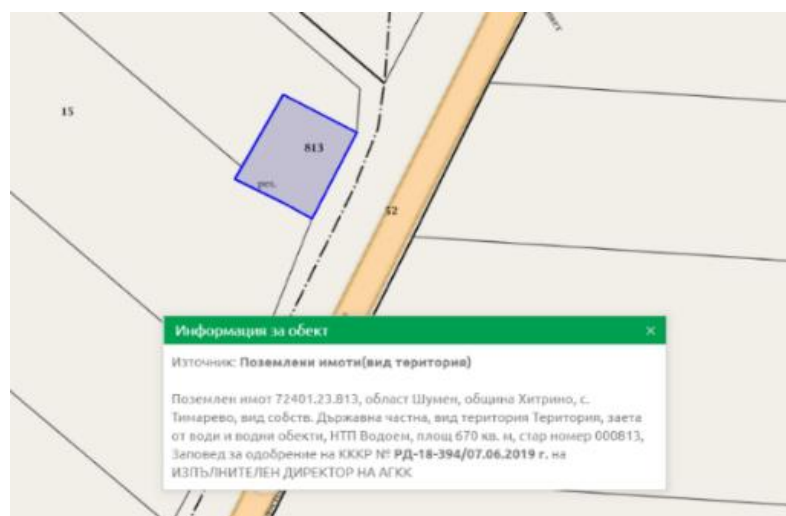


Fig. 3. Sanitary and security zone belt "A" with identifier 72401.23.813, located in the village of Timarevo

Table 5

Differences in coordinates and in the absolute position of the points

№ on the CRners of the property	Reported coordinates BGS 2005		Measured coordinates BGS 2005		Differences		
	X (m)	Y (m)	X (m)	Y (m)	dx (m)	dy (m)	ds (m)
1	4808822,727	614990,000	4808819,835	614998,085	-2,893	8,085	8,587
2	4808834,039	614968,000	4808831,265	614971,501	-2,774	3,501	4,467
3	4808857,594	614983,000	4808857,451	614983,271	-0,143	0,271	0,306
4	4808847,336	615003,000	4808846,231	615009,667	-1,105	6,667	6,758

Table 6
Differences in area

Area			Differences		
1970 y. (m ²)	BGS 2005 Cadastral map (m ²)	BGS 2005 Geodetic measurements (m ²)	1 (1-2) (m ²)	2 (3-2) (m ²)	3 (3-1) (m ²)
1	2	3	4	5	6
670,250	670,250	828,679	0,000	158,429	158,429

Using formula (2.1.), the permissible differences were calculated:

$$P_{per} = 2\Delta S\sqrt{P} = 2 * 1,20 * \sqrt{828,679} = 69,088 \text{ m}^2$$

The permissible value for the object sanitary-security zone belt "A" with identifier 72401.23.813 is 69,088 m², and the difference obtained in the area after geodetic measurements is 158,429 m², which is greater than the permissible value.

- The differences in the coordinates and in the absolute position for the fourth object, an energy production building (substation) with identifier 36419.63.70.1, located in the land of Karapelit village, Dobrichka municipality, Dobrich region (fig. 4.), are given in Table 7, and the area differences are given in Table 8.

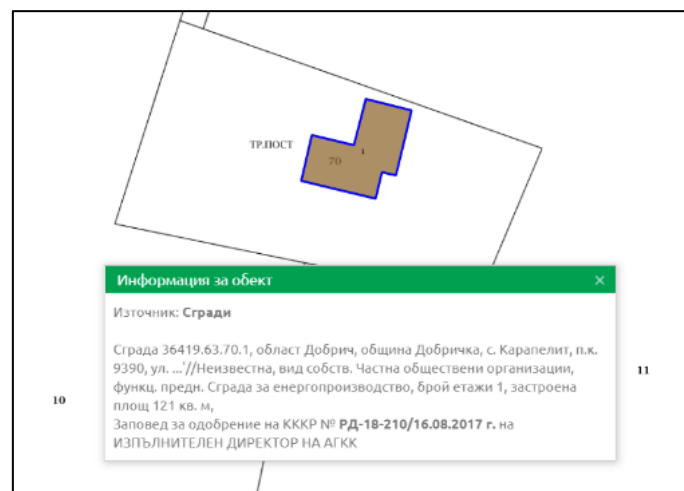


Fig. 4. Energy production building (substation) with identifier 36419.63.70.1, located in Dobrich district

Table 7
Differences in coordinates and in the absolute position of the poin

№ on the CRners of the property	Reported coordinates BGS 2005		Measured coordinates BGS 2005		Differences		
	X (m)	Y (m)	X (m)	Y (m)	dx (m)	dy (m)	ds (m)
1	4837037,532	666053,461	4837029,330	666051,448	-8,202	-2,013	8,445
2	4837038,725	666047,645	4837030,374	666044,364	-8,351	-3,281	8,972
3	4837032,387	666046,154	4837022,247	666042,426	-10,140	-3,728	10,804
4	4837029,927	666056,592	4837019,339	666054,952	-10,588	-1,640	10,714
5	4837033,506	666057,562	4837022,918	666055,623	-10,588	-1,939	10,764
6	4837033,133	666059,500	4837022,620	666057,338	-10,513	-2,162	10,733
7	4837042,304	666061,663	4837033,804	666059,649	-8,500	-2,014	8,735
8	4837043,870	666055,250	4837035,295	666052,566	-8,575	-2,684	8,985

Table 8
Differences in area

Area			Differences		
1970 y. (m ²)	BGS 2005 Cadastral map (m ²)	BGS 2005 Geodetic measurements (m ²)	1 (1-2) (m ²)	2 (3-2) (m ²)	3 (3-1) (m ²)
1	2	3	4	5	6
121,240	121,000	164,423	0,240	43,423	43,183

Using formula (2.1.), the permissible differences were calculated:

$$P_{per} = 2\Delta S\sqrt{P} = 2 * 1,20 * \sqrt{164,423} = 30,775 \text{ m}^2$$

The permissible value for the object building for energy production (substation) with the identifier 36419.63.70.1 is 30,775 m², and the difference obtained in the area after geodetic measurements is 43,423 m², which is greater than the permissible value.

3. Conclusion

The general condition of the maps of the restored property produced and subsequently maintained by the structures of the Ministry of Agriculture and Food in terms of accuracy is not good due to the fact that the provision of Art. 26 of the Regulations for the Implementation of the Law on the Ownership and Use of Agricultural Lands to amend the same. This has necessitated the adoption of

provisions to allow the correction of errors from converted maps of restored property and development plans in cadastral maps and cadastral registers.

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