NAKKAS-BASAKSEHIR MOTORWAY PROJECT FLORA AND VEGETATION

1. INTRODUCTION

Nakkas-Basaksehir Motorway Project will start from Nakkas region located in the borders of Catalca district of Istanbul and end in Basaksehir. Together with access roads, total length is approximately 30,64 km.

The planned route of the motorway majorly consists residential and agricultural areas. Therefore, natural and semi-natural vegetation constitutes only about 3-5% of the project area. The route is generally show Mediterranean climate characteristics and partially degraded Mediterranean vegetation types have developed in the region.

A significant part of the planned route of the motorway passes through is agricultural land and residential areas (see Figure 1 and Figure 2). Wheat farming is predominant activity in the agricultural areas. Natural and semi-natural areas consist of meadows, riparian, garrigue, and *Spartium junceum* (Spanish broom) communities. Natural and semi-natural habitats on the motorway route are non-continuous.



Figure 1. View from the Route



Figure 2. View from the Route

2. METHODOLOGY

To determine the flora and vegetation characteristics of Nakkas-Basaksehir Motorway Project route, to identify if there are critical plant species or habitats on the route, and to minimize any impacts of planned activities on these species and habitats; a number of sampling locations to represent each habitat were first determined on Google Earth. In the determination, CORINE habitat classification was also used. Sampling locations were selected on the route as much as possible and considering that impacts may occur on the both sides of the motorway, 250 m corridor from right and the left were also included to the study. Accordingly, six different sampling locations were determined on 30,64 km long motorway route. The selected sampling locations and their habitat types are presented in Table 1. On February 1-2, 2021, May 22-24, 2021 and September 13-15, 2021, a field study was performed at these six locations. During the field study, habitats of each location were examined in details, and field notes were recorded into the field book. The floristic list that presents species was prepared based on the findings and observations obtained during the field study.

Table 1. Studied sampling locations and their habitat types

İst. 01	F6.4: Black Sea garrigues
İst. 02	F5.4: *Spartium junceum* fields I1.1: Intensive unmixed crops
İst. 03	F5.4: *Spartium junceum* fields G3.F: Highly artificial coniferous plantations
İst. 04	E2.2: Low and medium altitude hay meadows F5.4: *Spartium junceum* fields I1.1: Intensive unmixed crops
İst. 05	I1.1: Intensive unmixed crops F5.4: *Spartium junceum* fields G1.3: Mediterranean riparian woodland
İst. 06	G1.3: Mediterranean riparian woodland E2.2: Low and medium altitude hay meadows

The flora list is presented in accordance with philogenetical order; ferns (Pteridophyta), gymnosperms (Gymnospermae), and angiosperms (Angiospermae). In the list, the Turkish names, if available; plant geography, endemic status, threat status, Bern and CITES status, habitat, and abundance in the area are given. The list is presented in details in Table 4.

Plants collected from the Project area were determined using “Flora of Turkey and East Aegean Islands” (Davis, 1965-1988). Turkish names of the identified plants are predominantly presented by using Prof. Dr. Turhan Baytop’s work “Turkish Plant Names”. While determining threat status of endemics and rare but non-endemics, Prof. Dr. Tuna Ekim’s work “Turkey Red Book of Plants” is used as a basic reference. In addition, the threat statuses have been reinterpreted by considering the population and threat factors of identified endemic species according to IUCN 2001 criteria and EBRD PR 6.

3. FINDINGS

3.1.Flora

As a result of the studies carried out on the Nakkas-Basaksehir Motorway route in February, May and September 2021, a total of **255** species and subspecies (i.e. taxa below the species level) belong to **60** families (see Table 2). **Two** of the identified species are endemic. While the endemic *Galanthus x valentinei* (see Figure 3) hybrid species spread in Thrace region in Turkey, the other endemic species *Cirsium polycephalum* (see Figure 4) spreads in Marmara region, especially in Istanbul. Therefore, two endemic species are regional endemic. In addition, *Feruloago confuse* which is rare species is defined durşng the field studies. The species is found in only Thracian region (see Figure 5).



Figure 3. *Galanthus x valentinei* (regional endemic)



Figure 4. *Cirsium polycephalum* (regional endemic, blooming period)



Figure 5. Ferulago confuse (rare species, not endemic)

3.1.1. **Flora Status in Terms of Threat Classification and Endemism**

As a result of the field study conducted in the project area, **two** endemic species (*Cirsium polycephalum*, *Galanthus x valentinei*) were identified. Among these, *Galanthus x valentinei* species spreads only in Thrace region, *Cirsium polycephalum* species spreads only in Marmara regions especially around Istanbul. The areas where the species spread are generally garrigue and meadow habitats. Such habitats are decreasing day by day in the region. Therefore, although theses species have good population these days, the population loss is constantly increasing due to the habitat losses. For this reason, one of the identified regional endemic species *Cirsium polycephalum* is categorised as **CR** "Critically Endangered", and the other one *Galanthus x valentinei* is determined as **VU** "Vulnerable" according to globally IUCN. The coordinates of the sampling locations where endemic species were detected on the route are given in Table 3 together with their population statuses. In addition, *Ferulago confuse* which is rare species (not endemic) were determined in the Project area. This species is distributed only Threacian Region of Turkey on meadows and oak openings. Althouth population status of the species is good condition these days, it tends to decrease continuously due to habitat loss. For this reason, national scale of IUCN of the species is classified as VU: Vulnarable. The coordinates and population status of the non-endemic rare species detected in the project area are given in Table 3.

Table 3. Endemic species spread in Nakkas-Basaksehir Motorway route, coordinates of sampling locations detected, population in the project area and ratio to their population in Turkey

TAXA		**Threat Classification**	**Sampling Locations Detected**	**Coordinates**	**Population in the Project Area**	**Ratio to Its Population in Turkey**	**Seed, Tuber or Bulb Collection Period**
1	*Cirsium polycephalum* (regional endemic)	CR	1	35 T 650637 4553385;	1500	%0.3-0.5	August-September
			2	35 T 645265 4552120	20		
			3	35 T 643707 4551823;	200		
			4	35 T 641096 4552655;	100		
2	*Galanthus* x *valentinei* (regional endemic)	VU	6	35 T 631933 4553746	50	%00.1	April

3	*Ferulago confusa* (rare)	VU	1	35 T 650472 4553478;	200	%00.1	July-August

3.2.Habitat Types

Seven different EUNIS habitat types in Level 3 were identified along the motorway route. Some of these habitat types are natural or semi-natural, and some are modified. Each of the natural and semi-natural habitats contain different vegetation types. An important part of the route consists of agricultural areas and natural habitats are generally non-continuous. Habitat and vegetation types on the route are described in the following sections.

E2.2: Low and Medium Altitude Hay Meadows

Such habitats are represented in the clearances of the Black Sea garrigues and in the flat areas of Project area (see Figure 6). The characteristic species of these habitats, where species composition is weak but distribution is almost 100%, are species belong to Cyperaceae, Juncaceae and Gramineae families. Among these, members of Fabaceae family are quite high. Therefore, these habitats are areas where ovine and bovine animals are grazed. The dominant species of vegetation in this habitat are *Juncus effusus, Ranunculus constantinopoliatanus, Plantago lanceolata, Conium maculatum, Silybum marianum,Raphanus raphanistrum, Dipsacus laciniatus, Medicago sativa, Dactylis glomerata,* and *Cynodon dactylon*.



Figure 6. Low and Medium Altitude Hay Meadows (E2.2)

F5.4: *Spartium junceum* Fields

This habitat type developed as secondary due to the destruction of deciduous oak forests. It usually represents arid slopes (see Figure 7). Usually found in small groups and its species composition is poor. The dominant species of the habitat is *Spartium junceum* (see Figure 8). Among these fields, single or perennial herbaceous species usually spreads. These are *Dactylis glometara, Pteridium aquilinum, Rosa canina, Osyris alba, Ruscus aculeatus, Piptatherum miliaceum,* and *Jasminum fruticans*. Regional endemic *Cirsium polycephalum* spred within this habitat and its clearances.



Figure 7. *Spartium junceum* fields (F5.4)



Figure 8. *Spartium junceum*

F6.4: Black Sea Garrigue

This habitat type on the route was formed as a result of degredation of pseudomaquis habitat due to anthropogenic effects (see Figure 9). The dominant species of habitat are *Cistus creticus, Cistus salviifolius, Phillyrea latifolia, Quercus cerris, Calluna vulgaris* and *Erica arborea* (see Figure 10-13). Regional endemic *Cirsium polycephalum* spred within this habitat. In addition, *Iris sintenisii, Dactylorhiza iberica, Bellardia trixago, Parentucellia viscosa, Onosma thracica, Orchis papilionacea, Serapias vomeracea, Serapias parviflora* and *Colchicum chalcedonicum* are found in this habitat (see Figure 14-22). *Cirsium polycephalum*, which is one of the regional

endemic species, and *Ferulago confusa*, which are rare but not endemic, also spread in this habitat.

G1.3: Mediterranean Riparian Woodland

This habitat type develops along alluvial valley grounds with high groundwater table level and along streams (see Figure 23). Dominant tree species vary from stream to stream. While *Ulmus minor* and *Salix alba* are dominant in some riparian areas, *Fraxinus angustifolius* is dominant in others. The characteristic tree species of this habitat are *Ulmus minor*, *Salix alba* and *Fraxinus angustifolius*. While there are bush species *Rubus sanctus* and *Prunus spinosa* in the underbrush, there are high water-use species such as *Juncus heldreichianus, Thypha latifolia, Berula erecta, Schoenoplectus lacustris, Juncus effusus, Phragmites australis, Pulicaria dysenterica, Plantago lanceolata,* and *Dipsacus laciniatus* (see Figure 24). Regional endemic *Galanthus x valentinei* species spred within this habitat



Figure 9. Black Sea Garrigue (F6.4)



Figure 10. *Cistus salviifolius*



Figure 11. *Cistus creticus*



Figure 12. *Calluna vulgaris*



Figure 13. *Erica arborea*



Figure 14. *Iris sinte*nisii



Figure 15. *Dactylorhiza iberica*



Figure 16. *Bellardia trixago*



Figure 17. *Parentucellia viscosa*



Figure 18. *Onosma thracica*



Figure 19. *Orchis papilionacea*



Figure 20. *Serapias vomeracea*



Figure 21. *Serapias parviflora*



Figure 22. *Colchicum chalcedonicum* subsp. *chalcedonicum*



Figure 23. Mediterranean Riparian Woodland (G1.3)



Figure 24. Mediterranean Riparian Woodland (G1.3)

G3.F: Highly Artificial Coniferous Plantations

Coniferous plantations are quite common in the Thrace regions. *Pinus pinea* and *Pinus pinaster* were planted predominantly on the plantation areas created on the motorway route (see Figure 25). The natural flora of the plantation areas is suitable for the pre-plantation habitat. However, as the plantation was made, natural flora elements were cut and the tree species become shrub. Flora is similar to the Black Sea garrigue habitat in terms of diversity.



Figure 25. Highly Artificial Coniferous Plantations (G3.F)

I1.1: Intensive Unmixed Crops

The most common habitat of the motorway route. There are large agricultural areas along the route, where wheat production is dominantly performed (see Figure 26).



Figure 26. Intensive Unmixed Crops (I1.1)

J1.1: Residential Buildings of City and Town Centres

A part of the planned motorway route passes through settlements. This habitat type represents residential areas (see Figure 27).



Figure 27. Residential Buildings of City and Town Centres (J1.1)

Table 4. Nakkas-Basaksehir Motorway Project Flora Species

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		T.S.	BERN	CITES			HABITAT (EUNIS 3. Level)						ABUNDANCE				
					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
PTERIDOPHYTA																						
EQUISETACEAE	1	*Equisetum telmateia* Ehrh.	Atkuyruğu	Widespread											x				x			
HYPOLEPIDACEAE	2	*Pteridium aquilinum* (L.) Kuhn	Eğrelti	Widespread									x	x						x		
SPERMATOPHYTA																						
GYMNOSPERMAE																						
PINACEAE	3	*Pinus pinea* L.	Fıstık çamı	Plantation												x					x	
	4	*Pinus pinaster* Ait.	Sahil çamı	Plantation												x				x		
CUPRESSACEAE	5	*Juniperus oxycedrus* L. subsp. *oxycedrus*	Ardıç	Widespread									x						x			
ANGIOSPERMAE																			x			
DICOTYLEDONES																			x			
RANUNCULACEAE	6	*Ranunculus arvensis* L..	Dugun cicegi	Mediterranean									x				x	x				
	7	*Ranunculus ficaria* L. subsp. *ficariiformis* Rouy & Fouc	Düğün çiçeği	Widespread								x	x	x	x	x	x		x			
	8	*Ranunculus constantinopoliatanus* (DC.) d'Urv.	Düğün çiçeği	Widespread											x				x			
	9	*Ranunculus repens* L.	Düğün çiçeği	Widespread								x			x				x			
	10	*Ranunculus muricatus* L.	Düğün çiçeği	Widespread									x				x		x			
	11	*Nigella damascena* L.	Çörekotu	Widespread									x							x		
	12	*Anemone pavonia* Lam.	Anemon	Widespread									x	x					x			
	13	*Clematis vitalba* L.	Akasma	Widespread											x				x			
PAPAVERACEAE	14	*Papaver rhoeas* L.	Gelincik	Widespread								x							x			
	15	*Fumaria parviflora* Lam.	–	Widespread								x							x			
BRASSICACEAE	16	*Thlaspi perfolatum* L.	Kulakçıklı akça çiçeği	Widespread								x						x				
	17	*Lepidium graminifolium* L.	–	Widespread								x						x				
	18	*Erophila verna* (L.) Chevall. Subsp. *verna*	_	Widespread									x			x			x			
	19	*Arabis verna* (L.) DC.	–	Mediterranean								x	x				x		x			
	20	*Raphanus raphanistrum* L.	Yabani turp	Widespread													x		x			
	21	*Rapistrum rugosum* (L.) All.		Widespread													x		x			
	22	*Sinapis arvensis* L.	Yabani hardal	Widespread													x		x			
	23	*Capsella bursa-pastoris* (L.) Medik.	Cobancantasi	Widespread													x		x			
	24	*Sisymbrium officinale* (L.) Scop.	Çalgıcı otu	Widespread													x		x			
	25	*Hirschfeldia incana* (L.) Lag.-Foss.	_	Widespread									x				x		x			
CISTACEAE	26	*Cistus creticus* L.	Laden	Widespread									x							x		
	27	*Cistus salviifolius* L.	Laden	Widespread									x							x		
	28	*Tuberaria guttata* (L.) Fourr. var. *guttata*	_	Widespread									x							x		
VIOLACEAE	29	*Viola odorata* L.	kokulu menekşe	Widespread									x	x						x		
CARYOPHYLLACEAE	30	*Minuartia hamata* (Hausskn.) Mattf.	–	Widespread								x	x					x				
	31	*Dianthus calocephalus* Boiss.	Yabani karanfil	Widespread									x	x					x			
	32	*Cerastium gracile* Dufour	_	Widespread									x						x			
	33	*Holosteum umbellatum* L. var. *Umbellatum*	–	Widespread									x						x			
	34	*Silene vulgaris (Moenc) Garcke var. vulgaris*	Gıvışkan otu	Widespread									x						x			
	35	*Silene dichotoma* Ehrh. subsp. *dichotoma*	Gıvışkan otu	Widespread										x						x		
	36	*Agrostemma githago* L.		Widespread													x		x			
	37	*Moenchia mantica* (L.) Bartl. subsp. *mantica*		Widespread										x						x		
ILLECEBRACEAE	38	*Herniaria incana* Lam.	Kirik otu	Widespread									x					x				
LINACEAE	39	*Linum bienne* Miller	–	Widespread									x	x					x			
	40	*Linum trigynum* L.	Yabani keten	Mediterranean									x							x		
RHAMNACEAE	41	*Paliurus spina-christi* Miller	Karaçalı	Widespread										x						x		
MALVACEAE	42	*Malva sylvestris* L.	Ebegümeci	Widespread								x							x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		T.S.	BERN	CITES			HABITAT (EUNIS 3. Level)						ABUNDANCE				
					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
	43	*Malva neglecta* Wallr.	Ebegümeci	Widespread								x							x			
	44	*Malope malacoides* L.		Mediterranean								x							x			
SIMAROUBACEAE	45	*Ailanthus altissima* (Miller) Swingle	Kokar ağaç	Widespread								x			x	x			x			
ACERACEAE	46	*Acer campestre* L. subsp. *campestre*	Akçaağaç	Widespread											x					x		
GERANIACEAE	47	*Erodium cicutarium* (L.) L. Herit subsp. *cicutarium*	Turna gagası	Widespread								x	x					x				
	48	*Geranium dissectum* L.	_	Widespread									x						x			
	49	*Geranium rotundifolium* L.	_	Widespread															x			
POLYGONACEAE	50	*Rumex tuberosus* L. subsp. *tuberosus*	Kuzukulağı	Widespread									x	x				x				
	51	*Rumex pulcher* L.	Labada	Widespread								x			x				x			
RUTACEAE	52	*Ruta montana* (L.) L.	_	Widespread										x					x			
ANACARDIACEAE	53	*Pistacia terebinthus* L. subsp. *terebinthus*	Çitlenbik	Mediterranean										x					x			
FABACEAE	54	*Medicago lupulina* L.	_	Widespread									x	x					x			
	55	*Medicago minima* L. var. *minima*	_	Widespread									x	x					x			
	56	*Medicago sativa* L.	Yonca	Widespread								x							x			
	57	*Genista tinctoria* L.	_	European-Siberia									x						x			
	58	*Chamaecytisus pygmaeus* (Willd.) Rothm.	_	European-Siberia										x					x			
	59	*Cercis siliquastrum* L. subsp. *siliquastrum*	Erguvan	Widespread											x				x			
	60	*Vicia cracca* L. subsp. *stenophylla* Vel.	Fiğ	Widespread								x	x						x			
	61	*Vicia sativa* L. subsp. *sativa*	Fiğ	Widespread									x						x			
	62	*Trifolium stellatum* L. var. *stellatum*	Ucgul	Widespread								x	x						x			
	63	*Trifolium campestre* Schreb.	Ucgul	Widespread								x	x						x			
	64	*Trifolium pratensis* L.	Üçgül	European-Siberia								x	x	x					x			
	65	*Trifolium ochroleucum* Huds.	Üçgül	Widespread								x							x			
	66	*Trifolium arvense* L. subsp. *arvense*	Üçgül	Widespread									x	x					x			
	67	*Trifolium repens* L. var. *repens*	Yonca	Widespread								x							x			
	68	*Melilotus neapolitana* Ten.	_	Widespread								x							x			
	69	*Anthyllis hermanniae* L.	_	Mediterranean										x					x			
	70	*Onobrychis aequidentata* (Sibth. & Sm.) d'Urv.	_	Mediterranean										x					x			
	71	*Coronilla varia* L. subsp. *varia*	Körigen	Widespread									x						x			
	72	*Spartium junceum* L.	Katır tırnağı	Mediterranean										x					x			
	73	*Robinia pseudoacacia* L.	Akasya	Plantation											x				x			
	74	*Psoralea bituminosa* L.	_	Mediterranean									x	x				x				
ROSACEAE	75	*Pyrus elaeagnifolia* Pallas subsp. *elaeagnifolia*	Ahlat	Widespread									x	x					x			
	76	*Geum urbanum* L.	–	Widespread									x	x					x			
	77	*Potentilla recta* L.	Dik parmak otu	Widespread								x						x				
	78	*Sanguisorba minor Scop. subsp. muricata (Spach)Brig*	Çayırdüğmesi	Widespread								x	x	x				x				
	79	*Filipendula vulgaris* Moench.	_	European-Siberia									x	x					x			
	80	*Pyracantha coccinea* Roemer	Ateşdikeni	Widespread									x	x					x			
	81	*Crataegus monogyna* Jacq. Subsp. *monogyna*	Alıç	Widespread									x	x					x			
	82	*Fragaria vesca* L.	Yabani çilek	Widespread									x	x					x			
	83	*Prunus divaricata* Ledeb. Subsp. *divaricata*	Yabani erik	Widespread									x	x					x			
	84	*Prunus spinosa* L. subsp. *dasyphylla* (Schur) Domin	Erik	European-Siberia									x	x					x			
	85	*Rubus sanctus* Schreber	Böğürtlen	Widespread									x		x					x		
	86	*Rosa canina* L.	Kusburnu	Widespread									x	x				x				
	87	*Rosa gallica* L.	Bodurgül	Widespread										x					x			
LYTHRACEAE	88	*Lythrum salicaria* L.	Aklar otu	European-Siberia											x				x			

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					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
APIACEAE	89	*Eryngium campestre* L. var. *virens* (Link) Weins	Şekerdikeni	Widespread								x	x					x				
	90	*Falcaria vulgaris* Bernh.	_	Widespread								x	x						x			
	91	*Tordylium apulum* L.	_	Mediterranean									x	x					x			
	92	*Ainsworthia trachycarpa* Boiss.	_	Mediterranean									x	x					x			
	93	*Eryngium creticum* Lam.	_	Mediterranean								x	x						x			
	94	*Scandix iberica* Bieb.	–	Widespread								x	x					x				
	95	*Berula erecta* (Huds.) Coville	Gendeme	Widespread											x				x			
	96	*Lagoecia cuminoides* L.		Mediterranean										x					x			
	97	*Foeniculum vulgare* Miller	Rezene	Widespread								x							x			
	98	*Daucus carota* L.	Yabani havuc	Widespread								x			x				x			
	99	*Oenanthe pimpinelloides* L.	_	Widespread									x	x						x		
	100	*Oenanthe fistulosa* L.	_	Widespread									x	x						x		
	101	*Ferula communis* L. subsp. *communis*	Çakşır	Mediterranean									x	x						x		
	102	*Ferulago confusa* Velen	Günlükotu	European-Siberia			VU						x							x		
	103	*Conium maculatum L.*	Baldıran	Widespread									x	x	x					x		
	104	*Seseli campestre* Besser	_	Widespread									x	x					x			
CRASSULACEAE	105	*Sedum album* L.	Damkoruğu	Widespread								x							x			
	106	*Sedum pallidum* Bieb. Var. *pallidum*	Damkoruğu	Widespread										x					x			
ARALIACEAE	107	*Hedera helix* L.	Duvar sarmaşığı	Widespread											x					x		
CORNACEAE	108	*Cornus mas* L.	Kızılcık	European-Siberia											x				x			
	109	*Cornus sanguinea* L. subsp. *australis* (C.A. Meyer) Jav.	Kansiğdiren	European-Siberia									x		x				x			
DIPSACACEAE	110	*Scabiosa argentea* L.	–	Widespread								x							x			
	111	*Scabiosa sicula* L.		Mediterranean										x					x			
	112	*Dipsacus laciniatus L.*	Fescitarağı	Widespread											x				x			
ASTERACEAE	113	*Senecio vernalis* Waldst. et Kit	–	Widespread								x							x			
	114	*Tussilago farfara* L.	Kabalak	European-Siberia													x		x			
	115	*Doronicum orientale* Hoffm.	–	Widespread									x	x					x			
	116	*Cichorium intybus L.*	Hindiba	Widespread								x							x			
	117	*Conyza canadensis* (L.) Cronquist	selviotu	Widespread								x							x			
	118	*Aster subulatus* Michaux	–	Widespread								x							x			
	119	*Silybum marianum* (L.) Gaertner	Gengel	Mediterranean								x							x			
	120	*Cnicus benedictus* L.	Bostan otu	Widespread								x							x			
	121	*Carthamus dentatus Vahl*	–	Widespread								x							x			
	122	*Anthemis cretica* L. subsp. *tenuiloba* (DC.) Grierson	Papatya	Widespread								x	x						x			
	123	*Anthemis tinctoria* L.	Papatya	Widespread								x	x						x			
	124	*Anthemis chia* L.	Papatya	Mediterranean									x	x					x			
	125	*Centaurea iberica* Trev. ex Sprengel	Peygamber çiçeği	Widespread								x							x			
	126	*Centaurea diffusa* Lam.	Peygamber çiçeği	Mediterranean								x	x						x			
	127	*Bellis perennis* L.	Yoğurt çiçeği	European-Siberia								x	x	x					x			
	128	*Chrysanthemum coronarium* L.	Krizantem	Mediterranean													x		x			
	129	*Hedypnois cretica* (L.) Dum-Cours.		Mediterranean									x	x					x			
	130	*Carduus pycnocephalus* L. subsp. *albidus* (M.Bieb) Kazmi	Kenger	Widespread								x	x						x			
	131	*Carduus nutans* L. sensu lato	Kenger	Widespread								x	x						x			
	132	*Scolymus maculatus* L.	Altındikeni	Mediterranean								x	x						x			
	133	*Scolymus hispanicus* L.	Altındikeni	Mediterranean								x	x						x			
	134	*Carlina corymbosa* L.	–	Mediterranean								x	x						x			
	135	*Hypochoeris radiata* L.	–	Widespread								x							x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		T.S.	BERN	CITES			HABITAT (EUNIS 3. Level)						ABUNDANCE				
					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
	136	*Logfia arvensis* (L.) Holub.	–	Widespread								x						x				
	137	*Lapsana communis* L. subsp. *intermedia* (Bieb.) Hayek	–	Widespread								x						x				
	138	***Cirsium polycephalum* DC.**	**Hoşkangal**	**Mediterranean**	**x**		**CR**						**x**	**x**					**x**			
	139	*Notobasis syriaca* (L.) Cass.		Mediterranean												x			x			
	140	*Chondrilla juncea* L . var. *juncea*	–	Widespread								x						x				
	141	*Lactuca serriola* L.	Yabani marul	Widespread								x						x				
	142	*Lactuca saligna* L.	Yabani marul	Widespread								x				x			x			
	143	*Crupna crupinastrum* (Moris) Vis.		Widespread									x	x					x			
	144	*Evax pygmaea* (L.) Brot.		Mediterranean										x					x			
	145	*Sonchus asper* (L.) Hill subsp. *glaucescens* (Jordon) Ball	Eşek marulu	Widespread								x			x				x			
	146	*Crepis sancta* (L.) Babcock	–	Widespread								x						x				
	147	*Tragopogon longirostris* Bisch. ex Schultz Bip. Var. longirostris	Dedesakalı	Widespread								x	x						x			
	148	*Scorzonera cana* (C.A.Meyer) Hoffm. var. *cana*	Yemlik	Widespread								x	x						x			
	149	*Scorzonera mollis* Bieb. Subsp. *mollis*		Widespread									x	x					x			
	150	*Leontodon tuberosus* L.		Mediterranean									x	x					x			
	151	*Tolpis virgata* (Desf.) Bertol	hoşkıskı	Mediterranean								x	x	x					x			
	152	*Pallenis spinosa* (L.) Cass.	dikenotu	Mediterranean								x	x						x			
	153	*Pulicaria dysenterica* (L.) Gaertn.	_	Widespread								x			x					x		
	154	*Pulicaria odora* (L.) Reichb.		Mediterranean									x	x					x			
CAMPANULACEAE	155	*Campanula lingulata* Waldst. & Kit.	Çançiçeği	European-Siberia									x						x			
ERICACEAE	156	*Erica arborea* L.	Funda	Widespread									x						x			
	157	*Erica manipuliflora* Salisb.	Funda	Mediterranean									x						x			
	158	*Calluna vulgaris* (L.) Hull	süpürge çalısı	European-Siberia									x							x		
PRIMULACEAE	159	*Anagallis arvensis* L. var. *caerulea* (L.) Gouan	Farekulağı	Widespread								x							x			
GENTIANACEAE	160	*Centaurium maritimum* (L.) Fritisch		Mediterranean									x	x					x			
	161	*Blackstonia perfoliata* (L.) Hudson subsp. *perfoliata*		Widespread									x	x					x			
OLEACEAE	162	*Jasminum fruticans* L.	Yasemin	Mediterranean									x	x					x			
	163	*Fraxinus angustifolia* Vahl subsp. *oxycarpa* (Bieb. ex Willd.) Franco & Rocha Afonso	–	European-Siberia												x			x			
	164	*Phillyrea latifolia* L.	Akkesme	Mediterranean									x	x					x			
	165	*Ligustrum vulgare* L.	Kurtbağrı	European-Siberia									x	x					x			
ASCLEPIADACEAE	166	*Vincetoxicum fuscatum* (Hornem.) Reichb. Subsp. *fuscatum*		Widespread									x	x					x			
BORAGINACEAE	167	*Echium italicum L.*	–	Mediterranean								x	x						x			
	168	*Echium plantagineum* L.		Mediterranean									x	x					x			
	169	*Onosma taurica* Willd. var. *tauricum*	emzikotu	Widespread								x	x						x			
	170	*Onosma thracicum* Velen.	emzikotu	European-Siberia									x						x			
	171	*Cerinthe minor* L. subsp. *minor*		European-Siberia									x	x					x			
	172	*Cynoglossum montanum* L.	_	European-Siberia								x	x						x			
	173	*Buglossoides arvensis* (L.) Johnston	–	Mediterranean								x	x						x			
SCROPHULARIACEAE	174	*Parentucellia latifolia* (L.) Caruel subsp. *latifolia*	–	Mediterranean								x							x			
	175	*Parentucellia viscosa* (L.) Caruel		Mediterranean									x	x					x			
	176	*Veronica multifida* L.		Iran-Turan									x	x					x			
	177	*Linaria pelisseriana* (L.) Miler		Mediterranean									x	x					x			
	178	*Digitalis ferruginea* L.subsp. *ferruginea*	Yüksükotu	European-Siberia									x						x			
	179	*Bellardia trixago* (L.) All	_	Widespread								x							x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		T.S.	BERN	CITES			HABITAT (EUNIS 3. Level)						ABUNDANCE				
					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
	180	*Verbascum sinuatum* L.	Sığırkuyruğu	Mediterranean								x							x			
CONVOLVULACEAE	181	*Convolvulus arvensis L.*	–	Widespread								x							x			
	182	*Convolvulus scammonia* L.		Mediterranean									x	x					x			
GLOBULARIACEAE	183	*Globularia trichosantha* Fisch. & Mey.	Küreçiçeği	Widespread									x	x					x			
LAMIACEAE	184	*Lamium amplexicaule* L.	Ballibaba	Widespread								x							x			
	185	*Lamium purpureum* L. var. *purpureum*	–	Widespread								x							x			
	186	*Micromeria myrtifolia* Boiss. & Hohen	boğumluçay	Mediterranean								x							x			
	187	*Teucrium polium* L.	acıyavşan	Widespread									x	x					x			
	188	*Teucrium chamaedrys* L. subsp. *chamaedrys*	acıyavşan	European-Siberia									x	x					x			
	189	*Sideritis montana* L. subsp. *montana*		Mediterranean									x	x					x			
	190	*Thymus longicaulis* C. Presl subsp. *longicaulis* var. *longicaulis*	Kekik	Widespread									x						x			
	191	*Mentha pulegium* L.	yarpuz	Widespread								x							x			
	192	*Prunella laciniata* (L.) L.	_	European-Siberia									x	x					x			
	193	*Calamintha nepeta* (L.) Savi subsp. *glandulosa* (Req.) P.W. Ball	kedifesleğeni	Widespread									x	x					x			
	194	*Prunella vulgaris* L.	–	European-Siberia									x	x					x			
	195	*Clinopodium vulgare* L. subsp. *vulgare*	_	Widespread									x	x					x			
	196	*Salvia virgata* Jacq.	Adaçayı	Iran-Turan								x	x						x			
	197	*Stachys byzantina* C. Koch	_	European-Siberia								x	x						x			
	198	*Stachys woronowii* (Schischkin ex Grossh.) R. Mill		Iran-Turan									x	x					x			
	199	*Origanum vulgare* L. subsp. *vulgare*	_	European-Siberia								x	x						x			
PLANTAGINACEAE	200	*Plantago lanceolata* L.	Bağa	Widespread								x	x						x			
SANTALACEAE	201	*Osyris alba* L.	Süpürge çalısı	Mediterranean								x	x	x					x			
EUPHORBIACEAE	202	*Mercurialis annua* L.	_	Widespread									x	x					x			
	203	*Euphorbia nicaeensis* All. Var. *lasiocarpa* Boiss.	sütleğen	European-Siberia									x	x					x			
	204	*Euphorbia seguieriana* Necker subsp. *seguieriana*	sütleğen	European-Siberia								x							x			
MORACEAE	205	*Ficus carica* L. subsp. *carica*	İncir	Widespread								x			x			x				
CORYLACEAE	206	*Corylus avellana* L.var. *avellana*	Fındık ağacı	European-Siberia											x				x			
SALICACEAE	207	*Salix alba* L.	Aksöğüt	European-Siberia											x				x			
ULMACEAE	208	*Ulmus minor* Miller. subsp. *minor*	Kara ağaç	Doğu Mediterranean											x				x			
URTICACEAE	209	*Urtica dioica* L.	Isırgan	European-Siberia								x			x				x			
FAGACEAE	210	*Quercus cerris* L. var. *cerris*	Saçlımeşe	Widespread									x							x		
	211	*Quercus infectoria* Olivier subsp. *olivier*	Mazımeşesi	European-Siberia									x	x						x		
	212	*Quercus coccifera* L.	kermesmeşesi	Mediterranean									x	x						x		
	213	*Quercus petraea* (Mattuschka) Liebl. Var. *iberica* (Steven ex Bieb.) Krassiln	Sapsız meşe	Widespread									x							x		
LORANTHACEAE	214	*Viscum album* L. subsp. album	Ökse otu	Widespread									x						x			
RUBIACEAE	215	*Galium verum* L. subsp. *verum*	_	European-Siberia											x				x			
	216	*Rubia peregrina* L.	_	Mediterranean									x	x					x			
MONOCOTYLEDONES																						
ARACEAE	217	*Arum byzantinum* Blumea	Yılanburçağı	European-Siberia									x	x					x			
	218	*Dracunculus vulgaris* Schott	Yılanyastığı	Mediterranean									x	x					x			
LILIACEAE	219	*Asphodelus aestivus* Brot.	çiriş	Mediterranean								x							x			
	220	*Ruscus aculeatus* L. subsp. *angustifolius* Boiss.	Tavşanmemesi	Widespread									x	x					x			
	221	*Colchicum chalcedonicum* Azn. subsp. *chalcedonicum*	kadıköyçiğdemi	Mediterranean									x						x			
	222	*Ornithogalum narbonense* L.	akyıldız	Mediterranean									x	x					x			

FAMILY	NO	SPECIES NAME	TURKISH NAME	PHYTOGEOGRAPHICAL REGION	ENDEMISM		T.S.	BERN	CITES			HABITAT (EUNIS 3. Level)						ABUNDANCE				
					B	Y		Anx1	App1	App2	App3	1	2	3	4	5	6	1	2	3	4	5
	223	*Allium rotundum* L.	yabanisoğan	Mediterranean									x	x					x			
	224	*Smilax excelsa* L.	Silcan	European-Siberia									x	x					x			
	225	*Asparagus acutifolius* L.	Kuşkonmaz	Mediterranean									x	x					x			
AMARYLLIDACEAE	**226**	***Galanthus x valentinei* Beck**	_	**European-Siberia**	**x**		**VU**									**x**					**x**	
IRIDACEAE	227	*Crocus biflorus* Miller subsp. *biflorus*	Çiğdem	Mediterranean									x						x			
	228	*Gladiolus italicus* Miller	Glayöl	Widespread									x						x			
	229	*Iris sintenisii* Janka	süsen	European-Siberia									x	x					x			
	230	*Iris suaveolens* Boiss. & Reuter	Süsen	Mediterranean									x	x					x			
ORCHIDACEAE	231	*Serapias parviflora* Parl.	Orkide	Mediterranean									x	x					x			
	232	*Serapias vomeraceae* (Burm. Fil.) Briq. Subsp. *orientalis* Greuter	Orkide	Mediterranean									x	x					x			
	233	*Orchis papilionacea* L.	Orkide	Widespread									x						x			
	234	*Dactylorhiza iberica* (Bieb. Ex willd.) Soo	orkide	Mediterranean									x	x					x			
TYPHACEAE	235	*Tyhpa latifolia* L.	çil	Widespread												x						
JUNCACEAE	236	*Juncus heldreichianus* Marsson ex Parl. subsp. *heldreichianus*	Kofa	Doğu Mediterranean												x				x		
	237	*Juncus effusus* L.	Kofa	Widespread												x			x			
CYPERACEAE	238	*Carex distachya* Desf. var. *distachya*	–	Mediterranean									x	x					x			
	239	*Carex pendula* Hudson	_	European-Siberia												x			x			
	240	*Schoenoplectus lacustris* (L.) Palla subsp. *lacustris*		Widespread												x			x			
POACEAE	241	*Poa bulbosa* L.	–	Widespread								x	x						x			
	242	*Poa annua* L.	_	Widespread								x	x						x			
	243	*Poa pratensis* L.		Widespread								x	x						x			
	244	*Bromus japonicus* Thunb. subsp. *japonicus*	–	Widespread								x	x						x			
	245	*Aegilops biuncialis* Vis.	–	Iran-Turan								x	x	x					x			
	246	*Piptatherum miliaceum* (L.) Cosson subsp. *thomasii* (Duby) Freitag	–	Widespread								x	x	x					x			
	247	*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman	Parmak otu	Mediterranean								x	x	x					x			
	248	*Briza minor* L.	–	Mediterranean								x							x			
	249	*Lolium perenne* L.	Çimen	Widespread												x			x			
	250	*Hordeum bulbosum* L.	Arpa	Widespread								x							x			
	251	*Hordeum murinum* L.	Yabani arpa	Widespread								x							x			
	252	*Brachypodium sylvaticum* (Hudson) P. Beauv.	_	Widespread									x	x	x					x		
	253	*Cynodon dactylon* (L.) Pers. var. *dactylon*	Domuz ayrığı	Widespread								x							x			
	254	*Phragmites australis* (Cav.) Trin. ex Steudel	Kamış	European-Siberia											x						x	
	255	*Elymus elongatus* (host) Runemark subsp. *elongatus*	–	Widespread								x	x						x			

*
B: Regional endemic
Y: Widespread endemic

**
1. E2.2: Low and Medium Altitude Hay Meadows
2.F6.4: Black Sea Garrigue
3. F5.4: Spartium junceum Fields
4. G.3.F: Highly Artificial Coniferous Plantations
5. G1.3: Mediterranean Riparian Woodland
6. I1.1: Intensive Unmixed Crops

***
1: Very rare
2: Rare
3: Moderate
4: Abundant
5: Very abundant

4. ECOSYSTEM SERVICES

Ecosystem services are the benefits of the environment (habitats and species) to humans and represent the flow of benefits that arise from natural capital. Potential important ecosystem services within the scope of the project are defined as follows:

a)Provisioning services (products people obtain from ecosystems):

• Agricultural areas and orchards provide the necessary services for people to feed them

• Mushrooms, hazelnuts (*Coryllus avellana*), and pine nut (*Pinus pinea*) collected from natural habitats by local people and used as food

• Industrial timber is obtained from planted forests

• Running and stagnant water resources both provide water to animals and are used as irrigation water in agricultural lands. In addition, these water resources regulate the water regime in the region.

• Natural and planted forests provide feeding, shelter, and breeding areas for many bird, mammal, reptile and insect species.

• Pastures are used for grazing animals

b) Regulating services (i.e ecological functions):

• Oxygen is produced by vegetation and trees

• Vegetation contributes to flood prevention by controlling erosion

• Vegetation helps precipitation to not create surface runoff by infiltrating it to the lower layers, and reduces sediment transport to lakes and seas

c)Cultural services (other intangible benefits to people):

• Natural habitats are suitable places for people to rest

• Natural forests create beautiful and pleasing landscapes

• Since natural habitats provide habitat for critical species, they have an extremely important role in terms of species sustainability

• Natural habitats act as genetic reserves as they contain flamboyant flowers such as *Galanthus x valentinei*

5. LANDSCAPE ASSESSMENT OF THE AREA

The motorway route is suitable for Mediterranean and European Siberian origin plants. After the activity is completed; to prevent erosion, to revegetate the roadside, and eventually to protect the species and integrity of habitat, it is extremely important to select plants that naturally spread in the region. Therefore, the most important tree species that can be used for landscaping are determined as *Quercus cerris* (Turkey oak), *Quercus petraea* (Sessile oak) and *Coryllus avellana* (Hazel). In areas with high groundwater table level, the tree species *Ulmus minor* (Black tree), *Fraxinus angustifolia* (Ash) and *Salix alba* (Willow) should be planted. To cover the slopes on the roadside, it is convenient to plant *Erica arborea, Erica manipuliflora, Cistus creticus, Cistus salviifolius* from groundcovers. If afforestation is to be made with coniferous species, only *Pinus pinea* (Stone pine) should be preferred.

6. CONCLUSION

To ensure that its Environmental and Social Policy results in successful practical outcomes, EBRD has adopted a set of 10 specific Performance Requirements (PRs) that its clients are expected to meet, covering key areas of environmental and social impacts. PRs reflect the EBRD's commitment to promote European Union (EU) environmental standards as well as the European Principles for the Environment. EBRD expects its clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs.

PR 6 of EBRD on Biodiversity Conservation and Sustainable Management of Living Natural Resources covers areas of biodiversity conservation, ecological functions of ecosystems, sustainable management of living resources, as well as the livelihood of indigenous people and affected communities whose access to or use of biodiversity or living natural resources may be affected by project activities. Accordingly, the objectives of PR6 are outlined as the following (EBRD, 2019: 44):

- To protect and conserve biodiversity using a precautionary approach;
- To adopt the mitigation hierarchy approach, with the aim of achieving no net loss of biodiversity, and where appropriate, a net gain of biodiversity; and
- To promote good international practice (GIP) in the sustainable management and use of living natural resources.

EBRD PR6 requires that all habitats, whether they are modified, natural or critical, which indicates disturbed or degraded habitats, as well as manmade areas should also be considered in defining conservation strategies and mitigation measures.

Modified habitats, in the most general sense, are those that have been subject to some form of alteration, often resulting in agricultural land. Despite the fact that some modified habitats might lose all of their natural characteristics, it is still required to minimize further impacts.

Natural habitats are terrestrial and aquatic habitats, where biological composition is made of native flora and fauna elements and the degree of modification by human activity is insignificant. Therefore, natural habitats are of great importance in terms of conservation of species in their natural ranges of distribution. As put forward by EBRD PR6, natural habitats should not be degraded or converted to an extent that (i) the ecological integrity and functioning

of the ecosystem is compromised or (ii) the habitat is depleted to the extent that it could no longer support viable populations of its native species (EBRD, 2008: 46).

Critical habitats are defined as the most sensitive biodiversity features, which include at least one of the following (EBRD, 2019: 46):

CH1: highly threatened and unique ecosystems

CH2: habitats of significant importance to endangered or critically endangered species as listed on the IUCN Red List

CH3: habitats of significant importance to endemic or geographically restricted species

CH4: habitats supporting globally significant migratory or congregatory species

CH5: areas associated with key evolutionary processes or ecological functions that are vital to maintaining the viability of biodiversity features described above

Two regional endemic species (*Cirsium poycephalum, Galanthus x valentinei*) and a rare spread species (*Ferulago confusa*) were identified during the field studies carried out in February, May and September 2021 on Nakkas-Basaksehir Motorway Project route. The IUCN category of *Cirsium polycephalum* is CR "Critically Endangered". For this reason, the Project area is a critic habitat trigger with Ch 2 and Ch3 criteria only due to the presence of *Cirsium poycephalum*.

Galanthus x valentinei and *Ferulago confusa* are VU "Vulnerable"according to IUCN. The Thrace population of the endemic species identified in the project area is currently in good condition. However, the ever-increasing habitat losses will endanger the population of these species over time. To minimize population losses, bulbs of *Galanthus x valentinei* located on the motorway route should be collected and replanted to areas that will not be affected by the activity. Habitats of regional endemic species *Cirsium polycephalum* and rare spread species *Ferulago confusa* have decreased considerably in recent years due to anthropogenic effects. Therefore, the seeds of this species should be collected in July-August, some of them should be delivered to the Turkish Seed Gene Bank located in Ankara for ex situ conservation, and some should be planted in suitable areas that will not be damaged by the activity for in situ conservation.

The Mediterranean riparian woodland habitat among the natural habitats located on the route is considered sensitive. Therefore, the water requirement of riparian habitats that are outside the motorway route, but which may be affected by motorway construction activities, should be

considered. Otherwise, such sensitive habitats may deteriorate in a short time in parallel with the decrease in water, although located outside the motorway route. The developed mitigation measures are presented in the following sections.

7. IMPACTS AND MEASURES

Impacts and measures have been determined for two phases as preconstruction and construction.

a) Preconstruction Phase

Seeds and/or bulbs of endemic species (*Cirsium poycephalum*, *Galanthus x valentinei* and *Ferulago confusa*) on the motorway route should be collected before construction. Seeds of *Cirsium poycephalum* and *Ferulago confusa* species should be collected in the appropriate season, should be kept in shade at +4°C, some should be delivered to Turkish Seed Gene Bank located in Ankara, and some should be planted in suitable habitats in the vicinity. Similarly, bulbs of *Galanthus x valentinei* species should be collected in the appropriate season (April) and replanted in suitable habitats that will not be affected by the project. The seed and bulb collection periods of these species are given in Table 3.

b) Construction Phase

The continuity of the water regime is extremely important for the future of water-dependent habitats. During the construction phase, it should be ensured that water systems that feed streams, ponds and swamps will not be damaged by the consruction activities. Otherwise, critical water-dependent habitats may disappear.

Natural habitats that are very limited and non-continuously located on the motorway route are extremely important in terms of biodiversity. Construction activities to be performed in these areas should be conducted with the utmost effort to minimize the population losses of endemic species. Necessary measures are explained below:

- Study areas will be clearly defined before vegetation clearance where construction activities will take place;
- Project construction sites will be separated from other areas with appropriate signboards, signs and fences. Therefore, staff and vehicle access to the area will be limited to the construction site;

- During vegetation clearance, equipment will be selected so as not to harm plant roots,
- Intrusion of any invasive species into the project area and its surroundings will be prevented. For this purpose, especially vehicles used for vegetation clearance and/or plant transfer will be checked beforehand;
- Construction waste generated due to project activities will first be stored at designated storage areas and then disposed. Solid waste will not be allowed to be left at natural habitats;
- Regular irrigation will be made at construction sites to prevent dust formation;
- Project workers will not be allowed to bring plants into the construction site to avoid the risk of pest/invasive species establishing in the Project Area;
- Mixing any chemical substances, that is used in the construction area, in waterbed and/or aquatic ecosystems will be prevented, and
- Excavation materials will not be dumped onto riverbed.

In conclusion, if the above-mentioned precautions are taken, the impact of the activity on plant species and habitats will be minimized.

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