Monitoring of wintering geese in the AES Geo Energy Wind Farm "Sveti Nikola" territory and the Kaliakra region in winter 2013/2014

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Contents

Introduction

This report presents results of the ornithological survey and monitoring at Saint Nikola Wind Farm (SNWF) in the period 01 December 2013 to 15 March 2014, continuing from similar studies in previous winters before and after construction of SNWF. The primary objective of wintering bird studies at SNWF is to investigate the possible effects of the wind farm on geese populations, notably the Red-breasted Goose *Branta ruficollis* (RBG) due to its globally threatened conservation status. Previous years' wintering studies at SNWF have been reported and presented for download on the AES SNWF website.

To date, as documented by previous reports, there have been no indications that SNWF has had any adverse impact on wintering geese, including RBG, and the more abundant Greater White-fronted Goose *Anser albifrons* (GWFG). This report presents the latest findings, from the 2013/14 winter, which continued to scrutinise the possibility of an adverse impact on wintering geese through SNWF's operation.

Methods

Methods were the same as in previous winter surveys. Data were collected within a 'core study area' that encompassed an area centered on the SNWF wind farm, but with additional areas in a buffer that extended at least 2 km from the wind farm (Figure 1): this is to distinguish this area of consistent effort across winters from a much wider area where observations were also undertaken periodically, that extended north, up the coast to the freshwater lake of Durankulak (see report for the 2010/11 winter). The 'footprint' of the SNWF wind farm, prescribed by a perimeter around the outermost turbines, is referred to as the 'SNWF territory' (also referred to as the Project Area in some previous reports).

The 75 days of the study encompassed the whole period when geese were recorded in the core study area, including SNWF, during 2013/14. Detailed observations were made daily, so far as possible within the constraints of suitable weather, on the location and counts (including species composition) of birds involved in flight activity and feeding behavior of any flocks within the wind farm and its vicinity. Observation points and the coverage of the BirdScan radar were as in the previous winters (for details see reports of winter monitoring 2008 – 2013 at http://www.aesgeoenergy.com/site/Studies.html). Some observation points (termed 'temporary' in Figure 1) were attended less frequently, and were used adaptively according to weather condition constraints and the ongoing behavior of the geese. Those close to the SNWF turbines were only used to record feeding geese, after the main early morning flight activity period had finished. Observations were also taken occasionally from vantage points close to the Black Sea in order to check periodically if geese may have been using the sea as roost sites. These points were visited more frequently when it was apparent, from records at the points and from flight line timings and directions that such behavior was regular. Crop types within the core study area were also recorded.

Searches under turbines for collision victims were set to be undertaken, as in previous winters, under a protocol for a basic seven day search interval that was to be

instigated after geese were first observed in the study area and conducted according to where the presence of geese could, potentially, result in collision. Searches were also due to be reduced in frequency well after it was apparent that geese were no longer observed in the study area. In practice for 2013/14, this protocol of a seven-day interval search under every turbine could not be realized because of the weather conditions of the 2013/14 winter, which was unusually mild and alternated quickly between snowfalls and snowmelt. The weather conditions led to search areas often either being temporarily inundated with soft snow or being thick, waterlogged mud. While these conditions facilitated binocular searches for collision victims from turbine towers they were often not conducive to physical searches on transects around turbines, as was planned.

These same conditions, however, also apparently led to a lower use of the region (including SNWF) by wintering geese (see Results). Hence, while the search regime was disrupted by the weather conditions, these same weather conditions also apparently led to a substantially reduced number of geese at risk of collision. In this respect, and with the coincidence between times when searches were difficult to conduct, and the absence of geese, then the inability to search every turbine every seven days should not have had any material effect on the discovery of any geese collision victims.

The searching procedures involved the use of GPS units to allow tracking and recording of search paths when observers were searching for collision victims under turbines, as in the previous winter.

A detailed description of methods underlying the decisions and procedures for switching off turbines (the Turbine Shutdown System: TSS) under a risk of bird collisions, is described in a number of previous reports and in the Owner Ornithological Monitoring Plan. The feeding grounds within the wind park territory identified in the winter surveys were investigated daily and the number of feeding geese at these sites and weather conditions (i.e. heavy mist, fog) were the bases of decisions for the TSS for reduction of the collision risk; as in previous winters.

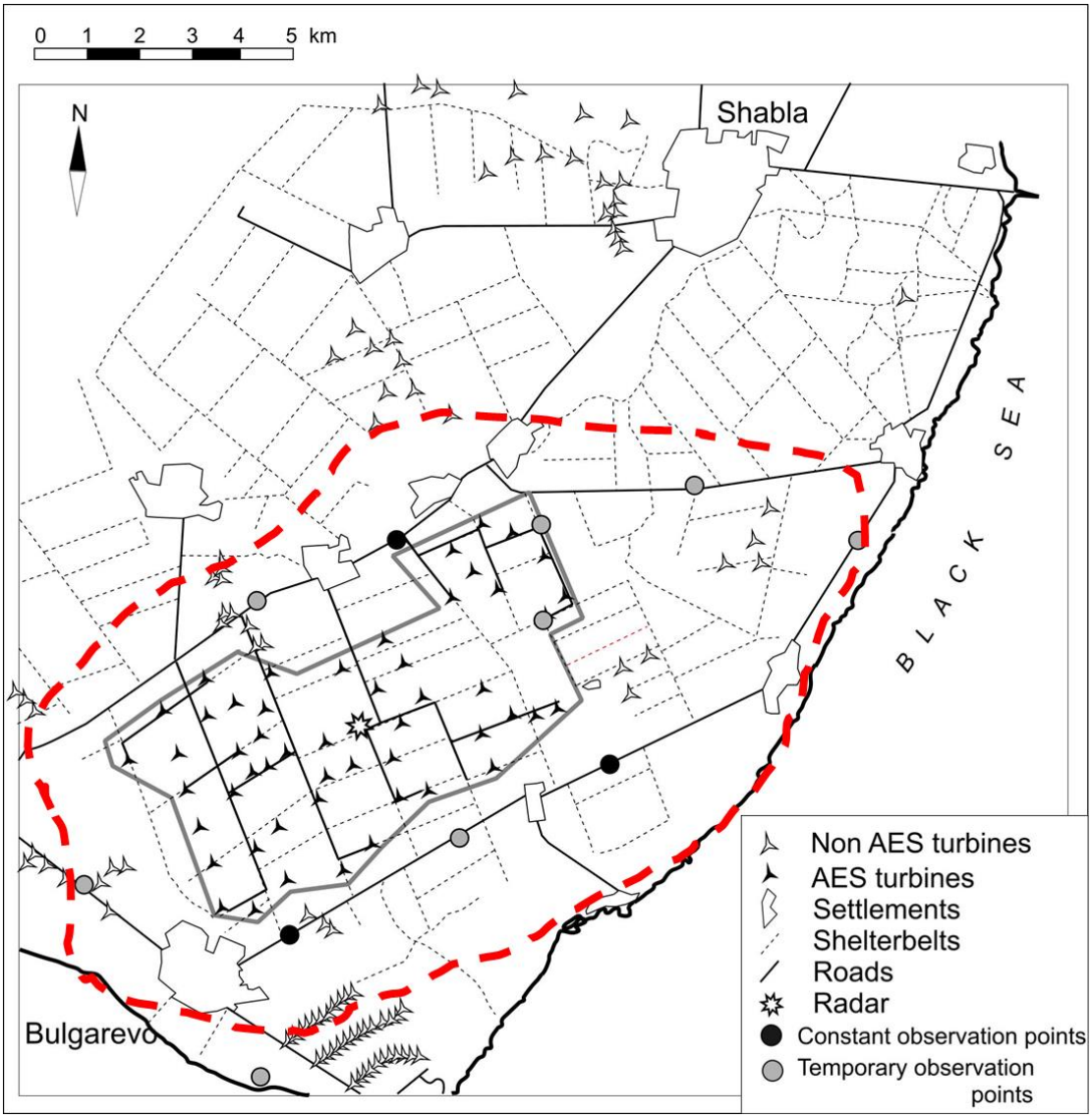

Figure 1. Map of the "SNWF" study area (grey line), and the "core study area" (red line) covered by the winter monitoring 2013 – 2014.

List of participants in the observations

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Results

Geese were observed within the core study area on 17 days between 27 January 2014 and 20 February 2014 (see Annex 1 for day by day movements of geese as recorded in the field). The number of birds per species, excluding geese species, is presented in Table 1 (for consistency with previous reports these are shown for January and February only, although observations of non-geese species were also made in December and the first fortnight in March). The estimated observed total number of geese, accepting the difficulty in goose species identification under distance, flock size and rapid flight activity constraints (see report for 2012/13 winter for details) is presented in Table 2.

Table 1. The total number of observed birds of different species (excluding geese: see Table 2 for geese) in the core study area (Fig. 1) recorded in winter season 2013 - 2014 during January and February (data from visual observations).

Species	January	February	Total
A. gentilis		1	1
A. nisus		2	2

Species	January	February	Total
A. platyrhynchos	62	125	187
Anas sp.		7	7
B. buteo	23	119	142
B. lagopus	1	5	6
B. rufinus	3	2	5
Buteo sp.		8	8
C. aeruginosus		1	1
C. cornix		2	2
C. cyaneus	15	109	124
C. cygnus		331	331
C. frugilegus		260	260
C. monedula		80	80
C. oenas	15		15
C. olor		638	638
Cygnus sp.	126	430	556
E. alba		34	34
F. cherrug	1		1
F. columbarius	1	3	4
F. tinnunculus	3	8	11
H. albicilla		2	2
L. cachinans	12		12
L. canus	11	109	120
L. michahellis		175	175
N. arquata	1		1
P. crispus		8	8
P. perdix	21	28	49
P. pica		28	28
Ph. carbo	86	1119	1205
Pl. apricaria		52	52
Plectophenax nivalis		2	2
T. ferruginea	16	1	17
T. pilaris		250	250
T. tadorna	15	66	81
V. vanellus		1	1

Total number of observed goose species and their locations

The estimated totals of three species of goose, RBG (*Branta ruficollis*), GWFG (*Anser albifrons*) and Greylag Goose (*Anser anser*) observed in the winter 2013/2014 in the core study area, are shown in Table 2. No Lesser White-fronted Geese (*Anser erythropus*) were seen in winter 2013/2014.

Table 2. The number of geese of different species recorded in the core study area (data from visual observations in winter 2013/2014).

Species	January	February	Total
A. albifrons	3211	8112	11323
A. anser	0	56	56
Anser/Branta	480	16177	16657
B. ruficollis	1580	3586	5166
Grand Total	5271	27931	33202

The recorded numbers of feeding geese of all species in the core study area varied during the season with short periods of maximum per species (Table 3). The maximum number of RBG feeding in SNWF was observed in mixed geese flocks on 02 February 2014.

The winter's unusually mild weather was probably the main reason for the lowest numbers of geese observed in 2013/14, in six consecutive winters of SNWF monitoring. Estimated totals of all geese (RBG and GWFG) seen flying and feeding within SNWF were 2725 and 3060 respectively (Table 3). Day by day numbers, as well as spatial distribution of feeding and flying geese within SNWF and out with SNWF but within the core study area, are presented in Table 3. Despite the low numbers of geese in the core study area and in the wider region, geese (including RBG) were once more recorded as feeding in and flying through the operational SNWF wind farm.

Daily records (not corrected for potential duplication of observations of the same birds) of distributions of geese are shown in a number of maps in Annex 1 of this report.

Table 3. Daily numbers of goose flights and geese feeding on the ground (RBG and GWFG, and mixed species flocks) inside the SNWF study area ("inside SNWF"), and out with the wind farm but within the core study area ("outside SNWF"), after correction for potential replicate records.

Date	Flights inside SNWF			Flights outside SNWF			Feeding inside SNWF			Feeding outside SNWF		
	RBG	GWFG	Mixed	RBG	GWFG	Mixed	RBG	GWFG	Mixed	RBG	GWFG	Mixed
27 January	100	1749				480						
28 January		111			111		40	100		1000		
29 January		40		400	1000		40	100				
01 February		100								1000	3000	
02 February	180	250		60	300				2280			
03 February		55					50	450				
04 February		140			47					2100	400	
05 February				100	93	1325						
07 February					840					15	1500	
09 February				27	42	1300						5300
10 February				54	72	72						4400
11 February					820	1500						
13 February					1							
20 February					2							
Totals	280	2445	0	641	3328	4677	130	650	2280	4115	4900	9700

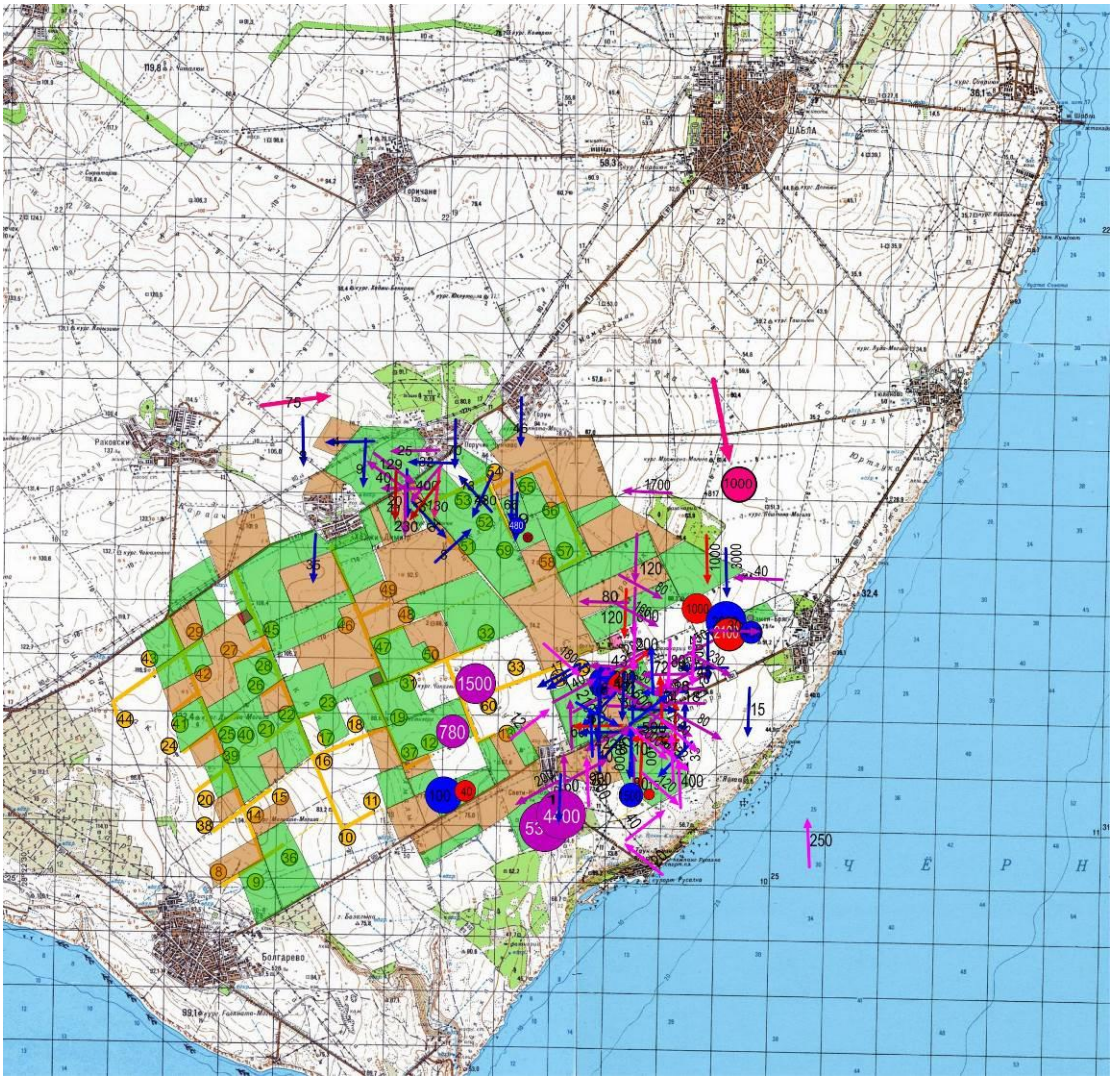


Figure 2. Raw data representing spatial distribution of GWFG (blue), RBG (red) and mixed flocks (purple) in the study area as observed in winter 2013 – 2014. Flights are shown as lines, with arrows indicating direction of flight, and circles indicate observations of feeding flocks on the ground. Wind turbines of SNWF are shown by the yellow numbered circles. Wheat fields are shown in green. Brown fields are ploughed, but potentially can be used by feeding geese because of the last season's crop seeds. White colored fields between turbines are planted with rape.

The difference in the spatial distribution of geese in winter 2013/2014 was likely dependent on the mild winter and so a relatively small proportion of the usual RBG population overwintered in the region of Durankulak and Shabla lakes during the 2013/14 winter season.

Because of the unusual winter weather and extremely low numbers of observed geese of all three species a detailed analysis of the flight altitudes as well as circadian variations in their activity is not especially meaningful, and while superficially similar to previous seasons do not allow a useful comparison of the same parameters from the previous five winters.

Carcass monitoring results

All 52 turbines were programmed to be searched every seventh day (when turbines where accessible) for carcasses during the whole winter survey period (01 December 2013 – 15 March 2014). The enacted frequencies of searches, as well as names of the field ornithologists involved in the surveys, are presented in Table 5. Some limitation on programmed searches in the study period resulted from restricted access because of weather conditions: mostly deep temporary snow drift or thick mud due to rapid snow melt or heavy rain. In such situations the plots of 200 x 200 metres under turbines were searched from the turbine base (stairs and platform around 3 meters high) by binoculars. Hence, on several days the surroundings of turbines were not accessible and thorough searches were impossible, which is a limitation on the basic protocol as anticipated. This is reflected in a sample size of 270 turbine-days searched during the monitoring period (Table 5).

However, as regards the target species – wintering geese – this practical limitation of deep snow or thick mud which generated difficulties faced by observers searching for carcasses were the same as those faced by feeding geese and geese looking for feeding opportunities (engendering a risk of collision). In other words, while several searches could not be made because of ground conditions generated by the unusually mild weather, these same conditions also were not conducive to geese using the wind farm area – neither searchers nor geese could access areas of thick snow or deep near-liquid mud. So while searches could not be conducted in such conditions, there was nothing or little, potentially, to search for as regards collision victims. Moreover, probably because of the mild weather, there were relatively few geese, anywhere in the study area, that were present across the whole winter. Generically, the risk of collision was therefore even lower than in previous winters – when this risk in previous winters has been shown to be very low, even when substantially more geese were present.

Overall, therefore, the reduced capacity for searches under turbines created by the unusual weather conditions in the 2013/14 winter should not have reduced the capacity for recording any collision events for the primary target species – wintering geese.

Table 5. The numbers of turbines searched for collision victims in winter season 2013/2014 (01 December 2013 – 29 February 2014) when geese were present in the region and turbines were accessible for the searchers.

Turbine number/searcher name	I. R.	K.B.	S.P.	V.V.	Grand Total
8	2	1		1	4
9	2	1		1	4
10	2	2		3	7
11	2	1		2	5
12	2	1	2	1	6
13	1	2		1	4

Turbine number/searcher name	I. R.	K.B.	S.P.	V.V.	Grand Total
14	2	2		1	5
15	2	2			4
16	2	1	1	2	6
17	2	2		2	6
18	2		1	1	4
19	2	1	1	1	5
20	2	2		2	6
21	2	1	1	1	5
22	2	1	1	1	5
23	1	3	1	1	6
24	1	3	1	1	6
25	2	4	1	1	8
26	1	3	1		5
27	1	1		2	4
28	1	2	1	1	5
29	2	2	1	1	6
31	2	1	2		5
32	3	1	1	1	6
33	1	4			5
34	1	4			5
35	1	4			5
36	2	1		1	4
37	2		2	1	5
38	2	2		1	5
39	2	1		2	5
40	2	2	1	1	6
41	2	2	1		5
42	2	2	1	2	7
43	2	2	1	2	7
44	3	2	1		6
45	1	1	1	2	5
46	2	1		2	5
47	1	1		2	4
48	1	1		2	4
49	1	1		1	3
50	2	2			4
51	1	1	2	1	5
52	1			5	6
53	1	1	1	3	6
54	1			2	3
55	1	1		4	6
56	1	1		4	6
57	1	1		4	6

Turbine number/searcher name	I. R.	K.B.	S.P.	V.V.	Grand Total
58	1	1		4	6
59	1			3	4
60	1	3		1	5
Grand Total	**83**	**82**	**27**	**78**	**270**

There were two carcasses which can be associated with a collision with the turbines in the 2013/14 winter: one coot (*Fulica atra)* and one mistle thrush *(Turdus pilaris)* were found. Both species are of least concern according to the IUCN criteria and are not listed in Bulgarian Red Data Book.

Table 6. The results of the collision victim monitoring in winter season 2013/2014.

Species/genus	feather	feathers	intact	wing	Grand Total
Alauda arvensis		1			1
Buteo sp.		1			1
Fulica atra			1		1
Perdix perdix		1			1
Sturnus vulgaris		1			1
Turdus pilaris			1		1
unknown	12	19		1	32
Grand Total	**12**	**23**	**2**	**1**	**38**

All other remains found during the winter collision victim monitoring including single feathers, bunches of feathers and body parts (Table 6) that could not be attributed to collisions. This included four bunches of feathers of skylark, buzzard, grey partridge and common starling. Several records of one or two feathers were not attributed to species ("unknown" in Table 6), because they were patently records of odd cast feathers and could be ascertained as not being from geese by their size and appearance.

No parts of the body or intact remains of geese which could definitely be considered as collision victims were detected after 270 cumulative searches of different turbines in the period 01 December 2013 – 15 March 2014 (Tables 5 and 6). Therefore, no evidence for collision of geese species, including RBG, was found in the winter 2013/2014 when geese were present.

In order to reduce the risk of collision with the rotors of the wind turbines in conditions of reduced visibility (fog or snowstorm), different groups of turbines as well as single turbines were stopped during the 2013/14 winter study period as during the previous three winters.

Collision Risk Modelling and Avoidance Rates

The numbers of geese that were 'available' to collide by way of flights through SNWF or using SNWF to feed, were so low in the 2013/14 winter that no meaningful contribution could be made by CRM analysis for this winter. Goose use of SNWF, reflected by wider utilization patterns, was so low that CRM predictions of mortality rates would probabilistically not predict that any goose collision remains should likely be found. None were found. This finding is therefore not surprising when apparently because of the weather there was a basic low exposure to risk. A CRM for 2013/14 winter, under the conditions of this winter, would therefore not add materially to knowledge on collision risk.

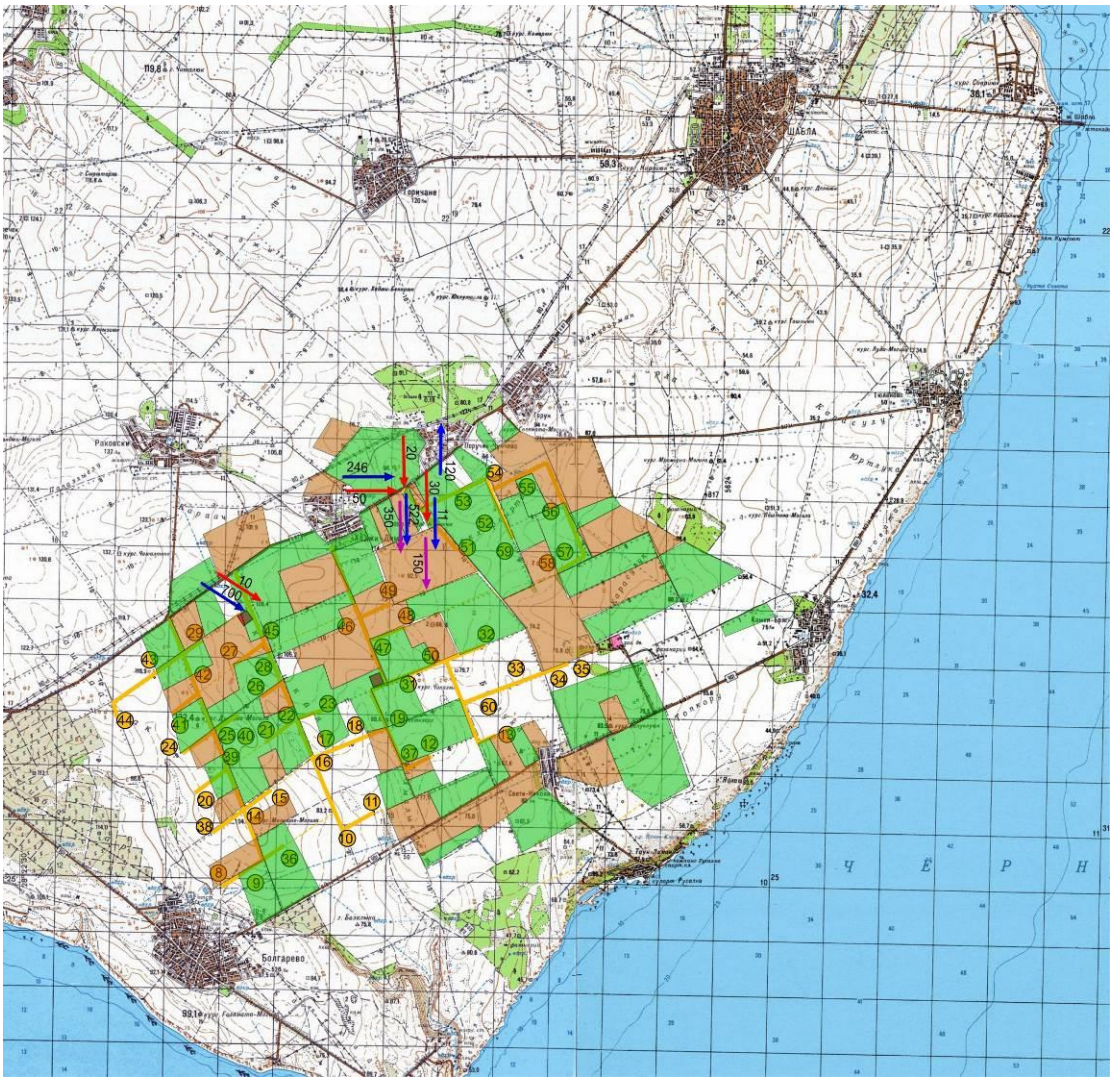
Conclusions

The methods applied to this study in 2013/14 were similar to those in the winters of 2008/2009, 2009/2010, 2010/201, 2011/2012 and 2012/2013. The main difference noted during the current (2013/14) season was an extremely mild winter with unusually low numbers of geese of all species present in a short time period between 27.01.2014 and 29.02.2014. Low goose numbers was not just a feature of SNWF, but apparently also of the wider region studied.

Relatively few geese were recorded compared to previous winters. No remains of geese that could be attributed to collision with turbine blades were found during searches under operational turbines. Searches for collision remains were partially compromised by the same weather that probably led to low numbers of geese that were present in and around SNWF. The constraints on searching for collision victims therefore probably had no bearing on recording goose collision events.

Superficially, the behaviour of geese seemed similar to previous post-operational winters but the numbers of geese were so low that no substantial contribution towards considering the longitudinal effects of SNWF, by way of analysis of the 2013/14 winter's data, would result in isolation.

Annex 1: Day by day movements of observed GWFG (blue), RBG (red) and mixed flocks (purple) of geese in winter 2013-2014: raw data



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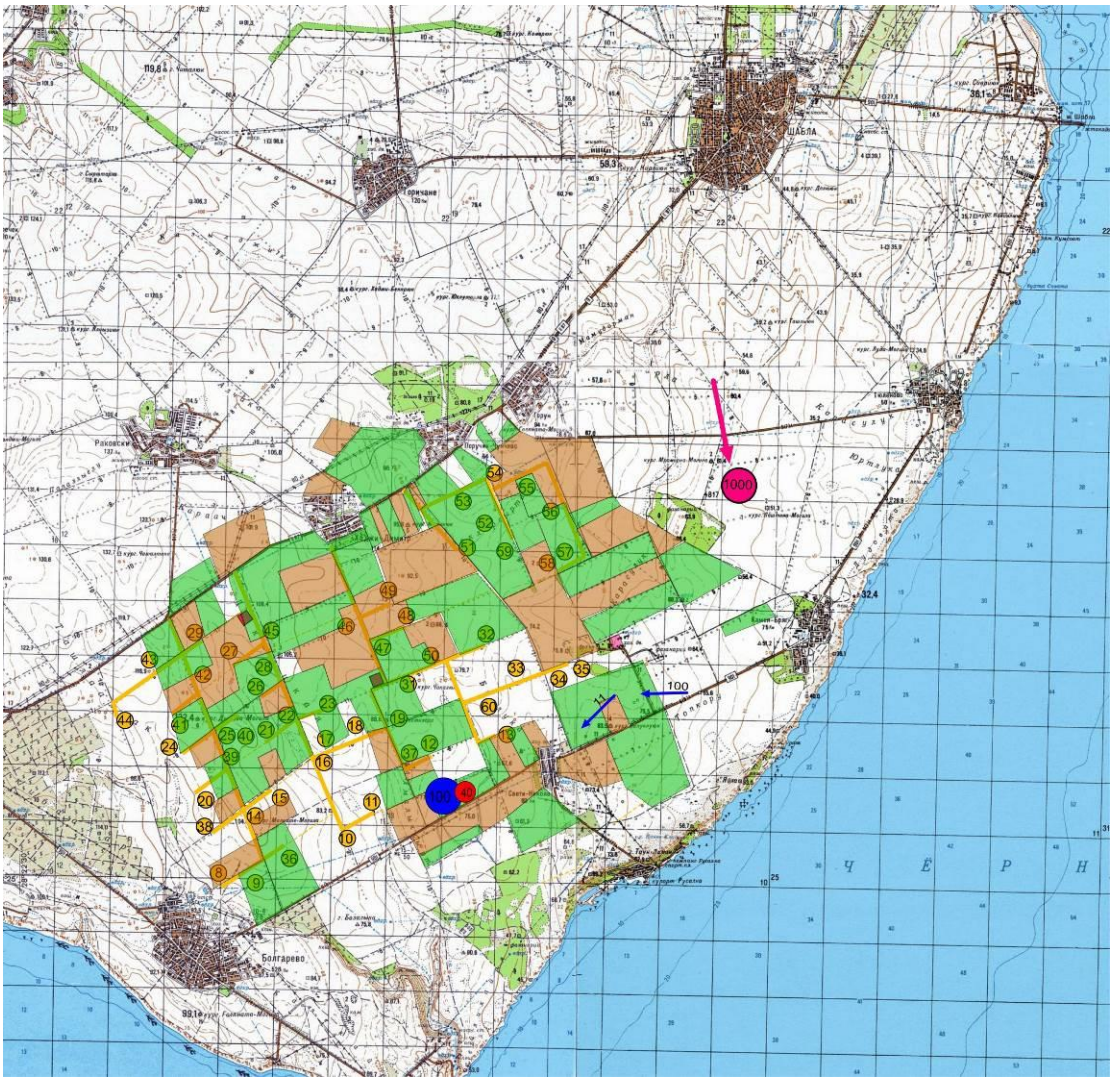

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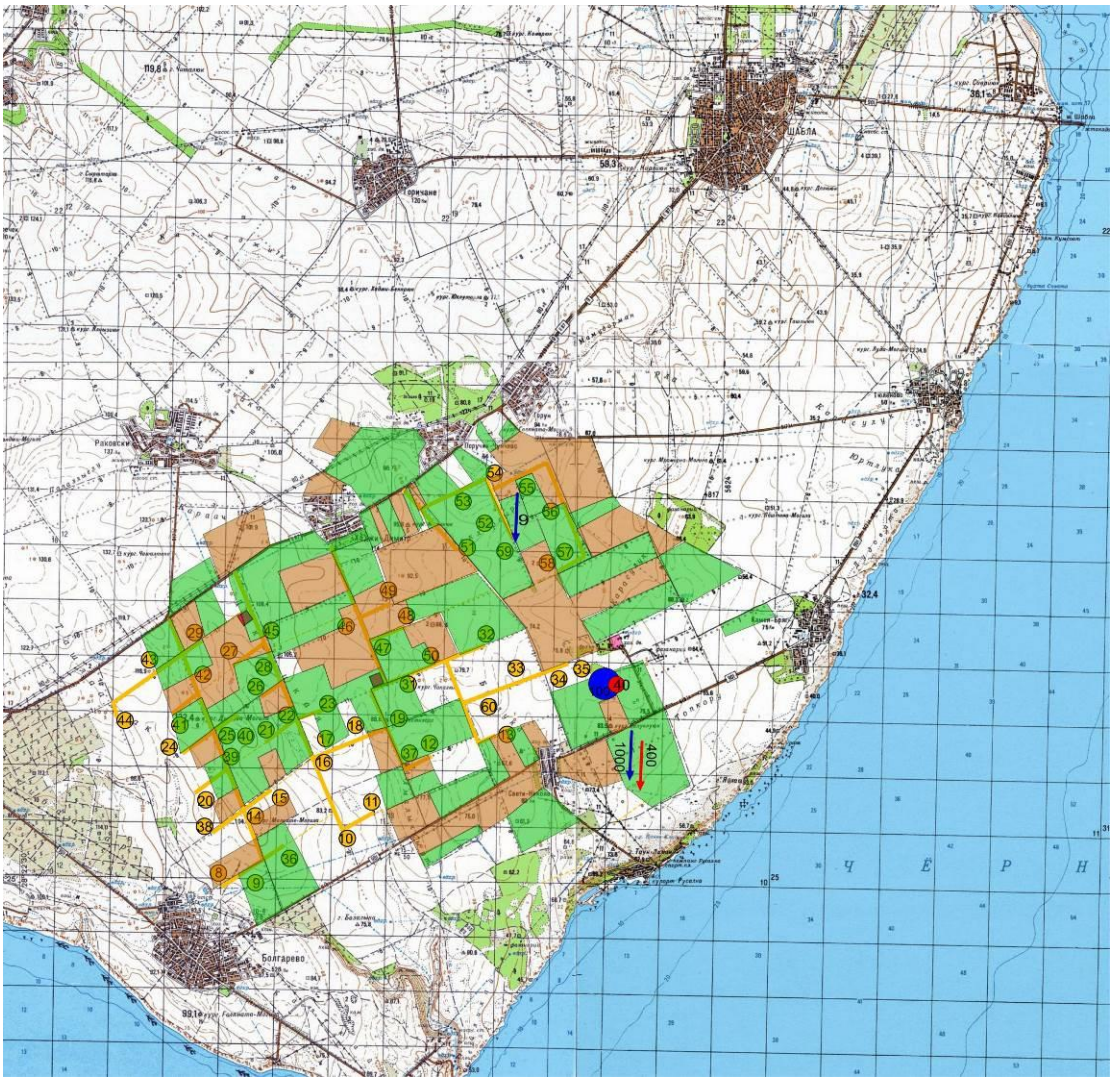

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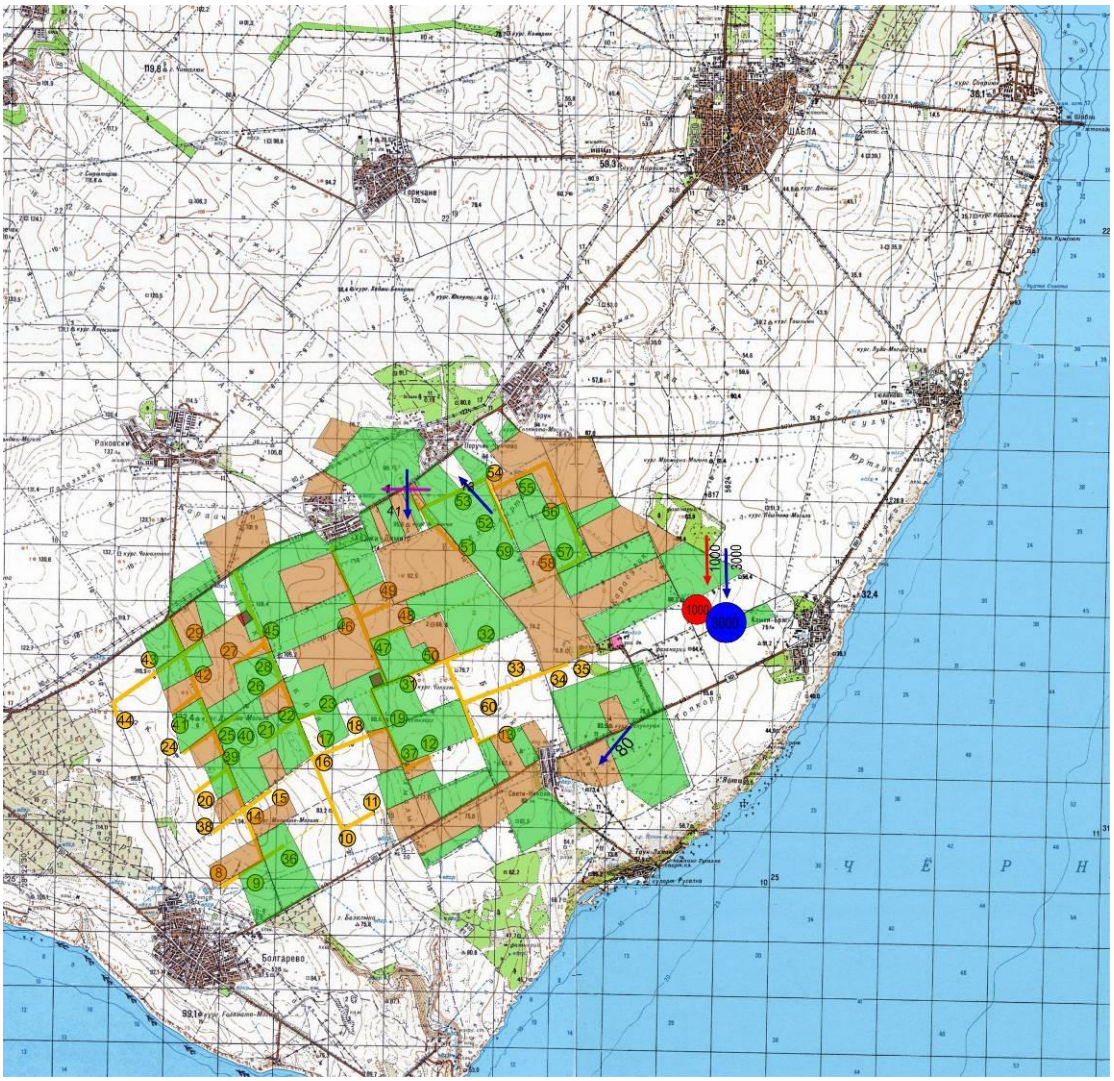

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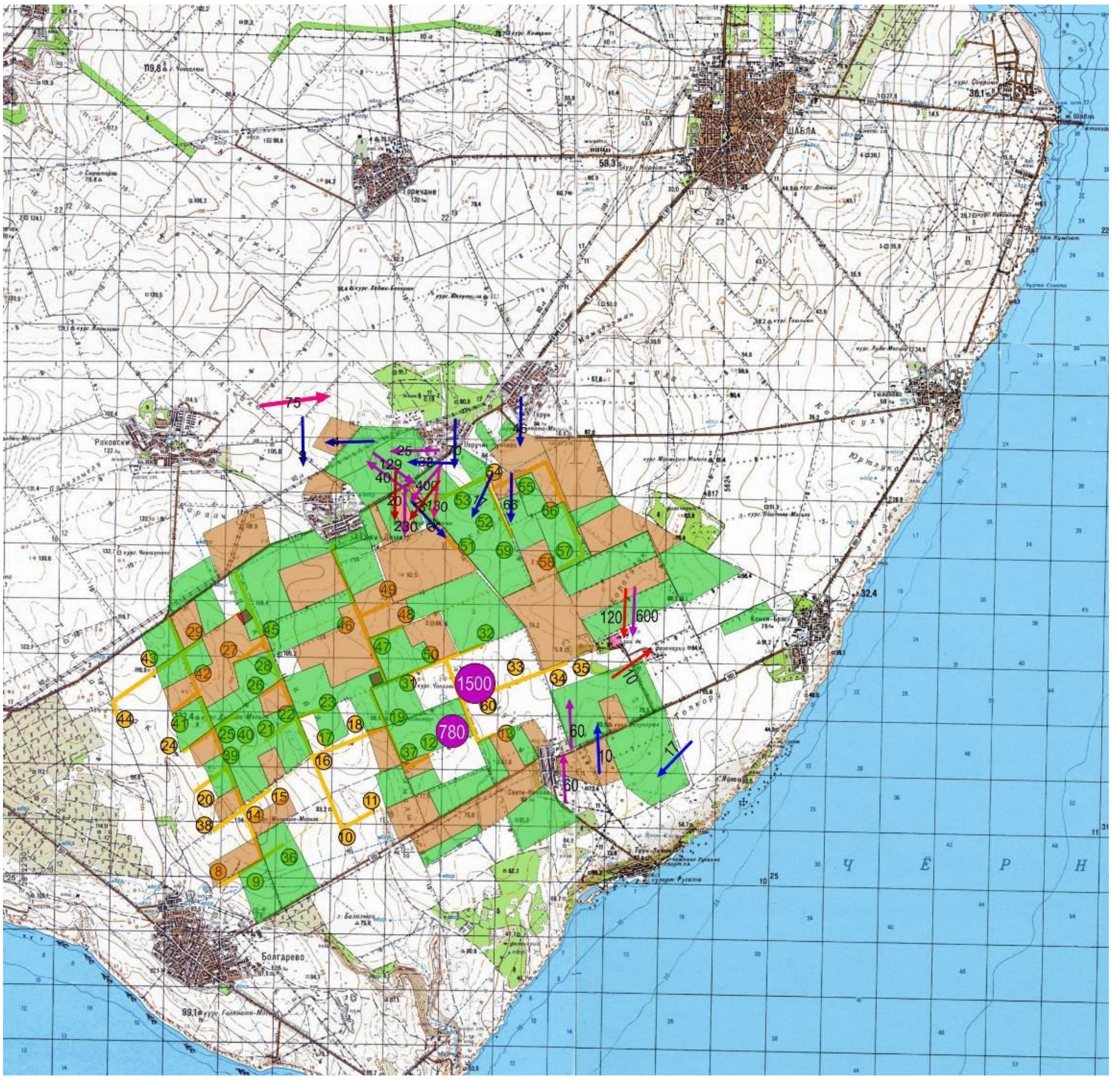

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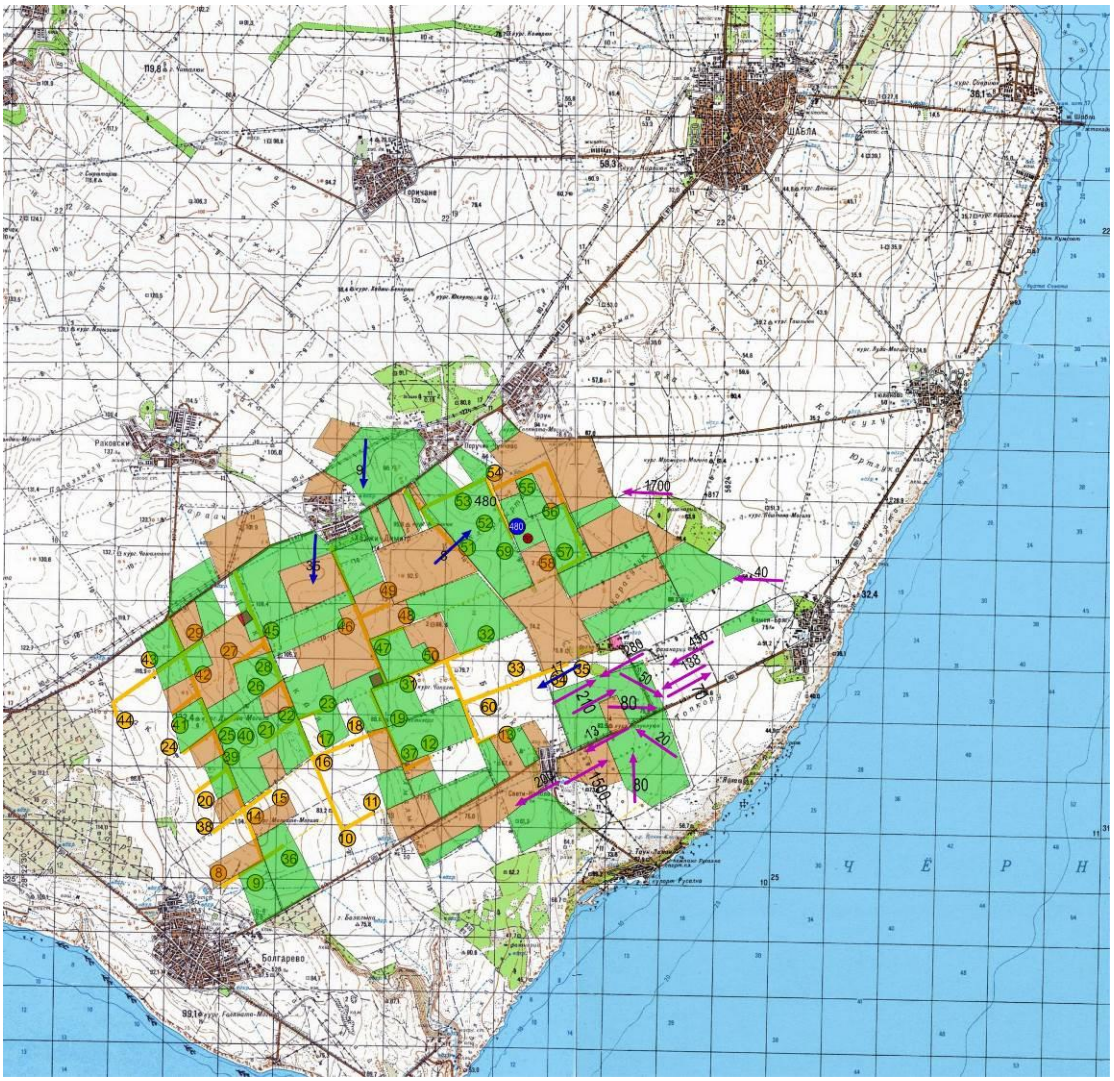

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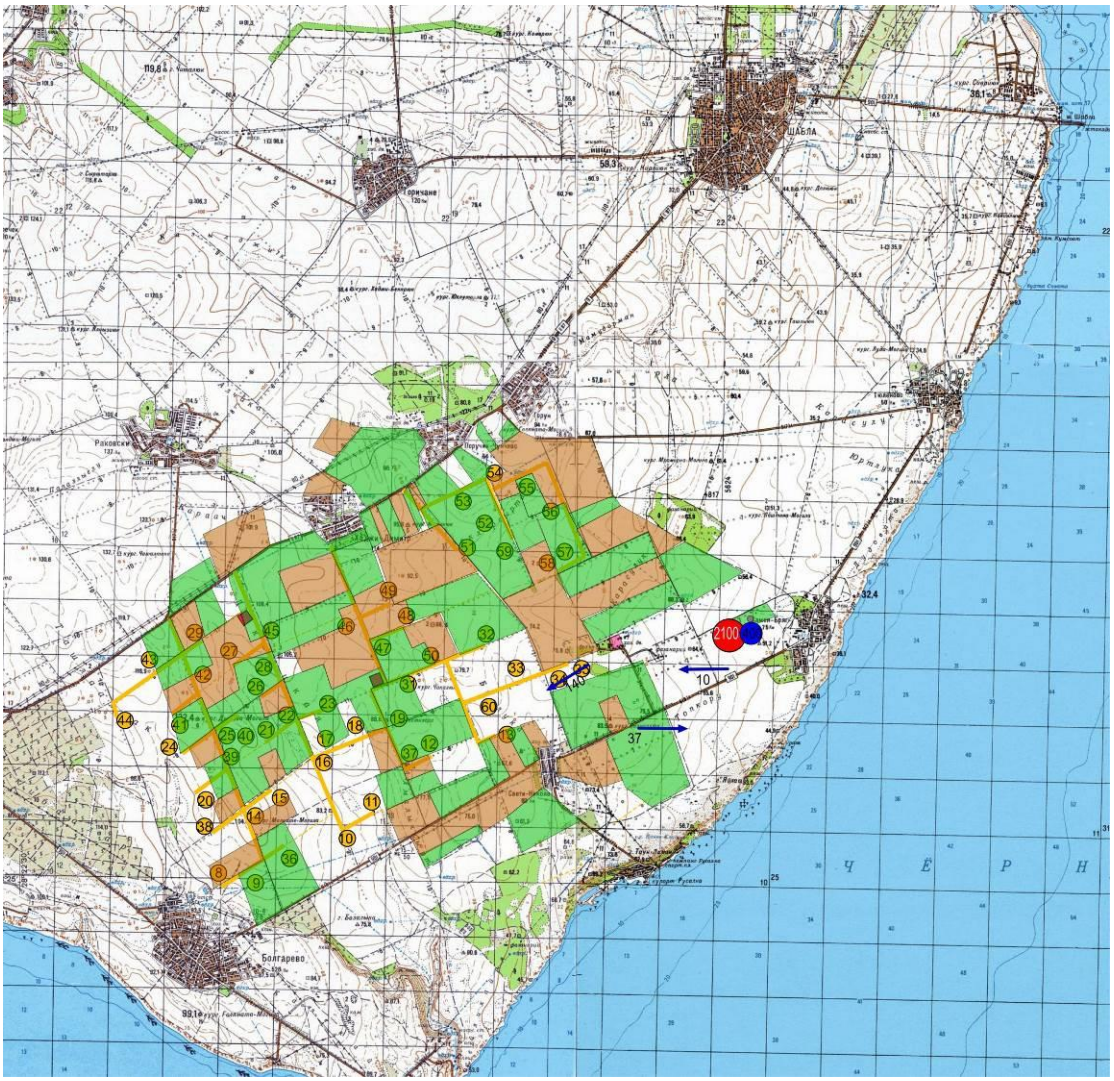

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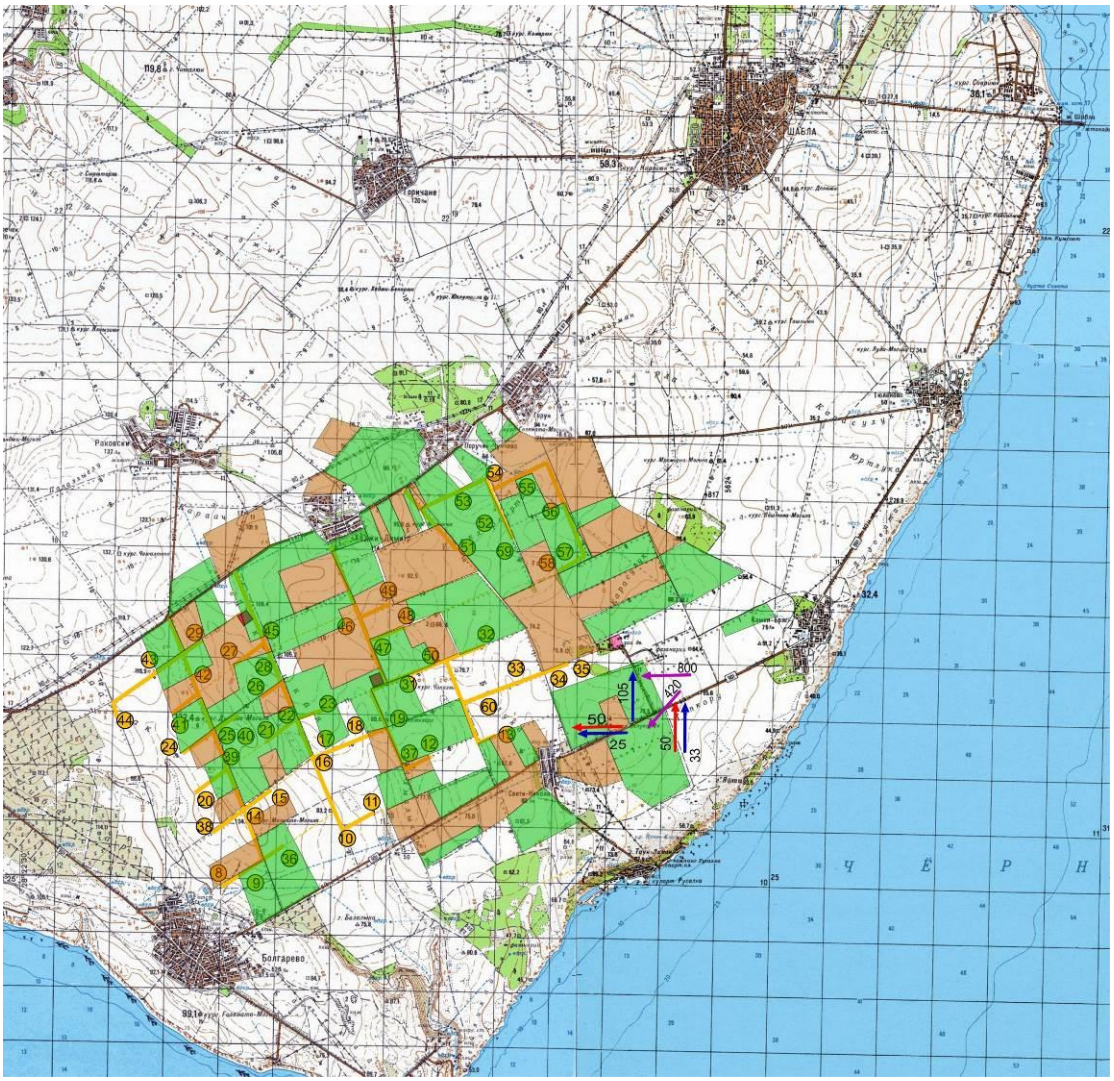

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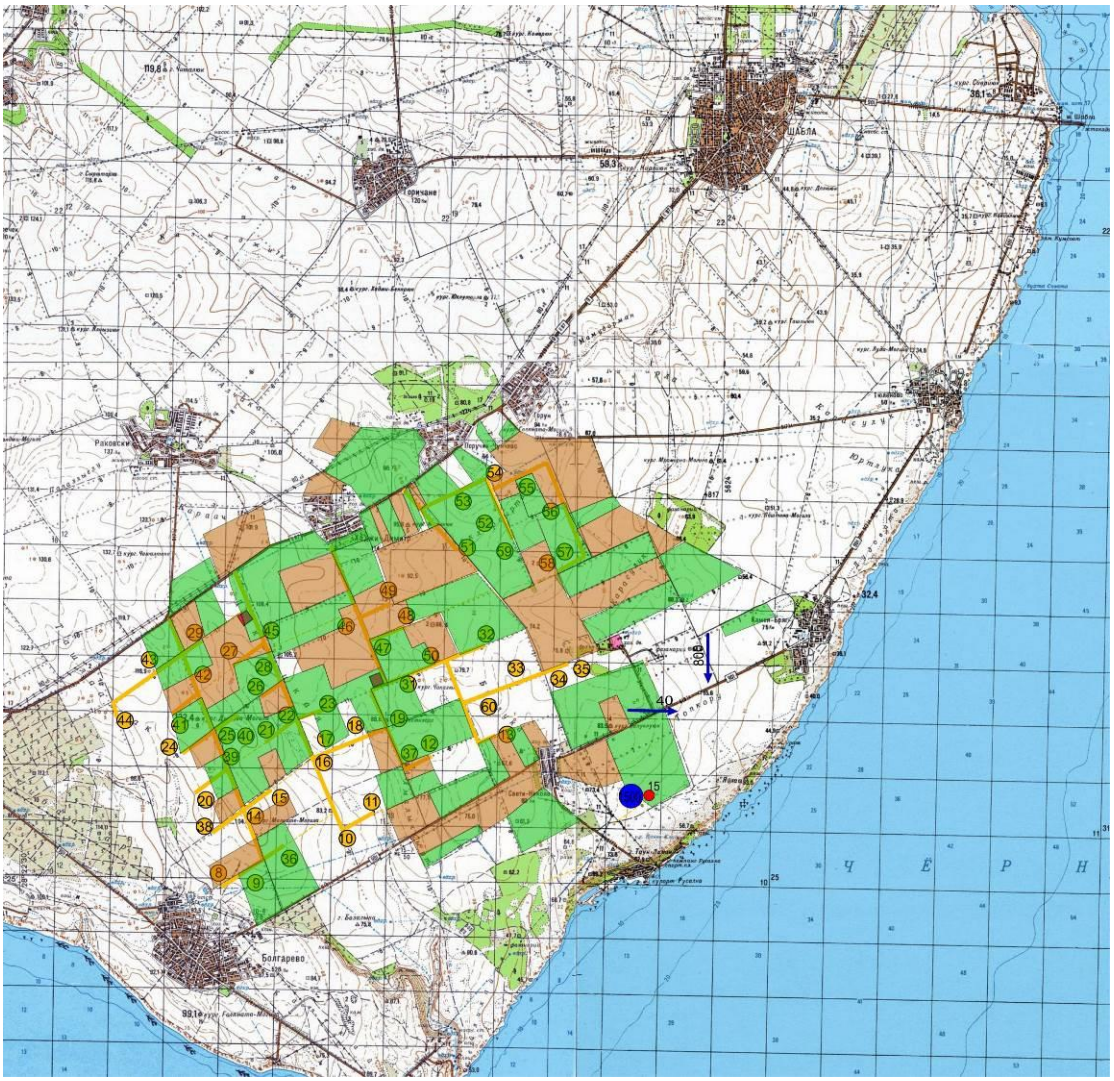

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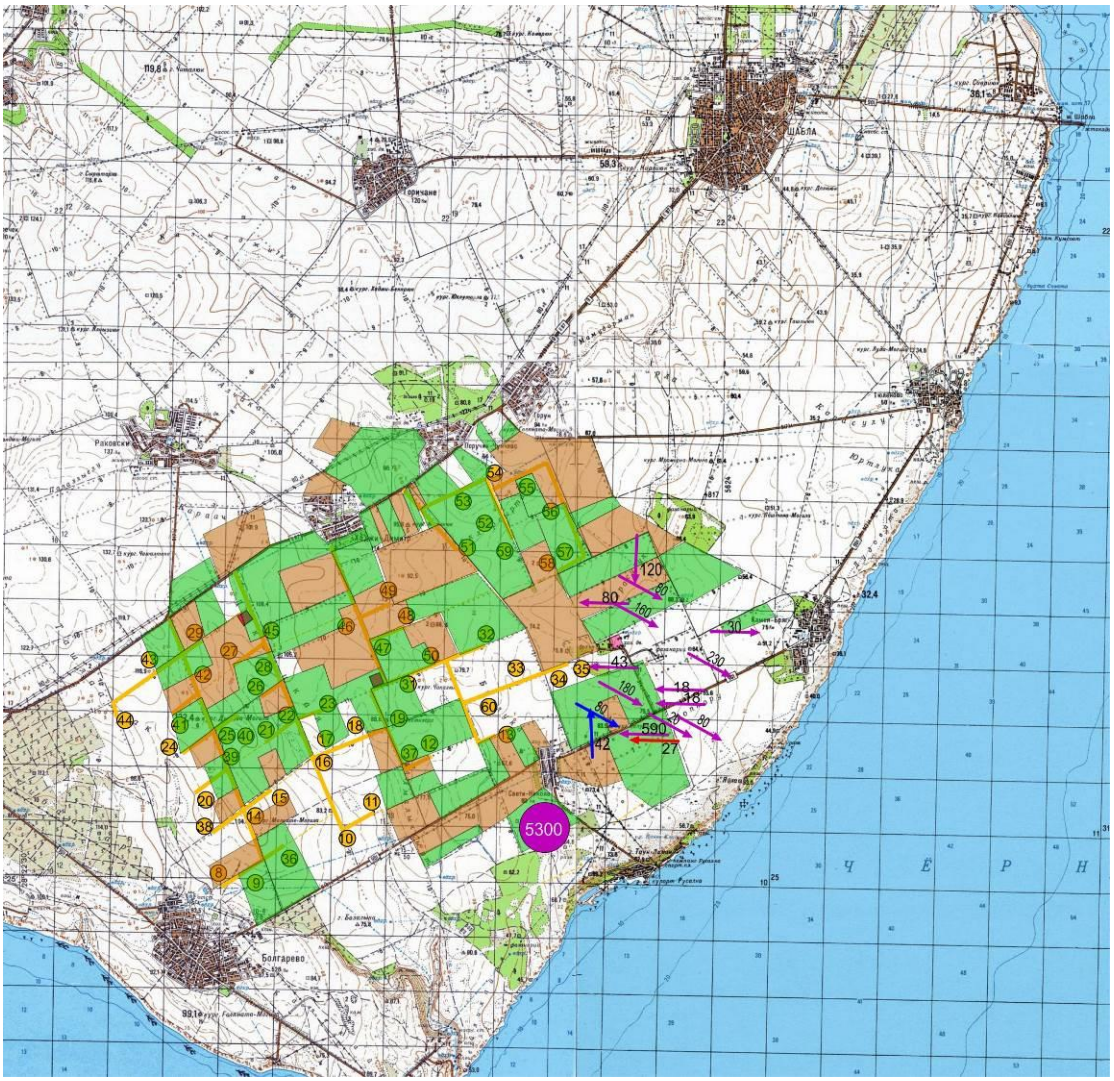

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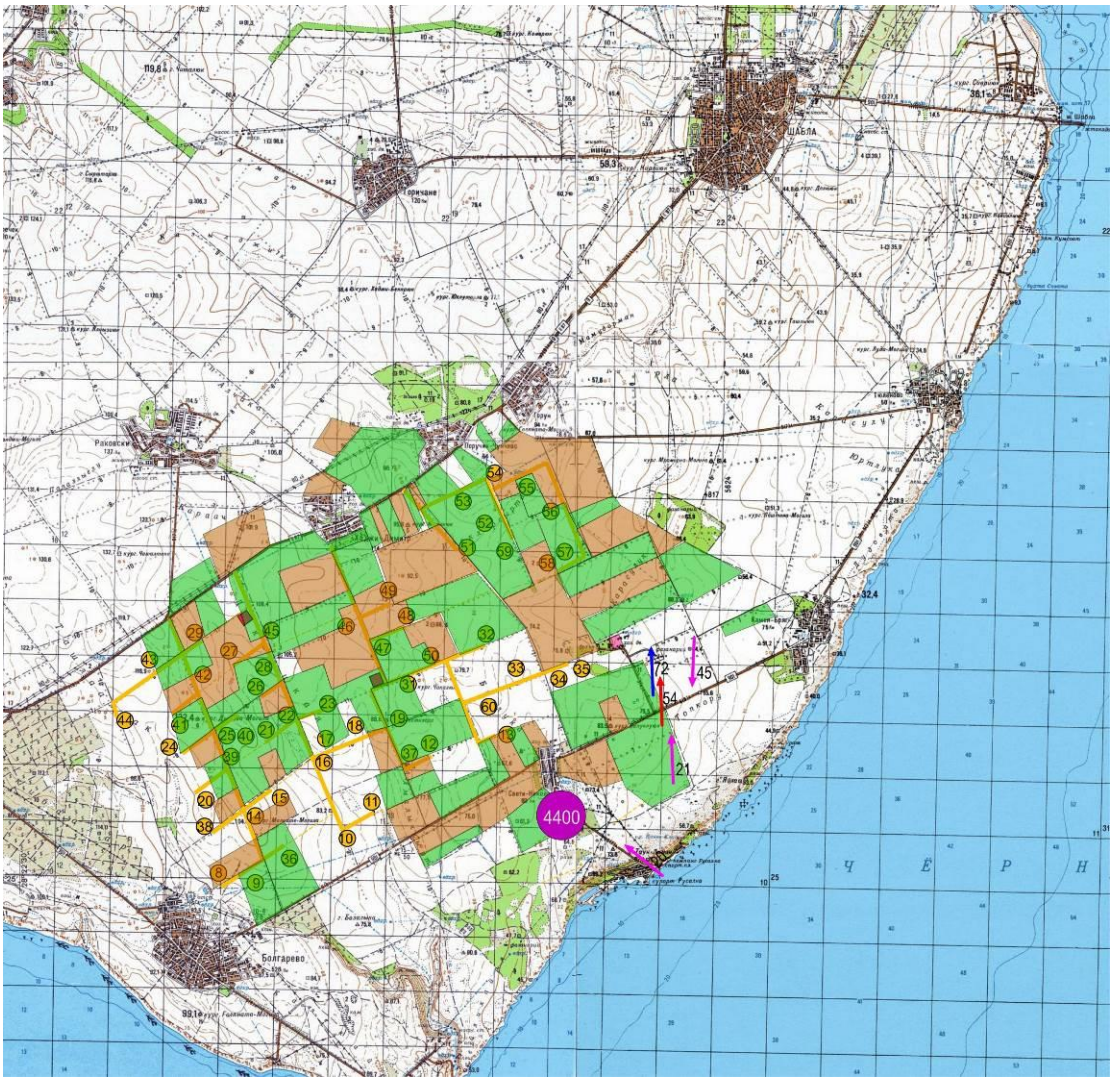

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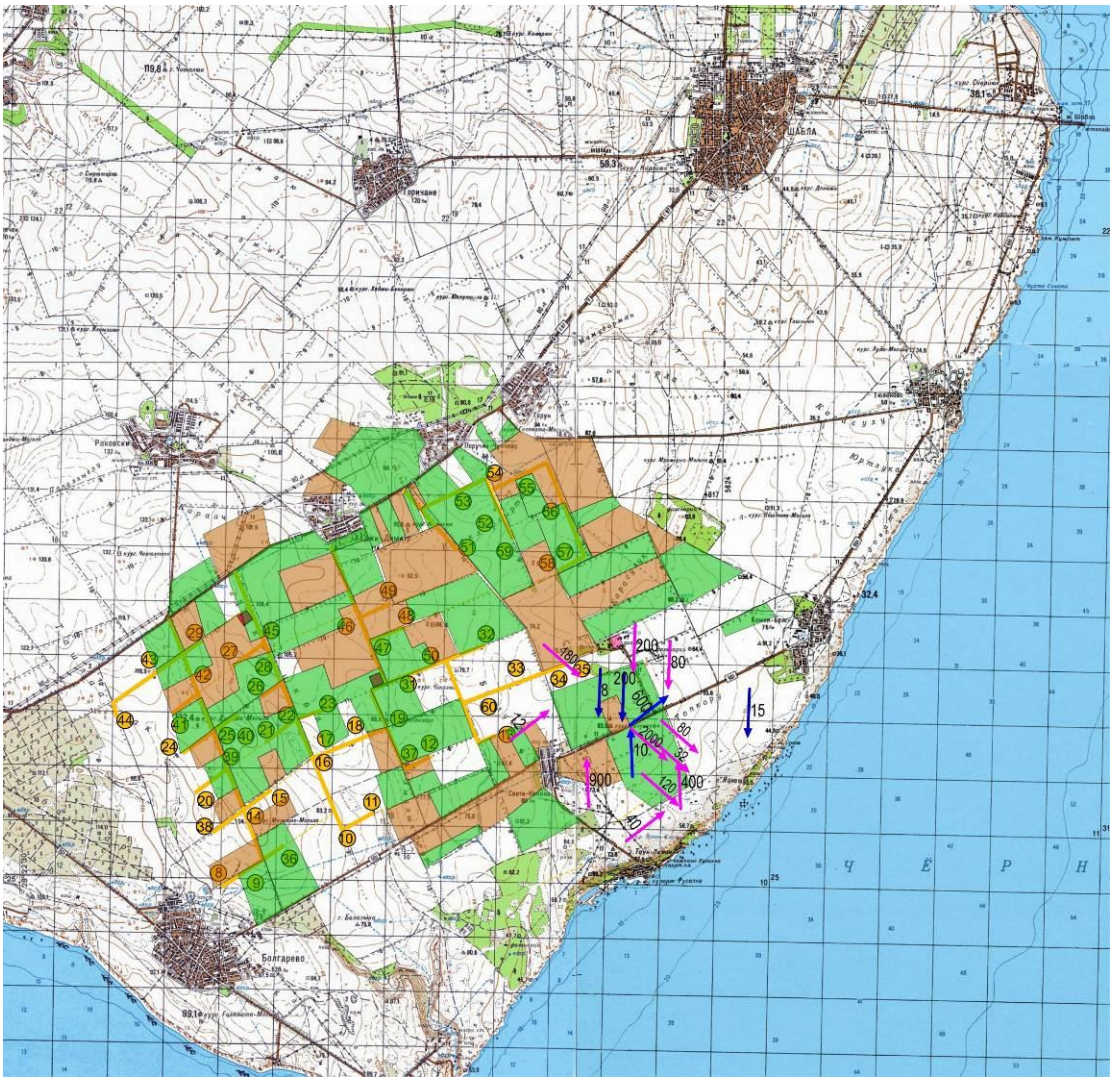

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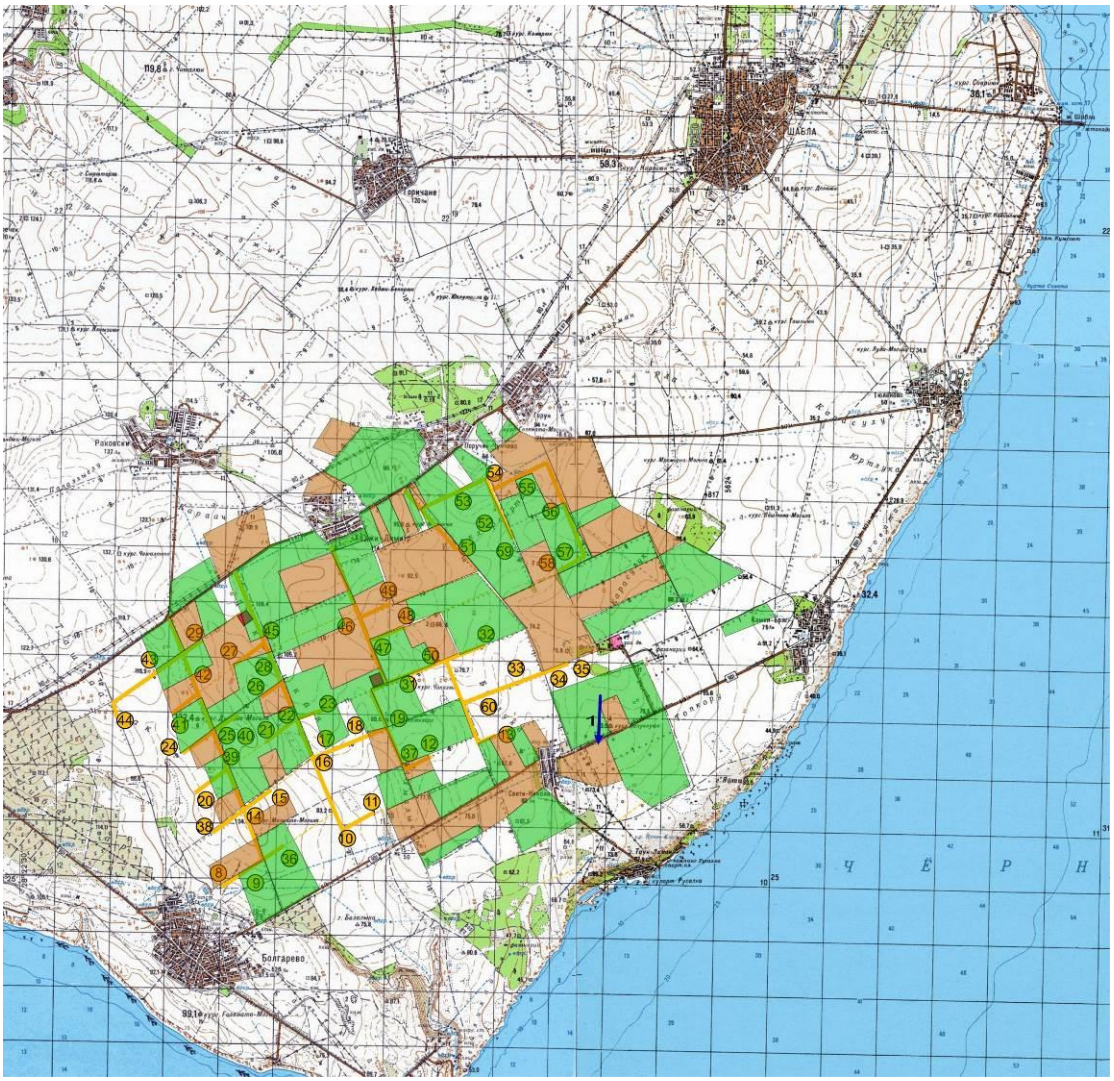

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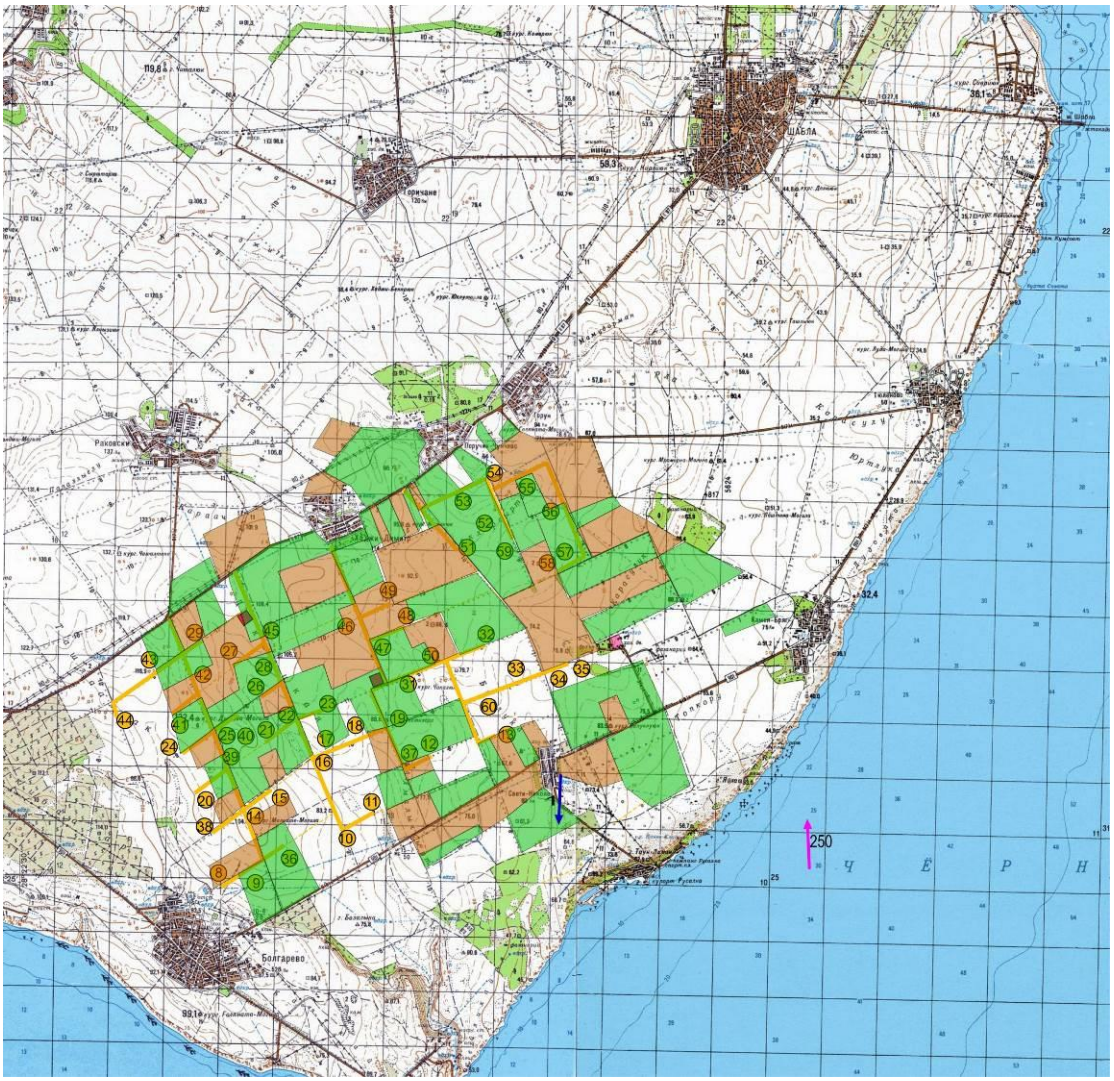

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