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Additional Report

ESTIMATES OF THE POSSIBLE IMPACT OF THE PLANNED CONSTRUCTION OF A WIND POWER PLANT IN THE YAVORIV DISTRICT OF THE LVIV REGION ON THE "CHOLGINSKY" EMERALD NETWORK (UA0000178)

Lviv-2019

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ENVIRONMENTAL ASSESSMENT OF THE POSSIBLE IMPACT OF THE YAVOROV WIND POWER PLANT (TERNOVITSA-ZALUZHYA) ON FAUNA

The territory of the Cholginsky Emerald Network (UA0000178) is located within the boundaries of the technogenic territory of the former state-owned "Sulfur" mining and chemical enterprise, which produced sulfur in an open (quarry) way. It required the accumulation of deep maternal rocks, like heaps around the quarry itself. The solid that was amassed was not fertile and had not been inhabited by plants for a long time. Over time, the successions began to appear, which were formed very quickly, and the loss of moisture contributed to this. Therefore, there was a change of habitats and the loss of attractive breeding sites for birds, as well as places for their rest and concentration during their migration (Shydlovskiy, Lisachuk, Bilonog, 2002, 2003).

According to the 2016 fauna studies and collected data on the composition of biodiversity in the territory of the planned wind power plant construction, the experts of the West Ukrainian Ornithological Station concluded that the construction of the wind power plant near the Cholginskiy Reserve is acceptable, however beyond its boundaries.

Scheme 1

Situational ecological plan for the location of the Yavoriv wind power plant ("Zaluzhya" and "Ternovitsa")

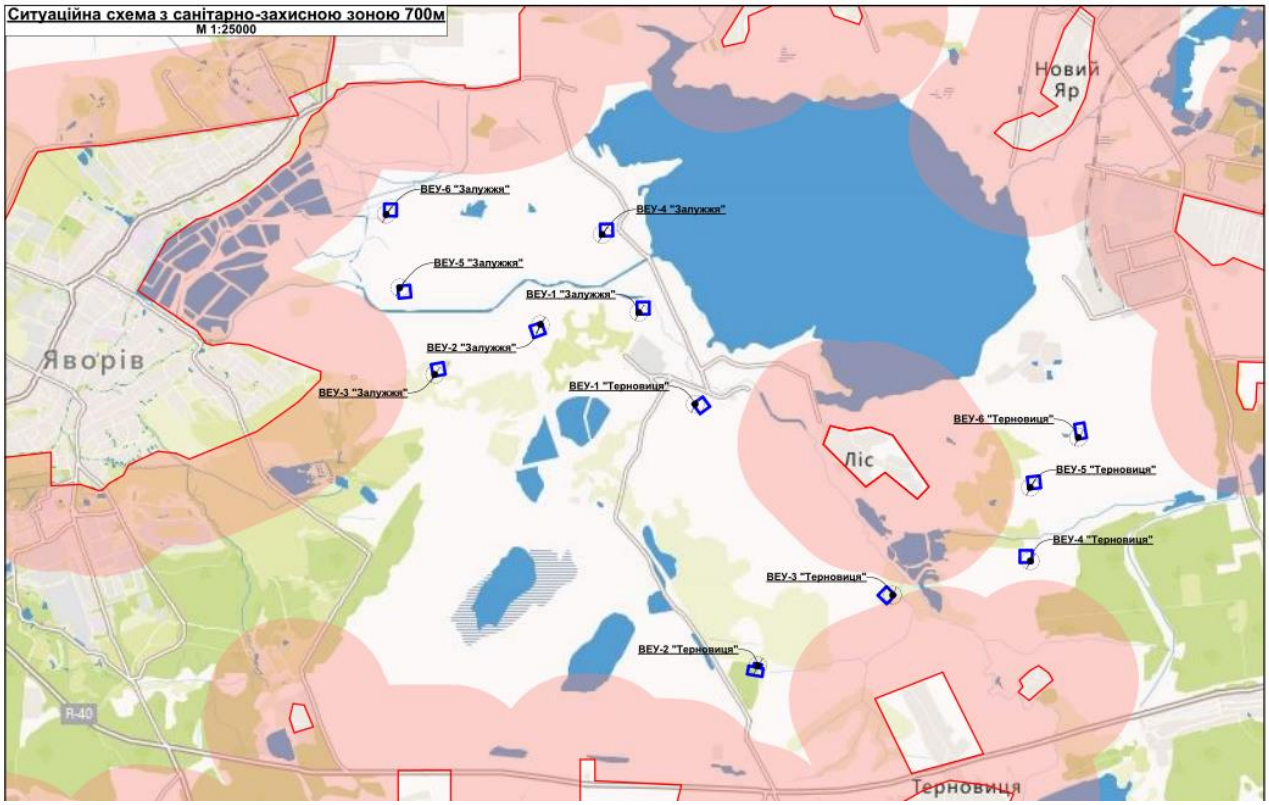

Table 1

Comparative list of bird species according to the Berne Convention, based on the status and number as of 2016 and 2019 on the territory of the Cholginsky Reserve Emerald Network (UA0000178)

№	Code	Species	2016				2019				
			type	*min*	*max*	*unit*		*type*	*min*	*max*	*unit*
1	A229	*Alcedo atthis*	**r**	1	2	p		**r**	1	2	p
2	A255	*Anthus campestris*	**c**	10	20	i	non-breeding, absent				
3	A091	*Aquila chrysaetos*	**c**	1	5	i	absent				
4	A089	*Aquila pomarina*	**c**	10	0	i	absent				
5	A222	*Asio flammeus*	**w**	3	5	i	absent				
6	A222	*Asio flammeus*	**r**	1	2	p	absent				
7	A060	*Aythya nyroca*	**r**	1	2	p	non-breeding, absent				
9	A021	*Botaurus stellaris*	**r**	3	4	p		**r**	3	4	p
10	A027	*Casmerodius albus*	**c**	50	100	i		**c**	15	20	i
11	A027	*Casmerodius albus*	**r**	10	15	p	non-breeding	DD			
14	A196	*Chlidonias hybridus*	**c**	50	150	i		**c**	5	15	i
15	A198	*Chlidonias leucopterus*	**c**	100	200	i	occasionally	**c**	5	15	i
16	A197	*Chlidonias niger*	**c**	500	1000	i	occasionally	**c**	10	15	i
17	A197	*Chlidonias niger*	**r**	20	30	p		**r**	1	10	p
18	A031	*Ciconia ciconia*	**c**	100	500	i	not-concentration				
19	A080	*Circaetus gallicus*	**c**	1	2	i	not-concentration	DD			
20	A081	*Circus aeruginosus*	**r**	3	4	p		**r**	3	4	p
21	A081	*Circus aeruginosus*	**c**	50	150	i		**c**	10	15	i
22	A082	*Circus cyaneus*	**c**	5	20	i	not-concentration	DD			
23	A082	*Circus cyaneus*	**w**	5	10	i		**w**	1	2	i
24	A084	*Circus pygargus*	**c**	30	50	i	not-concentration	DD			
25	A084	*Circus pygargus*	**r**	1	2	p	non-breeding				
26	A122	*Crex crex*	**r**	10	15	m		**r**	10	15	m
27	A122	*Crex crex*	**c**	50	100	i	not-concentration	DD			
28	A038	*Cygnus cygnus*	**c**	5	10	i	absent				

29	A026	*Egretta garzetta*	**c**	10	30	i	not-concentration				
30	A511	*Falco cherrug*	**c**	1	5	i	absent				
31	A098	*Falco columbarius*	**c**	10	20	i	absent				
32	A098	*Falco columbarius*	**w**	5	10	i	not-wintering				
33	A103	*Falco peregrinus*	**w**	1	2	i	not-wintering				
34	A103	*Falco peregrinus*	**c**	1	5	i	not-concentration				
35	A097	*Falco vespertinus*	**c**	5	30	i	absent				
36	A002	*Gavia arctica*	**c**	1	5	i	absent				
37	A127	*Grus grus*	**c**	500	700	i	not-concentration, flying		100	250	
38	A075	*Haliaeetus albicilla*	**c**	5	10	i	not-concentration				
39	A075	*Haliaeetus albicilla*	**w**	1	2	i		**w**	1	2	i
40	A092	*Hieraaetus pennatus*	**c**	1	5	i	absent				
41	A131	*Himantopus himantopus*	**c**	5	10	i	not-concentration				
42	A022	*Ixobrychus minutus*	**r**	5	10	p		**r**	5	8	p
43	A022	*Ixobrychus minutus*	**c**	50	100	i		**c**	20	30	i
44	A338	*Lanius collurio*	**r**	10	15	p		**r**	10	15	p
46	A272	*Luscinia svecica*	**r**	10	15	p		**r**	5	10	p
47	A272	*Luscinia svecica*	**c**	200	300	i		**c**	50	100	i
49	A073	*Milvus migrans*	**c**	5	20	i	absent				
52	A023	*Nycticorax nycticorax*	**c**	50	100	i	absent				
53	A094	*Pandion haliaetus*	**c**	5	10	i	not-concentration, occasionally		1	2	i
54	A072	*Pernis apivorus*	**c**	10	30	i	not-concentration	DD			
55	A170	*Phalaropus lobatus*	**c**	5	30	i	absent				
56	A151	*Philomachus pugnax*	**c**	200	450	i		**c**	70	200	i
57	A034	*Platalea leucorodia*	**c**	10	20	i	not-concentration				
58	A032	*Plegadis falcinellus*	**c**	5	10	i	absent				
59	A140	*Pluvialis apricaria*	**c**	5	15	i	absent				
60	A007	*Podiceps auritus*	**c**	1	5	i	absent				

61	A120	*Porzana parva*	**r**	10	20	p		**r**	5	10	p
62	A119	*Porzana porzana*	**r**	10	15	p	non-breeding				
63	A119	*Porzana porzana*	**c**	50	70	i	absent				
64	A132	*Recurvirostra avosetta*	**c**	3	15	i	absent				
66	A195	*Sterna albifrons*	**r**	3	5	p	absent				
67	A190	*Sterna caspia*	**c**	5	10	i	absent				
68	A193	*Sterna hirundo*	**r**	10	20	p		**r**	1	5	p
69	A193	*Sterna hirundo*	**c**	100	200	i		**c**	10	20	i
70	A307	*Sylvia nisoria*	**r**	5	7	p	non-breeding				
71	A166	*Tringa glareola*	**c**	200	700	i		**c**	50	100	i

According to the map of the Cholginsky Emerald Network object (UA0000178), there are 49 bird species registered on the territory of the reserve with different residence status - nesting, flying (concentrating) and hibernating. However, these data refer to a much earlier period of ornithofauna research and, in our opinion, are based on records registered before the year 2010 or even the year 2005. As of 2016, when the decision was made to create the Cholginskiy Emerald Network (UA0000178), significant changes and successions occurred due to significant moisture loss, and it resulted in the loss of biotopes and exhaustion of the bird fauna from the mentioned territory.

Below you will find a list of bird species and their status throughout the Cholginsky Emerald Network (UA0000178) as of 2019, based on the calculations performed during the winter season of 2016-2018 and warm seasons (including breeding season) during 2018-2019 (see Table 2).

Table 2

List of bird species according to the Berne Convention by status and number as of 2019 on the territory of the Cholginsky Emerald Network Nature Reserve (UA0000178)

№	**Code**	**Species**	**2016**				**2019**				
			type	*min*	*max*	*unit*		*type*	*min*	*max*	*unit*
1.	A229	*Alcedo atthis*	**r**	1	2	p		**r**	1	2	p
2.	A021	*Botaurus stellaris*	**r**	3	4	p		**r**	3	4	p
3.	A027	*Casmerodius albus*	**c**	50	100	i		**c**	15	20	i
4.	A027	*Casmerodius albus*	**r**	10	15	p	non-breeding	DD			
5.	A196	*Chlidonias hybridus*	**c**	50	150	i		**c**	5	15	i
6.	A198	*Chlidonias leucopterus*	**c**	100	200	i	occasionally	**c**	5	15	i
7.	A197	*Chlidonias niger*	**c**	500	1000	i	occasionally	**c**	10	15	i
8.	A197	*Chlidonias niger*	**r**	20	30	p		**r**	1	10	p
9.	A081	*Circus aeruginosus*	**r**	3	4	p		**r**	3	4	p
10.	A081	*Circus aeruginosus*	**c**	50	150	i		**c**	10	15	i

11.	A082	*Circus cyaneus*	**w**	5	10	i		**w**	1	2	i
12.	A084	*Circus pygargus*	**c**	30	50	i	not-concentration	DD			
13.	A122	*Crex crex*	**r**	10	15	m		**r**	10	15	m
14.	A122	*Crex crex*	**c**	50	100	i	not-concentration	DD			
15.	A127	*Grus grus*	**c**	500	700	i	not-concentration, flying		100	250	
16.	A075	*Haliaeetus albicilla*	**w**	1	2	i		**w**	1	2	i
17.	A022	*Ixobrychus minutus*	**r**	5	10	p		**r**	5	8	p
18.	A022	*Ixobrychus minutus*	**c**	50	100	i		**c**	20	30	i
19.	A338	*Lanius collurio*	**r**	10	15	p		**r**	10	15	p
20.	A272	*Luscinia svecica*	**r**	10	15	p		**r**	5	10	p
21.	A272	*Luscinia svecica*	**c**	200	300	i		**c**	50	100	i
22.	A094	*Pandion haliaetus*	**c**	5	10	i	not-concentration, occasionally		1	2	i
23.	A072	*Pernis apivorus*	**c**	10	30	i	not-concentration	DD			
24.	A151	*Philomachus pugnax*	**c**	200	450	i		**c**	70	200	i
25.	A034	*Platalea leucorodia*	**c**	10	20	i	not-concentration				
26.	A120	*Porzana parva*	**r**	10	20	p		**r**	5	10	p
27.	A193	*Sterna hirundo*	**r**	10	20	p		**r**	1	5	p
28.	A193	*Sterna hirundo*	**c**	100	200	i		**c**	10	20	i
29.	A307	*Sylvia nisoria*	**r**	5	7	p	non-breeding	DD			
30.	A166	*Tringa glareola*	**c**	200	700	i		**c**	50	100	i

Thus, as of 2019, there are only 23 bird species to be protected under the Berne Convention. Among them: 5 species do not have sufficient data to determine their status, because only 6 individuals of spoonbill species *(Platalea leucorodia)* were found on this territory in 2018, and in 2019 they were absent; two species of egrets *(Casmerodius albus)* and barred warblers *(Sylvia nisoria)* are no longer found during breeding season, and the latter was not found during migration; montagu's harriers *(Circuspygargus)* and honey hawks *(Pernis)* were not registered by us during the years 2018-2019. The numbers of all bird species declined sharply, except for the breeding birds, like common European kingfisher *(Alcedo atthis)*, bittern *(Botaurus stellaris)*, duck hawk *(Circus aeruginosus)*, corncrake *(Crex crex)*, shrike *(Lanius collurio)*, and white-tailed eagle *(Haliaeetus albicilla)* that stays during winter time, 1-2 species of which come to the Yavoriv "sea" (flooded quarry) from the State Natural Reserve «Roztochya».

Analyzing the distribution of the above-mentioned bird species, represented in Table 2, we can speak of a significant and indirect impact of wind power plant only on birds associated with open water. In particular, the T-3 wind power plant is located 300 meters south-west from the coasts of the ponds, where we can find nests of 1 pair of bittern *(Botaurus stellaris)*, 3-5 pairs of the

whiskered terns *(Chlidonias hybridus)* and 10 pairs of the black terns *(Chlidonias niger).* Besides some single individuals of great white heron *(Casmerodius albus)* and marsh harrier (Circus aeruginosus) come to visit the coasts of the ponds. All other wind power plants will not have a significant impact on the birds, because they are located far from the water pole, in places of dense thickets of reeds, antlers and shrubs, and in conditionally open terrain - degraded pasture, micro-depressions, overgrown with dense reeds or willows.

The breeding of the common kingfisher *(Alcedo atthis)* is related to the steep banks of channels, and it will not be influenced by wind power plant according to the biological peculiarities of the species of this type. These birds hunt on the edge of the surface thickets of reservoirs (macrophytes), and their movements are always associated with the shoreline or existing water channels, along which the birds fly.

Great white egrets and marsh terns *(Chlidonias)* are concentrated mainly within the Cholginskiy Reserve and in the northwestern part of the Yavoriv "sea", as well as in the most shallow areas. However, the numbers of these bird species are not significant even during the migration period, due to the loss of moisture throughout the territory, and consequently the loss of feeding places, at the same time the location of wind turbines by small groups will not create a barrier effect during the movement of birds throughout the territory.

Marsh harrier is a species of birds of prey, usually 3-4 pairs of birds of this type nest near the site. While searching for food, these birds can be everywhere, but flicker movement and the noise of the wind turbines may scare them away and encourage to search for food in neighboring areas.

Crane representatives (gray crane – Grus grus) cross this area at high altitudes - over 300 m, which ensures their safety.

Grass-drake *(Crex crex*) – is a representative of the rail birds, and is seen during the breeding season only by single pairs in the biotopes, represented by power plantland on the border with shrub willows - peripherally on the territory of the Emerald Network and only in one case – to the north and north-east in relation to the wind turbines Z-3 at the distance of 200-300 meters.

However, these birds rarely fly, but mainly move on foot and that ensures their safety. Yet these birds overtake the long-distance migration route to North Africa by land.

Little crake *(Porzana parva)* and little bittern *(Ixobrychus minutes)* are more common around the periphery of the reservoirs of the designated area and belong to the same group of birds as the corncrake, yet they run or swim rather than fly. Therefore, wind turbines will have little effect on breeding birds of these species.

Fish hawk *(Pandion haliaetus)* – some single individuals of this bird species may periodically visit the territory of the Yavoriv "sea" only to fish, yet the location of wind turbines will allow them to move safely between reservoirs without creating a barrier effect.

During the migration period, the representatives of the shore birds stay on the residual reservoir of the Cholginskiy Natural Reserve and practically are not seen within the territory of other reservoirs due to the sharp decrease of their bottom and the closed high and dense vegetation of the coasts.

During the migration period all members of the perching birds may be located throughout the site of the Emerald Network, and they do not create mass concentrations, and therefore can successfully bypass wind turbine installations by moving through shrubs.

Other species of animals protected under the Berne Convention

Other species of animals protected under the Berne Convention are represented by 8 species of mammals – the pond bat *(Myotis dasycneme),* the amphibians - the red-bellied toad *(Bombina bombina),* fish – the weatherfish *(Misgurnus fossilis),* the bitterling (*Rhodeus sericeus*), and insects – wood borer (*Catopta thrips*), cerambycid (*Cerambyx cerdo*), common stag beetle *(Lucanus cervus)* and the large copper (*Lycaena dispar*).

The pond bat - was not detected in the records during 2019, although this species may occur in the study area because its biology is related to forests and small bodies of water.

The red-bellied toad (Bombina bombina), weatherfish *(Misgurnus fossilis)* and bitterling *(Rhodeus sericeus amarus)* – as the animals that inhabit the reservoirs will not be affected by the construction or operation of the wind power plants. The construction of wind turbines is planned at a distance of at least 300 meters from the shores of reservoirs.

The two species of insects mentioned above – cerambycid and common stag beetle (species included in the Red Data Book of Ukraine) occur only in the immature and overmatures oak forests, which are not present in the mentioned territory today, and can only happen by chance during the mass fly.

The closest forest boundary is located within 300 meters to the south – southwest of the T-4 wind power plant. In general, no information was found about the findings of the great capricorn beetle, the cossid millers or large copper within the territory of the Cholginskiy Emerald Object, as well as no records were found within the Yavoriv and Zhovkva districts of Lviv region (Rare and Endangered…, 2013; Ukrbin.com).

There are no caves and old massive hollow trees in the study area where the wind power plant is planned to be built, because they are important for sheltering and wintering of the bats (Chiroptera). The main forest areas are far apart from all planned wind power plants. These factors greatly limit the possibility of dense biotope distribution and the species richness of the bats throughout the area where the building operations are planned to be undertaken for the construction of wind power plants.

In order to avoid the possible negative impact of the planned Yavoriv wind power plant on the bats, we suggest to apply the already implemented experience used on many European wind power plants, where, in case of frequent records of collisions of bats with the wind power plants, it will be necessary to introduce temporary or rather short-term protection measures for animals.

These measures may include: temporary stoppage of the wind turbines during periods of high activity of the bats with a wind speed of less than 6 meters per second (Baerwald end oth. 2009); refusal to illuminate the turbines in white light; preventive maintenance of distances in a radius of around 200meters from operating wind generators to important hunting areas and sites of increased activity of the bats. Also, an important condition is to avoid afforestation of the terrain on which the turbines are located and the failure to plant forest stand along the technical roads used to service wind towers.

Among the Berne Convention species, 23 bird species occur in the study area. However, as a result of anthropogenic transformation and successions occurring in the area of the planned wind power plant construction, irreversible changes have taken place which have led to a significant loss of bird species, a decrease in their numbers, disappearance of some of them, or disappearence of the places of birds' concentration and their overnight stops.

Analyzing the impact of the projected wind power plant construction on the ornithofauna, we believe that the impact of wind power plants will be minimal or nonexistent. The overwhelming

majority of bird species, under typical weather conditions, will be able to overcome successfully the obstacles arising due to the operation of wind turbines.

ENVIRONMENTAL ASSESSMENT OF THE PLANT COVER WITHIN THE TERRITORY OF THE YAVORIV WIND POWER PLANT (TERNOVITSA-ZALUZHYA)

According to the project documentation, Yavoriv wind power plant is planned to be located in the territory of the former state-owned mining and chemical enterprise «Sulfur», which was used for various technological processes of the sulfur ore production cycle (extraction on the surface, storage of extracted rock, drainage of process water after washing the rock and the like).
removal of process water after washing of the rock, etc.).

According to the Law of Ukraine "On the Nature Reserve Fund of Ukraine" such enterprises cannot be located within the territory of location of the objects of the Nature Reserve Fund, in particular, within the territory of the ornithological reserve of the local value "Cholginsky" (820 hectares in size).

At the same time, according to the basic studies of flora and fauna conducted in 2016, the territory of the planned construction did not intersect the sites of the Emerald Network. However, in 2017, the Standing Committee decided to include this area into the Emerald Network under the same name as "Cholginsky" Natural Reserve (UA0000178), while increasing the total area to 3379 hectares.

Therefore, the official documents accompanying the construction of the Yavoriv Wind Power Plant "Ternovitsa" and "Zaluzhya" triggered additional field studies of the vegetation cover in 2019, and not only at construction sites, but also at neighboring and remote sites in order to compare the current state of the biota within the territory of the mentioned wind power plant and the object of the Cholginsky Emerald Network (UA0000178). Field surveys of vegetation were carried out by methods of expeditionary visits with a detailed survey of the whole territory in general and specific sections of wind power plant, in particular to identify species and habitats that served as a basis for inclusion of this territory into the Emerald Network.

According to the Standard Data Forms for the Cholginsky Emerald Network site (UA0000178), it is based on some diversity of fauna species and three types of habitats. None of the flora species for which the Emerald Network territories are defined in the Standard Data Form for the Cholginsky Emerald Site section (UA0000178) have been specified.

According to the Standard Data Form for the site of the Cholginsky Emerald Network Natural Reserve (UA0000178), only the following types of habitats were listed:

- D 5.2 – Beds of large sedges normally without freestanding water (thickets of large carex species mainly without stagnation of water);
- E 1.9 – Open non-Mediterranean dry acid and neutral grassland, including inland dune grassland (non-closed Mediterranean dry acidic and neutral herbaceous groups, including continental herbaceous dunes);
- E 3.4 – Moist or wet eutropic and mesotrophic grassland (wet or wet eutrophic and mesotrophic meadows).

Based on the fieldwork and the analysis of the results obtained in this way, about 100 species of vascular plants of various taxonomic groups were found, but mostly of a syntanthropic nature. This relatively small amount of flora identified is an indication that the vegetation formed here occurred within a relatively short period of time, mainly in man-made landfills associated with sulfur extraction.

In general, the list of established flora consists of ruderal and vegetative plants, among them a considerable number of invasive and adventitious species (see Table), which aggressively compete with native species of flora and form low-species or monodominant groups in large areas.

Such groups include, first and foremost, plant associations dominated by *Phragmites australis, Solidago sanadensis, Typha laxmanii*, and the like. In particular, the first plant association is formed, due to the predominance of marl substrates, that retain water rather well and occupy at least half of the territory of the study area, regardless of the terrain and the slope of the dumps (photo 1). A large area of anthropogenically transformed relatively dry sandy areas is occupied by groups dominated by *Solidago sanadensis* and *Solidago gigantea*, which compete with native plant species (photo 2). Few coastal-water sites are sometimes occupied by *Typha laxmanii*-dominated groups (photo 3).

Among these and other predominantly ruderal groups, a number of adventitious species of predominantly American origin (*Conyza canadensis, Oenothera biennis, Stenactis annua*) have been identified. Herbal vegetation is much more prevalent than shrubbery, since environmental conditions (environmental factors, such as anthropogenic) contribute little to the active sylvatization processes over large areas. Considerable diversity is found only among species of the Salix genus (8 species), however, their participation in the vegetation is negligible, including the participation of species of other taxonomic groups, such as *Alnus, Pinus, Quercus*, etc.

Particular attention was paid to identifying the types of habitats that were specified in the Standard Data Forms for the Cholginsky Emerald Network Natural Reserve (UA0000178). None of these types of habitats have been established in the study area. Analyzing each of these habitats, it should be mentioned that in some cases, for example, in order to isolate the type of habitat D 5.2, even the primary ecological grounds for its existence are absent – the substrates do not correspond to the possibilities of formation of *"thickets of large carex species mainly without stagnation of water"*. Also none of the corresponding species of the carex of this type have been identified in this habitat.

Photo 1. Grouping with dominance of *Phragmites australis (Cav.) Trin. ex Steud.*

Photo 2. Grouping with dominance of *Solidago canadensis L.*

The hydrological network of the territory is significantly anthropogenically transformed, and the vegetation cover of floodplains of small rivers and canals has a derivative character with a large participation of adventitious species in its composition. Therefore, no suitable type of habitat E 3.4 – *"wet or wet eutrophic and mesotrophic meadows"* was detected in the investigated area of the Emerald Network of Cholginsky Natural Reserve (UA0000178).

Photo 3. Grouping with dominance of *Typha laxmanii Lepech.*

Most likely, even before the sulfur extraction, there could have been E 1.9 habitats in this area –*"non-closed non-Mediterranean dry acidic and neutral grasslands groupings, including continental grassland dunes"*. However, long-term activities in the study area (now sections of the

Emerald Network of the Cholginsky Natural Reserve (UA0000178)) lands for mining and agricultural works made it impossible for this type of habitat to exist here.

Detailed floristic studies have also been carried out within the 12 sites, chosen by the project for the construction of wind power plant and intallation of generating turbines. Surveys of each site were conducted within a radius of 100-200 meters from the center of the site, that is taking into account the impact on the vegetation cover, underlying the construction and operation of the wind power plant.

The results of the quantitative and qualitative indicators of the flora of each of the plots are shown in Table 3. In total, 95 species of vascular plants were identified: from 15 to 33 species per plot. Some more phyto-diversity was established at the sites of the Ternovytsya wind power plant, on average – 26 species for one area, less on the territory of the Zaluzhya wind power plant – 21 species respectively. The formation of vegetation occurs in anthropogenically transformed conditions, as it is indicated by a significant number of species of the synanthropic element of flora in all areas without exception, yet each area has its own specific floral features.

This is primarily due to the specific location of the sites, microrelief, as well as environmental conditions that comprehensively affect the formation of vegetation. Below are some characteristics of each section of the wind power plant.

1. **Plots of Yavoriv wind power plant "Ternovitsa"**

P-1 (WT-6 Ternovitsa) – coordinates: 49°56'02.0"N 23°29'53.0"E, cadastral numbers: 4625888600:03:000:0586, 4625888600:03:000:1240. This plot is located on the western slope of the dump near the solar power plant, from which the wastewater flows down the slope of the plot itself, and due to the marl rocks the wet supply is quite high. At the bottom of the site there are drainage channels and a small reservoir. Such environmental conditions have contributed to the formation of the mainly dominant *Phragmites australis* groupings here, with little involvement in the grasslands of synanthropic plant species (*Conyza canadensis, Oenothera biennis, Solidago canadensis,* and others).

P-2 (WT-5 Ternovitsa) - coordinates: 49°55'49.5"N 23°29'33.6"E, cadastral numbers: 4625888600:03:000:0582, 4625888600:03:000:1241. Unlike the previous plot, this one is located on a leveled sandy area, where the groupings are dominantly formed from *Solidago canadensis* – in the drier places, and *Molinia caerulea* - in the wetter ones, but the latter is several times smaller in area.

P-3 (WT-4 Ternovitsa) - coordinates: 49°55'28.2"N 23°29'31.5"E, cadastral numbers: 4625888600:03:000:0584, 4625888600:03:000:1239. This plot is in close proximity to the divided agricultural lands on sandy grounds. There is a reservoir nearby with the characteristic feature of groupings, dominated by the adventitious species *Typha laxmanii*. Here, the prevalence of woody shrubs is also greater than on other plots.

P-4 (WT-3 Ternovitsa) - coordinates: 49°55'19.2"N 23°28'32.3"E, cadastral numbers: 4625888600:03:000:0585, 4625888600:03:000:1244. This plot is located at the bottom of the Gnoenets River floodplain near a solar power plant on a leveled sandy terrace. The vegetation cover associated with the construction works, meant for the installation of solar panels is significantly degraded and represented by a large number of pioneering adventitious plant species, including invasive species that are present on all plots *(Conyza canadensis, Oenothera biennis, Solidago canadensis,* etc.).

P-5 (WT-2 Ternovitsa) - coordinates: 49°55'01.0"N 23°27'40.3"E, cadastral numbers: 4625888600:03:000:0581, 4625888600:03:000:1420. Similar to the previous plot, this plot is only located on the other west side of the solar panel fields. It is characterized by a fairly high diversity of synanthropic plant species, although the vegetation is degraded.

P-6 (WT-1 Ternovitsa) - coordinates: 49°56'11.1"N 23°27'18.2"E, cadastral numbers: 4625888600:03:000:0583, 4625888600:03:000:1246.The plot is sandy and leveled, closed stand

and vegetation are absent, due to the preparatory construction works. Synanthropic pioneer species are represented here by individual plants.

2. Plots of Yavoriv wind power plant “Zaluzhya”

P-1 (WT-4 Zaluzhya) - coordinates: 49°56'56.1"N 23°26'40.7"E, cadastral numbers: 4625884500:08:000:0062, 4625884500:08:000:0091. This plot of pre-technogenic purpose is the storage of used building materials (concrete, sand) with spontaneous overgrowth of synanthropic plant species. It stretches to the slope of the dump and is dominated mainly by *Phragmites australis*.

P-2 (WT-1 Zaluzhya) - coordinates: 49°56'34.1"N 23°26'51.4"E, cadastral numbers: 4625884500:08:000:0063, 4625884500:08:000:0097. A relatively flat plot near the abandoned premises of the former «Sulfur» plant. The peculiarity of this plot is the synanthropic species of hybrid origin *Aster×salignus* together with the groupings of *Phragmites australis i Calamagrostis epigeios.*

P-3 (WT-2 Zaluzhya) - coordinates: 49°56'30.7"N 23°26'10.0"E, cadastral numbers: 4625884500:08:000:0067, 4625884500:08:000:0093. This plot is distinct from the previous plots in design, because here on sandy places there is a significant number of both native and adventitious plant species with significant tree species composition (*Pinus sylvestris, Populus tremula*, etc.).

P-4 (WT-5 Zaluzhya) - coordinates: 49°56'41.7"N 23°25'15.3"E, cadastral numbers: 4625884500:08:000:0071, 4625884500:08:000:0102. This plot is located near the dump on the territory of the Shklo River in sandy area. Along with the typical synanthropic plant species prevalent here, the plot contains *Antennaria dioica*. The slopes of the dump (top to bottom) are occupied by solid thickets of *Phragmites australis.*

P-5 (WT-6 Zaluzhya) - coordinates: 49°57'01.8"N 23°25'10.8"E, cadastral numbers: 4625884500:08:000:0069, 4625884500:08:000:0099. This plot is similar to the previous one, however, the vegetation here is more related to the groupings of *Phragmites australis*.

P-6 (WT-3 Zaluzhya) - coordinates: 49°56'19.7"N 23°25'31.6"E, cadastral numbers: 4625884500:08:000:0061, 4625884500:08:000:0088. The peculiar vegetation of this plot is the related to the fact that it is located on the fallow fields of the former arable land. The lack of agricultural activity contributed to the restoration of vegetation, in particular the formation of groupings dominated by *Calamagrostis epigeios*. Here, the impact of adventitious species is much smaller.

Summarizing the above, it can be stated that the territory of the wind power plant, which is now located within the area of the Emerald Network of Cholginsky Natural Reserve (UA0000178) is represented mainly by a synanthropic vegetation with a large portion of ruderal invasive species. As of today, there are no corresponding habitats according to the Standard Data Forms, as well as there are no species of plants, registered in the Red Book of Ukraine. The impact of the construction of the wind power plant in this area will have only a remotely indirect impact on the vegetation, except for the places with direct installation of the windmills and necessary communication systems.

Table 3

Floristic composition of the plots within the territory of the wind power plants "Ternovitsa" and "Zaluzhya"

Name of species	Number of the plot within the territory of the wind power plant											
	D-1 (T)	D-2 (T)	D-3 (T)	D-4 (T)	D-5 (T)	D-6 (T)	D-1 (Z)	D-2 (Z)	D-3 (Z)	D-4 (Z)	D-5 (Z)	D-6 (Z)
1. *Achillea milefolium L.*	.	.	.	+	.	.	.	.	.	.	.	+
2. *Agrimonia eupatoria L.*	.	.	.	.	.	.	.	.	.	.	.	+
3. *Agrostis stolonifera L.*	.	.	+	.	.	+	.	.	.	.	.	
4. *Agrostis tenuis Sibth.*	+	.	+	.	+	.	+	.	.	.	.	+
5. *Alnus glutinosa (L.) Gaertn.*	.	+	.	.	+	.	.	.	.	.	.	.
6. *Antennaria dioica (L.) Gaertn.*	.	.	.	.	.	.	.	.	.	+	.	.
7. *Armoracia rusticana Gaertn., Mey et Schreb.*	.	.	.	.	+	.	.	.	.	.	.	.
8. *Artemisia absinthium L.*	+	.	.	.	+	+	.	.	.	.	.	.
9. *Artemisia campestris L.*	+	.	.	.	+	.	.	.	+	+	.	.
10. *Artemisia vulgaris L.*	.	.	.	+	+	+	+	+	.	.	+	+
11. *Aster × salignus* Willd.	.	.	.	.	.	.	.	+	.	.	.	.
12. *Berteroa incana* (L.) DC.	.	.	.	.	.	+	.	.	.	+	+	.
13. *Betula pendula* Roth	+	+	+	.	.	.	.	.	+	.	.	.
14. *Calamagrostis epigeios (L.)* Roth	+	+	+	+	+	+	+	+	+	+	+	+
15. *Carex ericetorum Poll.*	+	.	.	.	.	.	.	.	.	.	.	.
16. *Carex hirta L.*	+	+	+	+	+	+	+	+	+	+	+	+
17. *Carex pallescens L.*	.	+	.	.	.	.	.	.	.	.	.	.
18. *Centaurea rhenana Boreau*	.	.	.	.	.	.	.	.	+	+	+	+
19. *Chenopodium polyspermum L.*	.	.	.	.	.	+	+	.	.	.	.	.
20. *Cirsium arvense (L.) Scop.*	+	.	.	.	.	+	.	.	.	.	.	.
21. *Cirsium palustre (L.) Scop.*	.	.	.	+	.	.	.	.	.	.	.	.
22. *Cirsium vulgare (Savi) Ten.*	.	.	.	+	.	.	.	.	.	.	.	.
23. *Conyza canadensis* (L.) Cronq.	+	+	+	+	+	+	+	+	+	+	+	+
24. *Coryneforus cannescens*	.	.	.	.	+	.	.	.	+	+	.	.

(L.) Beauv.												
25. *Dactylis glomerata L.*	.	.	.	.	.	+	.	.	.	.	+	+
26. *Daucus carota L.*	.	.	.	+	.	.	.	.	.	.	.	+
27. *Deschampsia caespitosa (L.) Beauv.*	.	.	+	.	.	.	+	+	.	.	+	+
28. *Dianthus deltoides L.*	.	.	+	.	.	.	.	.	.	.	.	.
29. *Diplotaxis muralis* (L.) DC.	.	.	.	.	.	+	.	.	.	.	.	.
30. *Dipsacus sylvestris Huds.*	.	.	.	+	.	.	.	.	.	.	.	.
31. *Elytrigia repens (L.) Nevski*	.	.	.	+	+	.	.	.	.	.	.	.
32. *Equisetum arvense L.*	.	.	.	+	+	+	.	.	.	.	+	.
33. *Eupatorium cannabinum L.*	+	.	.	.	.	.	.	.	.	.	.	.
34. *Euphorbia cyparissias L.*	+	.	.		.	.	.	.	.	.	.	.
35. *Festuca ovina L.*		.	.		.	.	.	.	+	.	+	.
36. *Filipendula denudata (J. et C.Presl) Fritsch*	.	.	.	+	.	.	.	.	.	.	.	.
37. *Frangula alnus Mill.*	.	.	.	.	+	.	.	.	.	.	.	.
38. *Helichrysum arenarium (L.) Moench*	.	+	.	.	.	.	.	.	+	+	+	+
39. *Hieracium pilosella L.*	+	+	.	.	.	.	.	.	+	+	+	.
40. *Hippophae rhamnoides* L.	+	.	.	.	.	.	.	.	.	.	.	.
41. *Jasione montana L.*		.	.	.	.	.	.	.	+	.	.	.
42. *Juncus articulates L.*	+	.	.	.	.	.	.	.	.	.	.	.
43. *Juncus compressus Jacq.*	+	.	.	.	.	.	.	.	.	.	.	.
44. *Juncus effuses L.*	.	.	+	.	.	.	.	.	.	.	.	.
45. *Lathyrus sylvestris L.*	.	.	+	.	.	.	.	.	.	.	.	.
46. *Lepidium ruderale L.*	.	.	.	.	.	.	+	.	.	.	.	.
47. *Licopodium clavatum L.*	.	+	.	.	.	.	.	.	.	.	.	.
48. *Medicago lupulina L.*	.	.	.	+	.	.	+		.	.	.	.
49. *Mentha arvensis L.*	.	.	.	.	.	+		.	.	.	.	.
50. *Molinia caerulea (L.) Moench*	.	+	.	.	.	.	.	.	.	.	.	.
51. *Nardus stricta L.*	.	.	+	.	.	.	.	.	+	+	+	+
52. *Oenothera biennis* L.	+	+	+	+	+	+	+	+	+	+	+	+
53. *Phragmites australis*	+	+	+	+	+	+	+	+	+	+	+	+

(Cav.) Trin. ex Steud.												
54. *Pinus sylvestris L.*	+	+	+	.	.	.	.	.	+	+	+	+
55. *Plantago lanceolata L.*	.	.	.	.	.	.	.	.	+	.		+
56. *Poa compressa L.*	.	.	.	.	+	+	+	.	.	.	.	.
57. *Poligonum aviculare L.*	.	.	.	.	+	.	.	.	.	.	.	.
58. *Populus tremula L.*	+	.	+	.	.	.	.	.	+	.	+	.
59. *Potentilla anserina L.*	+	.		.	.	.	.	.	.	.	.	.
60. *Potentilla reptans L.*	.	.	+	.	.	.	.	.	.	.	.	+
61. *Pteridium aquelinum (L.) Kuhn*	.	+	.	.	.	.	.	.	.	.	.	.
62. *Pyrus communis L.*	.	.	.	.	.	.	.	.	+	.	.	.
63. *Quercus robur L.*	+	.	+	.	.	.	.	.	.	+	+	+
64. *Ranunculus flammula L.*	.	.	+	.	.	.	.	.	.	.	.	.
65. *Rubus caesius L.*	+	+	+	+	+	+	+	+	+	+	+	+
66. *Rubus plicatus Weihe et Nees*	+	+	+	.	.	.	.	.	+		+	+
67. *Rumex acetosa L.*	.	.	.	.	.	.	.	.	+	+	+	+
68. *Rumex crispus L.*	.	.	.	+	.	.	.	.	.	+	.	.
69. *Salix alba L.*	.	.	.	.	.	.	.	.	+	.	.	.
70. *Salix aurita L.*	.	+	.	.	.	.	.	.	.	.	.	.
71. *Salix caprea L.*	.	.	+	.	.	.	.	+	+	.	.	.
72. *Salix cinerea L.*	+	.	.	+	+	.	.	+	+	.	.	.
73. *Salix fragilis L.*		.	.	.	+	.	.	.	.	.	.	.
74. *Salix purpurea L.*	+	.	.	.	+	.	.	+	.	.	.	.
75. *Salix triandra L.*	+	.	.	+		+	.	.	.	.	.	.
76. *Salix viminalis L.*	.	.	.	.	+	.	.	.	.	.	.	.
77. *Sedum acre L.*	.	.	.	.	.	.	.	.	+	.	.	.
78. *Silene vulgaris (Moench) Garcke*	.	.	.	.	.	+	.	.	.	.	.	+
79. *Solanum dulcamara L.*	+	.	.	.	.	.	.	.	.	.	.	.
80. *Solidago gigantea* Ait.	+	+	+	.	.	+	+	+	.	.	.	.
81. *Solidago virgaurea L.*		+		.	.	.	.	.	+	.	.	.
82. *Solidago canadensis* L.	+	+	+	+	+	+	+	+	+	+	+	+
83. *Stenactis annua Nees*		+	.	+	+	+	+	.	.	.	.	.
84. *Tanacetum vulgare L.*	+	.	.	.	+	.	.	.	.	.	.	.
85. *Taraxacum officinalis*	.	.	.	.	+	.	.	.	.	.	.	.

Webb ex Wigg.												
86. *Thymus serpilum L.*	.	.	.	.	.	.	.	.	+	+	+	.
87. *Trifolium arvense L.*	+	.	.	+	.	.	.	.	.	.	.	.
88. *Trifolium fragiferum L.*	.	.	.	.	.	.	.	.	.	.	.	.
89. *Trifolium pretense L.*	.	.	.	+	.	.	.	.	.	.	.	.
90. *Tussilago farfara L.*	+	.	.	.	.	.	+	.	.	.	.	.
91. *Typha laxmanii Lepech.*	.	.	+	.	.	.	.	.	.	.	.	.
92. *Vaccinium myrtillus L.*	.	+	.	.	.	.	.	.	.	.	.	.
93. *Vicia angustifolia Reichard*	.	.	.	.	+	+	.	.	.	.	.	.
94. *Vicia cracca L.*	+	.	.	.	.	.	.	+	.	.	.	.
95. *Xantium strumarium L.*	.	.	.	.	.	.	+	.	.	.	.	.
Together with the plots	**33**	**22**	**26**	**24**	**30**	**23**	**19**	**15**	**28**	**20**	**23**	**24**

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