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Environmental and social impact assessment

Final report

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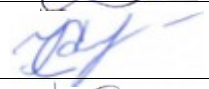
Acoustician	S. Kasimkhodjaeva	
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6 NATURAL CONDITIONS OF THE AREA OF PLANNED ACTIVITY

6.1 Climate

An analysis of climatic characteristics of the area where a combined cycle power plant with a capacity of 550 MW is located was carried out according to the observation data received from the “Uzhydromet” Service at the nearest weather station located in Jizzakh city.

The climate of Jizzakh city is sharply continental with cold winters and hot summers. The average annual temperature is +15.2°C, the maximum air temperature reaches +42.7°C, the minimum is 31.5°C below zero. The average air temperature for the month of July is +26.71°C, the average temperature for January is -1.49°C. The average annual relative humidity is less than 30%.

The winter period is characterized by extreme weather instability, the development of clouds, frequent precipitation and rapid changes in temperature and humidity. The coldest month of the year is January. In January, the average monthly temperature ranges from 0 to -5.4°C. Low temperatures are observed in the northern part of the region, which is facilitated by its open position in relation to the northern cold invasions.

Absolute minimum air temperatures range from -29 to -34°C, average absolute minimums from -18 to -26°C. A significant part of the territory of Jizzakh region is characterized by moderate frosts both in the mountains and in the valley. Winters are mild in most of the flat territory of the region, and moderately cold in the far north and in the mountains.

The snow cover in the flat part of the territory is unstable. The number of days with snow cover is insignificant: on average 30-34 days during winter. Stable snow cover is formed in the mountains from a height of 1000 m. The duration of stable snow cover is more than two months. The height of the snow cover in the flat part of the region is low. On average, its long-term average values for 10 days range from 4 to 8 cm, but in some cold winters they can be much higher (in 1969, the snow depth in Jizzakh was 48 cm).

Significant changes in air temperature with weak snow cover lead to soil freezing. The maximum freezing depth reaches 50 cm. In most of the territory, the frost-free period is long: 200-220 days, the shortest frost-free period is observed in the mountains - 170 days.

Summers are hot and dry. The absolute maximum air temperature in the entire territory of Jizzakh region reaches 45-47°C. According to the absolute maximum, the southern part of the Hungry Steppe is the hottest not only in Jizzakh region, but also in Uzbekistan, second only to some areas of the southern regions.

The entire summer period and most of autumn are characterized by a small area and a large number of clear days. The largest number of clear days is observed in August and reaches an average of 27-28 days. Cloudy days are mainly observed in the winter-spring period. The average number of cloudy days in a month is 10-15.

The state of the atmosphere is significantly influenced by the amount and intensity of precipitation, which performs a cleansing function.

Annual precipitation in most of the region is low at 376.8 mm. In the annual course, the largest share of precipitation falls in the autumn-winter-spring period. In summer, they

usually do not fall on the flat part of the precipitation. Precipitation also falls in the mountains in summer.

The annual distribution of precipitation is characterized by the greatest moisture in the winter-spring period, the least in the summer. The monthly maximum precipitation is observed in March and April, the minimum falls in September. Fogs are very rare, the average annual number of days is 5. Fogs are most often observed in the winter months.

The penetration of cold air masses through the northern open part of the region in winter causes a sharp drop in temperature. Frosts occur even in late spring, they cause damage to fruit trees and crops.

Local terrain features also have a significant impact on the wind regime. With the approach of the mountain hills near the northern slopes of the Nuratin range, the wind changes direction to the southwest.

In the area of Jizzakh city, the prevailing winds are western, northern and northwestern directions from the “Tamerlane Gate”. The average annual wind speed is 2.5-6 m/sec.

Dry winds and dust storms are among the adverse weather events in the territory of the region. In rain-fed areas, as well as in years when there is not enough irrigation water in irrigated areas, dry winds damage plants at different stages of their development, which leads to significant crop losses. Dry hot winds of low intensity are observed annually throughout the region and intensify near desert areas. The highest frequency of their occurrence is observed in the area of Galliarala and Jizzakh. Dust storms are observed throughout the region, but most of all in the flat part of it. Dust storms are most common in the Galliarala area.

The aridity of the climate and wind activity increase air pollution due to natural dust, which increases dramatically during dust storms and dry winds.

An important meteorological characteristic that determines the conditions for the dispersion of pollutants in the atmosphere is the wind speed. Weak winds contribute to the accumulation of pollutants coming from low emission sources.

Weak winds (0-1 m/sec and 2-3 m/sec) prevail in the considered area – 93.49% of cases.

Winds with a speed of 4-5 m/s, which contribute to the transfer of impurities from high hot springs, account for 5.39% of the annual distribution.

North winds prevail in Jizzakh city. The average annual frequency of these winds is 26.61%. Such winds are most frequent in spring and summer. It should be noted that the average annual wind speed of the eastern and southern directions is 8.21 and 7.84 m/s. The average annual frequency of strong winds (15 m/s) is low and is 0.02%.

The climatic conditions of the area contribute little to the dispersion of impurities without significant accumulation in the surface layer during periods of inversions.

Thus, based on the analysis of climatic characteristics, we can conclude that high temperatures in the warm season of the area, aridity of the surface, prevailing weak winds causing stagnation, contribute to the accumulation of pollutant emissions from low-lying unorganized sources.

Table 1 Climatic data of the area of the object location

No	Characteristic	Unit of measurement	Magnitude
1.	Coefficient A, depending on the temperature stratification of the atmosphere	-	200
2.	Average annual temperature	0C	+ 15,24
3.	The average temperature of the hottest month (July)	0C	+ 27,76
4.	Absolute maximum	0C	+ 42,2
5.	Average temperature of the coldest month (January)	0C	1,68
6.	Absolute minimum	0C	-19,7
7.	Average annual frequency of wind directions by direction:	%	
	N		9,83
	NNE		8,41
	NE		7,20
	ENE		4,80
	E		8,21
	ESE		3,56
	SE		4.56
	SSE		4,88
	S		7,84
	SSW		3.29
	SW		5,71
	WSW		4,91
	W		7,18
	WNW		4,77
	NW		6,50
	NNW		8,37
8.	Calm	%	25,72
9.	Precipitation	mm	376,80
10.	Wind speed (average)	m/sec	1,45
11.	Wind speed (absolute maximum)	m/sec	34
12.	The highest wind speed, the excess of which is 5%	m/sec	u*=4.06

Thus, both the physical and geographical and climatic conditions of the area under consideration contribute to the accumulation of impurities from low unorganized sources of emissions in the vital layer of the atmosphere.

The snow cover is unstable; it forms and thaws repeatedly during the winter. Only in some years can stable snow cover be observed for at least a month in a row. During the winter, the number of days with snow cover averages 30 days. The average height of the snow cover is 8-12 cm.

In spring, 30% of the annual precipitation falls, mainly in the form of rain, less often in the form of snow (in March), and there are frosts at night.

The area under consideration (a designated site for the construction of a combined cycle power plant with a capacity of 550 MW) is characterized during the year by: northern (8.83%); northeastern (7.20%); eastern (8.21%); western (7.18%); southwestern (5.71%); northwest (6.50%) winds.

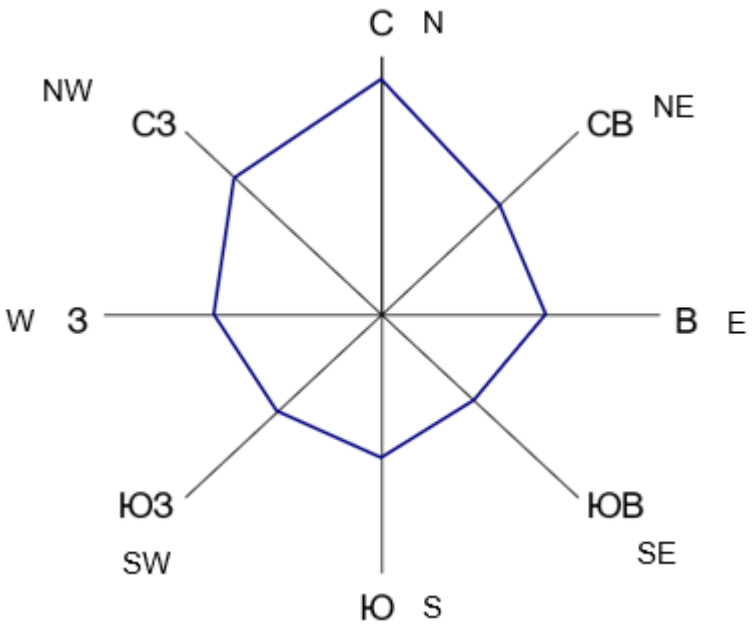

Figure 1: Frequency of wind direction (wind rose Jizzakh city)

6.2 Relief and engineering-geological conditions

According to the geomorphological structure, the grounds are represented by loess-like loams, with layers of lenses of sand and gravel with a thickness of 2 to 40 m. Below are water-saturated pebbles.

Lithological characteristics of sediments. The quaternary deposits of the Hungry Steppe are divided into four complexes: Sokhsky (or Nanai), Tashkent, Golodnostep, Syrdarya. The total thickness of the Quaternary deposits varies from 100 m (in the west) and up to 1 000 m in the eastern part of the Hungry Steppe. In the middle part of the Hungry Steppe, quaternary deposits are characterized by a thickness of 200-300 m.

The most ancient horizon of the anthropogenic (Q1) is the Sokh (Nanai), whose deposits are represented on the plain by loams, clays (reddish tone) and sandy loams, and in the foothills by pebbles, densely cemented conglomerates, overlain by loess (possibly later).

In the foothills of the Turkestan Range, Q1 sediments correspond to alignment surfaces with heights of more than 1000 m.

The average anthropogenic (Q2) is represented by sediments of the Tashkent complex lying on the blurred surface of the Sokha sediments. Its capacity is from 100 to 220 m. Within the proper foothill plain of the Jizzakh steppe, the surface corresponding to Q2 in the form of washed remnants can be traced along the foothills, as well as within the Sanzar and Zaamin cones.

Sediments of the Hungry Steppe period (Q3) are represented by loess-like loams with a thickness of 5 to 40 m, lying in the northern part of the Hungry Steppe on the alluvial sands of the Syrdarya, and in the southern part - on pebbles, sands, loams of alluvial cones of the Sanzara, Zaamina and other rivers. Sediments of the Hungry Steppe cycle compose most of the Hungry Steppe plain.

These sediments are also found in the foothills in river valleys. Apparently, the lowest step of the foothills, composed of pebbles and covered with loess, corresponds to

this age. The modern (Syrdarya) complex of quaternary deposits (Q4) can be traced in the Syrdarya valley and is represented by deposits of the second (lake), first terrace and floodplain of the Syrdarya River. Within the actual piedmont Hungry Steppe piedmont plain, the Syrdarya complex is represented by proluvial pebbles and sandy-loamy deposits of modern alluvial fans and log-like depressions. In some areas, especially on the periphery of the Sanzar cone, on the lands adjacent to Arnasai, sands of Aeolian origin are widespread.

As part of the field geotechnical work, two wells with a depth of 50 and 30 meters were opened and core drilling was carried out. The groundwater level was found at -1.60 m.

BH-1 during drilling, the topsoil was deposited at a depth of approximately 0.00-0.50 m, and alluvium between 0.50-50.0 m was presented as a fine-grained clay-silt-sand block with high clay content in some places. In some places, the increased density of silt has passed into the ground.

BH-2 during drilling, the vegetative soil was passed to a depth of about 0.00-0.50 m, and a fine-grained clay-silt-sand block with a high clay content in places and an increased silt density in places was passed.

6.3 Surface water

The nearest surface watercourse to the designated construction site is a ditch that flows at a distance of 11.5 meters in an easterly direction with a maximum capacity of 20 to 25 cubic meters (it depends on the season) of water per minute and a total depth of up to 1-2 meters along the edge of the normal water level.

Figure 2: The ditch next to the project area, where treated water will be discharged

The main irrigation ditch flows at a distance of 880 meters in the south-west direction with a throughput of 40 to 50 cubic meters of water per second and a total depth of 6 meters along the edge of the normal water level

The main irrigation ditch originates from the Jizzakh reservoir, then flows near

Jizzakh city in the direction of the agricultural fields of Yangikishlak village and others.

The coastal zone of the Jizzakh reservoir is located in the southern direction from the studied territory at a distance of 1.7 km.

The area of the Jizzakh reservoir (Figure 3) is 12.7 km2, the depth is 24 m, the useful volume of water is 96.0 million m3, the widest part is 5.1 km. Water mainly from the Sanzor River, is collected in the reservoir at a rate of about 10 m3/sec. The reservoir supplies water to more than 61.72 thousand hectares of irrigated lands of Jizzakh region and has an irrigation purpose. During the irrigation season, water from the reservoir is supplied through the drainage system back to the irrigation ditch. According to data received from the Jizzakh Region Reservoir Management for 2020-2023, the actual volume of water flowing into the reservoir ranged from 23.9 million m3 in 2021 to 64.9 million m3 in 2023. At the same time, the actual water consumption from the reservoir in 2023 amounted to 42.7 million m3.[1] In the winter months outside the irrigation season, the flow from the reservoir is at zero, the flow begins in March and ends in November, while the inflow of water and filling of the reservoir begins in January and ends in July.

Figure 3: Jizzakh reservoir

The main sources of surface runoff formation in the Jizzakh region are the Sanzar and Zaaminsu rivers.

The main high-water artery of the Jizzakh region, the Sanzar River (Figure 4), flows at a distance of 2.6 km to the west of the territory under consideration. The sources of the river are located approximately at an altitude of 3300 m, on the northern slope of the Chumkar-tau ridge. The large lateral tributaries Yelkoyday, Korangul, Karangibulak, Nauka and Zagor only carry water to the main channel during the period of snowmelt and precipitation. Sanzar river flows through the territory of the Bakhmali, Gallaaral and Jizzakh

[1] Response to the Consultant's request from the Jizzakh Region Reservoir Management dated 14.09.2024 No. 127

districts.

Figure 4: Sanzar River

Sanzar River, with a total length of 123 km (from the sources to the Kli village), has a catchment area of 2.6 thousand km2. Sanzar River is fed by infiltration of atmospheric sedimentation and waters of surface watercourses flowing down from the mountains, belongs to the snow-rain type. The average annual water consumption is 6.9 m3/sec. The maximum water consumption is observed in the spring and summer months, ranging from 7.36 m3/sec in August to 2.94 m3/sec in January.

6.4 Groundwater

Shallow groundwater lies at a depth of 1.5-3 m in the study area; in the project area, groundwater lies at a depth of 1.6 m. Groundwater supply occurs due to infiltration of irrigation water and precipitation. Groundwater has a high concentration of total organic and inorganic compounds and is salty, which makes it unsuitable for use in concrete production or for safe consumption.

The hydrology of Jizzakh city is represented mainly by networks of built canals and collectors that carry water from the mountains, wastewater from treatment plants, enterprises, as well as precipitation. The system of artificial channels transformed the surface hydrology of the region, which led to the appearance of Lake Aydarkul, which is located along the northern border of the region.

Aquifers of groundwater are filled due to losses due to infiltration of precipitation, mountain streams and irrigation channels.

In the Jizzakh region, groundwater in a flat area is close to the surface, the depth of groundwater does not exceed 3-4 m. Groundwater mineralizes, coming to the surface, causing salinization of the soil. With increasing elevation, the depth of groundwater increases, in the foothills and plains it is 10-25 m, while the degree of salinity decreases. Groundwater in mountainous areas is associated with river valleys and is shallow (4-5 m), has high taste characteristics.

In general, the situation with groundwater quality in the region is favorable, where the content of polluting components generally does not exceed MPC levels, except for the northern regions. In most of the territory of the region, there is a tendency to increase the mineralization of groundwater, remaining within the MPC. Previously detected changes in

mineralization (1.15-0.05 g/l) and hardness (8.0-18.6 mg/l) were noted at several water intakes (Industrial Zone, Kurgan, Sarybazar, Uchtepa, Sanzarselsky, Devon). The main sources of groundwater pollution are public utilities, industrial enterprises, and sewage treatment plants.

6.5 Soil

Hungry Steppe, in the southwestern part of which Jizzakh is located, is an alluvial-proluvial plain with a general surface slope to the north and northwest. Most of the flat territory of Jizzakh region is occupied by light gray soils. In the Hungry Steppe, the light gray soils are salty, loamy and clayey in mechanical composition, while at the northern foot of the Nurata ridge they are eroded skeletal or cartilaginous and pebble-loamy soils.

Gray soils are the most widespread automorphic soils within the vertical zone, forming at relatively low altitudes of piedmont plains and, less commonly, river valleys. Light gray soils are formed on the sub-mountain sloping plains, as well as in places on the foothills and low mountains, depending on the latitudinal position and exposure of the slopes of the main ridges.

Gray soils develop mainly on loose rocks of quaternary age - loess, on loess-like, but less sorted and thin sediments, and very rarely on eluvium bedrock. The humus horizon with a thickness of 12-15 cm contains 1-1.5% of humus. The humus poverty of gray soils is explained by the insignificant intake of organic residues and their rapid mineralization. Light gray soils, in comparison with other soils of high-altitude zones, are the lightest in terms of mechanical composition and poor in organic matter content.

The total nitrogen content in gray soils is low due to their low humus content. The arable horizon of cultivated soils contains only 0.05-0.09% nitrogen.

In the process of developing the Hungry Steppe, irrigated gray soils were formed as a result of tillage, washing, and irrigation. They differ from the virgin ones by the greater thickness of the humus horizon and the deeper position of the carbonate and gypsum horizons.

The resulting agroirrigation horizon is characterized by a uniform mechanical composition, most often heavy loamy or light loamy, monotonous grayish color and uniform humus content. High carbonate content and alkaline reaction promotes the transition of phosphorus into hard-to-digest forms. In addition, light gray soils are subjected to secondary salinization during irrigation. The main causes of salinization are associated with unsatisfactory drainage due to the lack of an optimal collector-drainage network, insufficient leaching and agrotechnical measures, and evaporation of filtered water.

Since the area under consideration is a fairly developed agricultural area, it is necessary to take into account the contamination of irrigated soils with pesticides. According to the average data from 2000 to 2006, soil contamination with pesticides in Jizzakh region amounted to 0.04 mg/kg (slightly contaminated). This is a favorable factor for the further development of agriculture in the region.

Thus, the condition of the soil in the area of the planned location of the power plant should be considered satisfactory in terms of the nature and degree of uncertainty and pollution.

The soils of the allocated area for the construction of a combined cycle power plant with a capacity of 550 MW are characterized by transitional hydromorphic soils, where meadow-gray grassy soils predominate, as well as saline soils.

Some areas of the soil cover of the land allocated for the construction of the power plant are formed on grassy loess and loess loams, they are also distinguished by the greater thickness of the humus horizon and the deeper position of the carbonate horizons.

The soil of the selected area is characterized by a uniform mechanical composition, most often loamy or light loamy, a monotonous grayish color and a uniform humus content.

Thus, the condition of the soils in the area of the planned location of the combined cycle power plant with a capacity of 550 MW should be considered satisfactory in terms of the nature and degree of unsolved conditions and pollution.

6.6 Vegetable world

In order to collect initial data to determine the potential impacts of the project on the flora in accordance with the requirements of PS-1 and PS-6 of the IFC, as well as the norms of the Laws of the Republic of Uzbekistan “On Nature Conservation”, “On Environmental Expertise”, zoological research was carried out in the area of the planned activity in May 2024.

As part of botanical research, a review of literature data on the flora and vegetation of the Jizzakh region was carried out, a brief description of the main types of plant communities, a list of plant species in the Project region listed in the Red Book of Uzbekistan and the IUCN, endemics, as well as a brief description of their ecology was determined, the locations of threatened plant species were established, and the state of populations was assessed.

When describing and mapping types of habitats (biotopes), assessing the state of the flora of the study area, natural and transformed habitats were identified in accordance with the requirements of clauses 9-15 of PS-6 of the IFC.

The data from field studies conducted in May 2024 served as a material for assessing the current state of the fauna of the area of the planned activity.

According to literary and herbarium data, there are no populations of rare species listed in the Red Book of Uzbekistan in the Project Area. The following 9 plant species listed in the National Red Book have been noted within the Jizzakh part of Mirzachul and in the foothills of the Malguzar ridge, but all their known locations are located far from the construction site.

During a field survey in May 2024, it was determined that the Project Area contains only converted habitats that, according to the IUCN Habitats Classification Scheme (Version 3.1), belong to type 14 Artificial – Terrestrial (Anthropogenic terrestrial habitats), subtypes 14.1 Arable Land, 14.2 Pastureland and 14.4 Rural Gardens and type 15 Artificial – Aquatic, subtype 15.9 Canals and Drainage Channels, Ditches. There are no natural habitats in the Project area. At the time of the survey, construction work was underway on the site, and vegetation had already been destroyed throughout the western half of the site, and several dirt roads run through the central and eastern parts, along which heavy machinery continuously moves.

5 geobotanical test sites were described, including 2 on the site allocated for the construction of a combined cycle power plant, and 3 sites in the 300 m zone. The entire construction site is an old deposit with secondary amber-grass vegetation (Hordeum murinum ssp. leporinum, Cynodon dactylon, Alhagi pseudalhagi) and single comb bushes (Figure 5). The remains of arable land furrows are clearly visible both on the satellite image and on the ground. Converted habitat, which according to the IUCN Habitats Classification

Scheme (Version 3.1) belongs to type 14 Artificial – Terrestrial, subtype 14.1 Arable Land, and according to the European classification EUNIS Habitat Classification Scheme, this habitat belongs to type V Vegetated man-made habitats and subtype V38 Dry perennial anthropogenic herbaceous vegetation.

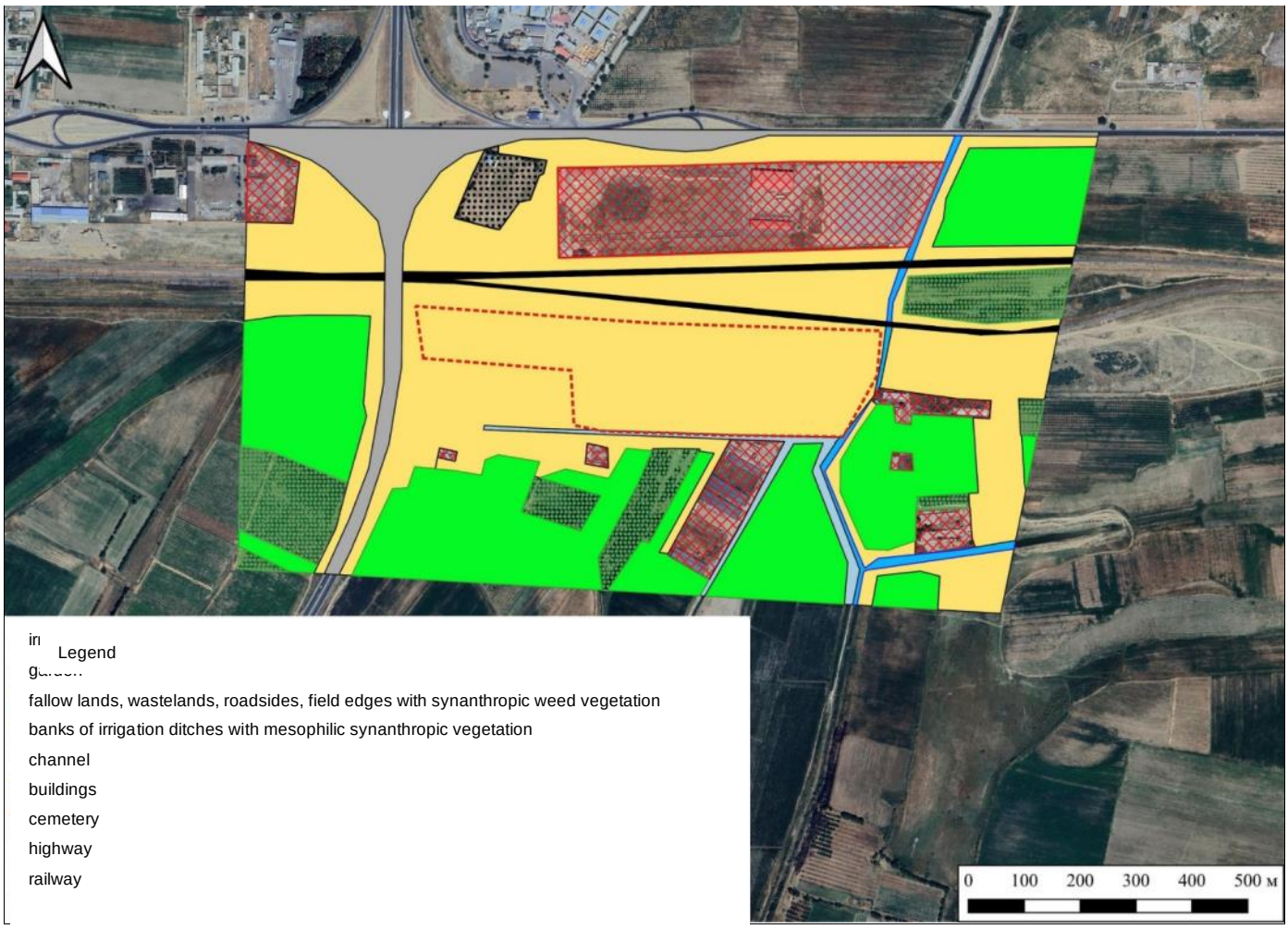

Figure 5: Habitat map of the Project area. The red dotted line is the boundary of the power plant construction site

In total, 68 plant species from 26 families were identified in the study area, of which 26 are weedy synanthropic species (including 6 adventitious), 5 are cultivated (including both introduced and cultivated local species). Rare species listed in the Red Book of Uzbekistan or the IUCN Red List, as well as quarantine weeds included in the national list of quarantine objects, have not been found.

6.6.1 Floral Survey of the coastal area of the Jizzakh reservoir

A geobotanical survey of the coastal area was conducted at 17-18 of May 2025, during the **Rapid Pre-FC Biodiversity survey**. The association of grain-amber-comb (*Tamarix elongata, T. hohenackeri, T. ramosissima, Alhagi pseudalhagi*, *Hordeum murinum ssp. leporinum*) on meadow saline soil. The projective coverage is 100%. The fullness of the shrub layer is 0.9. 25 plant species have been identified at the site (Table 2). There are no endemics or rare species listed in the national or international Red Book.

Table 2.List of plant species of the grass-amber-comb association (Tamarix elongata, T. hohenackeri, dT. ramosissima, Alhagi pseudalhagi, Hordeum murinum ssp. leporinum)

Types of plants	Life Shape	Abundance		Height, cm	Phenophase	Condition
		According to Braun-Blanquet	According to Drude			
Aeluropus littoralis	Pn	2	Cop1	15-20	Flw, fr	n
Alhagi pseudalhagi – false camel thorn, amber	Pn	2	Cop2	30-40	veg	n
Artemisia subsalsa	ssh	+	sol	30-40	veg	n
Asperugo procumbens – German madwort	pn	+	sp	20-25	fr	n
Bromus scoparius – paniculate brome	pn	+	sp	15-20	fr	n
Bromus tectorum – downy brome	pn	+	sp	15-20	fr	n
Carthamus lanatus subsp. turkestanicus (Carthamus turkestanicus) – Turkestan safflower	pn	+	sp	30-35	bud	n
Descurainia sophia	pn	+	sp	25-30	fr	n
Erodium cicutarium – common stork's-bill	pn	+	sp	12-15	Flw, fr	n
Festuca ambigua - Vulpia ciliata	pn	+	sp	15-20	fr	n
Galium spurium – false galium	pn	+	sp	40-45	Flw, fr	n
Galium tenuissimum – very slender bedstraw	pn	+	sp	12-15	Flw, fr	n
Hordeum murinum ssp. leporinum – hordeum murinum	pn	3	Cop3	25-30	fr	n
Hornungia procumbens – oval purse (slenderweed)	pn	+	sp	12-15	fr	n
Karelinia caspian	Pn	+	sol	30-40	veg	n
Lepidium draba (Cardaria draba) – whitetop (Thanet cress)	Pn	+	sol	25-30	fr	n
Limonium otolepis – ear-leaved limonium	Pn	+	sol	30-40	bud	n
Peganum harmala – wild rue	Pn	+	sol	30-40	veg	n
Phragmites australis – common reed	Pn	+	sp	50-70	veg	n
Poa bulbosa – bulbous bluegrass	Pn	2	Cop3	25-30	fr	n
Sonchus oleraceus – common sowthistle	pn	+	sol	25-30	Flw, fr	n
Sophora pachycarpa (Vexibia pachycarpa) – Siberian Pachycarpa	Pn	+	sol	30-40	Fr	n
Tamarix elongata – elongated tamarisk	shrb	2	Cop2	200-250	fr	n
Tamarix hohenackeri – Hohenacker's tamarisk	shrb	2	Cop1	180-200	fr	n
Tamarix ramosissima – saltcedar	shrb	2	Cop2	200-250	veg	n

Table 3 Assessment of vegetation condition

The name of the indicator type	Sign	Parameter	Scores
Tamarix elongata, T. hohenackeri, T. ramosissima	Completeness	closed	3
	Undergrowth	Medium	2
	Logging	Absent	3
	Age	All ages	3
The average score for the parameters of the state of the stand: (3+2+3+3)/4=2.75			2.75
Alhagi pseudalhagi – false camel thorn, amber	availability	ordinary	3
Phragmites australis – common reed	availability	rare	2
Tamarix elongata, T. hohenackeri, T. ramosissima	availability	ordinary	3
Cynodon dactylon – Bermuda grass, couch grass	availability	absent	3
Hordeum murinum ssp. leporinum – hare barley	availability	ordinary	1
Peganum harmala – wild rue	availability	rare	3
The average score for the parameters of the state of the grass tier: (3+2+3+3+1+3)/6=2,5			2.5

According to the assessment results for indicator species, the condition of shrub and herbaceous vegetation is good.

Ditch system near the project site.

Test site 1 (40.089981° N 67.946859° E)

The test site is located in the direct impact area of the Project, on the bank of a ditch running along a wheat field, next to the border of the site allocated for the construction of a combined cycle power plant. The vegetation is forb-grass-reed (*Phragmites australis, Hordeum murinum ssp. leporinum, Bromus sp., Karelinia caspia, Alhagi pseudalhagi)*, projective cover is about 100%. According to the IUCN Habitats Classification Scheme (Version 3.1), this habitat belongs to type 14 Artificial – Terrestrial, subtype 14.1 Arable Land, According to the European classification EUNIS Habitat Classification Scheme, this habitat belongs to type V Vegetated man-made habitats, subtype V39 Mesic perennial anthropogenic herbaceous vegetation. 41 plant species were identified at the site, of which 1 is cultivated (soft wheat – *Triticum aestivum*), 15 are weedy (synanthropic), including 4 are adventitious (Table 4). There are no endemics or rare species listed in the national or international Red Book. The vegetation condition is moderately degraded.

Table 4 List of plant species of the secondary grass-grass-cane association (Phragmites australis, Hordeum murinum ssp. leporinum, Bromus sp., Karelinia caspia, Alhagi pseudalhagi), noted at test site No. 1

Types of plants	**Life Form**	**Abundance**		**Phenophase**	**Condition**	**Status**
		According to Brown-Blank	**According to Drude**			
Alhagi pseudalhagi – false camel thorn, amber	Pn	3	Cop2	veg	n	
Apocynum venetum subsp. scabrum (Trachomitum scabrum)	Pn	+	sol	fr	n	
Atriplex micrantha – small-fruited quinoa	pn	+	sp	veg	n	Weedy
Bromus hordeaceus – soft brome	pn	1	cop1	Flw, fr	n	

Types of plants	Life Form	Abundance		Phenophase	Condition	Status
		According to Brown-Blank	According to Drude			
Bromus japonicus – Japanese brome	pn	1	cop1	Flw, fr	n	
Bromus scoparius – paniculate brome	pn	1	cop1	Flw, fr	n	
Capsella bursa-pastoris – common shepherd's purse	pn	+	sp	Flw, fr	n	Weedy
Carduus pycnocephalus – Plymouth thistle	pn	+	sp	Flw, fr	n	Weedy
Carthamus lanatus subsp. turkestanicus (Carthamus turkestanicus) – Turkestan safflower	pn	+	sp	bud	n	Weedy
Cirsium vulgare – common thistle	pn	+	sol	veg	n	
Convolvulus arvensis – field bindweed	Pn	+	sp	veg	n	Weedy, adventive
Cynanchum acutum subsp. sibiricum – Siberian cinanchum	Pn	+	sp	veg	n	
Cynodon dactylon – couch grass, aeluropus	Pn	1	cop1	veg	n	Weedy, adventive
Descurainia sophia	pn	+	sp	Flw, fr	n	weedy
Dodartia orientalis – Dodartia orientalis	Pn	+	sol	veg	n	
Elaeagnus angustifolia – wild olive	tr	1	sol	veg	n	
Erigeron canadensis (Conysa canadense) – Conyza canadensis	pn	+	sol	bud	n	Weedy, adventive
Galium spurium – false galium	pn	+	sp	Flw, fr	n	weedy
Hordeum murinum ssp. leporinum – hordeum murinum	pn	3	Cop2	fr	n	weedy
Hordeum spontaneum – wild hordeum	pn	1	sp	veg	n	weedy
Karelinia caspian	pn	2	Cop2	veg	n	
Lactuca serriola – wild lettuce	pn	1	Cop1	veg	n	weedy
Lactuca tatarica – Tatar lettuce	Pn	+	sp	fr	n	
Lamium amplexicaule – common henbit)	pn	+	sp	Flw, fr	n	
Lepidium draba (Cardaria draba) – whitetop (Thanet cress)	Pn	+	sp	Flw, fr	n	weedy
Lepidium latifolium – broadleaf lepidium	Pn	+	sp	Fr	n	weedy
Limonium otolepis – ear-leaved limonium	pn	+	sol	veg	n	
Lolium arundinaceum (Festuca arundinacea)	Pn	1	sp	Flw, fr	n	
Melilotus indicus – Melilotus indica	pn	+	sol	Flw, fr	n	
Phragmites australis – common reed	pn	3	Cop2	veg	n	
Phlum paniculatum –	pn	+	sp	Flw, fr	n	

Types of plants	Life Form	Abundance		Phenophase	Condition	Status
		According to Brown-Blank	According to Drude			
Timothy paniculata						
Plantago lanceolata – plantain lanceolate	Pn	1	sp	fr	n	
Plantago major – greater plantain	Pn	1	sp	fr	n	
Poa bulbosa – bulbous bluegrass	Pn	1	sp	fr	n	
Polypogon fugax – falling polybedon	Anl, pn	+	sol	Flw, fr	n	
Rumex dentatus – scalloped sorrel	pn	+	sol	Flw, fr	n	
Tamarix elongata – elongated tamarisk	shrb	1	sol	fr	n	
Tamarix hohenackeri – Hohenacker's tamarisk	shrb	1	sol	Fr	n	
Torilis arvensis – field torilis	pn	+	sol	Flw, fr	n	Weedy, adventive
Triticum aestivum – common wheat	pn	+	sp	fr	n	cultural
Typha latifolia – perennial herbaceous	Pn	1	sp	veg	n	

6.6.2 Additional Floral Survey of the project territory in late September 2025

Survey areas encompassed the project construction footprint and a 500 m terrestrial buffer, including natural, semi-natural, and agro-ecosystems (e.g., reservoir edges, canal banks, fallow fields).

This study was carried out by taking into account the preliminary survey conducted in May 2025 during peak phenological activity. The main surveys were conducted in late summer (e.g., September 2025).

All habitat types, which had initially been selected based on land cover, topography, and ecological variation, were present in the study area. However, during the site visit, it was observed that the area had long been subject to human impact and construction, and a large portion consisted of cultivated fields. Therefore, the total number of stations was reduced to 15. Particular attention was given to the power transmission line (ST 1-6) and the discharge area (ST 7) (TL route and discharge area was not known at May 2025 during the first baseline studies)

Table 5: Flora sampling points coordinates

SP	Easting	Northing	SP	Easting	Northing
SP-1	412885	4430998	**SP-9**	411217	4436199
SP-2	412956	4432338	**SP-10**	410193	4435502
SP-3	413497	4433823	**SP-11**	407150	4436350
SP-4	413336	4436943	**SP-12**	406120	4435544
SP-5	412970	4437363	**SP-13**	406722	4435496
SP-6	411761	4437634	**SP-14**	407292	4438378
SP-7	410409	4438432	**SP-15**	407225	4433226
SP-8	409921	4436904			

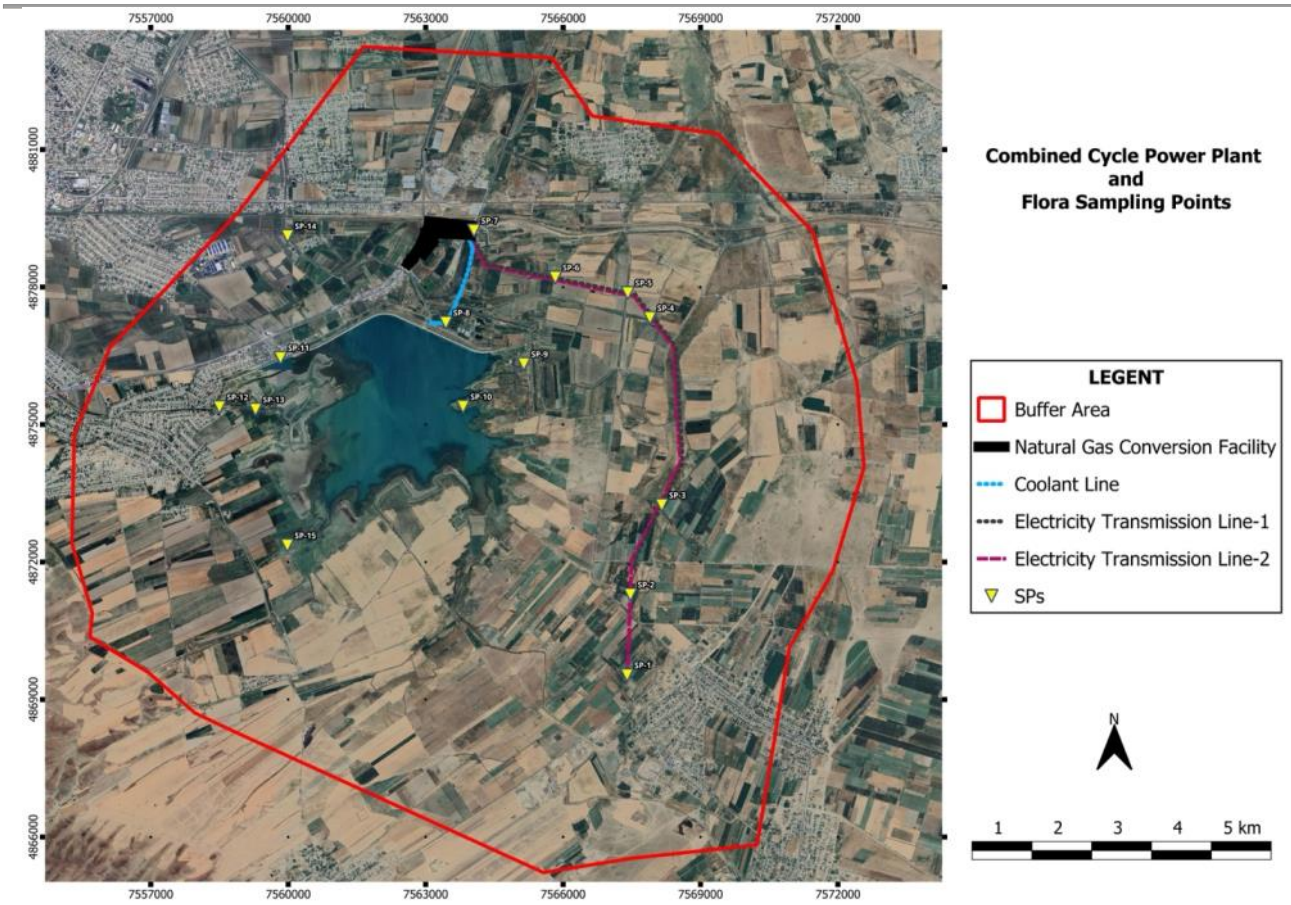

Figure 6: Study Area and Distribution of Quadrat Sampling Sites

Field surveys indicated that the total vegetation coverage across all quadrats was 100%. A total of 80 plant species were identified on the site, comprising (Table 5):

- 66 wild species
- 14 cultivated species
- 14 weed species

No endemic or rare species listed in the national or international Red Book were recorded. The surveyed area is not a designated protected area and has experienced significant development and human intervention. Among the surveyed zones, only the western coastal zone (SP15) retains characteristics of a natural habitat. This zone is primarily used for livestock grazing, particularly horses. Notably, this area does not appear to be directly impacted by the proposed facility. Flora composition is the same as in previous studies.

The study area comprises four distinct habitat types (Figure 7 below):
J5.3 – Highly artificial non-saline standing waters
J1.1 – Residential buildings of city and town centres
E3.4 – Moist or wet eutrophic and mesotrophic grassland
I1.1 – Intensive unmixed crops

These habitat types were assigned following the EUNIS classification system to support ecological assessment and vegetation surveys.

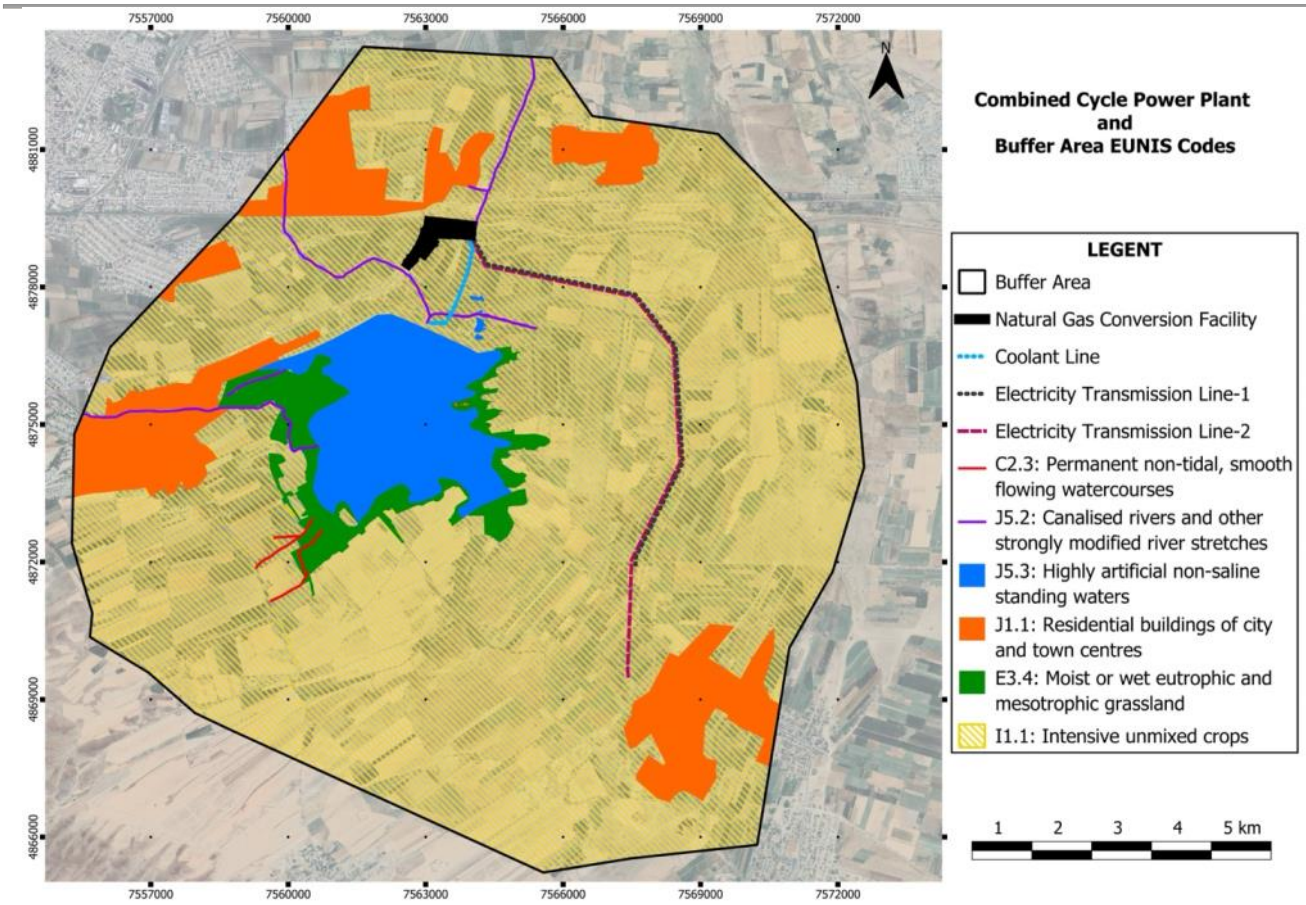

Figure 7: Habitat types based on the EUNIS classification system

Since the majority of the study area corresponds to cultivated land, the Braun-Blanquet cover-abundance method was considered less informative for these fields.

In the study area, weeds were observed mainly between crop fields, along field edges, in uncultivated plots, and along roadsides. The dominant species include Alhagi pseudalhagi as well as other weeds such as Amaranthus retroflexus, Cynodon dactylon, Atriplex micrantha, Heliotropium europeum, and some fresh or dried Poaceae species.

6.6.3 Vegetation and Flora Assessment Summary

Habitat: The project area's flora occurs entirely in converted (modified) habitats classified as anthropogenic terrestrial and aquatic types, such as former arable land, pastures, rural gardens, and irrigation channels. No natural habitats remain within the project site.

Vegetation Condition: The vegetation is highly disturbed due to prior land use and ongoing construction – large portions of the site's plant cover have been cleared, with only secondary regrowth present. The site was observed as an old field with sparse, weedy vegetation (e.g., wild barley Hordeum murinum, Bermuda grass Cynodon dactylon, false camelthorn Alhagi pseudalhagi) and some scattered shrubs, and even old furrows are still visible.

Flora Diversity: Approximately 68 plant species (from 26 families) were recorded during the survey, primarily common synanthropic weeds and a few cultivated species adapted to disturbed soils. This indicates the flora is dominated by widespread, non-sensitive species typical of degraded habitat.

Protected/Endemic Species: No threatened or endemic plant species were found in the project area. The assessment confirmed that no species listed in the Red Book of

Uzbekistan or the IUCN Red List occur on site. In other words, the project area's flora contains no Red List or endemic species, and even regionally noted rare plants are located far from the site.

Compliance: These findings demonstrate that the project is in alignment with IFC Performance Standards (notably PS1 and PS6 on environmental assessment and biodiversity conservation) and with Uzbekistan's environmental laws (e.g. the Laws On Nature Conservation and On Environmental Expertise). The flora assessment was conducted according to these standards, and the absence of critical habitats or protected species confirms compliance with biodiversity protection requirements.

6.7 Animal world

6.7.1 Terrestrial wildlife

The site allocated for the construction of a combined–cycle power plant is a cultural landscape with various biotopes – agricultural fields, orchards, reservoirs, artificial water structures for irrigation of land with cultivated vegetation, settlements with developed infrastructure.

Currently, 256 species of terrestrial vertebrates are found at the research sites and adjacent territories. The species composition of birds in the seasonal aspect changes naturally.

The herpetofauna of the Jizzakh region is represented by 36 species. According to preliminary data, only 19 species are found in the study area, of which Amphibia consists of 3 species, representatives of 2 families (Bufonidae and Ranidae), 1 order (Anura) and Reptiles of 16 species - 8 families (Testudinidae, Gekkonidae, Agamidae, Scincidae, Lacertidae, Anguidae, Boidae, Colubridae), 3 orders (Testudines, Sauria, Serpentes).

Rare and endangered species included in the national Red Book live here - 2 species (Agrionemys (Testudo) horsfieldii, Eryx tataricus), they are also included in Appendix II of the Convention on International Trade in Endangered Species of Fauna and Flora (CITES). All species of reptiles are included in the Red List of the International Union for Conservation of Nature (IUCN Red List).

In the project and adjacent territories there are 210 species of birds belonging to 48 families (Phasianidae, Anatidae, Phalacrocoracidae, Ardeidae, Ciconiidae, Threskiornithidae, Podicipedidae, Falconidae, Pandionidae, Accipitridae, Gruidae, Rallidae, Otididae, Burhinidae, Haematopodidae, Recurvirostridae, Charadriidae, Scolopacidae, Glareolidae, Laridae, Columbidae, Cuculidae, Strigidae, Caprimulgidae, Apodidae, Coraciidae, Alcedinidae, Meropidae, Upupidae, Picidae, Alaudidae, Hirundinidae, Motacillidae, Troglodytidae, Prunelidae, Turdidae, Muscicapidae, Sylviidae, Paradoxornithidae, Remizidae, Paridae, Laniidae, Oriolidae, Corvidae, Sturnidae, Passeridae, Fringillidae, Emberizidae) and 17 orders (Galliformes, Anseriformes, Pelecaniformes, Ciconiiformes, Podicipediformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Cuculiformes, Strigiformes, Caprimulgiformes, Apodiformes, Coraciiformes, Bucerotiformes, Piciformes, Passeriformes).

Mammals in the territories bordering the study site of the construction site are tentatively represented by 27 species of 6 orders. It is home to 3 species of the Insectivora order, 6 species of the Chiroptera order, 1 species of the Lagomorpha order, 9 species of the Rodentia order, 7 species of the Carnivora order, 1 species of the Artiodactyla order. Of these, 3 species: a wolf, a reed cat, a wild boar could accidentally wander into the nearest territory.

During the survey of the area of the planned activity, 7 observation points were selected that best characterize the composition of the local fauna of terrestrial vertebrates. Next, we will consider separately each survey point at the power plant construction sites.

Test site 1 (N 40.091277° EO 67.940638°)

The site occupies the western part of the allocated site for the construction of gas complex with herbaceous vegetation with tamarix, next to the M-39 highway.

21 species of terrestrial vertebrates and traces of their vital activity were observed at the survey site.

Reptiles are represented by 4 species: Eremias velox (family ofLacertidae), Eumeces schneideri (family of Scincidae), Coluber rhodorhachis, Natrix tessellata (family of Colubridae). The number of each species is 0.2 os/ha.

Birds represented by 15 species nest in the territory of the Jizzakh region. Among them are 1 species of representatives of the order Stork-like (Ciconia ciconia), 3 species of Pigeon-like (Columba livia,Streptopelia decaocto, Streptopelia senegalensis), 3 species of Coraciiformes (Coracias garrulus, Merops persicus, Merops apiaster), 8 species Passeriformes (Sturnus vulgaris, Acridotheres tristis, Pica pica, Corvus orientalis, Passer indicus, Riparia riparia, Hirundo rustica, Cecropis daurica). The nesting of the red-bellied swallow has been established near the construction site under the automobile (2 nests) and railway (1 nest) bridges.

Colonially nesting species include Ciconia ciconia, Columba livia, Passer indicus, Riparia riparia. The green Merops persicus and the golden squint Merops apiaster nest in groups.

Among the listed species, the white stork is included in the Republican Red Book (2019).

Mammals include only 2 species. The yellow ground squirrel is counted in the amount of 0.2 os/ha. In addition, 5 burrows were found. 26 burrows of the eastern blindfold were taken into account on the routes.

Test site 2 (N 40.090876° EO 67.947362°)

The site occupies the eastern part of the allocated site for the construction of a gas complex, the A 376 highway, railway and dirt roads pass, there is a ditch with reed vegetation.

The process water used by the power plant, after purification at local sewage treatment plants on the site, is discharged into a collector, the water from which is used by farms for irrigation of farmland.

The fauna of terrestrial vertebrates does not differ much from the first site, since birds have a large spatial activity, and therefore the complex of species diversity remains almost unchanged. On the other hand, the habitat of animals determines the presence of a particular species. There are only 15 species registered here, of which representatives of the herpetofauna – 2 species, birds – 13.

Amphibians are represented by 1 species on the site (marsh frog Pelophylax ridibundus). The frog was not numerous - 1.4 os/ha. The reptiles also consist of 1 species - the dice snake Natrix tessellata, whose number is 0.2 os/ha.

The species composition of the birds of the first and second sites of the project is

identical, the total number of birds is slightly less.

Mammals and traces of their vital activity in the form of burrows, footprints, food residues, etc. are not marked.

Test site 3 (N 40.086632° EO 67.948384°)

The site occupies the southeastern part of the territory of the construction site along the ditch from the Jizzakh reservoir with wheat fields on both sides.

At the test site, 10 species of terrestrial vertebrates were noted, mainly common bird species, representatives of pigeons, barnacles and passerines.

No amphibians or reptiles were found in this part of the survey area.

Mammals on the site under consideration are represented by only 1 species – the muskrat Ondatra zibethicus.

Test site 4 (N 40.104001° EO 67.956828°)

The site is located outside the territory to the northeast of the construction site, the continuation of the ditch of site No. 3 with a pumping station, a discharge reservoir with reed beds, fallow lands with tamarix, camel thorn and other wild vegetation, next to them are cuckoo fields and other crops.

16 species of terrestrial vertebrates have been recorded at the site.

The herpetofauna consists of 3 species, the marsh frog Pelophylax ridibundus is found from amphibians, the sheltopusik Pseudopus apodus and the dice snake Natrix tessellata from reptiles. Sheltopusik was found dead, crushed by a car on a dirt road. The marsh frog Pelophylax ridibundus (1.6 os/ha) dominates in this area. The numerical values of the sheltopusik Pseudopus apodus and the dice snake Natrix tessellata are equal to 0.3 os/ha.

The avifauna of the territory practically does not differ from the previous sites, 1 species has been added - the marsh harrier (Falconiformes order). There are 9 species of birds in total.

The analysis of the accounting data shows that the sand martin Riparia riparia dominates in number, i.e. it makes up 72.2% of the total number of registered birds.

Usually, after the end of the nesting period, blue-larks, green and golden squinters, swallows, and sparrows rest on the wires of power lines. Flocks of coastal swallows (40 birds) also rested on the wires of power lines. A white stork was nesting on a pole.

Mammals are represented by one species - the eastern blindfold. 7 burrows were visually observed.

Test site 5 (N 40.049551° EO 67.955773°)

The site is located on the southeastern coastline of the Jizzakh reservoir to the south of the construction site, and includes orchards, grain and melon fields.

The Jizzakh reservoir is located 9 km southeast of Jizzakh, in the Yoyilmasoy Gorge. It was built in 1963-1968. Canals have been built to supply water to the reservoir (9 km) and from the reservoir (15 km). The reservoir provides water to more than 15 thousand hectares of land in the Sharaf Rashidov district.

The fauna of terrestrial vertebrates of the site is poor, represented by only 8 species.

Amphibians are represented by one species - the marh frog Pelophylax ridibundus, it's number is 0.1 os/ha.

The avifauna consists of 6 species. Hydrophilic bird species (grey Ardea cinerea and red heron Ardea purpurea) were observed on the coastline. The obtained field materials confirm the scarcity of species diversity and the low number of birds.

Mammals are represented by one species - the eastern blindfold. 19 burrows were found at the site under consideration. Cenergo will establish 2 pipes (60 cm) on the existing pipeline that is controlled by the authority. The pipes that will be established by Cenergo will not be related directly to the Jizzak Reservoir; no additional construction or impact on the reservoir's flora and fauna is expected.

Figure 8: Jizzakh Reservoir and Water Supply Pipeline Design from Existing System

Test site 6 (N 40.073679° EO 67.952347°)

The site is located in the northeastern part of the Jizzakh reservoir, next to a dam bordered by orchards, grain and melon fields.

The reservoir's water distribution system is located here, where water is routed through pipes to various facilities, including the proposed power plant.

The fauna of terrestrial vertebrate animals of the site is represented by only 30 species.

Amphibians and reptiles at this site are represented by 3 species: the marsh frog Pelophylax ridibundus, the desert lidless skink Ablepharus deserti and the dice snake Natrix tessellata.

The avifauna of the site includes 22 species (Table 6). 9 species of birds have been recorded in summer records. Here, along with the usual species for the area (Columba livia - blue pigeon, Coracias garrulus - the European roller, the common starling - Sturnus vulgaris, the myna - Acridotheres tristis, the rook - Corvus frugilegus, the barn swallow Hirundo rustica), the list includes the following: the Eurasian hobby - Falco subbuteo, the Eurasian hoopoe Upupa epops, the pied bush chat Saxicola caprata. Rooks have the highest number on the site (86.2% of the total number of registered birds). Rook nesting colonies exist in several places in the Jizzakh region, the closest in the Gallaaral district center, more than 20 km from the construction site.

During the autumn research, the existing list was supplemented by another 13 species, consisting of migratory and sedentary birds. The Jizzakh reservoir attracts many hydrophilic species whose life cycle is related to water (the black-crowned night heron - Nycticorax nycticorax, the Caspian gull - Larus cachinnans, lake gull Larus ridibundus, the western marsh harrier - Circus aeruginosus, the common kingfisher - Alcedo atthis).

The Jizzakh reservoir is also of great importance for migrating wetland birds. Especially in the autumn period, geese and ducks accumulate in large numbers on the reservoir, which are objects of seasonal sports and amateur hunting. The Eurasian coot, several species of waders, gulls, etc. stop in the water area and the coastal part of the reservoir. Obviously, among the migratory birds there are species included in the Red Book of Uzbekistan and the IUCN Red List. Despite the fact that the reservoir was commissioned in 1973, there is currently no information on its fauna, so it is impossible to fully determine the species composition of birds.

Mammals consist of 5 species. The yellow ground squirrel was counted in the amount of 0.5 os/ha, 4 more burrows were found. 26 burrows of the eastern blindfold were found at the site. According to past research and surveys of local residents, the jackal, fox and long-eared hedgehog also live in this area.

Test site 7 (N 40.070695° EO 67.906386°)

Developed territory (domestic facilities, summer cottages, gardens, agricultural fields) in the northwestern part of the Jizzakh reservoir, located between the M-39 highway and the reservoir dam.

The fauna of terrestrial vertebrates is represented by only 10 species.

No amphibians or reptiles have been found.

The avifauna includes 8 species, of which 2 species are Pigeon Columbidae, 1 species is Bluefin Coraciidae, 2 species are Starling Sturnidae, 2 species are Corvidae, 1 species is Swallow Hirundinidae.

Mammals are represented by 2 species. 2 burrows of the yellow gopher and 6 burrows of the eastern gopher were found within the site.

As a result of the study of the animal world, 45 species of terrestrial vertebrates were registered in the surveyed territories, of which 2 species belong to amphibians, 5 species to reptiles, 24 species to birds, and 3 species to mammals.

The fauna of the studied Project area is represented by synanthropic, hydrophilic, dendrophilic, desert species. Many species have adapted to the conditions of the anthropogenic landscape. Terrestrial vertebrates are important components of altered ecosystems and good indicators reflecting the degree of intensity of anthropogenic impacts and ecosystem transformation. The proposed water intake site is equipped with concrete

structures and a water level control sluice , the project provides for the use of the existing water intake with a tapping point at the designated location, no additional construction or impact on the reservoir's flora and fauna is expected. The survey results showed that the Project Area does not contain vulnerable rare and endemic species and degraded habitats that meet the criteria set out in IFC Performance Standard 6.

6.7.2 Fauna Survey the coastal area of the Jizzakh reservoir

Fauna survey of the coastal area was conducted at 17-18 of May 2025 during the Rapid Pre-FC Biodiversity survey:

Test site 1 (40° 2'51.05"From° 67°57'22.61"IN°)

The site is located on the southeastern coastline of the Jizzakh reservoir and includes orchards and grain fields.

Here, the species composition of animals is relatively scarce. There are 8 species in total, reptiles – 1 species, birds – 6 species, mammals – 1 species.

Amphibians are represented by one species - the marh frog *Pelophylax ridibundus,* it's number is 0.1 IND/ha.

The avifauna consists of 6 species. The obtained field materials confirm the scarcity of species diversity and the low number of birds. In general, the species composition and abundance of birds are given in Table 6

Table 6 Species composition of birds at site No. 1

No	Common name	Scientific name	Nature of the stay	Number, ind/ha	In %	Nesting
1	White Wagtail	*Motacilla alba*	S	0.7	0.9	In the cracks of the earth
2	Common starling	*Sturnus vulgaris*		0.2	0.2	In the hollows of trees
3	European roller	*Coracias garrulus*	NM	0.1	1.3	On the cliffs
4	Black crow	*Corvus orientalis*	S	0.7	9.4	In the trees
5	Crested lark	*Galerida cristata*	S	0.7	9.4	On the ground
6	Indian Sparrow	*Passer indicus*	NM	5.8	78.8	On trees, cliffs
	Total			8.2	100	

Symbol: S – sedentary; NM – nesting-migratory; W – wintering

Mammals are represented by one species - the eastern blindfold *Ellobius tancrei*. 19 burrows were found at the site under consideration.

Test site 2 (40° 3'57.58"C 67°57'8.32"B°)

The site is located in the northeastern part of the Jizzakh reservoir, close to a dam bordering orchards, grain and other fields.

The fauna of terrestrial vertebrate animals of the site is represented by only 30 species. Herpetofauna includes 3 species, ornithofauna – 22 species, theriofauna – 5 species.

Amphibians and reptiles at this site are represented by 3 species: the lake frog Pelophylax ridibundus, the desert nudibranch Ablepharus deserti and the water snake Natrix tessellata.

The avifauna of the site includes 22 species. 9 bird species have been recorded in summer. Here, along with the usual species for the area (rock pigeon *Columba livia, European roller Coracias* garrulus, common starling *Sturnus vulgaris,* myna *Acridotheres tristis,* rook *Corvus frugilegus,* barn swallow *Hirundo rustica)*, the list is supplemented with the following new species: Eurasian hobby *Falco subbuteo, Eurasian hoopoe* Upupa *epops,* pied bush chat *Saxicola caprata.* Rooks have the highest number on the site (86.2% of the total number of registered birds). Rook nesting colonies exist in several places in the Jizzakh region, the closest in the Gallaaral district center, more than 20 km from the construction site.

The Jizzakh reservoir attracts many hydrophilic species whose life cycle is associated with water (Nycticorax nycticorax, Larus cachinnans, Larus ridibundus lake gull, marsh harrier Circus aeruginosus, kingfisher Alcedo atthis).

Table 7 Species composition of birds at site No. 2

	Common name	Scientific name	Nature of the stay	Number, ind/ha	In %	Nesting
1	Croaker	*Nycticorax nycticorax*	NM	0.3	0.4	In the hollows of trees
2	White Stork	*Ciconia ciconia*	NMW	0.2	0.3	On the supports of electrical lines
3	Giggler	*Larus cachinnans*	NMW	0.2	0.3	On the ground, on the islands
4	Lake Gull	*Larus ridibundus*	NMW	8.7	11.5	On the ground, on the islands
5	Marsh Harrier	*Circus aeruginosus*	S	0.2	0.3	In the reed beds
6	Ringdove	*Columba palumbus*	NMW	0.2	0.3	In the trees
7	Kestrel	*Falco tinnunculus*	NMW	0.1	0.1	In the trees
8	Eurasian hobby	*Falco subbuteo*	NM	0.2	0.2	In the trees
9	Rock pigeon	*Columba livia*	S	6.7	6.2	Under the roof of the building
10	European roller	*Coracias garrulus*	NM	0.2	0.2	On the cliffs
11	Kingfisher	*Alcedo atthis*	NMW	0.3	0.4	On the cliffs
12	Eurasian hoopoe	*Upupa epops*		0.2	0.2	In the hollows of trees
13	White Wagtail	*Motacilla alba*	S	0.7	0.9	In the cracks of the earth
14	Common starling	*Sturnus vulgaris*		0.2	0.2	In the hollows of trees
15	Magpie	Pica pica	S	0.3	0.4	In the hollows of trees
16	Myna	*Acridotheres tristis*	S	1	0.9	In the hollows of trees, in the voids of buildings, old nests of vranovs, etc.
17	Rook	*Corvus frugilegus*		93.2 (flock)	86.2	In the trees
18	Pied bush chat	*Saxicola caprata*		0.2	0.2	On the ground
19	Barn swallow	*Hirundo rustica*		6.2	5.7	On residential premises

20	Collared dove	*Streptopelia decaocto*	S	0.2	0.3	In the trees
21	Crested Lark	*Galerida cristata*	S	1.2	1.6	On the ground
	Total			75.4	100	

Symbol: S – sedentary; NM – nesting-migratory; W – wintering

Mammals consist of 5 species. The yellow ground squirrel *Spermophilus fulvus* was counted in the amount of 0.5 ind/ha, 4 more burrows were found. 26 burrows of the eastern blindfold were found at the site. According to past research and a survey of local residents, the area is also home to a jackal *Canis aureus*, a fox *Vulpes vulpes* and an eared hedgehog *Hemiechinus auritus*.

Test site 3 (40° 4'9.89"C 67°54'26.45"B)

Developed territory (domestic facilities, summer cottages, gardens, agricultural fields) in the northwestern part of the Jizzakh reservoir, located between the M-39 highway and the reservoir dam.

The fauna of terrestrial vertebrates is represented by only 10 species, including 8 species of birds and 2 species of mammals.

No amphibians or reptiles have been found.

The avifauna includes 9 species, of which 2 species are Pigeon Columbidae, 1 species is Bluefin Coraciidae, 2 species are Starling Sturnidae, 2 species are Corvidae, 1 species is Swallow Hirundinidae, 1 species is White Stork. The species composition and abundance are shown in Table 8.

Table 8. Species composition of birds at site No. 3

No	Common name	Scientific name	Nature of the stay	Number, ind/ha	In %	Nesting
1	Rock pigeon	*Columba livia*	S	4.3	25.3	Under the roof of the building
2	Eurasian collared dove	*Streptopelia decaocto*		0.3	1.8	In the trees
3	European roller	*Coracias garrulus*	NM	0.7	4.1	On the cliffs
4	Common starling	*Sturnus vulgaris*		1.7	10.0	In the hollows of trees
5	Myna	*Acridotheres tristis*	S	2.3	13.5	In the hollows of trees, in the voids of buildings, old nests of vranovs, etc.
6	Magpie	*Pica pica*	S	0.7	4.1	In the trees
7	Rook	*Corvus frugilegus*	S	5	29.4	In the trees
8	Barn swallow	*Hirundo rustica*		2	11.8	On residential premises
9	White Stork	*Ciconia ciconia*	NMW	0.2	0.3	On the supports of electrical lines
	Total			17	100	

Symbol: S – sedentary; NM – nesting-migratory; W – wintering

Mammals are represented by 2 species. 2 burrows of eastern gopher the yellow gopher *Spermophilus fulvus* and 6 burrows of the eastern gopher blindfold *Ellobius tancrei* were found within the site.

Test site near ditch (N 40.086632° EO 67.948384°)

The site occupies the southeastern part of the territory of the construction site along the ditch from the Jizzakh reservoir with wheat fields on both sides.

According to the survey results, 10 species have been identified at this site. Representatives of birds are 9 species; mammals are limited to only 1 species.

No amphibians or reptiles were found in this part of the survey area.

The avifauna of the studied area includes 9 species. Their numbers are relatively high. (Table 8).

Table 9 Species composition of birds at site No. 3 of the territory allocated for the construction of the gas complex

No	Common name	Scientific name	Nature of the stay	Number, ind/ha	In %	Nesting
1	Rock pigeon	*Columba livia*	S	1	5.0	Under the roof of the building
2	Eurasian collared dove	*Streptopelia decao*	S	1	5.0	In the trees
3	European roller	*Coracias garrulus*	NM	2	10.0	On the cliffs
4	Blue-cheeked bee-eater	*Merops persicus*	NM	4	20,0	On the cliffs
5	European bee-eater	*Merops apiaster*	NM			On the cliffs
6	Myna	*Acridotheres tristis*	S	2	10.0	In the hollows of trees, in the voids of buildings, old nests of vranovs, etc.
7	Magpie	*Pica pica*	S	1	5.0	In the trees
8	Black crow	*Corvus orientalis*	S	2	10.0	In the trees
9	Sand martin	*Riparia riparia*	NM	7	35.0	On the cliffs
	Total			20	100	

Symbol: S – sedentary; NM – nesting-migratory; W – wintering

Mammals on the site under consideration are represented by only 1 species – the muskrat *Ondatra zibethicus.*

6.7.3 Additional Fauna Survey of the project territory in late September 2025

Field surveys were conducted over 2 times a three-day period between 3-7 August and between 7–9 September 2025, focusing on the identification of fauna components within the project's area of influence. The surveys were designed in accordance with the IFC Performance Standard 6 protocol. Particular emphasis was placed on aquatic ecosystems (reservoir shoreline, irrigation canals, and small natural streams) and adjacent terrestrial ecotones (grasslands, agricultural fields, and semi-natural steppe areas).

Within the study area, 15 sampling points (SP-1, SP-15) were established, and their coordinates were recorded in KMZ format. These points were selected to represent habitat diversity and species distributions according the Table 5.

- **Reservoir shoreline**: 6 points (waterbirds, amphibians, semi-aquatic mammals)
- **Irrigation canal and ditchs**: 5 points (fish, frogs, waterbirds, reptiles)
- **Small natural streams**: 2 points (seasonal flow habitats, amphibian–reptile

diversity)

- Grassland and agricultural ecotones: 2 points (mammal and terrestrial bird observations)

Field surveys conducted in and around the project site (August and September 2025), combined with literature-supported species records, indicate that the terrestrial vertebrate fauna of the region comprises amphibians, reptiles, birds, and mammals. Habitat diversity (reservoir, irrigation canals, small natural streams, wet meadows, agricultural lands, and settlement ecotones) is identified as the primary factor supporting this species richness.

Amphibians: During the surveys, Pelophylax ridibundus and Bufotes viridis were directly observed, while literature data suggest that Hyla orientalis may also occur in the region. These species are listed as LC (Least Concern) on the IUCN Red List; however, habitat desiccation and agricultural chemical use represent the main threats.

Reptiles: Ablepharus deserti was recorded during field observations. Based on literature and regional distribution, species such as Testudo graeca, Lacerta trilineata, Ophisops elegans, Stellagama stellio, Natrix natrix, and Dolichophis caspius are also likely to occur. Notably, Testudo graeca is classified as VU (Vulnerable) by the IUCN and is protected under Annex II of the Bern Convention, indicating the sensitivity of the project area in terms of reptiles.

Birds: Field and literature data combined confirm the presence of more than 40 bird species. The majority are assessed as LC by the IUCN; however, Vanellus vanellus (Northern Lapwing) is categorized as NT (Near Threatened) and demonstrates regional sensitivity. Wetland birds (ducks, herons, grebes, gulls) are protected under Annex II/III of the Bern Convention and emphasize the ecological function of the reservoir.

Mammals: Lepus europaeus and Vulpes vulpes were directly identified during surveys. Rodents (Microtus arvalis, Meriones meridianus), insectivores (Erinaceus concolor, Hemiechinus auritus), and carnivores (Canis aureus, Mustela eversmanii) are supported by literature and national records. Bat fauna includes Myotis myotis, Pipistrellus kuhlii, and Rhinolophus ferrumequinum. The Uzbekistan Red Data Book lists Hemiechinus auritus, Spermophilus fulvus, Mustela eversmanii, and Rhinolophus ferrumequinum as nationally protected species.

Overall: According to IFC PS6 criteria, no species triggering Critical Habitat (CHA) were identified within the project site. Nevertheless, the presence of VU and NT species, the conservation importance of wetland birds under the Bern Convention, and mammal species listed in the Uzbekistan Red Data Book highlight the necessity of implementing species- and habitat-specific protection measures throughout project activities.

The detailed biodiversity baseline report is attached as **Appendix 1**

6.7.4 Fauna Assessment Summary

The terrestrial fauna survey recorded approximately 45 species of vertebrates (2 amphibian, 5 reptiles, 40 bird, and 3 mammal species) within the project area, predominantly common species adapted to the human-altered landscape. Importantly, no vulnerable or rare species or critical habitats were identified within the project footprint. Aside from an isolated observation of a Red Book-listed White Stork (Ciconia ciconia), no species listed as threatened in the national Red Book or on the IUCN Red List were encountered during the survey – two such reptile species known regionally (Horsfield’s tortoise Agrionemys horsfieldii and Tatar sand boa Eryx tataricus) were not recorded on site. These findings confirm that the project complies with IFC Performance Standard 6 and all relevant national

biodiversity protection laws, with no significant impacts on terrestrial fauna anticipated.

6.8 Critical Habitat Screening – IFC PS6 Compliance

This chapter summarizes the results of the Critical Habitat screening for the Jizzakh Reservoir and associated project areas, based on the May 2025 Rapid Pre-FC Biodiversity Survey. The screening follows the process and criteria set out in the International Finance Corporation's Performance Standard 6 (IFC PS6).

Table 10 IFC PS6 Critical Habitat Screening Summary

IFC PS6 Criterion	Trigger	Supporting Evidence
1. Critically Endangered (CR) and/or Endangered (EN) species	No	No CR/EN species were recorded in flora or fauna.
2. Endemic and/or restricted-range species	No	No endemics identified; species composition includes common, widespread taxa.
3. Migratory and/or congregatory species	No	Some migratory birds were noted (e.g., Coracias garrulus, Merops spp.), but no evidence of significant congregatory populations or key stopover sites.
4. Unique assemblages of species or key evolutionary processes	No	Species observed are typical of anthropogenic/agricultural landscapes. No unique assemblages noted.
5. Key ecosystem services	No	The site supports irrigation and grazing but does not appear to deliver critical ecosystem services in a unique or irreplaceable way.
6. Biodiversity of social, economic, or cultural value to local communities	No	No such biodiversity values were identified by the community or survey team.

6.8.1 Key Observations from the Survey

- Habitat: Artificial, degraded, and agricultural habitats dominate (e.g., arable fields, canals, and grazing areas).
- Flora: 25–41 plant species per site; none endemic, rare, or Red-listed.
- Fauna: Low species richness and density overall; mostly generalist species.
- No Critical Habitat areas were identified during fieldwork or community consultations.
- No protected areas or known biodiversity hotspots within the immediate impact area.

6.8.2 Conclusion

Critical Habitat is not triggered for the Jizzakh Reservoir or associated project sites per IFC PS6. The area is characterized by:

- Predominantly modified land uses (farming, grazing),
- Absence of threatened or restricted-range species,
- No evidence of significant migratory or congregatory use.

6.9 Hydrobiological studies

6.9.1 Scope of work

Aquatic sampling points covering the Combined Cycle Power Plant construction area, impact area, and immediate surroundings were established. Fish, benthic organisms, zooplanktonic organisms, and algae were collected, and habitat assessments were conducted. As a result of the studies, the presence of species belonging to all aquatic groups at the stations, their endemism status, and conservation status were evaluated. In addition, habitat assessments were conducted by defining the general ecological characteristics of aquatic environments.

In aquatic ecosystems, phytoplanktonic organisms form the first link in the food chain, while zooplanktonic organisms and benthic macroinvertebrates form the second link. Fish occupy the final link in this food chain.

Aquatic organisms were identified by sampling in the planned facility area and using literature data. The importance of the area in terms of aquatic organisms was determined, and assessments were made regarding critical species and critical habitats according to IFC PS6 criteria. Furthermore, the impacts of the activity on aquatic ecosystems, potential risks, and countermeasures were provided.

Sampling studies for aquatic organisms were carried out at five separate stations (stream/reservoir/canal) identified within the Combined Cycle Power Plant impact area between 3 -7 August and 6 - 9 September 2025. (The detailed biodiversity baseline report is attached as an appendix-1)

Accordingly, all five aquatic sampling stations were visited, and the following studies were conducted.

- Identification of the impacts of planned activities on aquatic habitats,
- Determining the general pollution status of the stations,
- Collection and identification of aquatic organisms from all suitable aquatic habitats for sampling,
- Identification of critical species defined as vulnerable (VU), endangered (EN) or critically endangered (CR) according to the Global IUCN Red List or the National Red List and/or legislation,
- Identification of endemic (local or regional endemic) or restricted-range species (species with a global range of 500 km or less or an equal linear geographical range).
- Making recommendations and proposals for prevention within the scope of protection strategies for critical habitats and species.

Within the scope of this report, an assessment has been made by highlighting the observations identified during the fieldwork. Literature data related to the project area has also been used and analysed together with field observations.

6.10 Sampling areas

The aquatic systems studied were selected based on criteria such as habitat size, importance, integrity and proximity to the facility. The aquatic systems within the impact area consist of stagnant water and flowing water environments (rivers, reservoirs and canals/ditches).

The freshwater sampling stations and their coordinates are provided in Table 11 and Figure 11.

Table 11: Freshwater sampling points coordinates

ID	Coordinates	
Sampling Point_1	407311.81 E	4435263.26 N
Sampling Point_2	408064.64 E	4434177.50 N
Sampling Point_3	409,975.23 E	4434919.84 N
Sampling Point_4	409,296.30 E	4436088.02 N
Sampling Point_5	410,443.00 E	4438496.00 N

Figure 9: Aquatic Study Areas

6.11 Findings

6.11.1 Habitat Assessment of Aquatic Sampling Points

Habitat assessments were conducted at aquatic station points, taking into account both the downstream and upstream aspects of each sampling point.

Within the scope of habitat quality assessment, important physical characteristics such as the water body and surrounding terrain, the catchment area of the studied site, and the bottom structure of the channel/reservoir/river are evaluated. The habitat parameters considered in the assessment are directly related to aquatic organisms. These physical elements significantly affect the presence and abundance of aquatic organisms.

When conducting habitat assessments, the following factors are considered: existing cover, burial characteristics of bedrock, substrate characteristics of stagnant water environments, velocity, depth, structure of stagnant water environments, sedimentation, channel/reservoir/river bed fill status, river bed variability, geomorphological status of the

river bed, stability of river banks, and vegetation cover of river banks.

The five stations were evaluated and the water quantities of these environments were provided. Despite low rainfall during this sampling period, water flow was observed at all sampling points.

6.11.2 Freshwater Algae

Algae are primary producers in aquatic environments. Thanks to the pigments in their structure, they convert carbon dioxide and water into carbohydrates under the influence of light, thereby increasing the nutrient value and dissolved oxygen ratio in the aquatic environment. Ultimately, they form the first link in the food chain by ensuring their own development. They are important in terms of their contribution to production and their relationship with organisms at higher trophic levels.

Benthic algae, in particular, possess many characteristics that are used in water quality assessment studies:

As autotrophs, benthic algae are crucial in aquatic ecosystems, linking the physical, chemical, and biological elements of the food chain. This chain is critical in aquatic ecosystems, and disruptions in it can profoundly affect the rest of the aquatic community.

Because benthic algae are sessile, they cannot escape potential pollution through migration or other means. They either tolerate the abiotic (environmental) factors surrounding them or die.

Algal communities generally have a relatively rich species diversity compared to other aquatic groups. Each species has its own tolerance and preferences for environmental factors. Thus, the entire community provides a wealth of information for environmental indicators.

Algae have a relatively short life cycle. The cells of some species can divide twice or more per day, allowing them to respond more quickly to changes in environmental conditions. Existing benthic algal communities are typically representative of current environmental conditions, as they are among the first organisms to respond to environmental stress.

Among the species identified in the sampled areas, the Heterokontophyta division is the most dominant group in terms of diversity and abundance. A total of 162 taxa (species and subspecies) belonging to six different divisions were identified within the study area. The Heterokonthophyta (diatom) group of algae was particularly rich in diversity. This divisio is represented by 88 taxa, Chlorophyta by 28, Charophyta by 5, Cyanobacteria by 29, Euglenophyta by 11, and Dinoflagellata by 1

6.11.3 Zooplanktonic Organisms

Zooplanktonic organisms living in freshwater systems are represented by three main dominant animal groups: Cladocera and Copepoda, two subclasses of Crustacea, and the Rotifera class, which belongs to the phylum Aschelminthes. Zooplankton not only constitute the food of planktivorous fish, but also serve as food for all fish larvae, aquatic insects, insect larvae and other aquatic animals in the ecosystem. Changes in the quantity or diversity of zooplanktonic organisms also affect the groups of organisms at the top of the food pyramid. Furthermore, changes in the quantity or diversity of planktonic organisms due to changes in environmental conditions are used in biological monitoring studies. The structure of planktonic organisms found in rivers before and after the discharge of polluting waste is determined and used to assess the environmental impact.

Another group of zooplanktonic organisms is Rotifera. Rotifera individuals are also very small, microscopic organisms. The vast majority are found in freshwater. The number of marine species is lower than in freshwater. Some species live in lakes, small pools, brackish water environments, and saltwater. The majority of species are planktonic, living in the limnetic and littoral zones of lakes, while some are sessile and found in the bottom zones. The use of Rotifera species as indicators in determining the water quality of freshwater systems is important because they form the food source for many invertebrates and vertebrates in aquatic ecosystems. The fact that the vast majority of Rotifera species feed on bacteria and detritus, have high metabolism, reproduce very rapidly, and form the food source for fish and many aquatic invertebrates makes them extremely important.

Zooplanktonic organisms mostly move around depending on water movement and live in still water habitats. Their presence in fast-flowing sections of rivers is very limited. However, in some groups, they can be seen as psammophiles, i.e. species that can live under stones, in fast-flowing streams. Specifically, species belonging to the Rotifera group utilise under rocks, thereby mitigating the negative effects of current speed.

The zooplanktonic organisms identified through sampling and literature studies are presented in Table II.8. Since the main habitats of zooplanktonic organisms are still waters, they are more prevalent at stations with high-flow water bodies.

As a result of sampling and literature studies, a total of 36 taxa belonging to Rotifera, Branchiopoda and Copepoda, which form the dominant groups of zooplanktonic organisms, were identified . Of these, 22 taxa belonging to the Rotifera phylum, 7 to Copepoda and 7 to Branchiopoda were identified.

6.11.4 Benthic Organisms

This includes organisms that spend at least part of their life on the bottom (sediment, debris, macrophytes, filamentous algae) in freshwater habitats. Animals that can be caught with a net with a mesh size of 500 µm fall under this definition. The initial forms of some species may be smaller. The concept of benthic organisms also includes nektons and forms buried in the bottom.

Biological monitoring studies involving benthic organisms are of two types. The first involves monitoring changes in benthic organisms before and after a project that is thought to affect the aquatic environment. For example, the species, diversity and abundance of benthic invertebrates in a river are determined before and after the discharge of polluting waste, and this information is used to assess the environmental impact. In this way, water quality standards are set based on the presence or absence of benthic invertebrates in the environment or changes in their numbers. Studies are conducted using benthic invertebrates to learn about the current state of the aquatic environment and to determine changes over time. These studies measure changes in the genetic structure of organisms, the biological accumulation of pollutants, pollution tests in the field and in the laboratory, changes in population and community structure, and changes in ecosystem function.

Due to the characteristics mentioned above, benthic organisms are among the preferred groups in biological monitoring studies (Rosenberg and Resh, 1992). Some of the reasons for preferring benthic organisms in such studies are as follows.

1. Despite the presence of very different environments in aquatic systems, they are adapted to every environment.
2. They respond across a wide spectrum with a variety of species groups depending on the intensity of environmental pressure.

3. They are generally dependent on the areas they inhabit. They cannot escape or move away from environmental changes and pollutant effects.

Based on the results of sampling studies and according to field and literature data, the benthic macroinvertebrates observed in the region are presented in Table II.9.

The macroinvertebrate sampling method was carried out in accordance with the standards TS EN ISO 10870 "Water quality - Guidance on sampling methods and selection of equipment for benthic macroinvertebrates in freshwater" and TS EN 16150 "Water quality - Guidance on proportional multiple habitat sampling of benthic macroinvertebrates from observable rivers" standards.

Of the total 50 taxa belonging to the three major phyla of benthic organisms, 10 belong to the Mollusca phylum, 5 to the Annelida phylum, and 35 to the Arthropoda phylum. As can be seen, the Arthropoda phylum is the most dominant phylum in terms of species number. Examples of the Mollusca phylum consist of the Bivalvia and Gastropoda classes. The Annelida phylum consists solely of the Oligochaeta class. Within the Arthropoda phylum, there are two major classes consisting of Malacostraca and Insecta. One taxon belonging to each of the Amphipoda, Decapoda and Mysida orders has been identified from Malacostraca. Within the Insecta class, 31 taxa belonging to the orders Heteroptera (3 taxa), Diptera (14 taxa), Ephemeroptera (5 taxa), Plecoptera (3 taxa), Coleoptera (3 taxa), Trichoptera (1 taxon) and Odonata (3 taxa) have been identified.

6.11.5 Fish

Fish are important biological components at the top of the food chain in aquatic systems. Ecologically, they feed on algae, zooplankton or benthic organisms. They are also an important input source in terms of their economic importance as well as their ecological significance.

In this study, the presence and distribution of fish species were assessed at the station level. In general, fish species in the Jizzakh Reservoir were examined, and subsequently, the identification and morphological assessment of fish in the Sangzor River and irrigation canals were carried out.

The total number of fish taxa in all aquatic stations was recorded as 22, and information on the distribution of species by station and their various conservation statuses was also provided. Fifteen of these species were sampled by us during fieldwork in the project area and are listed. The remaining 7 species are listed based on literature information as they are known species in the region

6.12 Results and findings

Construction of the Natural Gas Combined Cycle Power Plant is ongoing. According to the working principle, the cooling water to be taken from the pipeline which has been established by the local autority will be discharged into the irrigation canal near the facility at the end of the process. In this case, the effects that may arise from both the extraction of water and the discharge of water into the irrigation canal at the end of the process have been assessed in terms of the aquatic ecosystem. Accordingly, the results of the field and laboratory studies carried out are given below. (The detailed biodiversity baseline report is attached as an appendix-1)

- The project site is located in the Sangzor (Sanzar) sub-basin within the main Syr Darya basin. As the Jizzakh Reservoir and irrigation canals are affected, observations and sampling were carried out at five separate aquatic stations representing all these areas.

- As a result of the studies, algae, zooplanktonic organisms, benthic macroinvertebrates, and fish species were sampled and information from the literature was also utilised. These sampling studies identified 162 algal species, 36 zooplanktonic organisms, 50 benthic macroinvertebrates, and 22 fish species. Fifteen of the identified fish species were caught by us and Photographed, while the remaining seven taxa were listed based on their distribution in the area according to the literature.
- According to observations made in the study area and literature information, no endemic aquatic species were identified.
- According to the IUCN Red Data Book, one fish species (*Hypophthalmichthys molitrix*) is classified as NT (Near Threatened), a high conservation category. According to the Uzbekistan Red Data Book, one mollusc species (*Corbicula fluminalis)* is classified as VU (Vulnerable). The conservation status of the remaining species is low.
- Considering the climatic conditions of the region, it is recommended that no work that would interfere with aquatic ecosystems be carried out during the April-June period, which is the breeding season for aquatic life. If work is unavoidable during this period, attention should be paid to the sensitivities of the area where the work will be carried out. The bottom structure of the channels along the pipeline route is mostly muddy and sandy, and the bank areas are covered with macrophytes. Due to these characteristics, they may be suitable spawning grounds for fish. No direct intervention should be made in these spawning areas located in the activity area.

If intervention in the riverbed is necessary, it is preferable to change the course of the streams and rivers where the crossings will take place and to work on dry ground. This will ensure that no damage is caused to the downstream section of the stream and the watercourse systems. After the crossing process is completed, the flow direction of the river and stream should be returned to its original course. The water flow in the canal bed should be altered and work should be carried out on the dry section. Once the areas where construction work has been completed have been restored to their original state, the canal flow should be returned to this section. Construction work on other sections of the canal/stream should also be completed on dry ground after they have been drained in this way. This will prevent any permanent impact on aquatic systems.

Macrophyte-covered areas in bank sections are used by aquatic organisms as shelter, feeding and spawning grounds. Therefore, aquatic systems should not be disturbed during the spring breeding season.

- Riverbank sections where the construction process has been completed and the structure has been damaged should be restored, using plants from the area. Riparian vegetation is particularly strong in a significant section of the water intake and discharge channels. In these sections, there are broad-leaved trees and, in some places, reed beds. However, the machinery used in pipeline construction works should not deviate from a specific route and should not cause unnecessary damage. This is because the strong vegetation on the banks is an important habitat for many terrestrial animals, especially amphibians and reptiles. In this regard, particular attention should be paid during the breeding season, as some sections have dense riparian vegetation.
- There is no bank zone that could cause erosion at the stations located in the natural Sangzor River and irrigation channels outside the reservoir body. The personnel working with the machinery to be used should be provided with the necessary information and warnings so that they do not cause coastal damage. In addition, after the water intake pipeline crossing works are completed, reinforcement works should be carried out to ensure bank stability.

- After the works are completed, the bottom sections of the canal and the areas along the shoreline should be restored. The vegetation cover along the canal shoreline (bank) at the work stations is strong. Plants to be used for restoration should be rearranged with seeds from nearby plants to be compatible with the vegetation structure of the region.

In the current operating system of the Jizzakh Reservoir, water from the reservoir is supplied to the canal through two pipes passing through the dam body. For the planned facility, water supply will be provided by constructing additional pipes to these two existing pipes. The effects of this transformation on aquatic organisms living in the section where water is taken from the reservoir and in the canal where it will be discharged after this process have been identified, and countermeasures have been evaluated. Based on the hydrobiological data in the field and the technical operation of the project (cooling water being taken from pipes at the outlet of the Jizzakh Reservoir and discharged into the same canal system; continuous extraction of approximately 200 m³/hour; recirculating tower cooling), the following assessments have been made.

- According to hydrobiological data obtained from the field and literature information, all aquatic species in the canal-reservoir system are cosmopolitan in nature. In particular, Cyanobacteria taxa such as *Microcystis aeruginosa* and *Aphanizomenon flos-aquae* among algae, and Unionidae (e.g. *Sinanodonta woodiana, Anodonta anatina)* and *Corbicula* species (e.g. C*. fluminalis)* among macroinvertebrates are present. These species are prone to excessive growth and population explosions in response to increases in temperature and nutrient load and include aquatic groups that are sensitive to chemical-thermal stresses.
- Adding an additional pipe to the two existing pipes in the reservoir body will change the hydrodynamics in the channel cross-section as well as the water intake to the facility. This increases entrainment losses of ichthyoplankton and micro-mesozooplankton. This may cause aquatic organisms to pass through the screen systems from the reservoir and mix into the system. Alternatively, it may increase the risk of impingement in small benthic forms within the water coming from the dam body. This situation is known as aquatic organisms being trapped on the screen.

Therefore, the water intake structure should have a wide-fronted inlet that provides low approach velocities and a two-stage screen-trommel (fine mesh) combination. The Jizzakh Reservoir began operating in 1973. At that time, wide screens were installed in the section that draws water from the dam face into the irrigation canal. The water passing through here reaches a second screen system within the dam, which has a mesh size of 2 cm and is considered a suitable design for preventing fish passage.

If the flow (approach velocity) towards the water intake structure from the body is high, small benthic organisms (chironomid larvae, amphipods, young snails/mussels, small fish fry) are drawn towards the grate and are forced to stick to it by the pressure of the flow after hitting the grate surface. If they cannot escape, injury, stress and death occur.

In such situations, the following methods can be applied to reduce the risk in addition to the existing screens:

- The water velocity perpendicular to the screen is kept very low by designing a wide-fronted inlet. It can be seen that the first section of the water in the Jizzakh reservoir body is quite wide. From this perspective, it is understood that the design is appropriate.
- The entry of organisms into the water intake structure is prevented by creating a multi-stage grid using a coarse grid and a fine-mesh trommel/screen. It is understood that this dual grid system is also used in the Jizzakh Reservoir. Wide screens facing the body and a fine-mesh sieve system inside the body prevent aquatic organisms from

entering the water intake structure. Continuous/automatic cleaning systems can also be an effective operating system to prevent clogging in these sieves.

- Simple solutions such as light/strobe and air bubble curtains, used as behavioural deterrents, can also yield positive results as they prevent aquatic organisms from approaching the grids from the reservoir area onwards.
- The water intake section is located at the deepest point of the body and is deep/sloped and concrete in nature. Therefore, this section is not preferred by aquatic organisms due to unsuitable habitat conditions. It does not possess the characteristics of a spawning area for aquatic organisms and is a habitat where fish fry are not observed. In other words, the coastal sections consist of concrete structures that aquatic organisms do not favour for reproduction, feeding, and nesting, and they lack aquatic plants and gravelly/woody substrates.
- In this case, in the section where the grids are located, for aquatic organisms:
- There is no direct feeding from the bank areas,
- Small eggs and organisms in the early larval stage can pass through the 2 cm secondary screen inside the body. However, since the fry of fish species with high populations will not be observed in this zone, the total entrainment pressure will be significantly reduced.
- Deep-wall fronts are not typical adult spawning–feeding habitats, so there is very low risk of fish entering the screens.

The water intake area is unsuitable for spawning, and juvenile/larval pressure is significantly reduced; the 2 cm secondary screen and low velocity reduce the biological risk to an acceptable level.

As a result, under current conditions, there is a large grid in the section where water is drawn from the reservoir into the pipes, and there are also smaller grids with smaller pores inside the body that have a second filtration feature. However, the aquatic ecosystem conditions in the section where water is drawn from the reservoir into the pipes are not suitable for small fish to use the area. Due to these ecological and technical characteristics, the current system is sufficient for the species likely to pass through it, and there is no situation that would require new measures to be taken.

Process water passing through the plant will be discharged into the irrigation canal immediately adjacent to the facility. Although this canal was created by human intervention, it has retained its natural aquatic habitat characteristics due to the water it has held for many years. Therefore, managing the thermal and chemical effects that may arise from the discharge of process water is also important.

After passing through the cooling cycle (tower-recirculation) and being discharged in a natural gas-fired power plant, some changes occur in its chemical composition.

These include:

- Recirculation reduces the thermal load compared to a single-pass system; however, the blowdown water may be +0.5–3 °C warmer than the inlet water. The ecological implication of this is that dissolved oxygen (DO) saturation decreases slightly over short distances; plankton metabolism may accelerate in summer.
- In the tower, major ions such as Na^+, Cl^-, SO_4^{2-}, HCO_3^-, Ca^{2+}, Mg^{2+}, K^+, and SiO_2 increase relative to the feed water due to "concentration cycles (CoC)" (typical CoC ≈ 3–6). As a result, conductivity and Total Dissolved Solids (TDS) increase. The ecological significance of this is osmotic stress and a long-term tendency towards salinity in the receiving environment; this is a situation that requires attention, particularly during periods of low flow.

- CO_2 removal in the tower generally slightly increases the pH (alkaline shift). As a result, calcite saturation increases and calcification conditions change in shellfish, the solubility of metals decreases, and a tendency to precipitate may be observed.
- Blowhole water is generally low in conductivity and may be high in phosphate and pH. Furthermore, Fe/Cu particle traces may be observed in excessive amounts. Since the presence of cyanobacteria such as *Microcystis/Aphanizomenon* is known in the reservoir, even small increases in P load can trigger algal growth and eutrophication tendencies. Therefore, Total P (specifically PO_4–P) target values should be kept very low, and phosphorus-free chemicals should be preferred.

In the discharge water generated after the process, an increase in TDS/conductivity, a slight alkaline formation in pH, a small positive increase in temperature, and trace contributions from the chemical program (e.g., TRC, P, trace metals) may be observed. Ecologically, P and TRC (Total Residual Chlorine) are considered the most critical factors. Risks can be significantly reduced by using phosphorus-free/low-P chemistry + deoxidation (TRC≈0) and strict management of temperature increases against these critical effects. The low diversity and density of aquatic life in the reservoir, which is unsuitable in terms of, will also limit entrainment/impingement pressure.
Although the recirculation system reduces the thermal load compared to classic "once-through" cooling, the tower blowdown water, HRSG blowdown, and auxiliary process sources may carry increased temperature + TDS/ionic strength and biocides/corrosives/antiscalants to the receiving environment. This situation, especially during the summer period, may reduce dissolved oxygen saturation, causing valve closure and impaired filtering behaviour in Unionidae molluscs; in cyanobacteria, it may lead to eutrophication due to excessive proliferation caused by thermal-nutritional advantages.

The process of controlled discharge of part of the boiler water with the tower blowdown water and HRSG blowdown will be carried out. This increases the thermal effect in addition to the effects mentioned above. The following applications are recommended for this purpose.

- The mixing zone should be modelled hydrodynamically (seasonal flow/temperature) to demonstrate that temperature increases remain below habitat thresholds.
- The blowdown flow should be provided with dilution and heat matching. Thermistor-based online measurement and warning systems should be used.
- In terms of chemical quality, biocide dosing (oxidising chlorine/bromine or isothiazolinone, etc.) should be managed using a pulse-window logic and online free oxidising residue measurement. Residues should be kept close to zero by pre-discharge deoxidation (e.g. sodium bisulphite).
- Operating systems that minimise phosphorus input and suppress copper/zinc discharge should be used to ensure that discharge reaches standard values. pH, conductivity, TSS, TDS, temperature and (if applicable) free chlorine/monochloramine values for all process streams must be continuously monitored using online monitoring systems. A high-frequency field monitoring system must be installed in the channel where discharge will take place to monitor dissolved oxygen, chlorophyll-a and cyanotoxins.

These measures will provide a high level of operational assurance specific to the project, based on the water withdrawal from the reservoir in the project and the subsequent discharge configuration and quantity (200 m^3/hour; receiving environment: drainage channel).

From an ecosystem-focused conservation perspective, the presence of Unionidae and Corbicula families of molluscs at sampling stations necessitates a much more controlled operation against persistent oxidising residues and sudden temperature changes.

Acceptance criteria for transition to operation (seasonal ichthyoplankton density for

impingement-entrainment losses during water withdrawal from the reservoir; ΔT, DO, chlorophyll-a, free oxidising residue, conductivity-TDS and pH in the receiving environment) must be monitored. In terms of water withdrawal and discharge, these monitoring results should be reviewed at least once a year using a management cycle adapted to PS6, and the necessary chemical-operational corrections should be made.

None of these effects may be observed from an ecosystem perspective as long as there is no direct intervention in aquatic systems. However, assessments have been made considering the worst-case scenario.

Any adverse developments that may occur during construction will be short-term and cause temporary effects. All aquatic ecosystems examined are dynamic and healthy ecosystems that can tolerate these temporary adverse effects, provided that the necessary measures are taken.

The impacts of the activity on aquatic habitats and the necessary measures are defined in this report. However, it is also important to monitor the presence and population status of fish species and benthic invertebrates in particular.

A monitoring programme for aquatic ecosystems and their living organisms, especially endemic species, should be planned twice a year. The effects of the activity on aquatic habitats should be observed and reported during the construction period and for two years after the start of operation.

The monitoring programme for freshwater ecosystems should primarily include water quality, flow, and freshwater biodiversity.

Considering the climatic characteristics of the region, it is recommended that aquatic monitoring studies be conducted twice a year (in spring and autumn), particularly in this region. This will also allow for detailed studies of benthic invertebrates and fish in areas designated as sensitive.

6.13 Territories with special conditions of use

6.13.1 Specially protected areas

Based on the results of a preliminary environmental and social assessment using literature data, it was found that there are no specially protected areas of state, regional, or local significance in the Sharaf Rashidov district (report 125-1105-SR).

Protected natural areas, Key Biodiversity Areas, including key bird areas and wetland ecosystems included in the Ramsar list, as well as areas included in the UNESCO World Natural Heritage Sites, are located at a significant distance from the site of the combined-cycle power plant. In particular, the protected natural territories of the Jizzakh region include the Zaamin Reserve and the Zaamin National Park (part of KBA UZB 20 Northern slope of Turkestan Mountains), which are located 50–51 km southeast of the Project area on the northern slope of the Turkestan ridge, the Nurata Nature Reserve, which is located 95 km west of the Project area in the central part of the ridge. Nuratau (part of KBA UZB 24 Nuratau Ridge), and the Arnasay ornithological reserve, located 53 km northwest of the construction site on Lake Tuzkan (key bird area IBA UZ 35 and part of the Aydar-Arnasay lake system included in the Ramsar list). At the moment, the list of UNESCO World Natural Heritage Sites within the transboundary territory “Western Tien Shan” (Kazakhstan, Kyrgyzstan, Uzbekistan) includes the mountainous part of the Tashkent region, and the transboundary territory “Turan Deserts of the Temperate Zone” (Kazakhstan, Turkmenistan, Uzbekistan) includes the Uzbek part of the Ustyurt Plateau.

Both of these facilities are located at a considerable distance from the Project Area.

6.13.2 Critical habitats

According to clause 16 of PS-6 of IFC, critical habitats include habitats:

i) significant habitats of critically endangered and/or threatened species (this includes species included in the IUCN Red List with CR or EN status, as well as species included in national/regional red lists based on criteria similar to those of the IUCN). In the note to clause 16 of the IFC PS-6, it is noted that in cases where the classification of species in national or regional lists does not fully coincide with the IUCN classification, an assessment should be carried out, which will serve as the basis for determining the critical habitat;

ii) significant habitats of endemic species and/or species with a limited range;

(iii) habitats supporting globally significant concentrations of migratory species and/or gregarious species;

(iv) threatened and/or unique ecosystems;

v) territories associated with the most important evolutionary processes.

Quantitative criteria are defined for the first 4 categories of critical habitats, i.e. threatened, endemic and migratory species and threatened/unique ecosystems), these criteria are based on the IUCN methodology published in “IUCN Red List Categories and Criteria”(2012), “A Global Standard for the Identification of Key Biodiversity Areas”(2016), “Guidelines for the application of IUCN Red List of Ecosystems Categories and Criteria” (2016) and “Guidelines for using A Global Standard for the Identification of Key Biodiversity Areas” (2020). In particular, according to the requirements of “A Global Standard for the Identification of Key Biodiversity Areas” (2016), for identification as a key biodiversity area based on the criterion of the presence of threatened species, the territory must be home to at least 0.5% of the world population of species of categories CR and EN (but not less than 5 reproductive individuals) and at least 1% of the population of species of category VU (but not less than 10 reproductive individuals). Regarding the criterion for the presence of endemic and/or narrowly distributed species, KBA standards require the presence of at least 10% of the global population of the species (but not less than 10 reproductive individuals) in the territory. Quantitative assessment can be carried out both by the parameter of the number of reproductive individuals, and by the habitat area, the area of the range to which the species is confined, or the number of locations. For threatened and/or unique ecosystems, the standards of key biodiversity areas require at least 20% of the global area of this type of ecosystem.

According to the results of a survey of flora and fauna conducted in May 2024, habitats that meet the criteria of PS-6 of the IFC were identified in the area of project activity.

6.14 Environmental assessment

6.14.1 Atmospheric air quality

To obtain up-to-date and reliable information on the level of chemical pollution of the atmosphere in the area where the combined cycle power plant is located, monitoring of chemical pollution of the atmospheric air was carried out.

At the end of April 2024, an air quality study using the Zephyr sensor in the area of the planned activity began. This chapter includes data obtained at three monitoring points

that show the concentration of pollutants in the atmosphere. The results of the studies will be taken into account in the project documentation and, if necessary, will be used as the basis for action plans to reduce environmental and social impacts.

The scope of baseline studies includes monitoring of chemical pollution of atmospheric air with Zephyr sensor (3 points), arranged in order of priority of observations.

The Zephyr sensor allows you to determine atmospheric concentrations of nitrogen dioxide (NO2), nitrogen oxide (NO), sulfur dioxide (SO2), carbon oxide (CO), suspended particles PM 1, PM 2.5 and suspended particles PM 10.

The duration of studies with the Zephyr sensor is 20 days of continuous monitoring at each of the 3 points.

Atmospheric air quality studies using the Zephyr sensor

In the area of the planned activity, monitoring began on 22.04.2024 to collect information on the baseline conditions of chemical pollution of atmospheric air using the Zephyr compact air quality monitor.

Data from the Zephyr sensor was transmitted on-line to a cloud resource https://portal.earthsense.co.uk/. The list of points where the Zephyr sensor studies were performed is shown in Table 10.

Table 12 Monitoring points, Zephyr sensor

Point No	**Place of conducting observations**	**Geographical coordinates of the point**	
1	Poultry farm near the construction site	40° 5’25.18"N	67°56’45.57"W
2.	Gas distribution station near the construction site	40° 5’25.99"N	67°56’25.02"W
3	Cemetery behind the railway line	40° 5’38.85"N	67°56’27.38"W

A schematic map of the Zephyr sensor monitoring points is shown in Figure 10.

Figure 10: Schematic map of the location of monitoring points using the Zephyr Sensor

1. Single exceedances of the maximum single MPC of pollutants established by national requirements have been recorded.

2. According to the Consultant, the single exceedances recorded by the Zephyr automatic sensor are not sufficient to assign the "degraded" status to the airshed. The airshed of the project area at the local level has buffering with respect to those emission components whose concentrations are one time higher than the maximum permissible concentration and has the status of "nondegraded".

6.13.4 Physical factors

Noise

To determine the baseline acoustic situation in the project area, including assessing the compliance of noise impact with hygienic standards in residential areas and determining the requirements for noise protection measures in buildings and areas with standardized levels of noise impact, as part of baseline studies, acoustic measurements were carried out, the results of which are summarized in report 125-1105-Bio.

Taking into account the planning situation, the following points are selected for studies of noise, vibration and infrasound levels, indicated in Table 13.

Table 13 Noise Control Points

No	Place of observation	Coordinates
1.	Point No. 1 Entrance to the construction site	40.092745 67.939482
2.	Point No. 2 End of the construction site near the ditch	40.091163 67.948810
3.	Point No. 3 (near residential development)	40.090561 67.946963
4.	Point No. 4 the central part of the construction site	40.090727 67.944903

No	Place of observation	Coordinates
5.	Point No. 5 near the gas station	40.090877 67.940344

5 points have been selected for research in the project area (Figure 11).

Figure 11:Schematic map of acoustic measurement points

Noise measurements were performed in accordance with the methodology of GOST 23337-2014 “Noise Methods for measuring noise in the residential area in residential and public buildings”.

Vibration measurements are performed in accordance with GOST R 53964-2010 “Vibration. Vibration measurements of structures”.

Infrasound measurements were performed in accordance with MI PKF-14-016 Methodology for measuring sound pressure levels in the infrasound frequency range at workplaces in industrial premises and on the territory.

The measurement schedule is presented in Table 14.

Table 14 Graph of measurements

Point No	Place of conducting observations	Measurements	Frequency of observation
1.	Point No. 1 Entrance to the construction site	Infrasound, noise	2 times, during the day (from 7.00 to 23.00), at night (from 23.00 to 07.00)
2.	Point No. 2 End of the construction site near the ditch	Infrasound, noise	2 times, during the day (from 7.00 to 23.00), at night (from 23.00 to 07.00)
3.	Point No. 3 (near residential development)	Infrasound, noise, vibration	2 times, during the day (from 7.00 to 23.00), at night (from 23.00 to 07.00)

Point No	Place of conducting observations	Measurements	Frequency of observation
4.	Point No. 4 the central part of the construction site	Infrasound, noise	2 times, during the day (from 7.00 to 23.00), at night (from 23.00 to 07.00)
5.	Point No. 5 near the gas station	Infrasound, noise, vibration	2 times, during the day (from 7.00 to 23.00), at night (from 23.00 to 07.00)

As a result of measurements, it was established:

1. Sound pressure levels in octave frequency bands, the sound level, do not exceed the permissible levels established in SanR&N 0008-20 “Sanitary norms and rules for ensuring permissible noise in residential and public buildings, in residential areas and public recreation areas”

2. The general level of infrasound and the levels of infrasound pressure in the octave frequency bands do not exceed the maximum permissible levels established for the territories directly adjacent to residential buildings

3. Vibration levels in the octave frequency bands in a residential area do not exceed acceptable values.

4. The sound pressure levels at the measuring points comply with international requirements:

- International Finance Corporation. World Bank Group. Environmental Health and Safety (EHS) Guidelines. General EHS Guidelines: Environment. Noise level control. 1.7 Noise. 2007

- WHO recommendations on baseline noise in residential areas. World Health Organization. 1999

6.13.5. Surface water quality

In the course of baseline studies, a single sampling of surface waters in several reservoirs was performed:

- 1-Ditch flowing next to the project area below the project area
- 2-Ditch flowing next to the project area above the project area
- 3-Proposed surface water intake of the enterprise (Jizzakh reservoir)

Samples were taken in accordance with the methods of surface water sampling approved in the RUz.

Studies of surface waters included analysis of samples for the following indicators: BOD, COD, dissolved oxygen, chromium, copper, iron, mercury, lead, calcium, magnesium, manganese, nickel, vanadium, zinc, pH, total hardness, alkalinity, sulfates (water-soluble), phosphates, ammonium nitrogen, chlorides, nitrates, nitrites, dry residue, cyanides, fluorides, total content of petroleum hydrocarbons (petroleum products), benzo(a)pyrene, total phenols, suspended solids, total mineralization).

Detailed results of surface water studies are presented in Report 125-1105-BIO.

As a result of the quantitative chemical study of surface waters, the following

features were revealed - exceeding the target indicator.[2]

Chrome – exceeding the target was noted for all 3 samples.
Manganese - exceeding the target was noted for samples No. 1,3,
Copper - exceeding the target value was noted for samples 2.3.
Magnesium- exceeding the target was noted for all 3 samples.
Mercury - exceeding the target was noted for samples No. 2 and No. 3.
Lead - exceeding the target was noted for samples No. 1, No. 2 and No. 3.
Nickel - exceeding the target was noted for sample No. 1.

Thus, for surface waters, a minor anthropogenic impact associated with the discharge of untreated wastewater into a ditch was revealed.

Elevated concentrations of other indicators are most likely associated with natural factors.

It is also necessary to take into account the impact of irrigation channels after land flushing: the channel next to the project area is used for irrigation of agricultural land.

6.13.6 Groundwater quality

During the baseline studies in April-May 2024, a single sampling of groundwater was carried out at groundwater wells in the project area and a groundwater well in a private house near the project area.

Studies of groundwater to determine the level of its pollution included the sampling of groundwater and their subsequent analysis for the following indicators: BOD, COD, dissolved oxygen, chromium, copper, iron, mercury, lead, calcium, magnesium, manganese, nickel, vanadium, zinc, pH, total hardness, alkalinity, sulfates (water-soluble), phosphates, ammonium nitrogen, chlorides, nitrates, nitrites, dry residue, cyanides, fluorides, total content of petroleum hydrocarbons (petroleum products), benzo(a)pyrene, total phenols, suspended solids, total mineralization).

As a result of the quantitative chemical study of underground (ground) waters, the following features were revealed – exceeding the target indicator.

Chrome – exceeding the target was noted for all 2 samples.
Manganese - exceeding the target was noted for sample No. 5
Copper - exceeding the target was noted for samples 5.
Magnesium- exceeding the target was noted for all 2 samples.
Nickel - exceeding the target was noted for samples No. 4 and No. 5.

Thus, technogenic effects have been revealed for groundwater – targets have been exceeded. The increased concentrations of the remaining indicators are most likely due to natural factors and the impact of intensive agricultural production.

6.13.7 Soils

To assess the potential impact of the planned activity on soils and grounds, a quantitative chemical analysis of soils and parent rocks (grounds) was carried out as part

3 [2] The target indicator is the lowest permissible concentration of the indicator, depending on the category of water use (household-drinking, irrigation, cultural, household, fisheries), for more information, see the report for more information, see report 125-1105-BIO.

of the baseline studies.3

In total, 4 samples were taken from the upper genetic soil horizon on test plots 10*10 m. The assessment of the state of soils (grounds) was carried out taking into account the standards of the Republic of Uzbekistan, and the soil quality criteria given in the Soil Remediation Circular (2013).

Sampling was performed in the following locations:

- end of the construction site, grass cover (sample S01);
- beginning of the construction site, grass cover (sample S02);
- green area next to dilapidated buildings behind the construction site (sample S03).
- green area next to the planned power plant (sample S04)

Sampling was carried out on the basis of the current regulatory and technical documents, in accordance with the established norms and rules for the relevant types of work.

The Central Laboratory of “Uzbek Geological Exploration” JSC is a certified, accredited laboratory. The quality of the performed analyses is ensured:

- compliance with the requirements of the quality system procedures for working with samples, managing documentation, measuring instruments, standards, etc.;
- periodic state metrological verification of measuring instruments;
- using standards and certified comparison samples

The results of soil and ground testing showed that the content of copper, nickel, lead, zinc, chromium, and cadmium exceeds the MPC established in the RUz for mobile forms of metals.

At the same time, it should be noted that soil quality indicators for mobile forms of metals are focused on the assessment of pollutants that form the risks of translocation effects (first of all, risks in the production of agricultural products used to feed the population).

From this point of view, as well as taking into account the industrial purpose of the construction site, recommendations on the levels of Soil Remediation Circular intervention (2013), there are no restrictions for the project related to soil contamination. Nevertheless, when preparing proposals for monitoring environmental components and action plans, it is advisable to provide for the assessment of the soil condition of recreational facilities located in the area of the planned activity and/or on the border of the SPZ of the power plant.

It is worth noting that, conditionally, the baseline sampling site (S-4) is a green zone next to the construction site, in most cases, the degree of pollution is lower than the pollution level of the construction site of power plants. Exceedances are noted for two components (nickel and zinc)

MPC levels of petroleum products, mercury and arsenic in soils and grounds were

4 [3] For more information, see Report 125-1105-BIO.

not exceeded at any of the test sites.

7 SOCIO-ECONOMIC CONDITIONS

7.1 Republican and regional context

Uzbekistan – the most populous republic in Central Asia. Covering an area of 447,000 km2, Uzbekistan is the only Central Asian republic that borders all four other States of this group.

Jizzakh region is located in the central part of Uzbekistan between the Syrdarya and Zeravshan rivers. It borders the Republic of Kazakhstan and the Syrdarya region in the north, the Republic of Tajikistan in the southeast, and the Navoi and Samarkand regions in the west. The area of the region is 21.21 thousand km². The administrative center is Jizzakh city.

Administrative-territorial, the Jizzakh region is divided into 12 districts. There are 6 cities, 8 urban-type settlements and 100 rural settlements in the region.

Administrative division of the Jizzakh region is presented in Table 15 and Figure 12.

Table 15: Administrative districts of Jizzakh region

Item	District name	Administrative center
1.	Arnasay	Goliblar
2.	Bakhmal	Usmat
3.	Dustlik	Dustlik
4.	Farish	Yangikishlak
5.	Gallaaralian	Galliaral
6.	Sharaf-Rashidov	Uchtepa
7.	Mirzachul	Gagarin
8.	Pakhtakor	Pakhtakor
9.	Yangiabad	Balandchakir
10.	Zaamin	Zaamin
11.	Zafarabad	Zafarabad
12.	Zarbdar.	Zarbdar

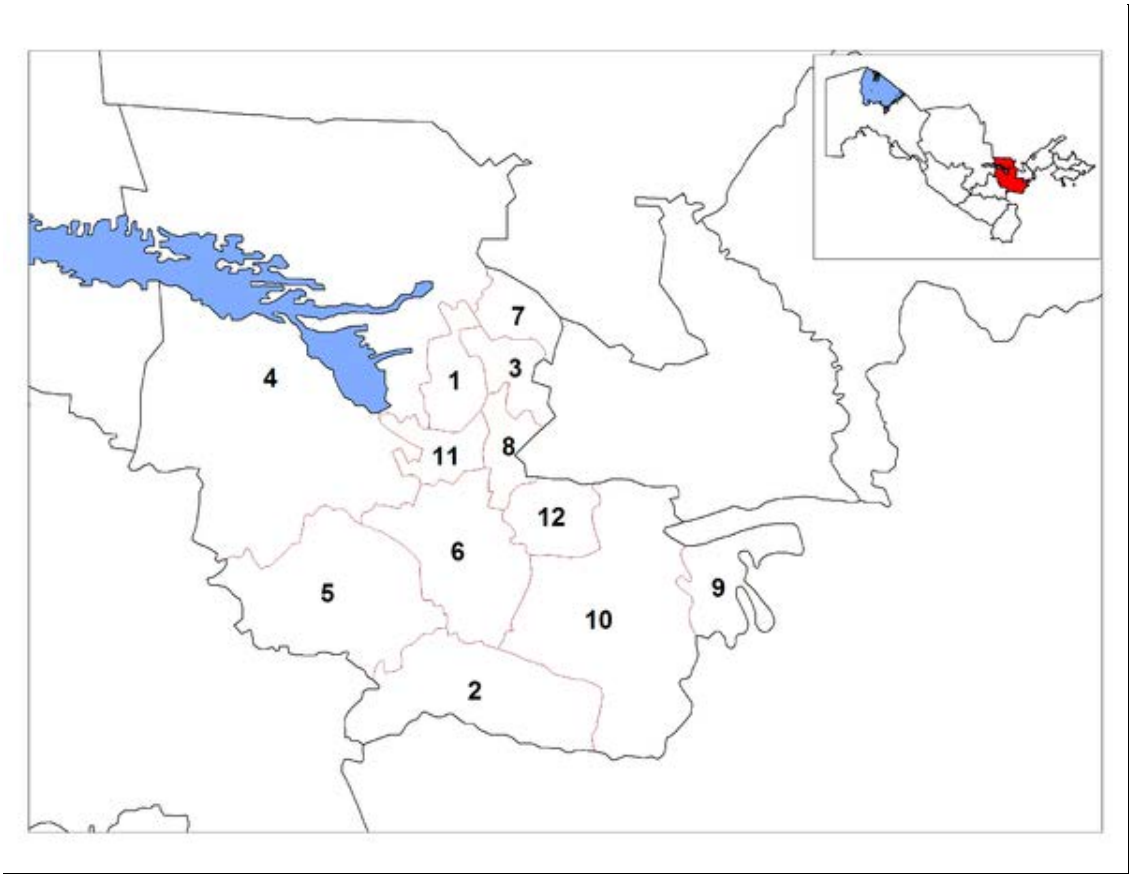

Figure 12: Administrative districts of the Jizzakh region

The construction site is located in Sharaf Rashidov district, in the immediate vicinity of Jizzakh city.

Source: https://stat.uz/ru

The socio-economic indicators of the Jizzakh region are presented in Table 16. *Socio-economic indicators of the Jizzakh region*

Table 16 Socio-economic indicators of Jizzakh region

Name	Indicators
Territory, km 2	21,178
Population	
Population density, people / km2	62.5
Total number of people	1 507 400
Women, people	768 774
Men, people	738 626
Urban population, people	707 300
Rural population, people	800 100
Educational institutions	
Primary schools	585
Secondary vocational institutions (colleges)	7
Academic lyceums	14
Higher educational institutions	2

Medical institutions		
Hospitals		32
Government clinics		9
Infrastructure, km		
Transport	Highways	1,965
	Railways	391
	Airport	-

Source: https://stat.uz/ru

The construction site is located in the Jizzakh region, in Sharaf-Rashidov district, in the immediate vicinity of Jizzakh city.

Sharaf-Rashidov district covers an area of 1.32 thousand km2

The region borders on the Farish, Zafarabad, Pakhtakor, Zarbdor, Zaamin, Bakhmal and Gallyaaral regions.

There are 39 settlements in Sharaf-Rashidov district, 48 makhalla councils, 243.1 thousand people live on January 1, 2024 (Figure 10 Makhallas of Sharaf-Rashidov district).

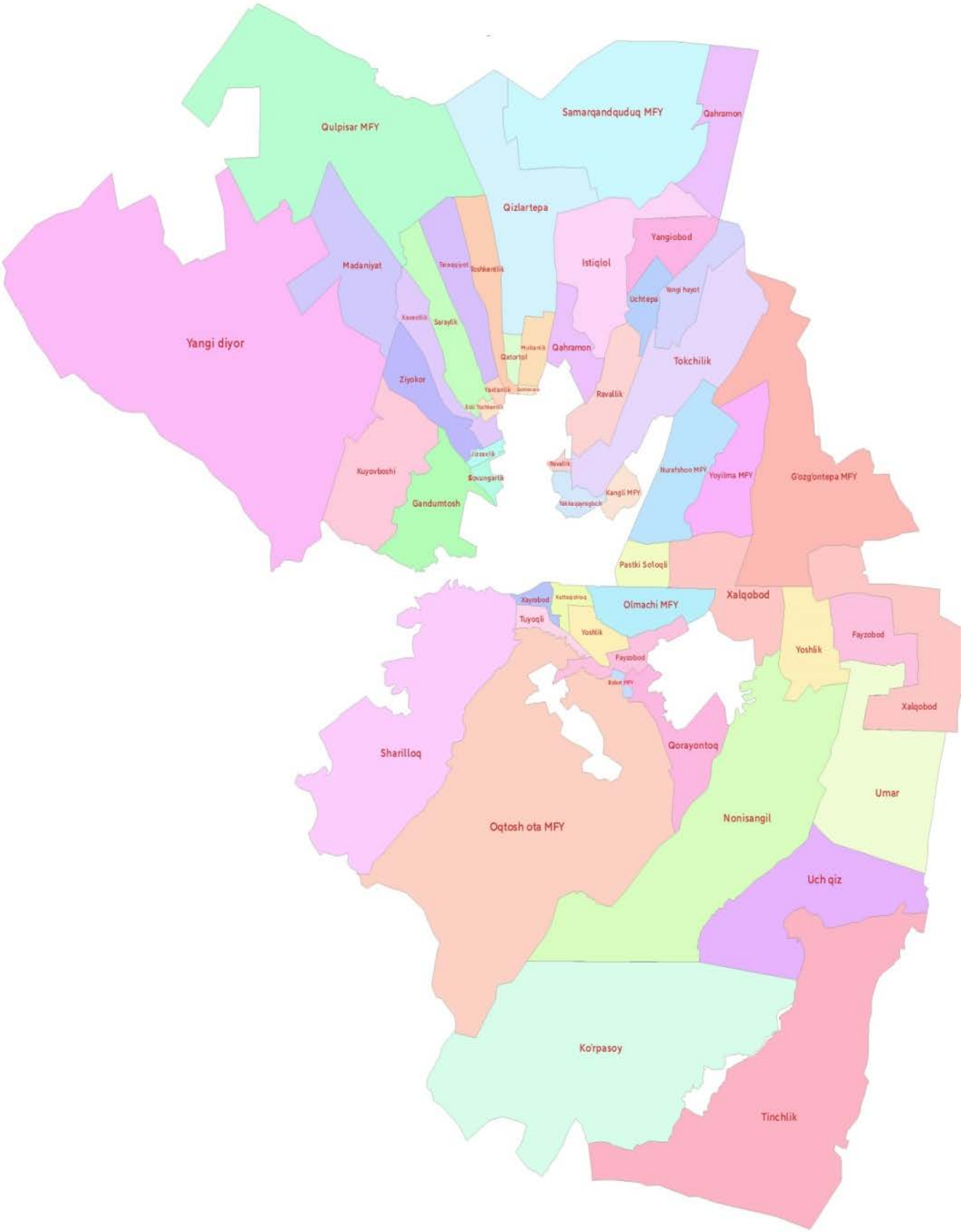
Qulpisar MFY
Samarqandquduq MFY
Qahramon
Qizlartepa
Yangiobod
Madaniyat
Istiqlol
Yangi diyor
Yangi hayot
Uchtepa
Saraylik
Qahramon
Qatortol
Tokchilik
Ziyokor
Ravallik
Kuyovboshi
Gandumtosh
Nurafshon MFY
Yoyilma MFY
G'ozg'ontepa MFY
Kangli MFY
Pastki Sotoqli
Xalqobod
Olmachi MFY
Tuyoqli
Yoshlik
Fayzobod
Sharilloq
Qorayontoq
Oqtosh ota MFY
Nonisangil
Umar
Uch qiz
Ko'rpasoy
Tinchlik

Figure 13: Makhallas of Sharaf-Rashidov district

7.2 Demographic characteristics

According to data for April 2024, 37 003 347 people live in Uzbekistan. Since 2016, the country's population has increased by more than 10%, mainly due to natural growth, although the republic has maintained a negative migration balance over the past 20 years. Approximately 50.1% of the population lives in cities. On average, a family in Uzbekistan consists of five people. The average age of Uzbek residents is 27.8 years.13 (Figure 11).

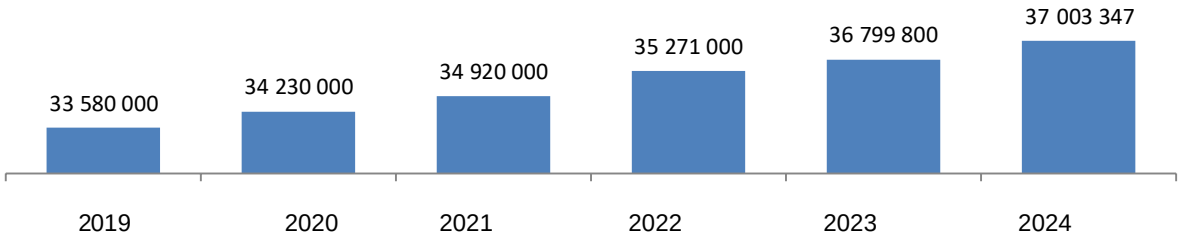

Figure 14: Population of Uzbekistan as of the beginning of the year, people.

Source: https://stat.uz/ru

There are 1,507,400 people living in the Jizzakh region (beginning of 2024), with 47% of the population being urban residents. The population in Jizzakh city is growing and at the beginning of 2024 reached 165,036 people.

According to the data, on January 1, 2024, the number of permanent residents of Sharaf-Rashidov district is 243.1 thousand people, and the increase compared to the previous year is 6.3 thousand people or 2.7%.

Table 17: Number of permanent residents (As of January 1, 2024, thousand people)

Name	**Total number of the population**	**Including:**	
		men	**women**
Jizzakh region.	1,507.4	760,6	746,8
Sh.Rashidov district	243,1	123,1	120,0

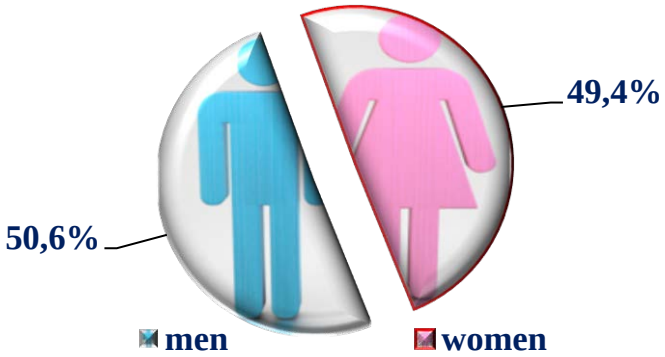

Figure 15: The ratio of men and women among the permanent residents of the district
(January 1, 2024, in %)

Thus, as of January 1, 2024, 50.6% of the permanent population of the district is male, and 49.4% is female. Based on this, it is possible to observe the predominance of the male population over the female one.

Table 18 Natural population movement for the period January-December 2023

Name	**Ppl.**			**In relation to 1000 people.**	
	2022 y.	**2023 y.**	**increase, decrease**	**2022 y.**	**2023 y.**
Birth rate	6,678	7 275	597	28.6	30,3
Mortality rate	861	1,141	280	3,7	4.8
Natural growth	5,817	6,134	317	24,9	25,6
Marriage	1,988	1,830	-158	8.5	7,6
Divorced	248	265	17	1,1	1,1

Birth rate. The number of births in the district for the period January-December 2023 amounted to 7,275 people, and compared to the same period of the previous year (6,678 people) increased by 597 people. Accordingly, the fertility rate is 30.3 ppm, and compared to the same period last year (28.6 ppm) increased by 1.7 ppm.

Mortality rate. The number of deaths in the district for the period January-December 2023 amounted to 1,141 people, and compared to the same period last year (861 people), the level increased by 280 people. Accordingly, the mortality rate was 4.8 ppm, in the previous year of the same period, this coefficient was 3.7 ppm.

Natural growth. When analyzing the above table, it can be observed that the natural increase in the district for the period January-December 2023 amounted to 6,134 people, which increased by 317 people compared to the same period of the previous year.

In 2024, according to https://countrymeters.info/ru, the life expectancy of residents of Uzbekistan was estimated at 72.5 years. According to this indicator, the republic ranks 100th among 228 countries in the world. For comparison: Tajikistan ranks 113th in this ranking (life expectancy is 70.8 years), and the UK is in 22nd place (81.4 years). Life expectancy for men is 69.5 years, for women - 75.7 years.

Source: https://stat.uz/ru

The following makhallas are located in the area of potential social impact of the project (Figure 13), which are subject to potential direct and indirect impacts of the planned activities:

- Gozgontepa makhalla is located in the 2000 m zone from the project area, the total area is 61 hectares, 892 households are located on this territory. In total, 3486 people live in this makhalla, of which 1714 are women.
- Khalkobad makhalla is located 1000 m away from the project area, with a total area of 39 hectares, and 1,358 households are located on this territory. In total, 8,390 people live in this makhalla, of which 3,923 are women.
- Pastki Sukokli makhalla is located in the 2000 m zone from the project area, the total area is 52 hectares, 1088 households are located on this territory. In total, 5810 people live in this makhalla, of which 3005 are women.
- Almachi makhalla is located in the 2000 m zone from the project area, the total area is 105 hectares, 2,882 households are located on this territory.).

Table 19: Population of the social influence zone of the project[4].

Makhalla	Gozgontepa	Khalkobad	Pastki Sukokli	Olmachi	Total
Population, people	3486	8390	5810	8187	25 873
Households, units	892	1358	1275	2882	6407
Number of families, units.	586	1712	1088	1441	4827
Women, people.	1714	3923	3005	3442	12084
Men, people.	1772	4467	2805	4745	13789
Women %	49,17%	46,76%	51,72%	42,04%	46,71%
Men%	50,83%	53,24%	48,28%	57,96%	53,29%
Children under 18 years of age, ppl.	1331	2985	1989	2872	9177
Children under 18 years of age %	38,18%	35,58%	34,23%	35,08%	35,47%

[4] According to the makhalla passports.

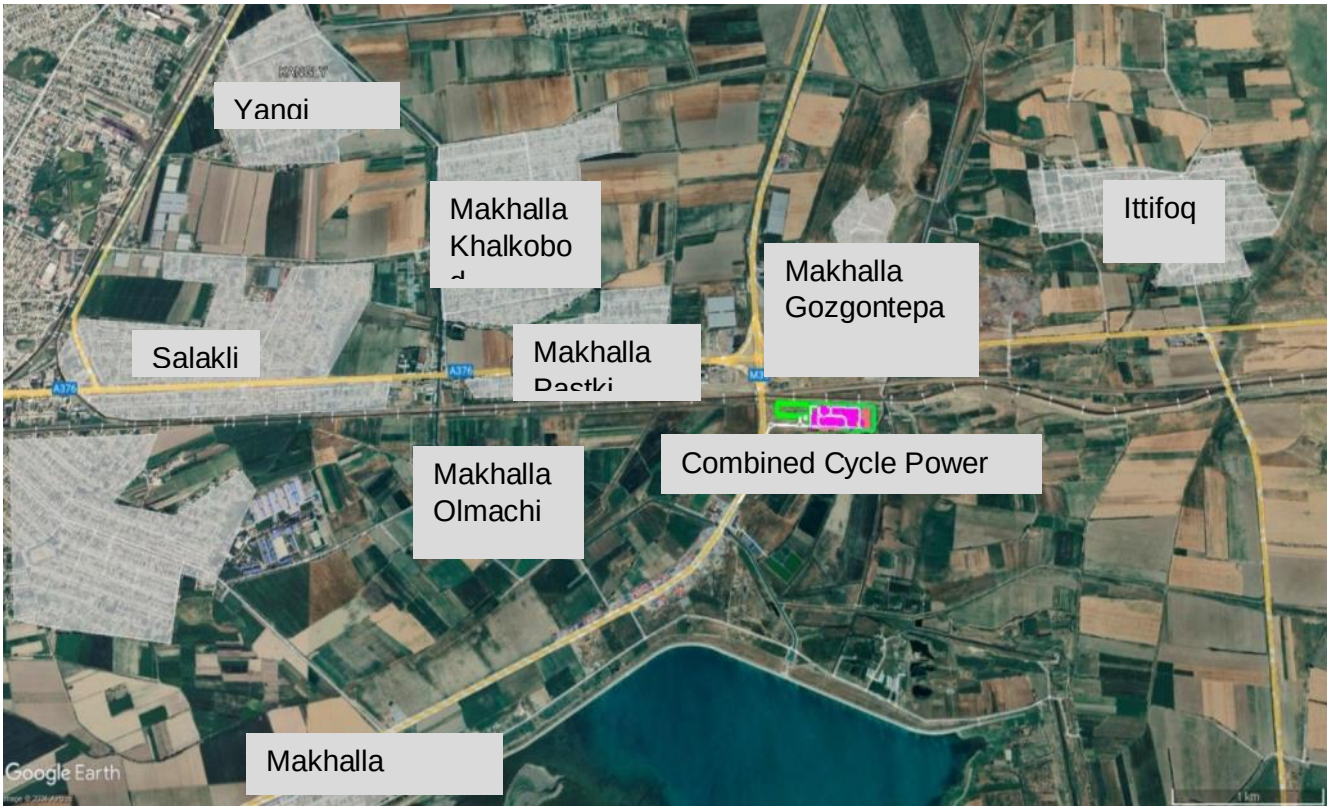

Figure 16:*Location of makhallas and other sensitive areas*

7.3 Ethnicity, indigenous peoples, religion and language

The peoples of Turkic (Uzbeks, Kazakhs, Karakalpaks), Semitic (Bukharian Jews) and Iranian (Tajiks) origin traditionally live on the territory of Uzbekistan, as well as representatives of other peoples who arrived here during the reign of the Russian Empire and the USSR (Russians, Crimean Tatars, Meshketian Turks, Koreans and a small number of Ashkenazi Jews).

The largest ethnic group in Uzbekistan is the Uzbeks. According to an updated official estimate published in 2017, the Uzbek population is just over 26.9 million (83.8% of the country's population), and the Tajik population is 1,544,700 (4.8%).

In the period from 1991 to 2017, the share of Uzbeks increased by 11% and reached 84%, against the background of a noticeable decrease in the share of Russians (by 5.4%), Kazakhs (by 1.6%), Tatars (by 1.4%) and Ukrainians (by 0.5%) as a result of emigration of representatives of these ethnic groups (Table 20).

Table 20 Ethnic composition of the population of Uzbekistan, %

Ethnic group	**1991**	**2017**	**Ethnic group**	**1991**	**2017**
Uzbeks	72.8	83,8	Tatars	2,0	0.6
Karakalpaks	2.1	2,2	Turkmens	0.6	0.6
Tajiks	4.8	4.8	Koreans	0,9	0.6
Kazakhs	4.1	2.5	Ukrainians	0.7	0,2
Russians	7.7	2.3			

Kyrgyz	0,9	0,9	Others	3.4	1,5

Source: https://stat.uz/en/open-data

The Uzbek population dominates in the project area. Based on the results of the study of documents, consultations and interviews, indigenous peoples or groups (i.e. Tajiks, Kyrgyz, Tatars, Turkmens) that have a collective attachment to a geographically defined habitat, traditional lands or ancestral territories in the project area, as well as to natural resources in this habitat and in such territories, have not been identified.

The state language of the Republic of Uzbekistan is the Uzbek language. The second most important language – Russian, which is spoken by a significant part of the population and which is widely used in the country. In addition to the Uzbek language, which has the status of an official state language, other languages are also used in several regions. In the Autonomous Republic of Karakalpakstan, the second official language is Karakalpak.

Consultations with representatives of local governments in the district of the planned activity (in makhallas) were held in Uzbek – the native language of the majority of representatives of the affected population groups.

The main religions in Uzbekistan – Sunni Islam, Orthodoxy and Judaism. For the republic as a whole, the distribution by confessions is as follows: Muslims – 79% (mostly Sunnis of the Hanafi madhhab; the Shiite minority does not exceed 1% and is concentrated mainly in the Bukhara and Samarkand regions), Orthodox – 4% (the share of Orthodox is decreasing, which is caused by the emigration of Russians, Ukrainians, Belarusians, etc.), other denominations of Christianity – 3% (Roman Catholics, Korean Christians, Baptists, Lutherans, Seventh Day Adventists, Evangelical Christians and Pentecostals, Jehovah's Witnesses), as well as Buddhists, Baha'is, Hare Krishnas and Atheists.

In the context of the IFC PS-7 definitions, the existing minority groups are assimilated and do not have any socio-economic or political characteristics that would distinguish them from the dominant groups living on the territory of the project implementation.

As such, the IFC PS-7 requirements for indigenous peoples do not apply to the project and are excluded from further assessment.

7.4 Public health and healthcare system

There are 2062 hospitals in Uzbekistan (according to data for 2024), including 1497 private clinics. Since 2018, 60 new public hospitals have been opened. On average, there are 45.2 hospital beds per 10,000 inhabitants, which is less than in Russia or Kazakhstan.

There are 226 polyclinics in Jizzakh region, of which 81 are located in Jizzakh city, in Sharaf Rashidov district -20. The number of polyclinics decreased by 34 compared to 2016, despite the population growth in the region. The number of hospitals in the Jizzakh region is 55 units, of which 25 hospitals operate in Jizzakh

city, and 4 in Sharaf-Rashidov district, despite the growth of the district's population. (Table 18).

As of the beginning of 2024, the degree of provision of hospitals (per 10 thousand population) in the Sharaf-Rashidov district at the rate of 243.1 thousand people amounted to 16.5%, while the provision of outpatient clinics is almost within the norm.

Table 21: Operating treatment and preventive healthcare institutions in the Sharaf-Rashidov district

Name	2020 y.	2021	2022
Sharaf Rashidov district			
Number of clinics and outpatient facilities	15	18	20
Hospital facilities (hospitals, medical centers, etc. hospitals)	6	4	4

Source: https://stat.uz/ru

The overall morbidity rate of the population of the Sharaf-Rashidom district for the period 2019-2021 tended to increase by an average of 6% (Table 19).

Table 22: Classification of the main diseases of the population of Djizakh city

Name	2019 y.	2020 y.	At the beginning of 2021
Total diseases	63445	63968	67993
Some infectious and parasitic infections	2588	2507	2442
Newly formed tumors	138	171	115
Diseases of the endocrine system, digestion, and metabolic disorders	1364	1034	612
Blood and hematopoietic diseases of organs and some disorders affecting the immune mechanism	13520	10510	6791
Psychological and mental disorders	58	124	127
Diseases of the nervous system	1341	2069	1633
Diseases of the eye and visual apparatus	3574	2205	4250
Ear and nasopharyngeal diseases	1996	1921	1853
Diseases of the circulatory system	732	2348	2218
Respiratory diseases	19106	18602	14543
Diseases of the digestive system	11566	12155	29145
Diseases of the urinary and reproductive system	3304	3992	3606
Complications of pregnancy, childbirth and postpartum complications	890	573	3583
Skin and skin-covering diseases	589	1097	1336
Diseases of the musculoskeletal system and connective tissue	1092	1607	2097
Congenital anamalia, deformities and chromosomal abnormalities	39	13	19
Complications associated with external cause, injury and poisoning	1409	2830	4628

Source: https://stat.uz/ru

In the structure of the general morbidity of the population of the region, the leading place is occupied by diseases of the digestive system (43% of cases of the total number of cases), in second place are diseases of the respiratory system (21% of cases of the total number of cases), in third place are diseases of the blood and hematopoietic diseases of the organs (16%). This is followed by injuries and poisoning (6.8%), diseases of the eye and its adnexa (6.25%), diseases of the genitourinary system (5.30%), complications of pregnancy, childbirth and postpartum complications (5.2%). Diseases of the endocrine system, mental and behavioral disorders, diseases of the skin and subcutaneous tissue, and neoplasms account for a total of 6.3%. Congenital anomalies (less than 1%), neoplasms (less than 1%), mental disorders and behavioral disorders (less than 1%) account for the smallest share in the morbidity structure.

The health of the population is in a certain relationship with the state of the environment. Environmentally determined classes of diseases serve as one of the most important criteria for assessing the quality of the environment, an indicator of its favorableness for human life.

Ecologically determined classes of diseases are able to vividly indicate the impact of the environment on the health of the population. The most sensitive to the effects of environmental factors are the hematopoietic, cardiovascular, central nervous, genitourinary systems, as well as the respiratory organs.

Based on the data presented, in the area of the planned activity, classes of diseases are more pronounced (respiratory diseases 21% and blood diseases and hematopoietic organ diseases 16%), one way or another related, among other things, to environmental conditions, in particular, the level of air pollution and the lifestyle of the population.

7.5 Education

In Uzbekistan, education includes four main levels (Table 23):

- general education training,
- vocational education,
- additional education
- advanced training.

Table 23 The education system in Uzbekistan

General education training	Professional education	Additional education	Advanced training
Preschool education (children aged 3-7 years)	Medium professional education (colleges and technical schools)	Additional education for children and adults	Vocational training is intended for people of different ages in order to develop the professional competencies necessary to perform specific labor (office) functions, including the operation of specific equipment, technologies, hardware and
Primary general education (1-4 academic years) - compulsory	Higher education (Bachelor's degree)	Additional professional education	

Basic general education (5-9 academic years) - compulsory	Higher education (Master's degree)		software and other professional tools. Such training is aimed at developing certain skills of a worker or employee (in accordance with the requirements for a certain rank, class, category) without changing the general educational qualification.
Secondary general education (9-11 academic year)			

Source: https://stat.uz/ru

There are 10,130 schools in the country (as of the 2021-2022 academic year), in which education is conducted in the following languages: 8,227 - Uzbek, 88 - Russian, 143 -

Kazakh, 245 - Karakalpak, 92 - Tajik, 21 - Kyrgyz, 23 - Turkmen. A total of 7,408 schools operate in rural areas.

There are 307 pre-school institutions in the Jizzakh region, and 40 in the Sharaf-Rashidov district (Table 24).

Table 24: Preschool education in Sharaf-Rashidov district

District/city	2020 y.	2021	2022
Sharaf Rashidov district Number of preschool education institutions	38	37	40
Number of children in preschool institutions, people.	7532	8189	9509

Source: https://stat.uz/ru

There are 585 schools in the Jizzakh region, and 61 in the Sharaf-Rashidov district. The average occupancy rate of one school is 685 students, which indicates a sufficient number of schools in the district and not overcrowded classrooms (Table 25).

Table 25: Secondary education of Sharaf-Rashidov district

District/city	2019/2020 academic year	2010/2021 academic year	2021/2022 academic year
Sharaf-Rashidov district: Number of schools in total	60	60	61
Number of pupils, people	39413	40465	41810

Source: https://stat.uz/ru

There are 7 vocational colleges in the Jizzakh region, and there are no colleges in the Sharaf-Rashidov district. Since 2019, the total number of colleges in the region has decreased from 76 to 7 due to the education reform related to the introduction of 11 years of secondary education.

7.6 Labor force and employment

The working-age population of Uzbekistan is almost 56% (as of the end of 2023). About 66% of this number is actually employed in the country's economy. 602

700 people of working age live in Jizzakh region, 89% of whom are currently employed.

The official unemployment rate in Uzbekistan is 10.5% (at the beginning of 2022), which is almost twice as high as in 2016. Similar figures are given in the reports of the Khokimiyat of the Jizzakh region: 9.3% of the inhabitants of the region, in Jizzakh city - 8.7% (7,400 people) have the status of unemployed in 2023.

It should be noted that the actual unemployment rate, especially in rural areas, may differ from official statistics, since not all local residents are registered with employment agencies. Thus, the real unemployment rate is likely to be higher. There are also cases of underemployment, when citizens work part-time, but would prefer full-time employment and are able to work full-time.

Before the pandemic (in March 2020), the average nominal salary in the Jizzakh region was 2 865 1 thousand UZS.

For the period January-December 2023, the nominal average monthly salary in Sharaf-Rashidov district amounted to 2,743.0 thousand UZS and, in relation to the indicators of the average monthly salary of the region, amounted to 79.0%.

According to statistical data of Sharaf-Rashidov district, the economically active population is 61.7 thousand people, of which the employed population is 55.1 thousand people, the number of unemployed is 6.6 thousand people (6).

Table 26: The number of economically active population, employed and unemployed by regions of the Jizzakh region

Name	The total number of the economically active population, thousands of people.	of these:		Unemployment rate as a percentage
		employed population	unemployed	
2022				
Jizzakh region	**602,7**	**546,4**	**56.3**	**9.3**
Jizzakh city	85,3	78,0	7,4	8,7
Sharaf Rashidov district	92,7	84,2	8.5	9,2

Based on statistical data, the unemployment rate considered for 2020-2022 decreased from 11% to 9.2%. Representatives of local communities claim that the number of unemployed is growing every year, the unemployed are not registered at the labor exchange, as the offered vacancies are low-paid and the unemployed prefer “gray” work in the markets or leave to work in other regions.

The distribution of the employed population by type of economic activity has not changed significantly over the period from 2020 to 2022. Activities such as industry, education, health care and social services gradually increased the employment of workers throughout the period and were the most in demand in the district and the region

The estimated number of migrant workers increased by 13% over the period, including female migrant workers. The smallest number of the population is engaged in agriculture, although the increase over the period amounted to 30%, residents of makhallas began to rent fields and engage in seasonal agricultural work.

During the consultations, representatives of the makhallas reported on the high unemployment rate of the local population, especially among women and youth. Young people, despite having specialized education, have little chance of earning an independent income or getting a qualified job.

The main source of income for local residents of the surveyed communities is work at enterprises in Jizzakh city, trade in local markets, as well as work in municipal services of the city.

Women work in sewing workshops, in medical institutions, preschool institutions or trade in bazaars. Men also work in construction.

According to official data, labor migration rates in the surveyed makhallas are quite high and, as interviews with local residents have shown, as a rule, one person from each family, mostly young men, go abroad to work.

Directions of labor migration – Tashkent, Russian Federation, Kazakhstan. Since men currently make up the majority of migrant workers, women are forced to cope with the responsibilities of the head of the family.

Taking into account all sources of income, the monthly household income averages 2.5-5 million UZS per month. Families with incomes over 5 000 000 UZS are considered well-off. The minimum income is considered to be 1 500 000 UZS.

Among the main sources of income for residents of settlements are the income, as a rule, of one or two family members from work in production, in government organizations, in the form of wages (kindergartens, schools, paramedic and obstetric centers, etc.).

Remittances from migrant workers are an important source of income for many families. Regarding household expenditure patterns, interviews with residents suggest that the main expenditures are on food, utilities, education and ritual expenses (weddings, funerals, etc.).

7.7 Status and land use

According to the results of the SCA of the allotment site for the construction of a combined–cycle power plant, it was found that the entire site affects the territory of one farm, whose lands are used mainly for grazing livestock.

A plot of land of 9.42 hectares was allocated for construction by the khokimiyat of Sharaf-Rashidov district on the basis of the decision of the Khokim of the district No. 01-51 dated on 30/01/2024.

In fact, according to the document, 9.42 hectares of land belonging to the “Donabek Sano” farm, based on cadastral documentation No. 4429 dated on 31/10/2018, were transferred to the state on a permanent basis, and 2 hectares of

land were taken for temporary use and will be returned to the farm after the completion of the construction of the facility.

According to the Khokimiyat and cadastral authorities of Sharaf-Rashidov district, before part of the farm land was acquired for the construction of a power plant, the total area of the farm was 46 hectares. Of these, 4 hectares are irrigated lands, the rest are dryland.

Due to the dense urban development of Jizzakh and Sharaf-Rashidov district and the availability of farmland, it was not possible to use vacant land owned by the state.

Analysis of the available information suggests that the placement of a combined-cycle gas power plant in a designated area near Jizzakh city is optimal from the point of view of the effectiveness of investment costs.

The provision of the design electric capacity of a combined-cycle gas turbine power plant with a capacity of 550 MW to the existing energy system will solve the issue of covering the shortage of energy supply in a number of districts of Jizzakh region and Jizzakh city.

The choice of the location of the combined cycle gas turbine power plant planned for construction is also due to the availability of available sources of water consumption, a gas pipeline and other necessary infrastructure.

Thus, the construction of combined-cycle power plant had the minimum possible impacts associated with temporary and permanent alienation of land, the consequences of which are expressed in the loss of pasture areas and farm structures.

Based on the assessment report, the amount of compensation amounted to 507 100 000 UZS, the report was agreed upon with the head of the farm and, on the basis of an agreement concluded between the farmer and the Khokimiyat, the amount was paid to the farmer.

While the compensation for affected structures was calculated using a market value approach, aligning with local regulations, the application of depreciation on these structures reduces the restoration costs. This approach is inconsistent with Performance Standard 5, which mandates compensation at "full replacement cost," ensuring that affected parties can restore their livelihoods without incurring additional expenses.

According the appraisal report, the full replacement cost is 753 832 870 UZS, this cost included:

Cost of the land plot under the structure - 35 321 000 UZS

Full replacement cost of the structure - 718 511 870 UZS

Thus, the farmer has been additionally paid the amount of 246 732 870 UZS.

Temporary land take: 2 hectares of land were taken for temporary use and will be returned to the farm after the completion of the construction of the facility. The

land was not being used at the time of the land order. Thus, the farmer did not lose any income due to the temporary use of the land plot

Project-related facilities: new access road to the power plant, length of about 90 meters, power lines with a length of approximately 8 and 10 km from the project area to the existing 220 kV overhead lines L-20-D and L-Z-S, gas pipeline line, water supply route, preliminary starting from the surface water intake, drainage canal of the Jizzakh reservoir is currently at the design and approval stage.

In accordance with the Project Agreement, all connection points and the construction of linear facilities must be provided by local government agencies, gas and water supply organizations, and the National electric networks.

The construction of infrastructure (associated facilities) will likely lead to the economic displacement of land users, temporary and permanent alienation of land plots.

But since the routes of linear objects are not currently defined, it is not possible to determine the impact at this stage of the assessment.

For more information, see 128-0948-ESIA-PE-3 in Section 10.

7.8 Access to public and social services

According to national statistics for 2023, 92.8% of households in rural areas of Uzbekistan have access to drinking water supply services at a basic level. The vast majority of rural settlements (90%) do not have sewage systems (Table 27).

Table 27: Proportion of the population of Uzbekistan with access to safe drinking water

Category	2019 y.	2020 y.	2021	2022	2023 y.
Households receiving basic drinking water services, urban areas	93,9	94,1	91,1	91,4	92,8
Households receiving basic drinking water services, rural areas	83,2	80,4	81,2	81,2	81,9
Households receiving basic drinking water services	88,8	87,6	86,4	86,6	87,6
Households with access to safe drinking water, urban settlements (% of urban households)	99.8	99,1	98,8	99,1	98,8
Households with access to safe drinking water, rural settlements (% of households in rural settlements)	96,1	97,2	96,7	98.0	98,7
Households with access to safe drinking water (% of households)	98.0	98,2	97,8	98,6	98,7

Source: https://stat.uz/

In the Jizzakh region, more than 74% of households in rural settlements have access to drinking water supply services. All settlements of the region are connected to the power supply network.

During the period January-December 2023, in the Sh.Rashidov district, a total area of 62.6 thousand square meters of residential buildings and buildings was put into operation, which is 110.0% compared to the same period in 2022. In the field of municipal construction, 188.0 km of water supply networks and 2.5 km of gas supply networks were put into operation.

Households in the Sharaf-Rashidov district in the project impact zone are provided with centralized public services to varying degrees.

According to information received during consultations with representatives of the makhallas, the settlements are fully gasified and connected to the electricity network, but local residents complain of power outages and do not have centralized sewerage.

The social objects of the project's territory of influence are presented in the table below. Olmachi Makhalla is the most developed in the social sphere; on its territory, in addition to a market, kindergartens and a school, there is also 1 clinic. There are also 2 pharmacies and 25 shops in the Olmachi makhalla, while pharmacies are absent in the other 2 makhallas of the project area, and the number of shops varies from 9 to 12 (Table 28).

Table 28: Social objects of the territory of the planned activity[5]

Name	Gozgontepa	Khalkobad	Pastki Sukokli	Olmachi	Total
Kindergartens	2	5	8	6	21
College	0	0	0	0	0
School	1	1	1	1	4
higher education institution	0	0	0	0	0
Clinics	1	1	0	1	3
Pharmacies	0	1	0	2	3
Shops	12	12	9	25	58
Restaurants	0	1	0	0	1
Catering	2	4	1	8	15
Market	0	3	0	1	4
children's/sports playground	2	2	0	4	8
Beauty salons	0	0	0	0	0
Training center	0	0	0	0	0
Mosque	1	1	0	1	3
Recreation center	0	0	0	3	3
Industrial enterprises	0	0	0	0	0
Cemeteries	2	1	0	1	4

7.9 Transport infrastructure

[5] According to the makhalla passports.

Transport corridors between Asian and European countries pass through the Jizzakh region. It borders two countries at once - Tajikistan and Kazakhstan. In addition, Jizzakh lies on the way from the capital to Samarkand, Bukhara and the Ferghana Valley. Geographical location is one of the most important factors in the development of the region's economy and the road infrastructure of the whole country.

In the field of infrastructure development in the Jizzakh region, 38 km of highways were laid in 2016-2020, the total length of railways is 217.8 km.

The main highway from Tashkent to Jizzakh city is route M–39, 202 km long.

In 2023, 8523.3 thousand tons and 5203.6 thousand tons, respectively, were transported by all types of road transport in the Jizzakh region and Sharaf-Rashidov district, the volume of traffic in the district is 61% of the total volume of the region.

In 2023, 21,698.7 thousand passengers and 2,621.2, respectively, were transported by all motor vehicles in the Jizzakh region and Sharaf-Rashidov district.

The flow of vehicles on the M-39 highway, the section before entering the project area, next to the turn, is quite intense and almost continuous, 6-15 vehicles per minute on a weekday (based on 30-minute observations in the morning, afternoon and evening on weekdays and weekends). Traffic intensity data is presented in the table below (Table 29).

Table 29 Traffic intensity on the M-39 highway

Name	**Weekday**			**Weekend**		
	9-00 up to 9-30	**16-45 up to 17-15**	**20-00 up to 20-30**	**9-00 up to 9-30**	**16-45 up to 17-15**	**20-00 up to 20-30**
Passenger cars	455	429	315	308	214	110
Trucks	26	34	10	5	4	3
Total	481	463	325	313	218	113

Passenger high-speed railway with a length of 741 km passes through Jizzakh city and the Sharaf-Rashidov district, connecting the largest cities of Uzbekistan - Tashkent, Samarkand, Bukhara, Karshi, Navoi.

7.10 Gender Aspects

There is no legislation on gender equality in Uzbekistan, although recent national reforms have improved women's economic opportunities.

In February 2019, the President of Uzbekistan signed a decree aimed at

"dramatically improving support for women and strengthening the institution of the family." The law criticizes the current situation with women's rights and their participation in the country's affairs. Also, in recent years in the country, issues of gender equality have been raised to the level of state policy, 25 legislative acts have been adopted, the share of women in political parties has reached 44%, in higher education - 40%, in entrepreneurship - 35%, women are widely involved in

information and communication, innovation, energy, and engineering fields.

The Committee for Women's Affairs of Uzbekistan, created in 1991, cooperates with political parties representing the interests of women, provides support and assistance to women in various social spheres, such as healthcare, education, culture, sports, etc. He also opens adaptation centers, conducts seminars, workshops and trainings for women who want to start their own business, offers them consulting services, organizes exhibitions and fairs. The Women's Affairs Committee is also engaged in legislative activities, developing gender-specific laws aimed at improving the status of women in society.

In 2013, the website of the State Statistics Committee was developed jointly with the Committee on Women's Affairs of Uzbekistan (www.gender.stat.uz). The site contains information in three languages: Uzbek, Russian and English to provide users with gender-sensitive information in areas such as population, health, labor, social security, etc. However, a mechanism for the regular collection of gender statistics has not yet been established.

Employment statistics for the country show *(*Figure 17*)* that women employed in industry and agriculture in Uzbekistan account for approximately 44% of the total number of employed and only 6% of the total number of employed in the construction sector. The same ratio remains in the area of the planned activity

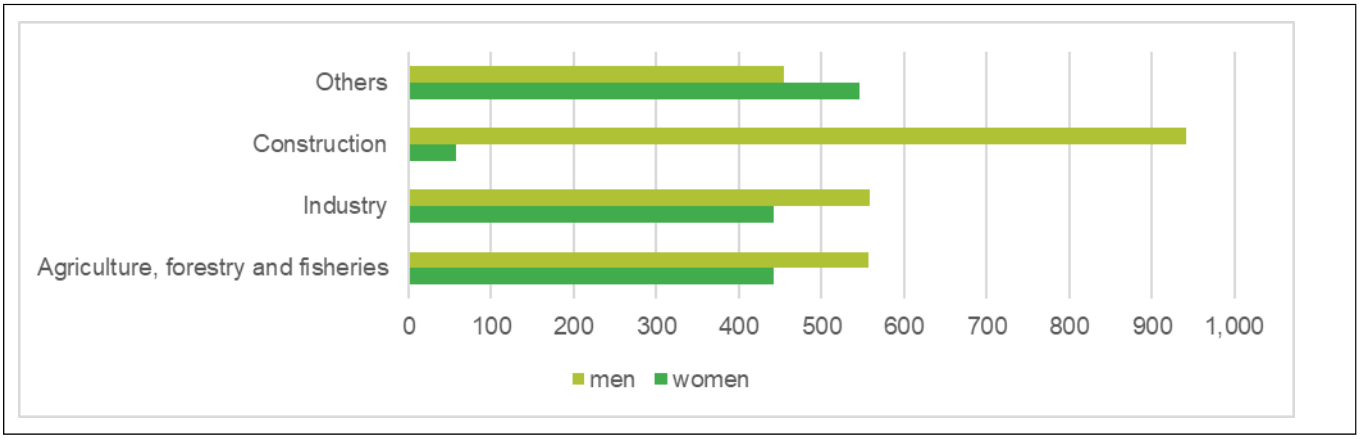

Figure 17: Employment, divided by sector and gender, 2022

Source: https://gender.stat.uz/en/

According to the results of focus group studies, out of the total number of respondents, 41 people, 4 makhallas of the social impact zone, a focus group of women from the project area (13 women) was formed.

Almost 90% of the women surveyed do not work because there are no job opportunities, most of them trade on the market or do homework. At the same time, many have degrees from colleges and even institutes.

When asked what jobs are available for women in the region, 21 respondents answered that there are no places for employment at all, 5 answered that it is possible to get a job as a teacher in preschool institutions, if you have the appropriate education, and 10 people answered that you can get a job in a sewing workshop, but

securing work is related to orders, which is not always stable.

7.11 Vulnerable groups of the population

Vulnerable groups of the population include families without breadwinners, women, heads of households and those affected by gender imbalance, lonely elderly people (pensioners and war veterans), the disabled, the unemployed, including unemployed young people and women, and poor and disadvantaged families.

A detailed survey study has been performed on the nearest machallas that are close to the project site.

Table 30: Vulnerable groups of the makhalla population of the project area[6].

Name	Gozgontepa	Khalkobad	Pastki Sukokli	Olmachi	Total	% of the total number of families/ residents of makhallas[7]
Number of families without breadwinners, units.	14	22	-	41	77	0,016%
Number of single mothers/fathers, people.	-	2	-	1	3	0,0006%
Lonely elderly people, persons.	-	4	-	2	6	0,00023%
Number of large families, units.	20	10	-	49	79	0,016%
Number of poor families, units	10	55	27	45	121	0,02%
Number of financial assistance recipients, people.	8	28	11	98	145	0,03%
Number of recipients of Disability benefits, people.	18	34	22	40	114	0,0044%

According to social research estimates, the female population is about 12,084, including 5,464 women of working age.

In total, there are 4,827 families in 4 makhallas (Table 28). Living conditions in the makhallas are assessed at a fairly high level, given that almost all households have access to water, electricity and gas supply.

Families who have lost a breadwinner are considered disadvantaged households that have difficulty maintaining their income due to the loss of household members involved in economic activities.

The available data indicate a small number of such families, only 77 families, which is only 0.016% of the families of all makhallas. There are also 79 large families registered in makhallas, 121 families have the status of poor and receive appropriate benefits.

[6] According to the makhalla passports.

[7] The total number of families is 4827, the total number of inhabitants is 25,873 people (4 makhallas).

7.12 Cultural heritage

It should be noted that in total in Jizzakh region 427 cultural heritage sites have been taken under state protection, including 100 shrines of historical areas, 268 archaeological sites, 59 monumental monuments.

The main areas rich in monuments of cultural and archaeological heritage are Firish and Bakhmali.

In total, 44 heritage monuments are registered on the territory of Sharaf-Rashidov district, according to the state register of cultural and architectural heritage sites. The nearest archaeological site is located at a distance of more than 5.5 km from the project area.

The three monuments closest to the project area are located on the territory of the Pastli-Sulokli makhalla.

Table 31 List of objects of cultural and architectural heritage of Sharaf-Rashidov district closest to the project area

№.	Name of the object	Project construction period	Address of the object
1	Safarboytepa	7th-8th century	Pastli-Sulokli Makhalla, Mustakillik Street
2	Nomsiztepa -1	5th-8th century	Pastli-Sulokli Makhalla, Toshkentlik Street
3	Nomsiztepa -1	5th-8th century	Pastli-Sulokli Makhalla, Toshkentlik Street

A request was sent to the Agency for Cultural Heritage of the Jizzakh Region to obtain data on significant cultural and archaeological heritage sites located next to the facility under construction.

Information was received from the Agency about three monuments presented in the table above. The distance to the objects exceeds 5 kilometers.

As a result of the joint departure of UMK specialists and the Cultural Agency

Based on the above, it is advisable to include a Procedure for detecting accidental finds in the Environmental and Social Management Plan.

APPENDİX – 1

Biodiversity Baseline Studies

August-September 2025

CENGIZ ENERGY INDUSTRY AND TRADE INC.

CONSTRUCTION OF A COMBINED-CYCLE POWER PLANT

WITH A CAPACITY OF 550 MW

BIODIVERSITY STUDIES

Prof. Dr. AYDIN AKBULUT

Hacettepe University

Faculty of Education

Department of Biology Education

SEPTEMBER 2025

CENGIZ ENERGY INDUSTRY AND TRADE INC.

CONSTRUCTION OF A COMBINED-CYCLE POWER PLANT

WITH A CAPACITY OF 550 MW

BIODIVERSITY STUDIES EXPERTS

FIRST NAME / LAST NAME	SCOPE OF WORK in the PROJECT	SIGNATURE
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Prof. Dr. Şakir Önder ÖZKURT	FAUNA Kırşehir Ahi Evran University Kırşehir Faculty of Education Department of Science Teacher Education Kırşehir	
Assoc. Prof. **Golshan Zare**	Hacettepe University Faculty Faculty of Pharmacy, Department of Pharmaceutical Botany, Ankara	

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SECTION I: PROJECT INTRODUCTION

I.1. GENERAL INFORMATION ABOUT THE PROJECT

Cengiz Energy, a subsidiary of Cengiz Holding, is constructing a 550 MW Natural Gas Combined Cycle Power Plant (CCGT) in the Sharof-Rashidov district of Jizzakh (Cizzak) city, Uzbekistan, within the Halqabod MFY settlement area. The project is planned to meet Uzbekistan's growing electricity demand, strengthen energy supply security, and support the country's industrialisation process (Figure I.1).

Figure I.1. Project Site

The power plant is designed based on combined cycle technology. This technology involves producing steam using a gas turbine and a heat recovery steam generator (HRSG) utilising the high-temperature gases emitted from the turbine, thereby generating additional electricity with a steam turbine. This achieves energy conversion efficiency levels approximately 55–62 per cent higher than traditional single-cycle systems.

The area where the power plant will be built is approximately 7.5 hectares, and the annual electricity generation capacity is expected to be approximately 4.1 billion kWh. This amount is equivalent to the annual electricity consumption of approximately 1.6 million households (Photograph I.1).

Photograph I.1. Project site under construction

The power plant is planned to utilise one Siemens S-GT54-000F V10 gas turbine and one Siemens SST-700/900 steam turbine. This turbine combination will maximise the efficiency of the energy obtained from the combustion of natural gas.

The natural gas to be used as fuel will be supplied from Uzbekistan's national gas network. The steam obtained by using the high-temperature gases at the turbine outlet in the HRSG will be directed to the steam turbine, providing additional electricity generation. Cooling towers and condenser systems will be installed for steam condensation.

The natural gas combined cycle power plant being constructed by Cengiz Energy in Jizzakh is a strategic investment that will strengthen Uzbekistan's energy infrastructure with its high efficiency, modern technology and strong installed capacity. Upon completion, the project will make significant contributions to both regional energy supply security and the country's economic development goals.

Biodiversity elements are also included among the environmental impacts of this project. Accordingly, studies have been conducted on terrestrial flora, fauna and aquatic life in the project area, impact area and working areas, including the Jizzakh Reservoir, along with the area where the power plant will be built. Field studies were conducted between 6 and 9 September 2025, and biodiversity reports compliant with IFC PS6 standards were prepared based on the data obtained from the field studies and literature data.

SECTION II: HYDROBIOLOGICAL STUDIES

II.1. INTRODUCTION

The cooling water requirement for the Natural Gas Combined Cycle Power Plant is planned to be supplied via an additional pipe to the existing two pipes located immediately below the Jizzakh reservoir. The technical design of the plant envisages a water-cooled condenser and a circulating cooling system, and a recirculation system based on water reuse via cooling towers will also be implemented. This method ensures efficient use of water while also significantly affecting the plant's total water consumption.

The plant's total cooling and process water requirement is estimated to be approximately 200 m^3/hour. This corresponds to approximately 4,800 m^3 per day and 1.68 million m^3 per year. A large portion of the water used will be utilised for cooling and for the necessary charging and cooling tower requirements of the steam-water cycle. In addition, certain amounts of water will be consumed in processes such as cooling the gas turbines, washing and purging operations, and chemical water preparation.

Domestic wastewater generated at the power plant will be directed to the central sewage system, while industrial wastewater will be treated through chemical processes, filtration, and appropriate cooling and discharge measures. The receiving environment will be the drainage channel of the Jizzakh reservoir immediately adjacent to the facility.

The water to be taken into the plant will be from the pipeline section immediately downstream of the dam body, and the discharge water environment will also be the canal system next to the facility. Therefore, this study was conducted to obtain biological inventory data on the aquatic organisms in the project and impact areas and working areas, regarding their current status during the construction phase of the facility and before it becomes operational. Therefore, it is critically important to conduct additional monitoring studies in subsequent phases to establish reference data for both the aquatic ecosystem and the physicochemical properties of the water and to verify compliance with IFC-compliant threshold values.

II.2. PROJECT AREA

The Jizzakh Reservoir is an artificial water storage area constructed on the Sanzar (Sangzor) River in the Jizzakh region of Uzbekistan. The Sanzar River is one of the tributaries of the Syr Darya River Basin, and the reservoir is connected to this large basin system.

The reservoir was commissioned in 1973 and was created by an earth-fill dam. The dam is approximately 33 metres high and 7.7 kilometres long, making it one of the largest water structures in the region. The total storage capacity of the reservoir is 100 million m^3. Of this, 96 million m^3 is defined as active volume and 4 million m^3 as dead volume. The water surface area is approximately 13.75 km^2, and the maximum depth of the reservoir reaches 24 metres. Considering its dimensions, its average width is 5.6 kilometres and its length is around 3.3 kilometres.

The primary purpose of the reservoir is agricultural irrigation. It ensures the sustainability of

agricultural production by providing regular water to irrigation channels in the region and serves as a critical water source, especially during dry periods. Although there is no direct information regarding its use as a drinking water source, it is understood that the reservoir plays a key role in supplying water for irrigation and industrial purposes.

Hydrologically, the reservoir's water source is the Sanzar River, while regional rainfall, surface runoff and small tributaries also contribute to its volume. The region has semi-arid climatic conditions, with high temperatures and evaporation during the summer months significantly affecting the reservoir level. Due to the intensity of agricultural activities in the surrounding area, soil salinisation problems have also been observed.

Current technical information provides detailed data on the reservoir's dimensions, capacity, and structural characteristics. However, some important parameters required for ecosystem assessment are missing. Detailed measurements of the reservoir's seasonal temperature profiles, dissolved oxygen levels, nutrient salts (nitrate, phosphate), heavy metals, and other chemical components are not available. Furthermore, regular hydrometric data on seasonal volume changes, evaporation and flow regime are also limited. From a biological perspective, a comprehensive inventory study has not been conducted on the existing aquatic fauna and flora, particularly fish species, plankton communities and benthic invertebrates.

The characteristics of aquatic ecosystems and the richness of their species are ecologically significant. In terms of fauna, flora, ecology and economics, they are the places on Earth with the highest production of organic matter and oxygen after tropical forests. Furthermore, as these areas also serve as reservoirs, including groundwater, they are of particular importance in terms of irrigation and drinking water supply. Given the importance of wetlands, planned investments necessitate planning that also aims to protect natural habitats.

The cooling water for the Combined Cycle Power Plant during operation will be taken from the pipes that transfer water from the Jizzakh Reservoir to the irrigation canal. The operating water will then be discharged back into the canal. It is crucial to understand the reactions of aquatic organisms to this operating process and the necessary precautions to be taken. To this end, all living groups in the stream/reservoir/canal areas where the work is being carried out have been studied within the scope of this project, and recommendations have been made regarding the impacts and necessary precautions.

II.3. SCOPE OF WORK

Aquatic sampling points covering the Combined Cycle Power Plant construction area, impact area, and immediate surroundings were established. Fish, benthic organisms, zooplanktonic organisms, and algae were collected, and habitat assessments were conducted. As a result of the studies, the presence of species belonging to all aquatic groups at the stations, their endemism status, and conservation status were evaluated. In addition, habitat assessments were conducted by defining the general ecological characteristics of aquatic environments.

In aquatic ecosystems, phytoplanktonic organisms form the first link in the food chain, while zooplanktonic organisms and benthic macroinvertebrates form the second link. Fish occupy the final link in this food chain.

Aquatic organisms were identified by sampling in the planned facility area and using

literature data. The importance of the area in terms of aquatic organisms was determined, and assessments were made regarding critical species and critical habitats according to IFC PS6 criteria. Furthermore, the impacts of the activity on aquatic ecosystems, potential risks, and countermeasures were provided.

Sampling studies for aquatic organisms were carried out at five separate stations (stream/reservoir/canal) identified within the Combined Cycle Power Plant impact area between 3 -7 August and 6 - 9 September 2025.

Accordingly, all five aquatic sampling stations were visited, and the following studies were conducted.

- Identification of the impacts of planned activities on aquatic habitats,
- Determining the general pollution status of the stations,
- Collection and identification of aquatic organisms from all suitable aquatic habitats for sampling,
- Identification of critical species defined as vulnerable (VU), endangered (EN) or critically endangered (CR) according to the Global IUCN Red List or the National Red List and/or legislation,
- Identification of endemic (local or regional endemic) or restricted-range species (species with a global range of 500 km or less or an equal linear geographical range).
- Making recommendations and proposals for prevention within the scope of protection strategies for critical habitats and species.

Within the scope of this report, an assessment has been made by highlighting the observations identified during the fieldwork. Literature data related to the project area has also been used and analysed together with field observations.

II.4. SAMPLING AREAS

The aquatic systems studied were selected based on criteria such as habitat size, importance, integrity and proximity to the facility. The aquatic systems within the impact area consist of stagnant water and flowing water environments (rivers, reservoirs and canals).

The freshwater sampling stations and their coordinates are provided in Table II.1 and Figure II.1.

Table II.1 . Freshwater sampling points coordinates

ID	Coordinates	
Sampling Point_1	407311.81 E	4435263.26 N
Sampling Point_2	408064.64 E	4434177.50 N
Sampling Point_3	409,975.23 E	4434919.84 N
Sampling Point_4	409,296.30 E	4436088.02 N
Sampling Point_5	410,443.00 E	4438496.00 N

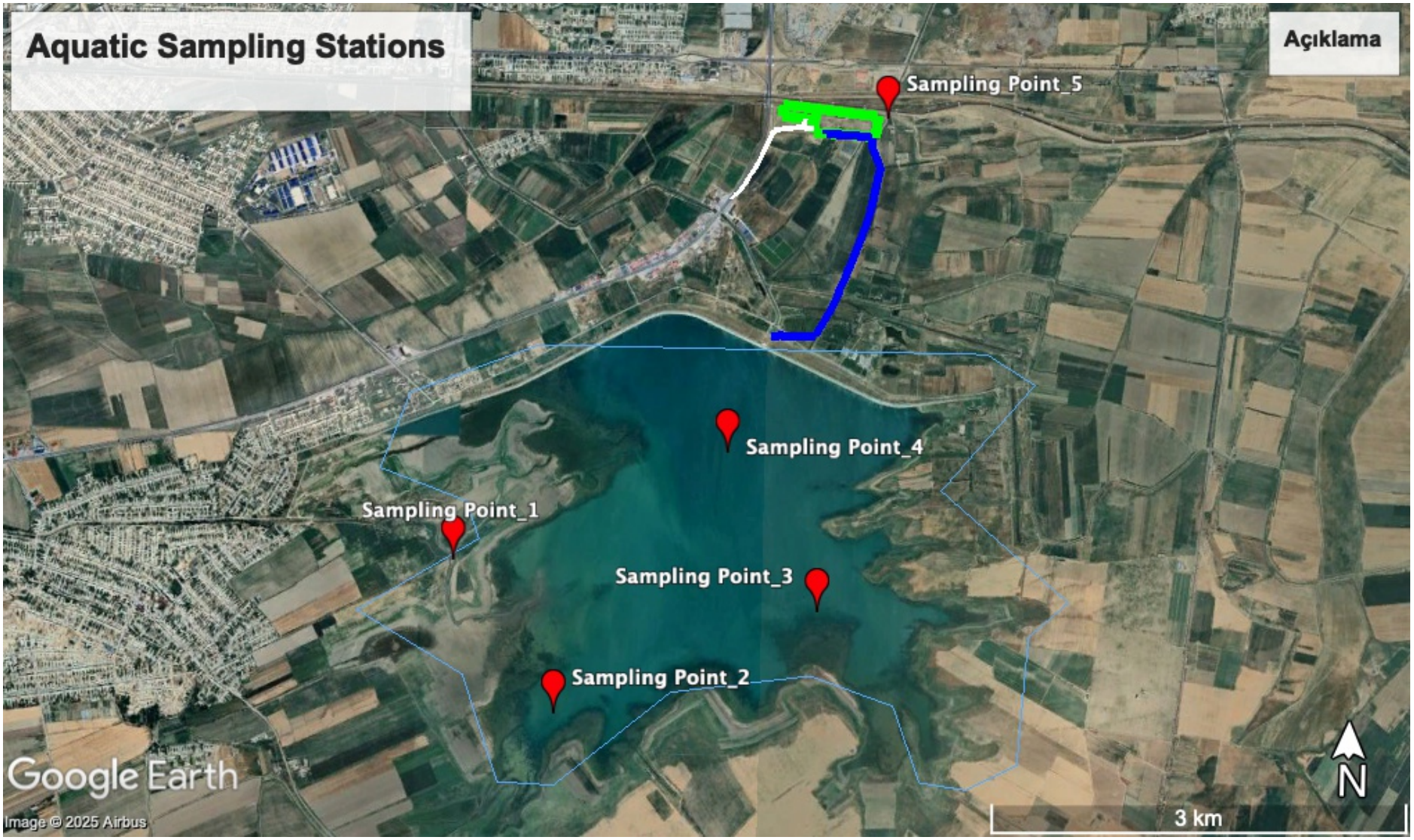


Figure II.1 . Aquatic Study Areas

II.5. MATERIALS AND METHODS

II.5.1. Planktonic Studies (Phytoplankton and Zooplankton) and Associated Algae

A plankton net with a mesh size of 55 µm, a diameter of 20 cm, and a length of 50 cm was used to detect phytoplanktonic and zooplanktonic organisms (Photograph II.1).

The plankton net was lowered horizontally from the boat into the water mass and hauled in after 5 minutes. The samples collected in the lower chamber of the net were transferred to 250 cc plastic jars.

Furthermore, due to the fact that freshwater algae occupy very different habitats in aquatic environments (on plants and stones and attached to sediment at the bottom), samples were taken by scraping the surface of plants, stones and sediment (Photograph II.2).

Planktonic samples were fixed by buffering with 4% formaldehyde.

Photograph II.1 . Sampling of Planktonic Organisms

Photograph II.2 . Attached Algal Samples

Temporary slides of freshwater algae other than diatoms were prepared from the samples brought to the laboratory and identified under a Nikon microscope.

Permanent slides, on the other hand, are prepared solely for the diagnosis of diatom species. Accordingly, the acid boiling method has been used to ensure that structures such as rafe and stria, which are used in the diagnosis of diatoms, can be clearly seen (Round, 1973).

The literature listed below was used in the identification of algae (Krammer and Lange-Bertalot, 1986; 1988; 1991a; 1991b; Bold and Wynne, 1985; Czernecki and Blen, 1982; Foged, 1981, 1982; Germain 1981; Hustedt, 1930; Patrick and Reimer, 1966; Sreenivasa and Duthie, 1973; Van Heurck, 1962; Cox, 1996; Huber Pestalozzi, 1938; 1941; 1955; 1961; 1968; 1982; Prescott, 1975, Komarek, 1983).

Two types of preparations, temporary and permanent, were prepared for the identification of zooplanktonic organisms. Temporary slides were obtained by covering samples taken onto the slide during the study with a cover slip or by direct examination. A Euromex Arnhem brand binocular microscope was used in the preparation of permanent slides.

Hutchinson (1967); Pejler (1962); Kuttikova (1970); Kolisko (1974); Koste (1978a; 1978b);

Ridder (1981) sources were used in the identification of Rotifera species. Kiefer (1978) was used as a reference for Cladocera and Copepoda. In addition, the distribution areas of the identified species were checked according to Illies (1978).

II.5.2. Benthic Organisms

This methodology covered the sampling of multi-habitat macrozoobenthos (aquatic macroinvertebrates) in river ecosystems and the collection of flying Odonata species. The method was applied based on standard hydrobiological protocols.

The macroinvertebrate sampling method was carried out in accordance with the standards TS EN ISO 10870 "Water quality - Guidance on sampling methods and selection of equipment for benthic macroinvertebrates in freshwater" and TS EN 16150 "Water quality - Guidelines for proportional multiple habitat sampling of benthic macroinvertebrates from passable rivers" standards.

Sampling included the use of a kick net, hand collection, traps (entomological nets) and PhotographPhotography. Sampling was carried out for the purposes of biodiversity assessment, ecological status monitoring or species inventory.

This study aimed to determine species diversity by sampling macrozoobenthos communities and flying Odonata species reflecting habitat diversity at selected river points. The multi-habitat approach enabled the collection of a representative dataset by covering different microhabitats (e.g., riffle, pool, littoral) in the stream bed. Sampling was performed using qualitative and semi-quantitative methods, and some species were Photographed for non-invasive documentation.

A standard hydrobiological net with a mesh size of 500 µm was used as a dip net (kick-net or hand-net). Tweezers, forceps and plastic containers were preferred as hand collection tools. A large hoop net (hoop diameter 30-50 cm) was selected as the trap (entomological aerial net) for flying insects and was found suitable for fast-moving species (e.g., dragonflies). Bottles filled with 70-80% ethanol or 4% formaldehyde solution and labels (date, location, habitat information) were used as preservation materials. High-resolution cameras or smartphones (with macro lenses) were used as Photography equipment. Other materials included a GPS device (for location recording), a waterproof notebook, and safety equipment (boots, gloves).

Sampling was carried out in suitable weather conditions and during daylight hours. The selected river point was a reach (river section) at least 50-100 m long and contained different habitat types (riffle, run, pool, littoral, macrophyte areas). The location was recorded using GPS. A multi-habitat approach was applied for multi-habitat macrozoobenthos sampling, and habitat diversity in the riverbed was sampled proportionally. Habitat assessment was performed according to standard protocols (e.g., EPA multi-e habitat method); habitat types

were identified within the reach, and sampling distribution was carried out according to the proportion of each habitat. Using the kick-net method, the dip net was placed against the current, and the substrate (gravel, sand, stones) was stirred with the foot for 30-60 seconds in a 1 m² area (kick technique), and the material carried by the current was collected. Three to five kicks were performed for each habitat (e.g., three kicks in fast-flowing riffles). Areas with macrophytes or slow currents were sampled using the sweep technique (sweeping the net through the water). During manual collection, stones, wood or plant roots were lifted with gloves and macroinvertebrates (e.g., larvae, snails) on them were collected with tweezers. Searches were conducted for 5-10 minutes per habitat, targeting rare species. Large debris (leaves, branches) was separated. Live specimens were transferred to containers filled with ethanol or formaldehyde and labelled. The total sampling time was no less than 30 minutes.

Additionally, samples were collected using a Petersen grab at deep-water stations in the Jizzakh Reservoir area.

In laboratory procedures, samples were examined under a stereomicroscope. Identification was performed at the family/genus/species level for macrozoobenthos and at the species level for Odonata. Standard identification keys were used.

Sampling studies are presented in Photographs II.3 - II.4.

Photograph II.3 . Sampling of Benthic Macroinvertebrates (Station_1_ Sangzor River)

Photograph II.4 . Sampling of Benthic Macroinvertebrates (Station_5_Irrigation Canal)

II.5.3. Fish

Fish sampling was conducted using electrofishing or nets, depending on the characteristics of the river and reservoir. Discussions were held with local fishermen and anglers to obtain additional information about fish species.

Fish were collected from the river ecosystem using electrofishing equipment and from the reservoir area using nets with different mesh sizes. The nets used for fish sampling in the reservoir were newly purchased and had not been used in other wetlands previously. Data from local residents who engage in angling in areas near the study site were also utilized.

Within the scope of the project, fish samples were collected using electro-shock devices at flow stations (Photographs II.5 and II.7) (European Committee for Standardisation, 2003; 2004). A half-hour study was conducted at each sampling station, and the number of fish caught per species was determined. The taxonomic identification of the samples, their counting, the measurement of their biological parameters (length, weight, etc.) and the examination of the fish for external anomalies were carried out.

Fish should be collected from the river ecosystem using electro-shockers and from the

reservoir area using nets with different mesh sizes. The nets used for fish sampling in the reservoir must be newly purchased and should not have been previously used in other wetlands. Otherwise, invasive species may be introduced into the Jizzakh Reservoir through the nets, potentially disturbing the ecological balance of the ecosystem (Photographs II.8 - II.11).

All specimens collected can be sorted on site and then preserved in 70% ethanol for laboratory analysis.

Working team personnel shall possess certificates and first aid training in order to use electrofishing equipment in the area.

Widely accepted standard survey methodologies must be adopted, including clear parameters to determine fishing effort, so that baseline information gathered can be easily verified and results from different studies compared.

Surveys with local fishermen and anglers may provide additional information on fish species present in freshwater habitats (Photograph II.12).

Images related to sampling and capture studies for fish species are provided in Photographs II.13 - 17.

Photograph II.5 . SAMUS 725 MP Electro-Shocker

Photograph II.6 . Fish Sampling Using an Electro-Shocker (5th Station_discharge channel)

Photograph II.7 . Fish Sampling Using an Electro-Shocker (1st Station_Sangzor River)

Photograph II.8 . Sampling using fish nets_1

Photograph II.9 . Sampling using fish nets_2

Photograph II.10 . Sampling studies using shrimp nets_1

Photograph II.11 . Sampling studies conducted using shrimp nets_2

Photograph II.12 . Angling

Photograph II.13 . Fish samples collected from fishing nets_1

Photograph II.14 . Fish samples collected from fishing nets_2

Photograph II.15 . Fish samples collected from fishing nets_3

Photograph II.16 . Samples caught with shrimp nets_1

Photograph II.17 . Samples caught with shrimp nets_2

II.5.4. Habitat Assessment of Streams and Rivers

The matrix used to assess the habitat quality of aquatic environments is based on the important physical characteristics of the water body and the surrounding terrain, particularly the catchment area of the studied site. All habitat parameters considered in the assessment are related to aquatic life use and are a potential source of aquatic environment limitation. The parameters used in habitat assessments mainly consist of epifauna substrate and characteristics, velocity and depth conditions, sedimentation, channel width and fill conditions, riparian zone stability, and cover conditions.

The studies were conducted using the U.S. EPA's "Rapid Bioassessment Protocols for Use in Streams and Wadable Rivers: Periphyton, Benthic Macroinvertebrates and Aquatic_" (EPA 841-B-99-002, 1999) method. In addition, the Qualitative Habitat Evaluation Index (QHEI) (U.S. EPA, 1989, 2001) was used during the studies.

The descriptive information and habitat assessments for the stations studied are provided in Tables II.2 - II.5.

Table II.2 . Descriptive information for the first sampling point

Sampling Point	Sampling Point_1
Basin	Syr Darya
River/Stream	Sangzor River
Coordinates	406240.58 E, 4435520.72 N
Field Photograph	

Habitat Characteristics	The water flow is high and the current speed is fast. The riverbed is predominantly composed of muddy areas. The riparian areas of the river are quite robust and covered with broad-leaved trees and reeds. Due to the low slope of the coastal sections, the risk of erosion is low.			
Visible Water Quality	**Good**	**Moderate**	**Poor**	**Very Bad**
			X	

Table II.3 . Descriptive information for the second sampling point

Sampling Point	Sampling Point_2			
Basin	Syr Darya			
River/Stream	Jizzakh Reservoir			
Coordinates	408064.64 E, 4434177.50 N			
Field Photograph				
				
Habitat Characteristics	This station is located in the southwestern part of the Jizzakh Reservoir, close to the shore. The station has moderate levels of aquatic vegetation and is characterised by shallow waters and littoral habitat features. The bottom is predominantly muddy.			
Visible Water Quality	**Good**	**Moderate**	**Poor**	**Very Poor**
		X		

Table II.4 . Descriptive information for the third sampling point

Sampling Point	Sampling Point_3			
Basin	Syr Darya			
River/Stream	Jizzakh Reservoir			
Coordinates	409975.23 E, 4434919.84 N			
Field Photograph				
				
Habitat Characteristics	This point is located in the south-east of the Jizzakh Reservoir, close to the shoreline, and its bottom consists of muddy areas. Due to its proximity to the shoreline, it is shallow. It is poor in aquatic vegetation.			
Visible Water Quality	**Good**	**Moderate**	**Poor**	**Very Poor**
		X		

Table II.5 . Descriptive information for the fourth sampling point

Sampling Point	Sampling Point_4			
Basin	Syr Darya			
River/Stream	Jizzakh Reservoir			
Coordinates	40.929630, 44.360880 N			
Field Photograph				
				
Habitat Characteristics	The Jizzakh Reservoir is located in the central part of the reservoir and is close to its body. The depth is quite significant, and the bottom is muddy.			
Visible Water Quality	**Good**	**Moderate**	**Root**	**Very Poor**
		X		

Table II.6 . Descriptive information for the fifth sampling point

Sampling Point	Sampling Point_5			
Basin	Syr Darya			
River/Stream	Irrigation Channel			
Coordinates	409419.04 E, 4437531.29 N			
Field Photograph				
				
Habitat Characteristics	It is one of the channel- ditch following the reservoir and is the point where the facility's discharge water will be released. The bottom contains a lot of silt, and the coastal areas are covered with reed beds and broad-leaved trees.			
Visible Water Quality	**Good**	**Moderate**	**Poor**	**Very Poor**
		X		

II.6. FINDINGS

II.6.1. Habitat Assessment of Aquatic Sampling Points

Habitat assessments were conducted at aquatic station points, taking into account both the downstream and upstream aspects of each sampling point.

Within the scope of habitat quality assessment, important physical characteristics such as the water body and surrounding terrain, the catchment area of the studied site, and the bottom structure of the channel/reservoir/river are evaluated. The habitat parameters considered in the assessment are directly related to aquatic organisms. These physical elements significantly affect the presence and abundance of aquatic organisms.

When conducting habitat assessments, the following factors are considered: existing cover, burial characteristics of bedrock, substrate characteristics of stagnant water environments, velocity, depth, structure of stagnant water environments, sedimentation, channel/reservoir/river bed fill status, river bed variability, geomorphological status of the river bed, stability of river banks, and vegetation cover of river banks.

The five stations were evaluated and the water quantities of these environments were provided. Despite low rainfall during this sampling period, water flow was observed at all sampling points.

II.6.2. Freshwater Algae

Algae are primary producers in aquatic environments. Thanks to the pigments in their structure, they convert carbon dioxide and water into carbohydrates under the influence of light, thereby increasing the nutrient value and dissolved oxygen ratio in the aquatic environment. Ultimately, they form the first link in the food chain by ensuring their own development. They are important in terms of their contribution to production and their relationship with organisms at higher trophic levels.

Benthic algae, in particular, possess many characteristics that are used in water quality assessment studies:

- As autotrophs, benthic algae are crucial in aquatic ecosystems, linking the physical, chemical, and biological elements of the food chain. This chain is critical in aquatic ecosystems, and disruptions in it can profoundly affect the rest of the aquatic community.
- Because benthic algae are sessile, they cannot escape potential pollution through migration or other means. They either tolerate the abiotic (environmental) factors surrounding them or die.

- Algal communities generally have a relatively rich species diversity compared to other aquatic groups. Each species has its own tolerance and preferences for environmental factors. Thus, the entire community provides a wealth of information for environmental indicators.
- Algae have a relatively short life cycle. The cells of some species can divide twice or more per day, allowing them to respond more quickly to changes in environmental conditions. Existing benthic algal communities are typically representative of current environmental conditions, as they are among the first organisms to respond to environmental stress.

Among the species identified in the sampled areas, the Heterokontophyta division is the most dominant group in terms of diversity and abundance. A total of 162 taxa (species and subspecies) belonging to six different divisions were identified within the study area. The Heterokonthophyta (diatom) group of algae was particularly rich in diversity. This divisio is represented by 88 taxa, Chlorophyta by 28, Charophyta by 5, Cyanobacteria by 29, Euglenophyta by 11, and Dinoflagellata by 1 (Table II.7).

Table II.7 . Freshwater Algal Species in the Study Area

Heterokontophyta
Platessa conspicua (Ant. Mayer) Lange-Bertalot.
Planothidium lanceolatum (Brébisson ex Kützing) Lange-Bertalot.
Amphora commutata Grun.
Amphora costulata Skv.
Amphora lineolata Ehr.
Amphora ovalis Kuetz.
Brachysira microcephala (Grunow) Compère
Caloneis alpestris (Grun.) Cl.
Caloneis amphisbaena (Bory) Cl.
Caloneis bacillum (Grunow) Cleve
Cocconeis placentula var. *euglypta* (Ehrenberg) Grunow
Crenotia thermalis (Rabenhorst) Wojtal
Lindavia bodanica (Eulenstein ex Grunow) T.Nakov, Guillory, Julius, Theriot & Alverson.
Pantocsekiella comensis (Grunow) K.T.Kiss & E.Ács.
Lindavia comta (Kützing) T.Nakov et al.
Stephanocyclus meneghinianus (Kützing) Kulikovskiy, Genkal & Kociolek.
Pantocsekiella ocellata (Pantocsek) K.T.Kiss & Ács.
Cymatopleura elliptica Grun.
Surirella librile (Ehrenberg) Ehrenberg.
Kurtkrammeria aequalis (W. Smith) Bahls.
Cymbella affinis Kuetz.
Cymbella cymbiformis C. Agardh
Cymbella helvetica Kuetz.
Encyonema lacustre (C. Agardh) Pantocsek.
Brebissonia lanceolata (C. Agardh) R.K. Mahoney & Reimer.
Cymbopleura lata (Grunow ex Cleve) Krammer.
Cymbopleura naviculiformis (Auerswald ex Heiberg) Krammer.
Encyonema leibleinii (C. Agardh) W. J. Silva, R. Jahn, T. A. V. Ludwig & M. Menezes.
Encyonema ventricosum (C. Agardh) Grunow.

Odontidium anceps (Ehrenberg) Ralfs.
Odontidium hyemale (Roth) Kützing.
Diatoma vulgaris Bory
Diploneis oblongella (Nägeli ex Kützing) A. Cleve.
Fragilariforma bicapitata (A. Mayer) D. M. Williams & Round.
Fragilaria capucina Desm.
Fragilaria intermedia Grun.
Fragilariforma virescens (Ralfs) D.M.Williams & Round.
Gomphonema constrictum Ehr.
Gomphonema intricatum Kuetz.
Gomphonella olivacea (Hornemann) Rabenhorst.
Gomphonema tergestinum (Grunow) Fricke
Gyrosigma acuminatum (Kuetz.) Rabenh.
Gyrosigma distortum (W.Sm.) Cl.
Gyrosigma acuminatum (Kützing) Rabenhorst.
Lacustriella lacustris (W. Gregory) Lange-Bertalot & Kulikovskiy
Ellerbeckia arenaria (D. Moore ex Ralfs) Dorofeyuk & Kulikovskiy.
Angusticopula dickiei (Thwaites) Houk, Klee & H. Tanaka.
Aulacoseira italica (Ehrenberg) Simonsen.
Melosira varians Ag.
Mayamaea atomus (Kützing) Lange-Bertalot.
Navicula cryptocephala Grun.
Humidophila perpusilla (Grunow) R.L.Lowe, Kociolek, Lange-Bertalot & Kopalová.
Navicula rostellata Kützing
Kobayasiella subtilissima (Cleve) Lange-Bertalot.
Nitzschia vermicularis (Kützing) Hantzsch 1860
Tryblionella acuta (Cleve) D.G.Mann.
Homoeocladia angularis (W. Smith) Kuntze.
Homoeocladia distans (W. Gregory) Kuntze.
Nitzschia filiformis (W. Sm.) Hust.
Nitzschia frustulum Hust.

Nitzschia obtusa W.Sm.
Nitzschia regula Hust.
Nitzschia sigmoidea (Ehr.) W.Sm.
Nitzschia sublinearis Hust.
Nupela neogracillima Kulikovskiy & Lange-Bertalot
Pleurosira laevis (Ehrenberg) Compère
Rhoicosphenia abbreviata (C. Agardh) Lange-Bertalot
Rhopalodia gibba (Ehr.) O. Muell.
Sellaphora mutata (Krasske) Lange-Bertalot
Sellaphora wummensis J.R.Johansen.
Surirella angusta Kützing.
Iconella capronii (Brébisson & Kitton) Ruck & Nakov.
Iconella didyma (Kützing) Bukhtiyarova.
Iconella linearis (W. Smith) Ruck & Nakov
Surirella ovalis Breb.
Iconella splendida (Ehrenberg) Ruck & Nakov.
Iconella tenera (W. Gregory) Ruck & Nakov.
Belonastrum berolinense (Lemmermann) Round & Maidana.
Synedra famelica Kützing
Ctenophora pulchella (Kützing) D.M.Williams & Round.
Tabularia tabulata (C. Agardh) Snoeijs.
Ulnaria ulna (Nitzsch) Compère.
Ulnaria biceps (Kützing) Compère.
Tabellaria fenestrata (Lyngb.) Kuetz.
Tabellaria flocculosa (Roth) Kützing.
Ophiocytium gracillimum Borzi
Tribonema spirotaenia Ettl.
Tribonema subtilissimum Pascher 1939
Cyanobacteria
Merismopedia elegans A. Br.
Merismopedia tranquilla (Ehrenberg) Trevisan.

Merismopedia tenuissima Lemm.
Phormidium breve (Kützing ex Gomont) Anagnostidis & Komárek.
Kamptonema chlorinum (Kützing ex Gomont) Strunecký, Komárek & J. Smarda.
Phormidium nigrum (Vaucher ex Gomont) Anagnostidis & Komárek.
Oscillatoria princeps Vaucher
Oscillatoria tenuis Ag.
Leptolyngbya foveolarum (Gomont) Anagnostidis & Komárek.
Planktolyngbya limnetica (Lemmermann) Komárková-Legnerová & Cronberg.
Nostoc zetterstedtii Aresch.
Johanseninema constrictum (Szafer) Hasler, Dvorák & Poulícková.
Jaaginema quadripunctulatum (Brühl & Biswas) Anagnostidis & Komárek.
Oscillatoria limosa Ag.
Oscillatoria rupicola Hansg.
Arthrospira jenneri Stizenberger ex Gomont.
Arthrospira gomontiana Setchell.
Leptolyngbya tenuis (Gomont) Anagnostidis & Komárek.
Microcystis aeruginosa Kütz. emend. Elenk
Microcystis pulverea (Wood) Forti emend. Elenk
Snowella lacustris (Chodat) Komárek & Hindák.
Aphanizomenon flos-aquae (L*)* Ralfs
Romeria leopoliensis (Racib.) Koczw.
Charophyta
Mougeotia genuflexa (Roth) C. Agardh 1824
Spirogyra fluviatilis Hilse 1863
Spirogyra majuscula (Kuetz.) Czurda
Cosmarium formosulum Hoff.
Closterium leibleinii Kuetz.
Chlorophyta
Desmodesmus opoliensis (P.G.Richter) E.Hegewald.
Scenedesmus quadricauda (Turp.) Breb.
Ulothrix zonata Kuetz.

Stigeoclonium tenue Kuetz.
Cladophora fracta Kuetz.
Cladophora glomerata (L.) Kuetz.
Rhizoclonium profundum Brand
Schroederia setigera (Schroed) Lemm.
Pseudopediastrum boryanum (Turpin) E. Hegewald.
Pediastrum duplex Meyen
Tetraedron caudatum (Corda) Hansg.
Oocystis borgei Snow
Closteriopsis longissima (Lemmermann) Lemmermann.
Ankistrodesmus arcuatus Korschik.
Ankistrodesmus falcatus (Corda) Ralfs
Kirchneriella obesa (West) Schmidle
Mucidosphaerium pulchellum (H.C.Wood) C.Bock, Proschold & Krienitz.
Coelastrum sphaericum Naeg.
Coelastrum microporum Naeg.
Willea apiculata (Lemmermann) D.M.John, M.J. Wynne & P.M.Tsarenko.
Crucigenia fenestrata Schmidle
Tetrastrum staurogeniaeforme (Schroed.) Lemm.
Actinastrum fluviatile (J.L.B. Schröder) Fott.
Tetradesmus obliquus (Turpin) M.J. Wynne.
Tetradesmus lagerheimii M.J. Wynne & Guiry.
Tetradesmus obliquus (Turpin) M.J. Wynne.
Scenedesmus quadricauda (Turp) Breb
Desmodesmus opoliensis (P.G. Richter) E. Hegewald.
Dinoflagellates
Glenodinium sp.
Euglenophyta
Strombomonas fluviatilis (Lemm.) Defl.
Trachelomonas volvocina Ehr.
Trachelomonas planctonica Swir.

Euglena granulata (G.A. Klebs) F.Schmitz.
Euglena vermicularis Prosch. Lavr.
Lepocinclis acus (O.F.Müller) B.Marin & Melkonian.
Lepocinclis oxyuris (Schmarda) B.Marin & Melkonian.
Lepocinclis ovum (Ehr.) Mink.
Phacus curvicauda Swir.
Phacus orbicularis Hübner
Phacus longicauda (Ehr.) Duj.

Physical factors such as dissolved oxygen, pH, salinity, temperature, water quantity, turbidity, bottom structure, and the shading characteristics of sampling areas affect the presence of species in an area. Among chemical compounds, nitrogenous and phosphorous compounds have significant effects on the presence of algae as well as their population numbers.

The high number of species at the study stations is closely related to habitat diversity. These stations have a high number of species because they have suitable and different habitats for algae. For example, epipelagic (sediment-dwelling), epilithic (rock-dwelling), and epiphytic (plant-dwelling) habitat types can be found even in areas very close to each other. In addition, with the decrease in current velocity and abundance at reservoir stations, phytoplanktonic forms also develop and species numbers can increase.

The main distribution areas of phytoplanktonic organisms are stagnant waters or lotic habitats with very low flow rates. Since the flow velocity causes free-floating phytoplanktonic organisms to drift, they are either absent or present in very low densities in fast-flowing channels and rivers. The main dominant algal communities in such areas are attached algae. Attached algae minimise the physical effects of the current by adhering to plants, rocks, and sediments and are not drifted. Consequently, fast-flowing systems are not suitable habitats for phytoplankton. At all sampling stations, attached algae, particularly epilithic forms living on rocks, were very dominant. The number of epilithic species was also very high in these areas. Given the shallow depth of stations in flowing environments and the substrate composition consisting of mud, rocks, and a dominant habitat feature, the dominance of epilithic algae is expected. Due to the muddy and sandy substrate composition of a significant portion of the sampling stations, the dominance of sediment-attached (epipelagic) macro and microalgae is also notable.

In general, the population densities of phytoplanktonic organisms remained low, as expected, in all rivers and streams studied. In general, the population densities of phytoplanktonic organisms at the river and canal stations remained at low levels as expected. On the other

hand, they were observed at quite high densities at the reservoir stations. However, within the algal groups, the dominant forms belong to the divisions Heterokontophyta, Cyanophyta, and Charophyta.

The study areas do not contain any endemic, rare, or protected algal species; they consist of cosmopolitan species.

II.6.3. Zooplanktonic Organisms

Zooplanktonic organisms living in freshwater systems are represented by three main dominant animal groups: Cladocera and Copepoda, two subclasses of Crustacea, and the Rotifera class, which belongs to the phylum Aschelminthes. Zooplankton not only constitute the food of planktivorous fish, but also serve as food for all fish larvae, aquatic insects, insect larvae and other aquatic animals in the ecosystem. Changes in the quantity or diversity of zooplanktonic organisms also affect the groups of organisms at the top of the food pyramid. Furthermore, changes in the quantity or diversity of planktonic organisms due to changes in environmental conditions are used in biological monitoring studies. The structure of planktonic organisms found in rivers before and after the discharge of polluting waste is determined and used to assess the environmental impact.

Another group of zooplanktonic organisms is Rotifera. Rotifera individuals are also very small, microscopic organisms. The vast majority are found in freshwater. The number of marine species is lower than in freshwater. There are also species that live in lakes, small pools, brackish water environments, and saltwater. The majority of species are planktonic, living in the limnetic and littoral zones of lakes, while some are sessile and found in the bottom zones. The use of Rotifera species as indicators in determining the water quality of freshwater systems is important because they form the food source for many invertebrates and vertebrates in aquatic ecosystems. The fact that the vast majority of Rotifera species feed on bacteria and detritus, have high metabolism, reproduce very rapidly, and form the food source for fish and many aquatic invertebrates makes them extremely important.

Zooplanktonic organisms mostly move around depending on water movement and live in still water habitats. Their presence in fast-flowing sections of rivers is very limited. However, in some groups, they can be seen as psammophiles, i.e. species that can live under stones, in fast-flowing streams. Specifically, species belonging to the Rotifera group utilise under rocks, thereby mitigating the negative effects of current speed.

The zooplanktonic organisms identified through sampling and literature studies are presented in Table II.8. Since the main habitats of zooplanktonic organisms are still waters, they are more prevalent at stations with high-flow water bodies.

As a result of sampling and literature studies, a total of 36 taxa belonging to Rotifera, Branchiopoda and Copepoda, which form the dominant groups of zooplanktonic organisms, were identified . Of these, 22 taxa belonging to the Rotifera phylum, 7 to Copepoda and 7 to Branchiopoda were identified.

Table II.8. Zooplanktonic Organisms in the Study Areas

ROTIFERA
Acanthocyclops bicuspidatus odessana
Acanthocyclops gigas
Acanthodiaptomus denticornis
Asplanchna priodonta
Asplanchna priodonta
Brachionus calyciflorus
Brachionus falcatus
Brachionus plicatilis
Brachionus quadridentatus
Brachionus urceus
Euchlanis dilatata
Filinia longiseta
Hexarthra fennica
Keratella cochlearis

Keratella quadrata
Lecane bulla
Lecane lamellata
Lecane luna
Notholca acuminata
Notholca squamula
Platyas quadricorni
Trichotria pucillum
BRANCHIOPODA
Daphnia magna
Daphnia longispina
Bosmina longirostris
Coronatella rectangula
Moina brachiata
Ilyocryptus sordidus
Leptodora kindtii
COPEPODA
Mesocyclops ogunnus
Cyclops vicinus
Chydorus latus
Chydorus sphaericus
Macrotrix hirsuticornis
Pleuroxus aduncus
Nitocra lacustris

Zooplanktonic organisms, like phytoplankton, prefer stagnant habitats with little current. Among the three major groups of zooplankton in the study area, Rotifera is the most dominant group in terms of species number and population density.

A significant proportion of the identified species belong to Rotifera. Branchiopoda and Copepoda are very rare in flowing waters. A significant proportion of Rotifera species have developed an adaptation to flow velocity. These species can protect themselves from the sweeping effect of water by clinging to the undersides of stones in flowing environments. The greater representation of Rotifera compared to other groups stems from these adaptive characteristics.

Zooplanktonic organisms must feed on phytoplanktonic organisms in order to continue their development. Consequently, they prefer areas where this food is abundant and other physical and chemical factors are optimal for them. Rivers and streams are not suitable habitats for these organisms. In these areas, the phytoplanktonic organisms they use as food are scarce, and the river current is a significant limiting factor. Due to their very small size, they can easily be swept away and die. Indeed, abundance values for zooplanktonic organisms were found to

be very low in all sampling areas.

Rotifera are the most dominant group in terms of population density compared to other zooplankton groups, due to their good adaptation to both the stagnant Jizzakh Reservoir and flowing environments. It was observed that zooplankton became more prominent as the flow velocity decreased at the study stations.

No endemic, rare, or protected zooplanktonic organisms were found within the study areas; all species were determined to be cosmopolitan.

II.6.4. Benthic Organisms

This includes organisms that spend at least part of their life on the bottom (sediment, debris, macrophytes, filamentous algae) in freshwater habitats. Animals that can be caught with a net with a mesh size of 500 µm fall under this definition. The initial forms of some species may be smaller. The concept of benthic organisms also includes nektons and forms buried in the bottom.

Biological monitoring studies involving benthic organisms are of two types. The first involves monitoring changes in benthic organisms before and after a project that is thought to affect the aquatic environment. For example, the species, diversity and abundance of benthic invertebrates in a river are determined before and after the discharge of polluting waste, and this information is used to assess the environmental impact. In this way, water quality standards are set based on the presence or absence of benthic invertebrates in the environment or changes in their numbers. Studies are conducted using benthic invertebrates to learn about the current state of the aquatic environment and to determine changes over time. These studies measure changes in the genetic structure of organisms, the biological accumulation of pollutants, pollution tests in the field and in the laboratory, changes in population and community structure, and changes in ecosystem function.

Due to the characteristics mentioned above, benthic organisms are among the preferred groups in biological monitoring studies (Rosenberg and Resh, 1992). Some of the reasons for preferring benthic organisms in such studies are as follows.

4. Despite the presence of very different environments in aquatic systems, they are adapted to every environment.
5. They respond across a wide spectrum with a variety of species groups depending on the intensity of environmental pressure.
6. They are generally dependent on the areas they inhabit. They cannot escape or move away from environmental changes and pollutant effects.

Based on the results of sampling studies and according to field and literature data, the benthic

macroinvertebrates observed in the region are presented in Table II.9.

The macroinvertebrate sampling method was carried out in accordance with the standards TS EN ISO 10870 "Water quality - Guidance on sampling methods and selection of equipment for benthic macroinvertebrates in freshwater" and TS EN 16150 "Water quality - Guidance on proportional multiple habitat sampling of benthic macroinvertebrates from observable rivers" standards.

Of the total 50 taxa belonging to the three major phyla of benthic organisms, 10 belong to the Mollusca phylum, 5 to the Annelida phylum, and 35 to the Arthropoda phylum. As can be seen, the Arthropoda phylum is the most dominant phylum in terms of species number. Examples of the Mollusca phylum consist of the Bivalvia and Gastropoda classes. The Annelida phylum consists solely of the Oligochaeta class. Within the Arthropoda phylum, there are two major classes consisting of Malacostraca and Insecta. One taxon belonging to each of the Amphipoda, Decapoda and Mysida orders has been identified from Malacostraca. Within the Insecta class, 31 taxa belonging to the orders Heteroptera (3 taxa), Diptera (14 taxa), Ephemeroptera (5 taxa), Plecoptera (3 taxa), Coleoptera (3 taxa), Trichoptera (1 taxon) and Odonata (3 taxa) have been identified.

Table II.9. Benthic macroinvertebrates identified in the study areas (

SUBORDER	CLASS	**ORDER**	**Family**	**Species**	**IUCN 2/25 Ver.1**	**Uzbekistan Red Data Book**
Mollusca	Gastropoda	Littorinimorpha	Hydrobiidae	*Caspiohydrobia conica* Logvin. et Starobog.	NE	
		Hygrophila	Lymnaeidae	*Galba truncatula* (O. F. Müller, 1774)	LC	
				Radix auricularia (Linnaeus, 1758)	LC	
		Basommatophora	Physidae	*Physella acuta* Drapamaud	LC	
	Bivalvia	Unionidae	Unionidae	*Sinanodonta woodiana* (I. Lea, 1834)	LC	
				Anodonta anatina (Linnaeus, 1758)	LC	
		Verenida	Cyrenidae	*Corbicula fluminalis* (O. F. Müller, 1774)	LC	VU
				Corbicula tibetensis Prashad, 1929	NE	
				Corbicula ferghanensis Kursalova & Starobogatov, 1971	DD	
		Cardidae	Cardiidae	*Cerastoderma glaucum* (Bruguière, 1789)	NE	
Annelida	Oligochaeta	Tubificidae	Naididae	*Paranais simplex* Hrabe	NE	
				Paranais littoralis O.F. Müller	NE	
				Tubifex tubifex (Müller, 1774)	NE	
				Nais sp.	--	
		Lumbriculida	Lumbricidae	*Lumbriculus sp.*	--	
Arthropoda	Malacostraca	Amphipoda	Gammaridae	*Gammarus* sp.	--	

		Decapoda	Palaemonidae	*Macrobrachium nipponense* De Haan	LC	
		Mysida	Mysidae	*Mesomysis kowalevskii* Czerniavsky	NE	
				Paramysis lacustris (Czerniavsky)	NE	
	Insect	Coleoptera	Dytiscidae	*Dytiscus* sp.	--	
			Gyrinidae	*Gyrinus sp.*	--	
			Elmidae	*Elmis* sp.	--	
		Diptera	Athericidae	*Atherix* sp.	--	
			Tabanidae	*Tabanus autumnalis* (Linnaeus, 1761)	NE	
			Chironomidae	*Chironomus* sp.	--	
				Chironomus halophilus Kieffer	NE	
				Chironomus hummi Kieffer	NE	
				Cricotopus sp.	--	
				Cricotopus sylvestris (Fabricius)	NE	
				Procladius ferrugineus Kieffer	NE	
				Polypedilum aberrans Tschern.	NE	
				Endochyronomus tendens (Fabricius)	NE	
				Glyptotendipes barbipes (Staeger)	NE	
				Glyptotendipes glaucus (Meigen)	NE	
			Tipulidae	*Tipula* sp.	--	
			Culicidae	Culicidae family	--	

		Mayflies	Caenidae	*Caenis macrura Stephens*	NE	
			Baetidae	*Cloeon dipterum* L.	NE	
				Baetis sp. 1	--	
				Baetis sp. 2	--	
			Heptageniidae	*Rhithrogena caucasica* Braasch, 1979.	NE	
		Heteroptera	Gerridae	*Gerris sp.*	--	
			Corixidae	*Sigara sp.*	--	
			Notonectidae	*Notonecta sp.*	--	
		Odonata	Euphaeidae	*Epallage sp.*	--	
			Calopterygidae	*Calopteryx sp.*	--	
			Gomphidae	*Onychogomphus sp.*	--	
		Plecoptera	Perlodidae	*Isoperla sp.*	--	
			Hydropsychidae	*Hydropsyche* sp.	--	
		Trichoptera	Ecnomidae	*Ecnomus tenellus* Rambur	NE	

In areas with a high number of species, the diversity of the bottom structure is noteworthy. The presence of muddy, sandy, and gravelly areas in these areas means an increase in the diversity of benthic organisms. This is because benthic organisms determine their habitats based on the bottom structure. A species does not occur in both muddy and gravelly areas. There are species specific to each environment. For example, a significant portion of Diptera species, particularly members of the Chrinomidae family, are found only in muddy, low-oxygen environments, while members of orders such as Trichoptera, Odonato and Ephemeroptera live in gravelly, oxygen-rich environments. Therefore, the diversity of the bottom structure is an important factor that increases the number of species. There are other physical and chemical factors that affect the presence and distribution of benthic species. Some species may prefer polluted environments, while others can only live in clean water environments. Within the order Diptera, members of the family Chrinomidae have been observed abundantly in muddy and eutrophic dam reservoir stations and canal stations. Factors such as flow velocity and pollution exert a suppressing effect on species. This situation is also reflected in the sampling results obtained in the study areas. Almost all members of the Chironomidae family were found in stations with muddy, stagnant and silty bottom structures. Species belonging to the Trichoptera, Odonata and Ephemeroptera orders were observed in environments associated with the fast-flowing, oxygen-rich and gravelly bottom structure of the Sanchar River flowing into the reservoir.

Some of the benthic organisms observed in the studies are shown in Photographs II.18-II.21.

Photograph II.18 . ***Anodonta anatina***

Photograph II.19 . *Macrobrachium nipponense*

Photograph II.20 . *Corbicula fluminalis*

Photograph II.21 . *Radix auricularia*

II.6.5. Fish

Fish are important biological components at the top of the food chain in aquatic systems. Ecologically, they feed on algae, zooplankton or benthic organisms. They are also an important input source in terms of their economic importance as well as their ecological significance.

In this study, the presence and distribution of fish species were assessed at the station level. In general, fish species in the Jizzakh Reservoir were examined, and subsequently, the identification and morphological assessment of fish in the Sangzor River and irrigation canals were carried out.

Fish samples were collected from all sampling stations (Table II.10).

The total number of fish taxa in all aquatic stations was recorded as 22, and information on the distribution of species by station and their various conservation statuses was also provided. Fifteen of these species were sampled by us during fieldwork in the project area and are listed. The remaining 7 species are listed based on literature information as they are known species in the region (Table II.11).

Table II.10. Fish caught at stations in aquatic sampling areas

Station Number	**Station Name**	**Fish Caught/ Not Caught**
Sampling Point_1	Sangzor River	Caught
Sampling Point_2	Jizzakh Reservoir	Caught
Sampling Point_3	Jizzakh Reservoir	Caught
Sampling Point_4	Jizzakh Reservoir	Caught
Sampling Point_5	Irrigation Channel	Caught

Table II.11. Availability of fish species at the stations studied

Latin Name	English Name	Station_1	Station_2	Station_3	Station_4	Station_5	Source	Endemic	Invasive	Native Species	Migrant	IUCN (2025 ver-1)	Uzbekistan Red Data Book	BERN	CITES
Xenocyprididae															
Silver carp	Silver carp		X	X	X		Obs.		X		Yes	NT	--		--
Hemiculter leucisculus	Sharpbelly			X			Obs.		X		--	LC	--		--
Leucuscidae															
Petroleuciscus squaliusculus	Syr-Darya Dace		X	X	X		Obs.			X	No	LC	--		--
Rutilus lacustris	Pontic Roach		X	X	X		Obs.			X	Yes	LC	--		--
Alburnoides holciki	Riffle Minnow	X	X	X	X	X	Obs.			X	--	NE	--		--
Chalcoid bleak	Caspian Shemaya		X	X	X	X	Obs.			X	Yes	LC	--		--
Common bream	Common Bream						Lit.			X	Yes	LC	--		--
Asp	Eurasian Asp						Lit.			X	Yes	LC	--		--
Pelecus cultratus	Sickle						Lit.			X	--	LC	--		--
Percidae															
Sander lucioperca	Eurasian pikeperch		X	X	X		Obs.			X	Yes	LC	--		--
Cyprinidae															

Latin Name	English Name	Station_1	Station_2	Station_3	Station_4	Station_5	Source	Endemic	Invasive	Native Species	Migrant	IUCN (2025 ver-1)	Uzbekistan Red Data Book	BERN	CITES
Cyprinus carpio	Common carp		X	X	X		Obs.			X	Yes	LC	--		--
Crucian carp	Crucian carp		X	X	X	X	Obs.		X		No	LC	--		--
Schizothorax fedtschenkoi	Sattar snowtrout	X					Obs.			X	Yes	LC	--		--
Poeciliidae															
Gambusia holbrooki	Eastern Mosquitofish			X	X	X	Obs.		X		No	LC	--		--
Gobionidae															
Gudgeon	Central Asian gudgeon		X	X	X		Obs.			X	No	LC	--		--
Pseudorasbora parva	Topmouth Gudgeon		X	X	X	X	Obs.		X		No	LC	--		--
Nemacheilidae															
Paracobitis sp.	Stone Loaches	X					Obs.			X		--	--	--	--
Acheilognathidae															
Rhodeus ocellatus	Rosy bitterling		X	X	X	X	Obs.		X		No	DD	--		--
Siluridae															
Silurus glanis	Wels catfish						Lit.			X	No	LC	--	App. III	--

Latin Name	English Name	Station_1	Station_2	Station_3	Station_4	Station_5	Source	Endemic	Invasive	Native Species	Migrant	IUCN (2025 ver-1)	Uzbekistan Red Data Book	BERN	CITES
Esocidae															
Esox lucius	Northern pike						Lit.			X	No	LC	--		--
Channidae															
Channa argus	Snakehead						Lit.		X		Yes	LC	--		--
Gobiidae															
Neogobius pallasi	Caspian Monkey Goby						Lit.		X		No	LC	--		--

Obs.: Observation, Lit.: Literature, VU: VULNERABLE NT: NEAR THREATENED LC: LEAST CONCERN, NE: NOT EVALUATED, DD: DATA DEFICIENT

The numbers of 22 fish species identified as a result of fish sampling studies within the boundaries of the Jizzakh Reservoir Basin are given in Table II.12 according to stations.

Table II.12. Number of Fish Species by Basin and Station

Station No	Number of Fish Species Detected
Station_1	3
Station_2	11
Station_3	13
Station_4	12
Station_5	6

In terms of families, the Leuciscidae family has the highest number of species with 7 species. The Cyprinidae family ranks second with 3 taxa. This is followed by the Xenocyprididae and Gobionidae families with 2 taxa each. Other families are represented by 1 taxon each (Table II.13).

Table II.13. Number of Species by Family

Family	Number of Taxa
Xenocyprididae	2
Leucuscidae	7
Percidae	1
Cyprinidae	3
Poeciliidae	1
Gobionidae	2
Nemacheilidae	1
Acheilognathidae	1
Siluridae	1
Esocidae	1
Channidae	1
Gobiidae	1

The number of fish species caught was calculated differently according to the sampling methodology and is presented in Table II.14. Accordingly, fish nets were used at all three stations in the Jizzakh Reservoir area. At each station, 500 m long gill nets with a mesh size of 22 mm were used and left in the water for a total of 24 hours. At the first and fifth stations, electrofishing was used for a total of half an hour of sampling.

Table II.14. Fish species and numbers caught at each station (individuals/half hour)

Latin Name	English Name	Station_1	Station_2	Station_3	Station_4	Station_5
Xenocyprididae						
Silver carp	Silver carp		11	8	4	

Latin Name	English Name	Station_1	Station_2	Station_3	Station_4	Station_5
Hemiculter leucisculus	Sharpbelly			2		
Leucoscidae						
Petroleuciscus squaliusculus	Syr-Darya Dace		1	2	1	
Rutilus lacustris	Pontic Roach		1	2	2	
Alburnoides holciki	Topmouth Gudgeon	1	1	3	2	3
Chalcoid bleak	Caspian Shemaya		1	4	6	2
Percidae						
Sander lucioperca	Eurasian pikeperch		24	14	21	
Cyprinidae						
Common carp	Common carp		18	9	15	
Carassius gibelio	Crucian carp		9	13	17	1
Schizothorax fedtschenkoi	Sattar snowtrout	3				
Poeciliidae						
Gambusia holbrooki	Eastern Mosquitofish			2	3	15
Gobionidae						
Gudgeon	Central Asian gudgeon		3	1	4	
Pseudorasbora parva	Topmouth Gudgeon		3	3	2	5
Nemacheilidae						
Paracobitis sp.	Stone Loaches	1				
Acheilognathidae						
Rhodeus ocellatus	Rosy bitterling		4	6	5	11

None of the fish species caught and identified in the project area and its immediate surroundings based on literature data are endemic.
One taxon (*Silurus glanis*) is included in Appendix III of the Bern Convention.
There are no species included in the appendices of the CITES Convention, which was prepared to prevent the population status of traded plant and animal species from being adversely affected.
According to the European Red List (ERL) assessment criteria:

- There are no species classified as Critically Endangered (CR).
- There are no species classified as Endangered (EN_Tehlikede),
- There are no species classified as Vulnerable (VU_Vulnerable),
- There is 1 species (*Hypophthalmichthys molitrix*) classified as Near Threatened (NT_Near Threatened),
- There is 1 species (*Alburnoides holciki*) classified as Not Evaluated (NE_Not Evaluated),
- There is 1 species (*Rhodeus ocellatus)* classified as Data Deficient (DD_Data Deficient),
- The remaining 18 species fall under the Least Concern (LC_Low Risk) category,

The fish species caught at the sampling points as a result of the fieldwork are shown in Photographs II.22 – II.36.

Photographs II.22 . Hypophthalmichthys molitrix

Photograph II.23 . *Sander lucioperca*

Photograph II.24 . *Cyprinus carpio*

Photograph II.25 . *Carassius gibelio*

Photograph II.26 . ***Rutilus lacustris***

Photograph II.27 . ***Alburnoides holciki***

Photograph II.28 . *Alburnus chalcoides*

Photograph II.29 . ***Hemiculter leucisculus***

Photograph II.30 . ***Schizothorax fedtschenkoi***

Photograph II.31 . ***Gambusia holbrooki***

Photograph II.32 . *Paracobitis* sp.

Photograph II.33 . *Gobio gobio*

Photograph II.34 . ***Rhodeus ocellatus***

Photograph II.35 . ***Pseudorasbora parva***

Photograph II.36 . ***Petroleuciscus squaliusculus***

II.7. TARGET SPECIES (INCLUDING SPECIES LIKELY TO BE FOUND)

According to IFC Guide 6, Critical habitats are (i) habitats of great importance to Critically Endangered and/or Endangered species; (ii) habitats of significant importance to endemic and/or limited range species; (iii) habitats supporting global concentrations of migratory and/or important community species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

- None of the fish species fall under the critical species classification.
- There are no endemic fish species.
- No fish species falling under the CR (Critically Endangered) and EN (Endangered) categories according to the IUCN Red Data Book 2025-Ver.1 has been identified.
- No fish species with a resticted range has been observed in the project area and its immediate surroundings.
- Therefore, no critical species in terms of fish that is compatible with the IFC PS6 standard has been observed in the project area, nor has it been found in the literature records.
- However, assessments of benthic organisms identified in the project area did not reveal any species endemic to Uzbekistan or with a restricted distribution. Furthermore, there are no species with a high conservation status according to the IUCN Red List.

- No fish species with high conservation status were found among the species listed in the Uzbekistan Red Data Book. Among benthic invertebrates, *Corbicula fluminalis*, belonging to the Bivalvia class of the Mollusca phylum, is listed in the Vulnerable (VU) category.
- There are no species with high conservation status, endemic species, or species with a restricted distribution in terms of freshwater algae and zooplanktonic organisms.

None of the aquatic organisms identified in the Jizzakh Reservoir area and its immediate surroundings fall within the critical species definition. Accordingly, the project area and its immediate surroundings cannot be defined as critical habitats in terms of aquatic ecosystems.

II.8. INVASIVE FISH SPECIES

Invasive alien species (IAS) are organisms that are transported to ecosystems outside their natural distribution areas as a result of human activities and rapidly multiply in their new environments, creating negative ecological, economic and socio-cultural impacts on native species. These species, particularly in river ecosystems, alter biotic interactions, transforming the composition of fish, macroinvertebrate and plant communities, degrading habitat quality and threatening native species populations (Kolar & Lodge, 2001; Gozlan et al., 2010). Uzbekistan is one of the countries vulnerable to the introduction and spread of invasive species due to its biogeographical location and intensive aquaculture activities.

Eight invasive alien fish species have been identified in the study area:

Hypophthalmichthys molitrix

The silver carp, native to East Asia, was introduced worldwide for aquaculture and "algae control" purposes; it is considered invasive in many waters outside its natural range. Due to its filter-feeding structure, it consumes phytoplankton and zooplankton intensively; this leads to direct competition with plankton-dependent species, including larval fish and native mussels, and disruption of the food web. Declines in the abundance of native sport/commercial fish have been reported in many ecosystems following silver carp pressure. Consequently, various agencies promote intensive fishing/harvesting to limit its spread and classify the species as posing a high environmental risk.

H. molitrix causes a reduction in plankton-based food sources through its strong filtering and competitive effects, suppressing the juvenile stage of native fish and causing ecological and economic damage.

The species **was introduced into** Uzbekistan's lakes and reservoirs after the 1960s.
Therefore, **it is not native** to places such as Jizzakh**.**

Hemiculter leucisculus

Hemiculter leucisculus (sharpbelly) is a small species considered **alien/invasive** in Uzbekistan. In the current fish list of the basin, including the Chirchik River–Charvak dam, it is clearly given the status **"AI = Alien introduced"**; that is, it is not a member of the natural fauna and has been established through human activity. This species shows a tendency to **dominate** the pelagic zone, as it can form high populations in regional waters such as the Aydar–Arnasay Lake System. It has **a high invasive potential** and, under favourable conditions, can multiply rapidly, creating **competition for food and habitat** with native cyprinids. Therefore, in the context of Uzbekistan**,** it is recommended to **monitor** the spread of the species **and encourage its capture** at entry/exit channels.

Carassius gibelio

Carassius gibelio **(Prussian crucian carp) is considered alien/invasive in Uzbekistan.** It has established itself in numerous dams and the Jizzakh reservoir (e.g. Tudakul, Tuzkan; Aydar–Arnasay system) in the country, and local studies report the species as **"invasive**," noting its ability to form rapidly growing, dominant populations.

Gambusia holbrooki

Gambusia holbrooki **(mosquito fish) is considered alien/invasive in Uzbekistan. It was introduced from the Caucasus to Uzbekistan** in the 1920s for **malaria vector control**. Today**, it reproduces naturally** in the country's waters **and** forms **widespread** populations. It is particularly **abundant** in the coastal marshes **of the Aydar–Arnasay lake system** (including Tuzkan); **high populations have also been detected in the Jizzakh reservoir, especially in coastal areas.** It is listed as invasive in the global literature due to its strong **invasive effects** (preying on native fish/finned larvae and amphibians, competition).

Pseudorasbora parva

Pseudorasbora parva **(topmouth gudgeon) is not native** to Uzbekistan**;** it was introduced into the country in the 1960s with Chinese carp stocks and quickly **became established** (**first recorded** in the country **in 1966,** Kamilov & Borisova). **Current** local lists give the species an **"AI = Alien introduced"** status; for example, in the **Chirchik River** inventory, P*. parva* is clearly marked as **AI**. Global assessments also classify the species as **"introduced and invasive,"** and **Uzbekistan** is specifically included in this list. Ecologically, despite its small size, it can reach high densities **and increase competition for planktonic/benthic resources**, putting **pressure** on native small cyprinids and juvenile fish; therefore, it is considered **invasive** in inland waters.

Rhodeus ocellatus

Rhodeus ocellatus (rosy bitterling) is considered alien/invasive in Uzbekistan. The species is clearly marked as "AI = Alien introduced" in the current fish list of the Chirchik River. In addition, numerous individuals have been recorded in the Aydar–Arnasay Lake System and the Jizzakh reservoir within this system, and it has been reported that they form dense populations in coastal shallows.

Historically, it has also been reported that the species was introduced to the country in the 1960s with Asian-origin carp stocks and has become fully naturalised.

Channa argus

Channa argus **(northern snakehead) is not native** to Uzbekistan**;** the species was accidentally introduced **to the Aral Basin (Amu Darya–Syr Darya system)** between 1960 and **1963** and has established **resident populations** in the region. This is clearly stated in both global risk summaries and Central Asian literature. The species is considered **ecologically risky/invasive** due to its high predatory nature and reproductive success; it has the potential to alter community structure by competing with native fish fry and small fish . Therefore, it is assessed as a **high-risk invasive** species in management documents, and monitoring/reducing its spread is recommended.

Neogobius pallasi

Neogobius pallasi (Caspian goby) is not native to Uzbekistan; the species' natural range is the Caspian basin, and it is noted to have been introduced to the Aral basin at a later date. Therefore, it has an alien/introduced status in the Aral Sea and associated Uzbek waters. Goby species (e.g. *Neogobius* spp.) introduced to the Aral Sea after the 1950s have rapidly naturalised and have been associated with changes in community structure; some studies have linked this group to effects such as declines in benthic invertebrates (specific cause-effect relationships are not always clear).

Management and Monitoring Recommendations for Invasive Species

The presence of these species in the project area should be carefully considered in terms of biodiversity conservation. The main measures recommended under IFC PS6 and EU IAS regulations are as follows:

- Preventing the stocking, transport, or release of invasive alien species within the project scope,
- Monitoring existing populations and regularly reporting their densities,

- Establishing awareness programmes for local fishermen, cooperatives, and aquaculture facilities,
- Prioritising habitat restoration and conservation efforts for native and endemic species,
- Implementing management strategies consistent with the National Biodiversity Strategy and Action Plan (NBSAP) and international agreements (CBD, Bern Convention).

PS6's risk/impact assessment process explicitly addresses invasive alien species as one of the priority threats; it mandates that, where possible, avoidance of the impacts of invasive species should be prioritised, followed by mitigation where avoidance is not feasible, and restoration of ecosystems to their original state. In cases of uncertainty, management must be conducted in accordance with adaptive management principles. Both direct and indirect impacts are assessed in this process, and the list of "invasive alien species" is analysed alongside other key pressures such as habitat loss, fragmentation, overuse, and hydromorphological changes.

The provisions of PS6 concerning alien species clarify the roadmap to be followed in the field. New alien species for the region may only be introduced in accordance with the existing legal framework and without introducing species posing a "high risk of invasion" under any circumstances. A prerequisite for this is the assessment of the invasion risk for the species concerned. In addition, operational controls must be established to prevent accidental transport (soil, mud, ballast, plant material, etc.) resulting from activities and supply chains. Even where the alien species is already established in the country, it is necessary to prevent its spread to new areas and, where possible, to eradicate it completely from natural habitats under management control.

The international basis for this practice is the principle of "preventing, controlling or eradicating invasive alien species" in Article 8(h) of the Convention on Biological Diversity. Decisions adopted by the Parties recognise that the risk of IAS (Invasive Alien Species) is increasing due to climate change and shifts in land use; therefore, they recommend strengthening components such as process management, site-specific prioritisation, and integration with climate scenarios.

The monitoring and early warning system should be designed in two layers, consistent with PS6. The first layer is process-focused surveillance: water intake structures, canal/collector inlets, boat docks, fish stocking/aquaculture contact points, and heavy equipment logistics are scanned with high-frequency visual/instrumental observation; pre- and post-contact records

are kept. The second layer involves taking biological measures. Here, eDNA-based screening is conducted alongside multi-mesh nets, minnow traps, and larval plankton sampling. eDNA provides a strong signal for the early detection of new invaders; national/international guidelines recommend that eDNA data be kept in tandem with traditional capture records and directly support the EDRR (Early Detection–Rapid Response) framework.

This holistic framework ensures the continuity of ecosystem services while reducing the long-term impacts of projects on biodiversity. When read together, PS6 and GN6, which defines how to implement it, identify preventive biosecurity, legal compliance + risk-based decision-making, EDRR with operational speed, and management planning as indispensable components for technically managing invasive species risk in freshwater ecosystems.

Ultimately, preventing invasive species introduction, preventing accidental introductions, limiting the spread of existing populations, and, where possible, employing local control methods form the scientific backbone of the fight.

II.9. IMPACT, MITIGATION AND MEASURES/ACTION

Construction of the Natural Gas Combined Cycle Power Plant is ongoing. According to the working principle, the cooling water to be taken from the pipeline which has been established by the local autority will be discharged into the irrigation canal near the facility at the end of the process. In this case, the effects that may arise from both the extraction of water and the discharge of water into the irrigation canal at the end of the process have been assessed in terms of the aquatic ecosystem. Accordingly, the results of the field and laboratory studies carried out are given below.

- The project site **is located in the Sangzor (Sanzar) sub-basin within the main Syr Darya basin.** As **the Jizzakh Reservoir** and irrigation canals are affected, observations and sampling were carried out at five separate aquatic stations representing all these areas.
- As a result of the studies, algae, zooplanktonic organisms, benthic macroinvertebrates, and fish species were sampled and information from the literature was also utilised. These sampling studies identified 162 algal species, 36 zooplanktonic organisms, 50 benthic macroinvertebrates, and 22 fish species. Fifteen of the identified fish species were caught by us and Photographed, while the remaining seven taxa were listed based on their distribution in the area according to the literature.
- According to observations made in the study area and literature information, no endemic aquatic species were identified.
- According to the IUCN Red Data Book, one fish species (*Hypophthalmichthys molitrix*) is classified as NT (Near Threatened), a high conservation category. According to the

Uzbekistan Red Data Book, one mollusc species (*Corbicula fluminalis)* is classified as VU (Vulnerable). The conservation status of the remaining species is low.

- Considering the climatic conditions of the region, it is recommended that no work that would interfere with aquatic ecosystems be carried out during the April-June period, which is the breeding season for aquatic life. If work is unavoidable during this period, attention should be paid to the sensitivities of the area where the work will be carried out. The bottom structure of the channels along the pipeline route is mostly muddy and sandy, and the bank areas are covered with macrophytes. Due to these characteristics, they may be suitable spawning grounds for fish. No direct intervention should be made in these spawning areas located in the activity area.

  If intervention in the riverbed is necessary, it is preferable to change the course of the streams and rivers where the crossings will take place and to work on dry ground. This will ensure that no damage is caused to the downstream section of the stream and the watercourse systems. After the crossing process is completed, the flow direction of the river and stream should be returned to its original course. The water flow in the canal bed should be altered and work should be carried out on the dry section. Once the areas where construction work has been completed have been restored to their original state, the canal flow should be returned to this section. Construction work on other sections of the canal/stream should also be completed on dry ground after they have been drained in this way. This will prevent any permanent impact on aquatic systems.

  Macrophyte-covered areas in bank sections are used by aquatic organisms as shelter, feeding and spawning grounds. Therefore, aquatic systems should not be disturbed during the spring breeding season.

- Riverbank sections where the construction process has been completed and the structure has been damaged should be restored, using plants from the area. Riparian vegetation is particularly strong in a significant section of the water intake and discharge channels. In these sections, there are broad-leaved trees and, in some places, reed beds. However, the machinery used in pipeline construction works should not deviate from a specific route and should not cause unnecessary damage. This is because the strong vegetation on the banks is an important habitat for many terrestrial animals, especially amphibians and reptiles. In this regard, particular attention should be paid during the breeding season, as some sections have dense riparian vegetation.
- There is no bank zone that could cause erosion at the stations located in the natural Sangzor River and irrigation channels outside the reservoir body. The personnel working with the machinery to be used should be provided with the necessary

information and warnings so that they do not cause coastal damage. In addition, after the water intake pipeline crossing works are completed, reinforcement works should be carried out to ensure bank stability.

- After the works are completed, the bottom sections of the canal and the areas along the shoreline should be restored. The vegetation cover along the canal shoreline (bank) at the work stations is strong. Plants to be used for restoration should be rearranged with seeds from nearby plants to be compatible with the vegetation structure of the region.

In the current operating system of the Jizzakh Reservoir, water from the reservoir is supplied to the canal through two pipes passing through the dam body. For the planned facility, water supply will be provided by constructing additional pipes to these two existing pipes. The effects of this transformation on aquatic organisms living in the section where water is taken from the reservoir and in the canal where it will be discharged after this process have been identified, and countermeasures have been evaluated. Based on the hydrobiological data in the field and the technical operation of the project (cooling water being taken from pipes at the outlet of the Jizzakh Reservoir and discharged into the same canal system; continuous extraction of approximately 200 m³/hour; recirculating tower cooling), the following assessments have been made.

- According to hydrobiological data obtained from the field and literature information, all aquatic species in the canal-reservoir system are cosmopolitan in nature. In particular, Cyanobacteria taxa such as *Microcystis aeruginosa* and *Aphanizomenon flos-aquae* among algae, and Unionidae (e.g. *Sinanodonta woodiana, Anodonta anatina)* and *Corbicula* species (e.g. C*. fluminalis)* among macroinvertebrates are present. These species are prone to excessive growth and population explosions in response to increases in temperature and nutrient load and include aquatic groups that are sensitive to chemical-thermal stresses.
- Adding an additional pipe to the two existing pipes in the reservoir body will change the hydrodynamics in the channel cross-section as well as the water intake to the facility. This increases entrainment losses of ichthyoplankton and micro-mesozooplankton. This may cause aquatic organisms to pass through the screen systems from the reservoir and mix into the system. Alternatively, it may increase the risk of impingement in small benthic forms within the water coming from the dam body. This situation **is known as** aquatic organisms **being trapped on the screen.**

Therefore, the water intake structure should have a wide-fronted inlet that provides low

approach velocities and a two-stage screen-trommel (fine mesh) combination. The Jizzakh Reservoir began operating in 1973. At that time, wide screens were installed in the section that draws water from the dam face into the irrigation canal. The water passing through here reaches a second screen system within the dam, which has a mesh size of 2 cm and is considered a suitable design for preventing fish passage.

If the flow (approach velocity) towards the water intake structure from the body is high, small benthic organisms (chironomid larvae, amphipods, young snails/mussels, small fish fry) are drawn towards the grate and **are forced to stick to it** by the pressure of the flow **after hitting the grate surface.** If they cannot escape**, injury, stress and death** occur.

In such situations, the following methods can be applied to reduce the risk in addition to the existing screens:

- The water velocity perpendicular to the screen is kept very low by designing a wide-fronted inlet. It can be seen that the first section of the water in the Jizzakh reservoir body is quite wide. From this perspective, it is understood that the design is appropriate.
- The entry of organisms into the water intake structure is prevented **by creating a multi-stage grid** using a coarse grid and **a fine-mesh trommel/screen**. It is understood that this dual grid system is also used in the Jizzakh Reservoir. Wide screens facing the body and a fine-mesh sieve system inside the body prevent aquatic organisms from entering the water intake structure. **Continuous/automatic cleaning** systems can also be an effective operating system to prevent clogging in these sieves.
- Simple solutions such as light/strobe and air bubble curtains, **used as behavioural deterrents**, can also yield positive results as they prevent aquatic organisms from approaching the grids from the reservoir area onwards.
- The water intake section is located at the deepest point of the body and is **deep/sloped** and concrete in nature. Therefore, this section is not preferred by aquatic organisms due to unsuitable habitat conditions. **It does not possess the characteristics of a spawning area** for aquatic organisms **and is a habitat where fish fry are not observed**. **In other words**, the coastal sections consist of concrete structures that aquatic organisms do not favour for reproduction, feeding, and nesting, and they lack aquatic plants and gravelly/woody substrates.

In this case, in the section where the grids are located, for aquatic organisms:

- **There is no direct feeding** from the bank areas**,**

- Small eggs and organisms in the early larval stage can pass through the 2 cm secondary screen inside the body. However, since the fry of fish species with high populations will not be observed in this zone, the total entrainment pressure will be significantly reduced.
- Deep-wall fronts are not typical **adult spawning–feeding habitats**, so there is **very low** risk of fish entering the screens.

The water intake area **is unsuitable for spawning**, and **juvenile/larval pressure is significantly reduced;** the **2 cm** secondary screen and **low velocity** reduce **the biological risk** to an **acceptable** level.

As a result, under current conditions, there is a large grid in the section where water is drawn from the reservoir into the pipes, and there are also smaller grids with smaller pores inside the body that have a second filtration feature. However, the aquatic ecosystem conditions in the section where water is drawn from the reservoir into the pipes are not suitable for small fish to use the area. Due to these ecological and technical characteristics, the current system is sufficient for the species likely to pass through it, and there is no situation that would require new measures to be taken.

Process water passing through the plant will be discharged into the irrigation canal immediately adjacent to the facility. Although this canal was created by human intervention, it has retained its natural aquatic habitat characteristics due to the water it has held for many years. Therefore, managing the **thermal and chemical** effects that **may arise from the discharge of process water** is also important.

After passing through the cooling cycle (tower-recirculation) and being discharged in a natural gas-fired power plant, some changes occur in its chemical composition.

These include:

- Recirculation reduces the thermal load compared to a single-pass system; however, the blowdown water may be **+0.5–3 °C** warmer than the inlet water. The ecological implication of this is that **dissolved oxygen (DO)** saturation decreases slightly over short distances; plankton metabolism may accelerate in summer.
- In the tower, major ions such as **Na^+, Cl^-, SO_4^{2-}, HCO_3^-, Ca^{2+}, Mg^{2+}, K^+,** and **SiO_2 increase relative to the feed water** due to **"concentration cycles (CoC)"** (typical CoC ≈ 3–6). As a result, **conductivity and Total Dissolved Solids (TDS) increase.** The ecological significance **of this** is **osmotic stress** and **a** long-term **tendency**

towards salinity in the receiving environment**;** this is a situation that requires attention, particularly during periods of low flow.

- **CO_2 removal** in the tower generally **slightly increases** the pH (alkaline shift). As a result, calcite saturation increases and **calcification** conditions change **in shellfish**, the solubility of metals decreases, and a tendency to precipitate may be observed.
- Blowhole water **is** generally **low in conductivity** and **may be high in** phosphate and **pH. Furthermore, Fe/Cu particle traces** may be observed in excessive amounts. Since the presence of cyanobacteria such as ***Microcystis/Aphanizomenon*** is known in the reservoir, even **small increases in** P **load** can trigger **algal growth and eutrophication tendencies**. Therefore, **Total P (specifically PO_4–P)** target values should be kept very low, and **phosphorus-free chemicals** should be preferred.

In the discharge water generated after the process, an increase in TDS/conductivity, a slight alkaline formation in pH, a small positive increase in temperature, and trace contributions from the chemical program (e.g., TRC, P, trace metals) may be observed. Ecologically, **P** and **TRC** (Total Residual Chlorine) are considered the most critical factors. Risks can be significantly reduced by using **phosphorus-free/low-P chemistry + deoxidation (TRC≈0)** and **strict management of temperature increases** against these critical effects. The low diversity and density of aquatic life in the reservoir, which is unsuitable in terms of, will also limit **entrainment/impingement** pressure.

Although the recirculation system reduces the thermal load compared to classic "once-through" cooling, the tower blowdown water, HRSG blowdown, and auxiliary process sources may carry increased temperature + TDS/ionic strength and biocides/corrosives/antiscalants to the receiving environment. This situation, especially during the summer period, may reduce dissolved oxygen saturation, causing valve closure and impaired filtering behaviour in Unionidae molluscs; in cyanobacteria, it may lead to eutrophication due to excessive proliferation caused by thermal-nutritional advantages.

The process of controlled discharge of part of the boiler water with the tower blowdown water and HRSG blowdown will be carried out. This increases the thermal effect in addition to the effects mentioned above. The following applications are recommended for this purpose.

- The mixing zone should be modelled hydrodynamically (seasonal flow/temperature) to demonstrate that temperature increases remain below habitat thresholds.
- The blowdown flow should be provided with dilution and heat matching. Thermistor-based online measurement and warning systems should be used.

- In terms of chemical quality, biocide dosing (oxidising chlorine/bromine or isothiazolinone, etc.) should be managed using a pulse-window logic and online free oxidising residue measurement. Residues should be kept close to zero by pre-discharge deoxidation (e.g. sodium bisulphite).
- Operating systems that minimise phosphorus input and suppress copper/zinc discharge should be used to ensure that discharge reaches standard values. pH, conductivity, TSS, TDS, temperature and (if applicable) free chlorine/monochloramine values for all process streams must be continuously monitored using online monitoring systems. A high-frequency field monitoring system must be installed in the channel where discharge will take place to monitor dissolved oxygen, chlorophyll-a and cyanotoxins.

    These measures will provide a high level of operational assurance specific to the project, based on the water withdrawal from the reservoir in the project and the subsequent discharge configuration and quantity (200 m^3/hour; receiving environment: drainage channel).

From an ecosystem-focused conservation perspective, the presence of Unionidae and Corbicula families of molluscs at sampling stations necessitates a much more controlled operation against persistent oxidising residues and sudden temperature changes.

Acceptance criteria for transition to operation (seasonal ichthyoplankton density for impingement-entrainment losses during water withdrawal from the reservoir; ΔT, DO, chlorophyll-a, free oxidising residue, conductivity-TDS and pH in the receiving environment) must be monitored. In terms of water withdrawal and discharge, these monitoring results should be reviewed at least once a year using a management cycle adapted to PS6, and the necessary chemical-operational corrections should be made.

None of these effects may be observed from an ecosystem perspective as long as there is no direct intervention in aquatic systems. However, assessments have been made considering the worst-case scenario.

Any adverse developments that may occur during construction will be short-term and cause temporary effects. All aquatic ecosystems examined are dynamic and healthy ecosystems that can tolerate these temporary adverse effects, provided that the necessary measures are taken.

The impacts of the activity on aquatic habitats and the necessary measures are defined in this report. However, it is also important to monitor the presence and population status of fish species and benthic invertebrates in particular.

A monitoring programme for aquatic ecosystems and their living organisms, especially endemic species, should be planned twice a year. The effects of the activity on aquatic habitats should be observed and reported during the construction period and for two years after the start of operation.

The monitoring programme for freshwater ecosystems should primarily include water quality, flow, and freshwater biodiversity.

Considering the climatic characteristics of the region, it is recommended that aquatic monitoring studies be carried out twice a year (in spring and autumn), especially in this region. This will also allow for detailed studies of benthic invertebrates and fish in areas designated as sensitive.

Action plans and aquatic monitoring programmes for aquatic ecosystem organisms, particularly fish, are provided in Tables II.15 and II.16.

Table II.15. Action Plan for the Protection of Fish Species and Benthic Invertebrates

Biodiversity Element	Objective	Action	Timeframe	Responsibility / Partnership	Indicator
Fish Species, Benthic Invertebrates	No net loss in species populations or habitats	Limiting project activities to designated areas to avoid direct impacts	During construction and operation	Investor / Contractor / Hydrobiologist	No direct impact on fish and benthic populations
		Monitoring the presence and population status of aquatic environments downstream of the project site	During construction and operation	Investor / Contractor / Hydrobiologist	Protection of species and population status during operation Positive results in monitoring reports
	All personnel are aware of the importance of protecting aquatic species	Informing and training project personnel	During construction and operation	Investor / Contractor / Hydrobiologist	Number of trained personnel, Written informational documents

Table II.16. Aquatic Ecosystem Monitoring Programme Aquatic Ecosystem Monitoring Programme

Species to be monitored	Monitoring Method	Reasons for Monitoring	Monitoring Period	Monitoring Stations	Monitoring Parties
What?	**How?**	**Why?**	**When?**	**Where?**	**Who?**
Fish Species, Benthic Macroinvertebrates	Fish sampling will be conducted in areas determined using standard methods Species and relative population densities will be determined Aquatic habitats forming their habitats will be defined	They are nationally or internationally protected species They are indicator species for water quality. There is a declining trend in population status.	**<u>During the construction phase</u>** Twice a year (May and October) **<u>Operational phase</u>** Twice a year (May and October) At least every two years	Sucul_1 Sucul_3 Sucul_5	Hydrobiologist

SECTION III: FAUNA STUDIES

III.1. INTRODUCTION

The conservation of biodiversity is considered a critical priority in terms of global sustainable development goals and international environmental standards. In this context, IFC Performance Standard 6 (PS6) on *Biodiversity Conservation and Sustainable Management of Living Natural Resources* requires the protection of ecosystem services, the identification of critical habitats, the mitigation of potential impacts on species, and the implementation of conservation and impact reduction measures in investment projects. This standard particularly emphasizes the need for detailed inventories of natural and semi-natural habitats and the monitoring of species diversity in large-scale energy developments.

The planned 550 MW Combined Cycle Power Plant (CCPP) and associated infrastructure in the Jizzakh region may exert potential ecological pressures on the Jizzakh reservoir, irrigation canals, natural streams, and the surrounding agro-steppe ecotone. Aquatic ecosystems in the area not only sustain aquatic species but also support diverse habitats for mammal, bird, reptile, and amphibian communities inhabiting riparian and adjacent terrestrial ecosystems. Therefore, fauna surveys within the project's area of influence must be conducted with particular consideration of ecosystem connectivity and habitat heterogeneity.

Previous rapid biodiversity assessments in the region were limited by short survey durations and produced insufficient data, particularly regarding aquatic and semi-aquatic fauna components. Consequently, the baseline biodiversity dataset for the project area lacked compliance with international standards. To address this gap, a three-day intensive field survey was conducted between 3-7 August and between7–9 September 2025, focusing on the assessment of terrestrial vertebrate fauna associated with aquatic ecosystems.

Within the scope of the study, sampling points (SP-1 … SP-15) were systematically examined along reservoir shores, canals, and streambeds. Species observations were recorded using internationally recognized methodologies, including point counts, camera trapping, and track–scat surveys. Habitat classifications were carried out in accordance with the EUNIS system, and species' conservation statuses were evaluated based on the IUCN Red List, CITES appendices, and the Uzbekistan Red Data Book.

The main objectives of this report are as follows:

- To provide an updated inventory of terrestrial vertebrate fauna species within the project's area of influence,
- To evaluate habitat use and ecological roles of the recorded species,
- To identify potential critical habitats in line with IFC PS6 criteria,
- To assess the potential impacts of project activities on fauna and to develop evidence-based mitigation and monitoring recommendations.

III.2. STUDY AREA AND HABITAT CHARACTERISTICS

The project site and its immediate surroundings exhibit a mosaic landscape structure comprising agricultural lands, wetlands, grassland zones, river systems, and settlement areas, according to the EUNIS habitat classification. The area is characterized by the interaction between intensive agriculture and irrigation systems shaped by human activities, and the presence of natural and semi-natural habitats (Figure III.1).

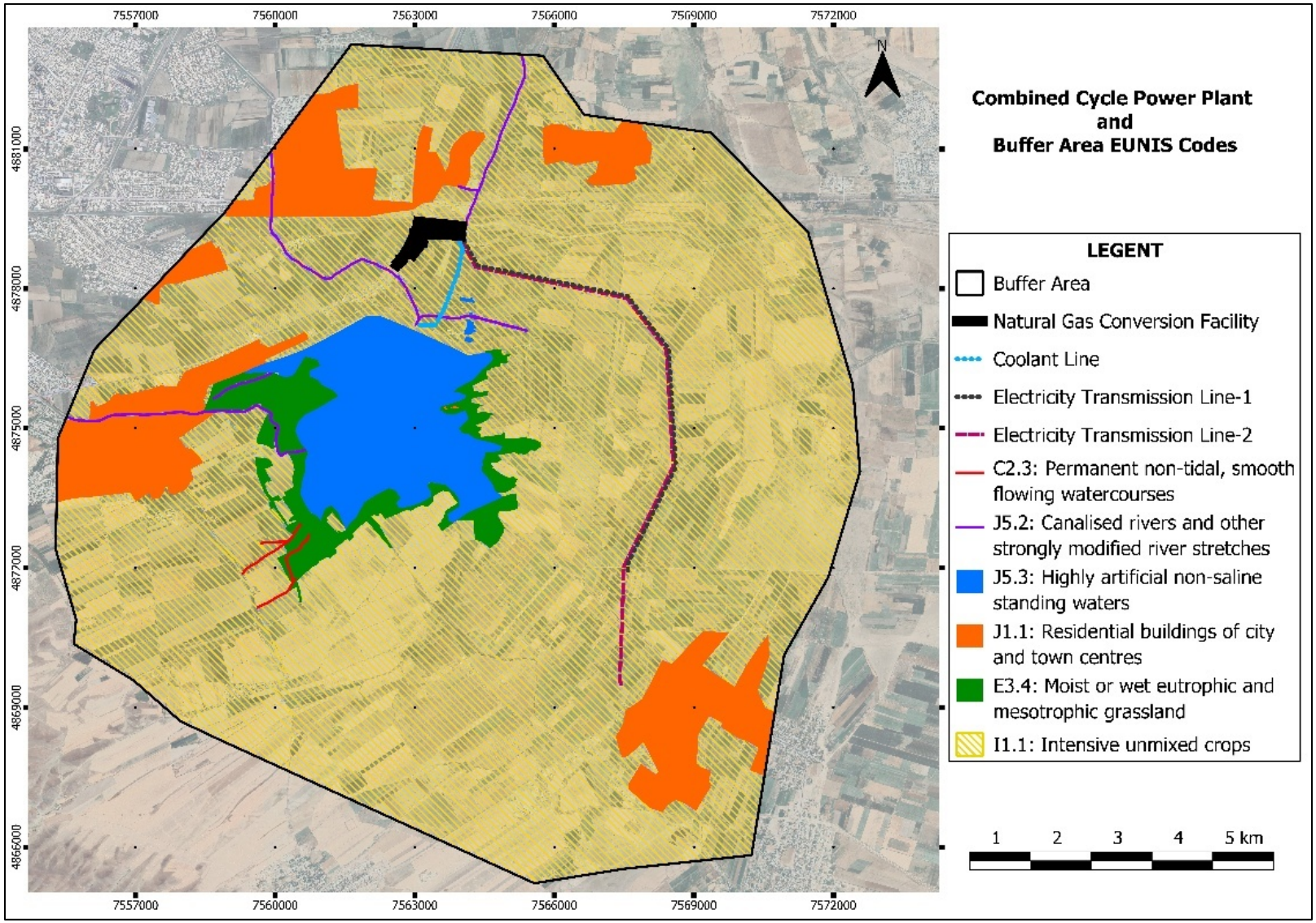


Figure III. 1. Habitat types within the project area and buffer zone

I1.1 – Intensive unmixed crops:

A large portion of the study area is composed of intensive agricultural lands. Monoculture farming (primarily maize, alfalfa, and other irrigation-dependent crops) is widespread. Although these areas contribute to habitat fragmentation, their edge zones provide temporary habitats for reptiles, birds, and small mammals (Photograph III.1).

Photograph III. 1. Intensive unmixed crops (I1.1)

E3.4 – Moist or wet eutrophic and mesotrophic grassland:

These habitats are observed around the reservoir and in wet meadow areas. They serve as important breeding and foraging sites particularly for amphibian species (e.g., *Pelophylax ridibundus*) and waterbirds. In addition, they provide rich feeding resources for insect communities. However, grazing pressure and alterations in the water regime may negatively affect habitat quality (Photograph III.2).

Photograph III. 2. Moist or wet eutrophic and mesotrophic grassland (E3.4)

J5.3 – Highly artificial non-saline standing waters:

The reservoir itself is classified within this category. Although it is an artificial water body, it provides an important habitat for fish, waterbirds, aquatic invertebrates, and amphibians. However, the artificial regulation of water level and quality directly influences the ecological balance (Photograph III.3).

Photograph III. 3. Highly artificial non-saline standing waters (J5.3)

J5.2 – Canalised rivers and other strongly modified river stretches:

The irrigation canals and artificial water conveyance lines present within the site are classified in this category. These habitats not only meet the irrigation needs of the surrounding agricultural areas but also serve as a water source for wildlife. However, fluctuations in water quality and canal maintenance activities exert pressure on overall ecosystem health (Photograph III.4).

Photograph III. 4. Canalised rivers and other strongly modified river stretches (J5.2)

C2.3 – Permanent non-tidal, smooth-flowing watercourses:

The small tributaries and natural streambeds within the study area fall under this category. These habitats are of critical importance for the life cycles of amphibians, reptiles, and waterbirds. However, alterations in the flow regime and agricultural pressures on habitat edges pose significant ecological risks (Photograph III.5).

PhotographPhotograph III. 5. Permanent non-tidal, smooth flowing watercourses (C2.3)

J1.1 – Residential buildings of city and town centers:

The villages and settlements surrounding the project site are included in this category. Settlement pressure contributes to habitat fragmentation and leads to increased human-induced threats to wildlife.

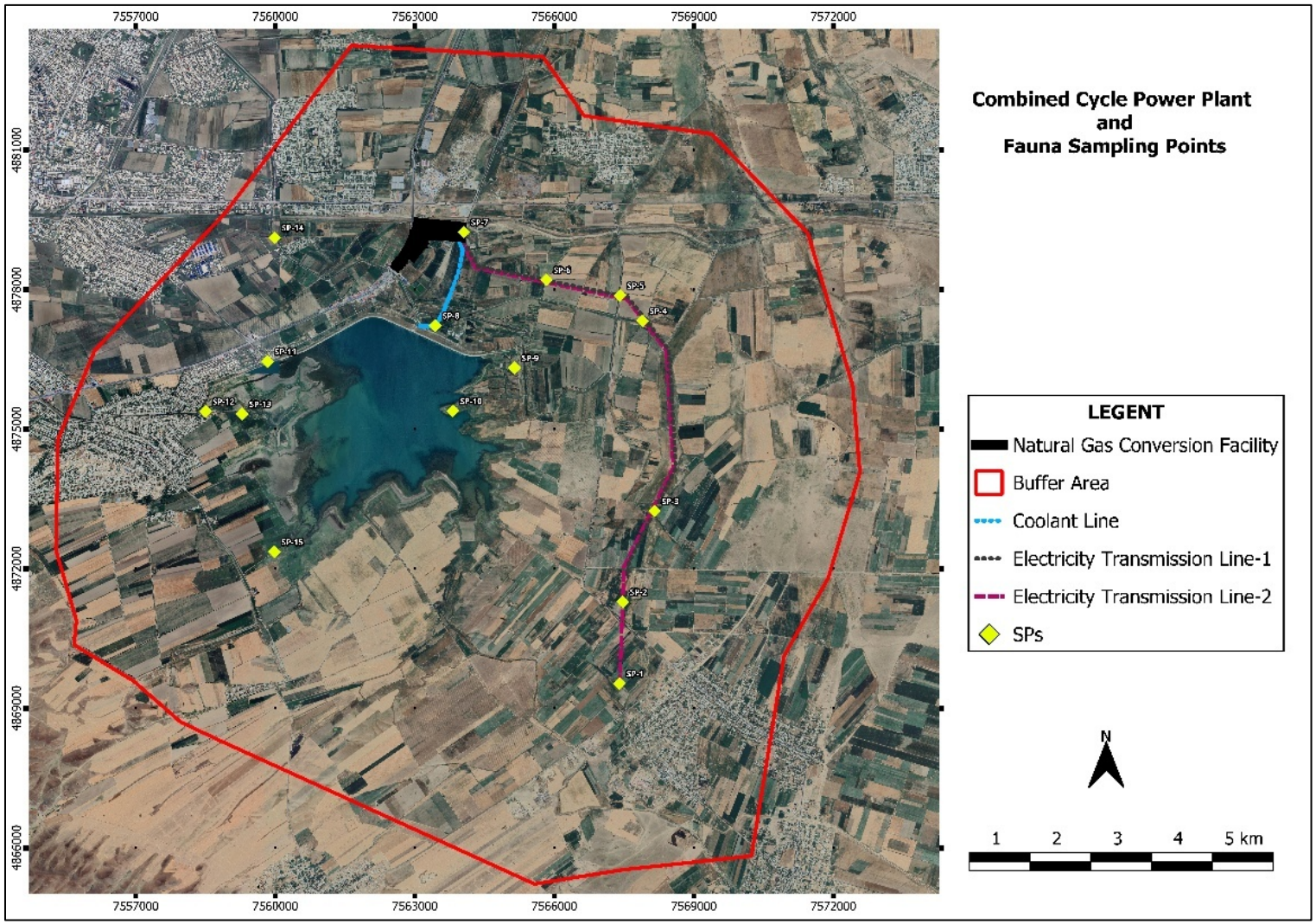
III.3. METHODOLOGY

III.3.1. Study Design

Field surveys were conducted over 2 times a three-day period between 3-7 August and beetween 7–9 September 2025, focusing on the identification of fauna components within the project's area of influence. The surveys were designed in accordance with the IFC Performance Standard 6 protocol. Particular emphasis was placed on aquatic ecosystems (reservoir shoreline, irrigation canals, and small natural streams) and adjacent terrestrial ecotones (grasslands, agricultural fields, and semi-natural steppe areas).

Within the study area, 15 sampling points (SP-1, SP-15) were established, and their coordinates were recorded in KMZ format. These points were selected to represent habitat diversity and species distributions.

Detailed information on the monitored points is provided in Figure **IV.**2 and Table III.1.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SP-3
SP-15
SP-2
SP-1
Combined Cycle Power Plant
and
Fauna Sampling Points
LEGENT
Natural Gas Conversion Facility
Buffer Area
Coolant Line
Electricity Transmission Line-1
Electricity Transmission Line-2
SPs
N
1
2
3
4
5 km

Figure III. 2. Monitoring points for fauna species

Table III. 1. Coordinate information of fauna monitoring points (UTM-42T)

SP	Easting	Northing	SP	Easting	Northing
SP-1	412885	4430998	**SP-9**	411217	4436199
SP-2	412956	4432338	**SP-10**	410193	4435502
SP-3	413497	4433823	**SP-11**	407150	4436350
SP-4	413336	4436943	**SP-12**	406120	4435544
SP-5	412970	4437363	**SP-13**	406722	4435496
SP-6	411761	4437634	**SP-14**	407292	4438378
SP-7	410409	4438432	**SP-15**	407225	4433226
SP-8	409921	4436904			

III.3.2. Sampling Points

- **Reservoir shoreline**: 6 points (waterbirds, amphibians, semi-aquatic mammals)
- **Irrigation canals**: 5 points (fish, frogs, waterbirds, reptiles)
- **Small natural streams**: 2 points (seasonal flow habitats, amphibian–reptile diversity)
- **Grassland and agricultural ecotones**: 2 points (mammal and terrestrial bird observations)

III.3.3. Research Techniques

Fauna surveys were designed to cover the species that may occur within the project site and its buffer area, and various standard methods were applied to detect different taxonomic groups.

For the identification of bird species, the point-count method was employed, with visual and auditory observations conducted at each point for a specified duration.

In addition, transect walks were conducted to reflect habitat diversity, and supplementary observations were recorded along the reservoir shorelines and canal routes (PhotographPhotograph III.6).

PhotographPhotograph III. 6. Transect walks for fauna species

For mammal species, indirect methods such as tracks, scats, shelters, and feeding traces were recorded to determine species presence. Camera traps were installed at selected sampling points to document the presence of nocturnal species with supporting evidence. In this context, a total of 4 camera traps were deployed (Table III.2, Figure III.4, PhotographPhotograph III.7).

Table III. 2. . Camera trap placement point coordinate information

Camera Trap No	Coordinate (UTM 42 T	
Camera Trap 1	409980	4437037
Camera Trap 2	411195	4436189
Camera Trap 3	410432	4438461
Camera Trap 4	410219	4440959

Figure III. 3. Camera trap deployment points

PhotographPhotograph III. 7. Camera trap deployment points

For amphibians and reptiles, systematic visual surveys were conducted in shoreline zones and moist habitats. To account for the concealment behavior of species, stones, logs, and other cover materials were inspected.

III.3.4. Data Recording

At each sampling point, the following parameters were recorded:

- GPS coordinates (WGS84),
- Habitat description (according to the EUNIS classification),
- Species name (Latin and English), number of individuals, and observation method,
- Behavior (foraging, flight, breeding, vocalization),
- Indicators of disturbance/threats (grazing, agriculture, human activity).

III.3.5. Critical Habitat (CH) Assessment

The identified species and habitats were evaluated in accordance with IFC PS6 criteria. Within this framework, the following aspects were considered:

- IUCN Red List categories,
- Records in the Uzbekistan Red Data Book,
- Endemism and distributional restrictions,
- The presence of habitats important for migration, breeding, and foraging.

III.3.6. Ecosystem Services Assessment

During the field surveys, not only the presence of fauna species but also ecosystem services were taken into account. Ecosystem services are of critical importance for both biodiversity conservation and the livelihoods of local communities. In this context, the following aspects were examined for aquatic and terrestrial ecosystems within the project area:

Provisioning Services: Observations were made on the role of the reservoir and canals in providing irrigation water, their contribution to the productivity of surrounding agricultural lands, and their potential for local fisheries.

Regulating Services: The influence of wetlands on the microclimate, carbon sequestration capacity, erosion control, and contributions of habitats to water quality were assessed.

Cultural Services: The recreational and landscape value of the reservoir and surrounding ecosystems, as well as their potential for nature education, were considered.

Supporting Services: The role of aquatic and riparian habitats as shelter, breeding, and foraging areas for birds, amphibians, and mammals was evaluated.

This assessment enables the evaluation of project activities not only at the species level but also within the broader framework of ecosystem services, contributing to a better understanding of long-term impacts.

III.4. FINDINGS

III.4.1. Amphibians (Amphibia)

Based on field surveys and literature review, only a limited number of amphibian species were recorded within the project's area of influence. Reservoir shorelines, irrigation canals, and seasonal streams were identified as suitable habitats; particularly during spring, higher water levels provide favorable microhabitats for breeding (Table III.3).

Table III. 3. Amphibian species potentially occurring within the project site and its surroundings

Species Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Pelophylax ridibundus	C2.3 - J5.3 - E3.4	LC	App III	–	Observed	Reservoir shorelines, irrigation canals, and wet meadows
Bufotes viridis	E3.4 I1.1	LC	App II	–	Literature	Grasslands, agricultural field margins, and moist habitats
Hyla orientalis	E3.4 I1.1	LC	App II	–	Literature	Grasslands, agricultural field margins, and moist habitats

Within the project site and its surroundings, monitoring surveys conducted in suitable amphibian habitats during August and September recorded individuals of *Pelophylax ridibundus* (Marsh Frog). This species was observed along reservoir shorelines, irrigation canals, and wet meadow areas. It is listed as Least Concern (LC) on the IUCN Red List and is not included in the National Red Data Book. However, decreasing water resources, water pollution, and potential declines in insect populations are considered major risk factors for this species.

Ecologically, *P. ridibundus* plays a key role in the natural control of insect populations and also serves as a food source for waterbirds in the region. Therefore, the protection of its habitats and the monitoring of aquatic habitat quality during the project implementation are of critical importance for the species' long-term sustainability (Photograph III.8).

Photograph III. 8. Pelophylax ridibundus

During field observations, individuals of *Bufotes viridis* (Green Toad) were also recorded. This species was observed in wet meadow habitats and at the edges of agricultural fields. It is listed as Least Concern (LC) on the IUCN Red List and is not under national protection. However, habitat desiccation, the use of agricultural chemicals, and water pollution represent the main pressures threatening its presence in the region.

In addition, literature data indicate the potential occurrence of *Hyla orientalis* (Eastern Tree Frog) within the project site. This species is typically recorded in irrigation canals and moist meadow areas, and its possible presence should therefore be taken into account (Photograph III.9).

Photograph III. 9. Suitable habitats for amphibian species

During the field survey, *Pelophylax ridibundus* were recorded through direct observations. Considering literature data, it is also highly likely that *Bufotes viridis* and *Hyla orientalis* occur in suitable habitats within the region. Within the framework of IFC–PS6, these species are not regarded as critical habitat triggers; however, as they are sensitive to habitat degradation, it is recommended that they be monitored during project activities.

III.4.2. Reptiles (Reptilia)

During the field surveys conducted in August and September within the project site and its surroundings, individuals of *Ablepharus deserti* were recorded. This species was particularly observed along agricultural field margins, in shrublands, and near water bodies. As a small and slow-moving reptile directly affected by habitat fragmentation, it faces risks of mortality from crushing, as well as habitat loss and fragmentation, during construction and operational activities (Table III.4).

Table III. 4. Reptile species observed in the study area and those potentially recorded from literature sources

Species Name	English Namr	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Testudo graeca	Spur-thighed Tortoise	I1.1, E3.4	VU	App II	VU	Literature	Protected
Lacerta trilineata	Balkan Green Lizard	I1.1, E3.4, J5.2	LC	App II	-	Literature	Common species
Ophisops elegans	Snake-eyed Lizard	I1.1	LC	App II	-	Literature	Common species
Stellagama stellio	Starred Agama	I1.1	LC	App II	NT	Literature	Common species
Natrix natrix	Grass Snake	C2.3, J5.2	LC	App III	NT	Literature	Common species
Dolichophis caspius	Caspian Whipsnake	I1.1, E3.4	LC	App II	-	Literature	Common species
Ablepharus deserti	Desert skink	E3.4	LC	App II	-	Observed	Not listed
Natrix tessellata	Dice Snake	J5.3, E3.4	LC	App II	-	Observed	Common species

Field observations conducted within the study area and its surroundings confirmed the presence of *Ablepharus deserti* (Desert skink) and *Natrix deserti* (Desert Skink) (PhotographPhotographs III.10 ve III.11). These species were recorded in habitats characterized by short herbaceous vegetation, grasslands, and the margins of agricultural areas. Both are listed as Least Concern (LC) on the IUCN Red List and have no special status in the National Red List. With their insectivorous feeding behavior, they play an important role in regulating insect populations within the ecosystem. However, agricultural activities, habitat fragmentation, and pesticide use represent the main threats to these species. It is therefore recommended to monitor the grassland and agricultural edge habitats where they were observed, prevent habitat loss, and minimize pesticide use.

Photograph III. 10. Ablepharus deserti (Desert skink)

Photograph III. 11. Natrix tessellata (Dice Snake)

In addition, considering literature records and regional distribution, the following species are

likely to occur within the study area and its surroundings:

- *Testudo graeca* (Spur-thighed Tortoise): Vegetated areas, grasslands, and agricultural field margins
- *Lacerta trilineata* (Balkan Green Lizard): Shrublands and field-edge habitats
- *Ophisops elegans* (Snake-eyed Lizard): Open areas and rocky habitats
- *Stellagama stellio* (Starred Agama): Rocky and semi-open areas
- *Natrix natrix* (Grass Snake): Wetlands and irrigation canal surroundings
- *Dolichophis caspius* (Caspian Whipsnake): Open agricultural lands and grassland habitats

All of these species play important ecological roles in regulating populations of insects, small mammals, and amphibians, while also contributing to the regional food chain as prey for birds and mammals.

Testudo graeca (Spur-thighed Tortoise) is classified as Vulnerable (VU) on the IUCN Red List and is protected under Appendix II of the Bern Convention. It is also strictly protected in Türkiye under the decisions of the Central Hunting Commission.

The other species (*Lacerta trilineata, Ophisops elegans, Stellagama stellio, Natrix natrix, Dolichophis caspius*) are generally listed as Least Concern (LC) on the IUCN Red List and are protected under Appendices II–III of the Bern Convention.

III.4.3. Birds (Aves)

Field surveys conducted in September, together with literature records, indicate that more than 30 bird species may occur across different habitats in the project area (reservoir shorelines – J5.3, wet meadows – E3.4, agricultural lands – I1.1, canals and small streams – C2.3 / J5.2).

Reservoir shorelines and wet meadows provide particularly important habitats for waterbirds, offering suitable feeding areas for species such as *Ardea cinerea* (Grey Heron), *Egretta garzetta* (Little Egret), *Anas platyrhynchos* (Mallard), and *Fulica atra* (Eurasian Coot). Canals support species like *Motacilla alba* (White Wagtail) and *Alcedo atthis* (Common Kingfisher), while agricultural lands provide feeding grounds for widespread species such as *Passer domesticus* (House Sparrow), *Hirundo rustica* (Barn Swallow), *Corvus cornix* (Hooded Crow), and *Streptopelia decaocto* (Eurasian Collared Dove).

Based on literature records and regional distribution, additional species such as *Podiceps cristatus* (Great Crested Grebe), *Phalacrocorax carbo* (Great Cormorant), *Larus ridibundus* (Black-headed Gull), *Vanellus vanellus* (Northern Lapwing), and *Charadrius dubius* (Little Ringed Plover) may also be observed in reservoir and wetland ecosystems, depending on seasonal conditions (Table III.5).

Most of the bird species potentially occurring in the study area are listed as LC (Least Concern) on the IUCN Red List. However, waterbirds are protected under Annex II/III of the Bern Convention. Among them, *Vanellus vanellus* (Northern Lapwing), which can be observed along reservoir shorelines, is listed as NT (Near Threatened) both on the IUCN Red List and in the Uzbekistan National Red Data Book. At the regional scale, wetland birds (ducks, grebes, herons) are sensitive to habitat quality and therefore highlight the ecological importance of the reservoir.

Some bird species observed in the field are given in Photographs III.12 – III.15..

Table III. 5. Bird species observed in the study area and those potentially recorded from literature sources

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Anas crecca	Common Teal	J5.3	LC	App. III	–	Literature	Wetlands during migration
Anas platyrhynchos	Mallard	J5.3, C2.3	LC	App. III	–	Observed	Reservoirs, small rivers
Ciconia ciconia	White Stork	E3.4	LC	App. II	-	Observed	Open agricultural lands, near wetlands
Ciconia nigra	Black Stork	E3.4	LC	App. II	NT	Observed	Open agricultural lands, near wetlands
Ardea cinerea	Grey Heron	J5.3, E3.4	LC	App. II	–	Observed	Reservoir shorelines, wet meadows
Ardea purpurea	Purple Heron	J5.3, E3.4	LC	App. II	–	Literature	Reedbed habitats
Egretta garzetta	Little Egret	J5.3, E3.4	LC	App. II	–	Observed	Wetlands
Nycticorax nycticorax	Black-crowned Night Heron	J5.3	LC	App. II	–	Literature	Reservoir shoreline
Phalacrocorax carbo	Great Cormorant	J5.3, C2.3	LC	App. II	–	Literature	Water bodies, shorelines
Plegadis falcinellus	Glossy Ibis	J5.3, E3.4	LC	App. II	–	Observed	Wet meadows, agricultural field edges
Podiceps cristatus	Great Crested Grebe	J5.3	LC	App. II	–	Literature	Reservoir body
Pandion haliaetus	Osprey	J5.3, E3.4	LC	App. III	–	Observed	Wetlands and surroundings
Buteo buteo	Common Buzzard	I1.1, E3.4	LC	App. II	–	Literature	Open areas, field margins

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Accipiter nisus	Eurasian Sparrowhawk		LC	App. III	-		
Circaetus gallicus	Short-toed Snake Eagle	E3.4, I1.1	LC	App. II	–	Observed	Open agricultural lands, near wetlands
Circus aeruginosus	Western Marsh Harrier	J5.3, E3.4	LC	App. II	+	Observed	Reedbed habitats
Milvus migrans	Black Kite	E3.4, I1.1	LC	App. II	–	Observed	Open agricultural habitats, wetland surroundings
Falco tinnunculus	Common Kestrel	I1.1, E3.4	LC	App. II	–	Literature	Open agricultural habitats
Falco subbuteo	Eurasian Hobby	I1.1, E3.4	LC	App. II	–	Observed	Open agricultural habitats
Fulica atra	Eurasian Coot	J5.3, E3.4	LC	App. II	–	Observed	Reservoir–grassland ecotone
Charadrius dubius	Little Ringed Plover	J5.2, E3.4	LC	App. II	–	Literature	Canal banks, meadows
Vanellus vanellus	Northern Lapwing	E3.4, I1.1	NT	App. II	NT	Literature	Surroundings of settlements, agricultural lands
Larus ridibundus	Black-headed Gull	J5.3, I1.1	LC	App. III	–	Literature	Reservoirs and agricultural lands
Larus cachinnans	Caspian Gull	J5.3, I1.1	LC	App. II	–	Literature	Reservoirs and agricultural lands
Tringa totanus	Common Redshank	E3.4, J5.3	LC	App. II	–	Literature	Open areas, shrublands, field tracks
Columba palumbus	Wood Pigeon	E3.4, I1.1, J1.1	LC	App. II	–	Observed	Settlements, agricultural areas

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Columba livia	Rock Pigeon	E3.4, I1.1, J1.1	LC	App. II	–	Observed	Settlements, agricultural areas
Streptopelia decaocto	Eurasian Collared Dove	J1.1, I1.1	LC	App. II	–	Observed	Settlements and agricultural lands
Asio otus	Long-eared Owl	J1.1, E3.4	LC	App. II	–	Literature	Shrublands and village edges
Alcedo atthis	Common Kingfisher	C2.3, J5.2	LC	App. II	–	Observed	Streams, irrigation canals
Coracias garrulus	European Roller	All area	LC	App. II	–	Observed	All habitats
Merops apiaster	European Bee-eater	I1.1, E3.4	LC	App. II	–	Observed	Wet meadow ecotones
Merops persicus	Blue-cheeked Bee-eater	I1.1, E3.4	LC	App. II	–	Observed	Open grasslands, wetland edges
Upupa epops	Eurasian Hoopoe	I1.1, E3.4	LC	App. II	–	Observed	Grasslands and agricultural lands
Acridotheres tristis	Common Myna	I1.1, J1.1	LC	–	–	Observed	Settlements, agricultural areas
Acridotheres grandis	Great myna	I1.1, J1.1	LC	-	-	Observed	Settlements, agricultural areas
Delichon urbicum	Common House Martin	J1.1	LC	App. II	–	Literature	Settlements
Galerida cristata	Crested Lark	E3.4, I1.1, J1.1	LC	App. II	–	Observed	Village surroundings, field boundaries
Hirundo rustica	Barn Swallow	I1.1, C2.3	LC	App. II	–	Observed	Open agricultural habitats
Hirundo daurica	Red-rumped Swallow	E3.4, J1.1,	LC	App. II	–	Observed	Settlements and agricultural

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
		E1.1					lands
Riparia riparia	Sand Martin	E3.4, J1.1, E1.1	LC	App. II	–	Literature	Settlements and agricultural lands
Motacilla alba	White Wagtail	C2.3, I1.1	LC	App. II	–	Observed	Canal banks, agricultural lands
Motacilla flava	Yellow Wagtail	E3.4, I1.1	LC	App. II	–	Literature	Grassland habitats
Passer domesticus	House Sparrow	I1.1, J1.1	LC	–	–	Observed	Settlements
Passer montanus	Eurasian Tree Sparrow	J1.1, I1.1	LC	–	–	Literature	Village surroundings, field boundaries
Passer indicus	Indian Sparrow	J1.1, I1.1	LC	App. II	–	Observed	Village surroundings, field boundaries
Pica pica	Eurasian Magpie	I1.1, J1.1	LC	–	–	Observed	Field and settlement margins
Corvus cornix	Hooded Crow	I1.1, E3.4	LC	–	–	Observed	Agricultural fields, wet meadows
Corvus orientalis	Eastern Crow	E3.4, I1.1	LC	App. II	–	Literature	All habitats
Corvus frugilegus	Rook	E3.4, I1.1	LC	App. II	–	Observed	All habitats
Sturnus vulgaris	Common Starling	All area	LC	App. II	–	Observed	Open areas, shrublands, and field tracks
Saxicola caprata	Pied Bush Chat	E3.4, I1.1	LC	App. II	–	Literature	Wet meadows, lake shorelines

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Alaemon alaudipes	Greater Hoopoe-lark	E3.4, I1.1	LC	App. III	–	Literature	Open areas, shrublands, and field tracks
Alauda arvensis	Eurasian Skylark	E3.4, I1.1	LC	App. III	–	Literature	Open areas, shrublands, and field tracks
Athene noctua	Little Owl	E3.4, I1.1	LC	App. II	–	Literature	Open areas, shrublands, and field tracks
Circus cyaneus	Hen Harrier	E3.4, I1.1	LC	App. III	–	Literature	All habitats without Wetlands
Circus pygarcus	Montagu's Harrier	E3.4, I1.1	LC	App. III	–	Literature	All habitats without Wetlands
Emberiza schoeniclus	Reed Bunting	E3.4, I1.1	LC	App. II	–	Literature	Open areas, shrublands, and field tracks
Garrulus glandarius	Eurasian Jay	E3.4, I1.1	LC		–	Observed	Open areas, shrublands, and field tracks
Miliaria calandra	Corn Bunting	E3.4, I1.1	LC	App. III	–	Literature	Open areas, shrublands, and field tracks
Sylvia atricapilla	Blackcap	E3.4, I1.1	LC	App. III	–	Observed	Open areas, shrublands, and field tracks

Photograph III. 12. Ardea cinerea (Grey Heron)

PhotographPhotograph III. 13. Circaetus gallicus (Short-toed Snake Eagle)

Photograph III. 14. Plegadis falcinellus (Glossy Ibis)

PhotographPhotograph III. 15. Podiceps cristatus (Great Crested Grebe)

III.4.4. Mammals

Considering field surveys and literature records, the presence of small- and medium-sized mammals was confirmed within the project area. During the fieldworks, *Lepus europaeus* (European Hare) and *Vulpes vulpes* (Red Fox) were identified through tracks and scat records. In addition, rodent fauna was represented in agricultural fields and shrubland habitats by species such as *Microtus* spp. (Field Voles) and *Meriones meridianus* (Midday Jird) (Table III.6).

Table III. 6. Mammal species observed in the study area and those potentially recorded from literature sources

Species Name	English Name	EUNIS	IUCN 2025 Ver.1	Bern	Uzbekistan Red Data Book	Observation Status	Habitat Note
Ellobius tancrei	Transcaspian mole vole	I1.1	LC	Ek III	-	Literature	Agricultural field surroundings
Ondatra zibethicus	Muskrat	I1.1, E3.4	LC		-	Literature	Agricultural fields and open areas
Canis aureus	Golden Jackal	I1.1, E3.4	LC	Ek III	–	Literature	Open areas, grasslands, village edges
Sus scrofa	Wild Boar	E3.4, I1.1			-	Literature	
Erinaceus concolor	Southern White-breasted Hedgehog	I1.1, J1.1	LC	Ek III	NT	Literature	Gardens, field margins
Hemiechinus auritus	Long-eared hedgehog	I1.1, E3.4	LC	Ek III	VU	Literature	Open steppe, agricultural lands
Lepus europaeus	European hare	I1.1, E3.4	LC	Ek III	–	Tracks + scat	Open agricultural land, grassland
Meriones meridianus	Midday jird	I1.1, E3.4	LC	–	–	Literature	Steppe habitats
Microtus arvalis	Common vole	I1.1, E3.4	LC	–	VU	Literature	Agricultural fields, grassland habitats
Mustela eversmanii	Steppe polecat	I1.1, E3.4	LC	Ek III	+	Literature	Grassland–agricultural ecotones
Myotis myotis	Greater mouse-eared bat	J1.1	LC	Ek II	NT	Literature	Wooded areas, village edges

Pipistrellus kuhlii	Kuhl's pipistrelle	J1.1, I1.1, E3.4	LC	Ek II	–	Literature	Settlements, agricultural habitats
Pipistrellus pipistrellus	Common pipistrelle	J1.1, I1.1, E3.4	LC	Ek II	–	Literature	Settlements, agricultural habitats
Rhinolophus ferrumequinum	Greater horseshoe bat	J1.1	LC	Ek II	VU	Literature	Buildings, caves, wooded areas
Eptesicus serotinus	Serotine bat	E3.4, I.1,1, J1,1	LC	Ek II		Literature	Buildings, caves, wooded areas
Nyctalus noctula	Common noctule	E3.4, I.1,1, J1,1	LC	Ek II		Literature	Buildings, caves, wooded areas
Plecotus auritus	Brown long-eared bat	E3.4, I.1,1, J1,1	LC	Ek II	NT	Literature	Buildings, caves, wooded areas
Spermophilus fulvus	Yellow ground squirrel	I1.1, E3.4	LC	–	VU	Literature	Open agricultural land, grassland
Vulpes vulpes	Red Fox	I1.1, E3.4, J1.1	LC	Ek III	–	Tracks + scat	Field margins, shrublands

According to literature sources and ESIA reports, species such as *Erinaceus concolor* (Southern White-breasted Hedgehog), *Canis aureus* (Golden Jackal), and *Myotis myotis* (Greater Mouse-eared Bat) are also likely to occur in the region (PhotographPhotographs III.16 ve III.17).

From an ecological perspective:

- **Rodents** → Represent a fundamental component of the food chain,
- **European Hare and Red Fox** → Key elements of prey–predator dynamics,
- **Bat species** → Play a critical role in regulating insect populations.

Examination of the PhotographPhotographs obtained from the camera traps set up at four different points as part of the project's fauna monitoring studies revealed that Vulpes vulpes individuals were active at Camera Trap-2, both during the day and night.

Photograph III. 16. Vulpes vulpes (Red Fox)

PhotographPhotograph III. 17. Vulpes vulpes (Red Fox)

Camera trapping was carried out for a period of 10 consecutive days within the project site and the adjacent ecotone zones in order to assess the presence and activity of carnivores. During this survey, two individuals of *Vulpes vulpes* were recorded by camera trap No. 2. The limited number of detections, despite systematic monitoring across both the core area and transition habitats, suggests that carnivore activity within the project area and its immediate surroundings is relatively low. This low level of activity may reflect restricted habitat suitability, reduced prey availability, or avoidance behavior in response to anthropogenic disturbance.

III.5. RESULTS

Field surveys conducted in and around the project site (August and September 2025), combined with literature-supported species records, indicate that the terrestrial vertebrate fauna of the region comprises amphibians, reptiles, birds, and mammals. Habitat diversity (reservoir, irrigation canals, small natural streams, wet meadows, agricultural lands, and settlement ecotones) is identified as the primary factor supporting this species richness.

Amphibians: During the surveys, *Pelophylax ridibundus* and *Bufotes viridis* were directly observed, while literature data suggest that *Hyla orientalis* may also occur in the region. These species are listed as LC (Least Concern) on the IUCN Red List; however, habitat desiccation and agricultural chemical use represent the main threats.

Reptiles: *Ablepharus deserti* was recorded during field observations. Based on literature and regional distribution, species such as *Testudo graeca*, *Lacerta trilineata*, *Ophisops elegans*, *Stellagama stellio*, *Natrix natrix*, and *Dolichophis caspius* are also likely to occur. Notably, *Testudo graeca* is classified as VU (Vulnerable) by the IUCN and is protected under Annex II

of the Bern Convention, indicating the sensitivity of the project area in terms of reptiles.

Birds: Field and literature data combined confirm the presence of more than 40 bird species. The majority are assessed as LC by the IUCN; however, *Vanellus vanellus* (Northern Lapwing) is categorized as NT (Near Threatened) and demonstrates regional sensitivity. Wetland birds (ducks, herons, grebes, gulls) are protected under Annex II/III of the Bern Convention and emphasize the ecological function of the reservoir.

Mammals: *Lepus europaeus* and *Vulpes vulpes* were directly identified during surveys. Rodents (*Microtus arvalis*, *Meriones meridianus*), insectivores (*Erinaceus concolor*, *Hemiechinus auritus*), and carnivores (*Canis aureus*, *Mustela eversmanii*) are supported by literature and national records. Bat fauna includes *Myotis myotis*, *Pipistrellus kuhlii*, and *Rhinolophus ferrumequinum*. The Uzbekistan Red Data Book lists *Hemiechinus auritus*, *Spermophilus fulvus*, *Mustela eversmanii*, and *Rhinolophus ferrumequinum* as nationally protected species.

Overall: According to IFC PS6 criteria, no species triggering Critical Habitat (CHA) were identified within the project site. Nevertheless, the presence of VU and NT species, the conservation importance of wetland birds under the Bern Convention, and mammal species listed in the Uzbekistan Red Data Book highlight the necessity of implementing species- and habitat-specific protection measures throughout project activities.

III.6. MITIGATION MEASURES

The fauna recorded in the project area (amphibians, reptiles, birds, and mammals) largely consists of species categorized as Least Concern (LC). However, the presence of species listed under Annex II–III of the Bern Convention, those assessed as Vulnerable (VU) (*Testudo graeca*) and Near Threatened (NT) (*Vanellus vanellus*) by the IUCN, as well as certain mammals registered in the National Red Data Book, necessitates the implementation of conservation measures at both habitat and species levels.

Karasal omurgalı türlerine ilişkin önlemler Table III.7 - III.10'da verilmiştir.

III.6.1. Mitigation Measures for the Construction Phase

Table III. 7. General Mitigation Measures

Impact Area	Risk/Threat	Mitigation Measure
Habitat loss/fragmentation	Degradation of wetlands and meadows	Project area will be restricted; a minimum 100 m buffer zone will be left around wetlands
Fauna movement	Entry of species into the site	Temporary fences will be installed; sloped exits will be left in open excavations
Pollution (dust, chemicals)	Dust emissions, pesticide risk	Dust will be reduced through regular watering; use of pesticides and chemicals will not be allowed
Noise	Disturbance to species	Noise levels will not exceed 55 dB during the day and 45 dB at night; the use of heavy machinery will be restricted during the breeding season (April–July).
Monitoring & reporting	Ineffectiveness of measures	Fauna monitoring and reporting will be carried out at least once a year

Table III. 8. Mitigation Measures for Amphibians and Reptiles

Taxon Group	Risk/Threat	Mitigation Measure
Amphibians	Habitat desiccation, water pollution	Wetland survey will be conducted prior to construction; water resources will be protected during works
Amphibians	Risk of crushing	Temporary embankments and barriers will be installed in the project area
Reptiles	Crushing of slow-moving species (e.g., *Testudo graeca*)	Individuals will be relocated to safe areas under the supervision of a biologist before construction

Reptiles	Habitat fragmentation	Habitat continuity will be maintained along field margins and rocky areas

Table III. 9. Mitigation Measures for Birds

Taxon Group	Risk/Threat	Mitigation Measure
All birds	Damage to nests (April–July breeding season)	Nest surveys will be conducted during the breeding season; if active nests are found, work will be halted
Wetland birds	Loss of feeding grounds	Buffer zones will be applied around the reservoir and wet meadows
Waterbirds	Disturbance (noise, human pressure)	Noise levels will be kept low; heavy machinery will be restricted during the breeding season

Table III. 10. Mitigation Measures for Mammals

Taxon Group	Risk/Threat	Mitigation Measure
Small/medium-sized mammals	Habitat fragmentation, risk of crushing	Pre-construction survey; sloped exits will be provided in open excavations
Predators (*Vulpes vulpes, Canis aureus*)	Disruption of movement corridors	Monitoring with camera traps; migration routes will be preserved
Bat species	Light pollution, decline of insect populations	Lighting will be restricted near agricultural and riparian areas; pesticide use will be reduced

General mammal fauna	Lack of monitoring	Camera trap data will be included in the report to ensure continued fauna monitoring

III.6.2. Mitigation Measures for the Operation Phase

Wetland Management: The water level of the reservoir should be maintained in ecological balance; sudden drawdowns and habitat desiccation must be avoided.

Ecotone Zone Management: Ecological corridors between agricultural lands and wetland habitats must be maintained to ensure continuity.

Prey–Predator Balance: The habitat use of predatory mammals such as *Vulpes vulpes* and *Canis aureus* should be monitored; population balance must not be disrupted.

Bat Foraging Areas: Foraging grounds of insectivorous bats in agricultural areas and along water bodies should be preserved; lighting in these areas must be restricted.

Long-term Monitoring: An annual fauna monitoring program (amphibian surveys, reptile, bird point-counts, mammal camera trapping) should be implemented.

III.6.3. Monitoring and Reporting

The effectiveness of all mitigation measures should be assessed through biological monitoring carried out at least twice a year, and the results should be reported to the competent authorities. For this reason, monitoring must be conducted in spring 2026. Based on the monitoring results, additional conservation measures should be developed if necessary.

III.7. CRİTİCAL HABİTAT ASSESSMENT (CHA)

III.7.1. Compliance with IFC PS6 Criteria

Within the framework of IFC Performance Standard 6, the critical habitat assessment determines the importance of the project area at the global, regional, or national scale with respect to threatened species, endemic species, migration routes, and ecosystem services.

Critical Habitat (CHA):

At the global scale, no species classified as CR (Critically Endangered) or EN (Endangered) under the IUCN Red List were identified within the project site. Although *Testudo graeca* (VU) and *Vanellus vanellus* (NT) are of conservation concern, their presence alone is not sufficient to trigger a Critical Habitat designation. Therefore, according to IFC PS6, the project site does not qualify as Critical Habitat Table III.11).

Priority Biodiversity Features (PBF):

Despite not meeting CHA thresholds, the site supports elements that fall under Priority Biodiversity Features (PBF):

- Species listed as VU and NT (*Testudo graeca, Vanellus vanellus*),
- Species included in the Uzbekistan National Red Data Book (*Hemiechinus auritus, Spermophilus fulvus, Mustela eversmanii, Rhinolophus ferrumequinum*),
- Reservoir and wet meadows functioning as foraging and stopover areas for waterbirds,
- Ecosystem services such as insect regulation by amphibians and bats.

Table III. 11. Assessment of the Project Area According to CHA Criteria

IFC PS6 Criterion	Findings	Assessment
Presence of CR or EN species	No	Critical Habitat not triggered
Presence of VU or NT species	*Testudo graeca* (VU), *Vanellus vanellus* (NT)	Regional sensitivity present
National Red Data Book species	*Hemiechinus auritus*, *Spermophilus fulvus*, *Mustela eversmanii*, *Rhinolophus ferrumequinum*	Priority Biodiversity Feature
Migratory species / assemblages	Waterbirds (*Anas platyrhynchos*, *Fulica atra*, *Ardea cinerea*)	Reservoir serves as foraging and stopover habitat for wetland birds
Ecosystem services (water regime, biological control)	Amphibians (insect control), bats (pressure on agricultural pests)	Priority Biodiversity Feature

In summary, while the project site does not trigger Critical Habitat under IFC PS6, it does qualify as Priority Biodiversity Features. This requires the adoption of species- and habitat-specific conservation and monitoring measures throughout the project lifecycle.

III.7.2. Priority Biodiversity Features

Within the framework of IFC Performance Standard 6, although the project area does not trigger Critical Habitat criteria, several species and habitat components are assessed under Priority Biodiversity Features. These elements are not globally threatened but hold ecological importance at the regional and national scale.

Field surveys and literature records from the project area and its surroundings particularly highlight:

- Reservoirs and wet meadows as important foraging and stopover habitats for wetland birds (*Ardea cinerea*, *Fulica atra*, *Anas platyrhynchos*),
- The ecological functionality of aquatic habitats for amphibians (*Pelophylax ridibundus*, *Bufotes viridis*),
- Habitat continuity for reptiles, especially *Testudo graeca* (VU, Bern Appendix II),
- The national significance of mammal species listed in the Uzbekistan Red Data Book (*Hemiechinus auritus*, *Spermophilus fulvus*, *Mustela eversmanii*, *Rhinolophus ferrumequinum*).

Accordingly, the project area is considered to fall within the category of Priority Biodiversity Features. Within this scope, maintaining habitat integrity, sustaining wetland functions, monitoring nationally protected species, and safeguarding regional ecological balances should be regarded as key management objectives throughout the project. (Table III.12).

Table III. 12. Recommended Measures for Priority Biodiversity Features

Risk / Sensitivity Area	Species / Habitat	Recommended Measures
Wetland birds (*Anas platyrhynchos*, *Fulica atra*, *Ardea cinerea*)	Reservoir and wet meadows	Buffer zones exist around the reservoir between the project water intake unit and the waterfront. Heavy activity should be avoided in these areas during breeding/migration periods. Bird monitoring (point counts, transects) should be conducted at least twice a year by the project environmental unit.
Amphibians (*Pelophylax ridibundus*, *Bufotes viridis*)	Irrigation canals, stream banks, meadows	- Regular monitoring of water quality within the project area. - Restrict pesticide/chemical use. - Protect moist habitats.
Reptiles (*Testudo graeca* – VU)	Grasslands, field margins	- Pre-construction species survey under the supervision of a biologist. - Relocate individuals to safe areas. - Maintain habitat connectivity.
Mammals (*Hemiechinus auritus*, *Spermophilus fulvus*, *Mustela eversmanii*, *Rhinolophus ferrumequinum*)	Field margins, steppe habitats, cave/settlement ecotones	- Monitor populations with camera traps. - Limit light pollution. - Preserve the natural predator–prey balance of rodents.
Ecosystem services	Insect control (bats & amphibians), prey–predator balance	- Promote biological control in agriculture. - Minimize pesticide use. - Preserve bat flight corridors.

III.7.3. Protected Areas and Features in the Vicinity of the Project Site

Important Bird Areas (IBA) and Key Biodiversity Areas (KBA) within a 3 km radius of the project site were reviewed. The assessment revealed that the closest protected area to the project site is Tuzkan Lake (Tuzkon Lake), located in the Jizzakh region, approximately 36 km north of the project site in a straight line. It is recognized as an Important Bird Area (IBA) within the Aydar-Arnasay Lake System. The site is particularly significant as a wetland habitat along migratory routes, serving as a stopover and breeding ground for many waterbird species (Figure III.5).

Another protected area is Dzhum-Dzhum, located approximately 25 km southeast of the project site (BirdLife, 2025).

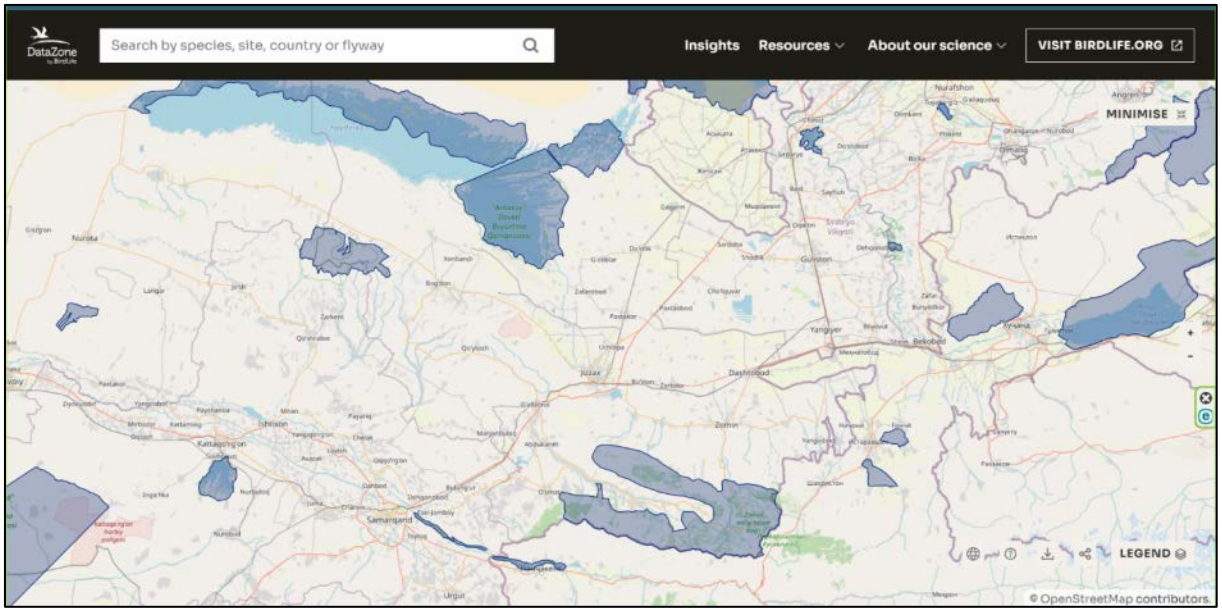


Figure III. 4. IBA and KBA in the Vicinity of the Project Site

Considering the distance between the project site and the protected areas and given that the status of these areas is designated as IBA and KBA, bird species constitute the primary conservation value. However, taking into account the distance of the project site from these two areas and the scale of project activities, no significant risk is anticipated for bird species, which represent the main conservation concern.

III.8. ECOSYSTEM SERVİCES

According to IFC PS6, ecosystem services are the direct and indirect benefits provided by natural ecosystems to human communities. The project site is surrounded by reservoirs, irrigation canals, natural streams, wet meadows, and agricultural lands, all of which provide important ecosystem services for local communities.

Provisioning Services:

Reservoirs and streams provide water resources for irrigation and livestock.

Agricultural lands are of critical importance for food and crop production for local communities.

Although limited, the reservoir ecosystem offers potential for fisheries.

Regulating Services:

Amphibians (*Pelophylax ridibundus*, *Bufotes viridis*) and bats (*Myotis myotis*, *Pipistrellus kuhlii*) contribute to the natural regulation of insect populations, helping to reduce agricultural pests.

Wetlands regulate water quality through water retention and filtration.

Vegetation (grasslands, reedbeds) reduces soil erosion and supports land stability.

Supporting Services:

Wet meadows and agro-ecotones provide foraging and stopover sites for numerous bird species.

Grassland and field habitats serve as feeding and breeding grounds for mammals and reptiles.

Aquatic ecosystems enrich insect fauna, forming the basis of the food chain for terrestrial vertebrates.

The project site, in addition to supporting species and habitats identified as Priority Biodiversity Features under IFC PS6, also delivers ecosystem services that directly affect the quality of life of local communities. Therefore, the conservation and monitoring of ecosystem services during the project is critical not only for biodiversity but also for the sustainability of local socio-economic benefits.

III.9. CONCLUSIONS AND RECOMMENDATIONS

Based on the field surveys and literature data collected in and around the project area, the region's fauna diversity includes amphibians, reptiles, birds, and mammals. The mosaic of habitats formed by the reservoir, wet meadows, agricultural lands, and small streams/canals constitutes the main factor supporting this species richness.

Findings:

Among amphibians, *Bufotes viridis* was recorded; among reptiles, *Ablepharus deserti* was observed during field surveys. Sensitive species such as *Testudo graeca* were additionally supported by literature records.

The bird fauna is represented by more than 30 species; wetland birds in particular have ecological significance within the reservoir ecosystem. *Vanellus vanellus* (NT) shows regional sensitivity.

Among mammals, *Lepus europaeus* and *Vulpes vulpes* were directly confirmed in the field. Species such as *Hemiechinus auritus*, *Spermophilus fulvus*, *Mustela eversmanii*, and *Rhinolophus ferrumequinum* are listed in the National Red Data Book and have a high potential to occur in the area.

IFC PS6 Assessment:

The project area does not trigger Critical Habitat (CHA) criteria.

However, due to the presence of *Testudo graeca* (VU), *Vanellus vanellus* (NT), and mammal species listed in the Red Data Book, the site qualifies as Priority Biodiversity Features (PBF).

This requires the implementation of conservation and monitoring measures throughout the project.

Mitigation and Management Measures:

Conduct fauna surveys prior to and during construction; relocate sensitive species such as *Testudo graeca* to safe areas.

Restrict activities during bird breeding periods; maintain buffer zones around wetlands.

Close open excavations or provide fauna escape ramps.

Minimize pesticide and chemical use; safeguard the ecological role of bats and amphibians in insect control.

Implement an annual fauna monitoring program (amphibians, reptiles, birds, mammals)

throughout the project duration.

Ecosystem Services Perspective:

Reservoirs and wetlands play a critical role as a water source and for agricultural production.

Amphibians and bats provide important regulating services by controlling agricultural pests. Wetland birds and the reservoir ecosystem hold cultural value for local communities in terms of ecotourism, birdwatching, and natural heritage.

In conclusion, although the project site does not trigger Critical Habitat criteria, the presence of Priority Biodiversity Features (PBF) requires the strict implementation of conservation measures. If the mitigation and monitoring programs described above are implemented, project impacts are expected to remain manageable and acceptable at the local scale.

III.10. ANNEX: Vegetation Views of the Project Site and Ecotone Zone

SECTION IV: FLORA STUDIES

IV.1. INSTRUCTION

This document presents the detailed Work Instructions developed to support the Environmental and Social Impact Assessment (ESIA) for the construction of a 550 MW combined-cycle power plant, in alignment with IFC Performance Standard 6.

It provides specific guidance for conducting botanical (flora) surveys, focusing on both terrestrial and riparian vegetation within the project's construction site and its wider area of influence.

The assessment covers natural, semi-natural, and anthropogenically influenced habitats, particularly those located around the Jizzakh reservoir, canal systems, and cultivated landscapes. Special attention was given to the identification of sensitive species and habitats, including those that may trigger critical habitat criteria under IFC Performance Standard 6.

Based on the results of the preliminary field survey conducted in May, a more detailed study was subsequently planned, carried out, and documented.

IV.2. OBJECTIVE

The objective of the flora survey is to collect comprehensive baseline information on terrestrial and riparian plant communities within the project footprint and its area of influence (500 m buffer zone). The study aims to:

- Identify the composition and structure of vegetation types and plant communities,
- Detect the presence of threatened, endemic, or restricted-range plant species listed in the IUCN Red List, the Uzbekistan Red Data Book, or national legislation,
- Classify habitats according to international standards (EUNIS),
- Evaluate habitat condition, connectivity, and conservation value,
- Screen for the presence of sensitive and critical habitats according to IFC Performance Standard 6,
- Provide a scientific basis for long-term biodiversity monitoring and impact mitigation planning.

IV.3. METHODOLOGY

The flora survey will be conducted through a combination of desktop assessments and field investigations using international botanical survey standards, with reference to IFC Performance Standard 6 and EUNIS habitat classification guidelines.

IV.3.1 Site Selection and Timing

- Survey areas encompassed the project construction footprint and a 500 m terrestrial buffer, including natural, semi-natural, and agro-ecosystems (e.g., reservoir edges, canal banks, fallow fields).
- This study was carried out by taking into account the preliminary survey conducted in May 2025 during peak phenological activity. The main surveys were conducted in late summer (e.g., September 2025).
- All habitat types, which had initially been selected based on land cover, topography, and ecological variation, were present in the study area. However, during the site visit, it was observed that the area had long been subject to human impact and construction, and a large portion consisted of cultivated fields. Therefore, the total number of stations was reduced to 15. Particular attention was given to the power transmission line (ST 1-6) and the discharge area (ST 7).

IV.3.2 Survey Methods

Stratified habitat-based walkover surveys were conducted using transects and quadrats (1 × 1 m), and the locations were provided on the Figure **IV.**1 and **IV.**2.

In each quadrat, all vascular plant species were recorded using the Braun-Blanquet cover-abundance scale.

Habitat types were assigned based on the EUNIS classification system.

Observations also included:

- Land use patterns,
- Habitat connectivity,
- Grazing or disturbance,
- Presence of invasive species,
- Evidence of habitat degradation.

IV.3.3 Data Recording

- Species name (scientific),
- Cover-abundance estimate,
- GPS coordinates of quadrat/transect,
- Habitat type and structure,
- Presence of red-listed or protected species,
- Signs of anthropogenic impact.

IV.3.4 Habitat Sensitivity Screening

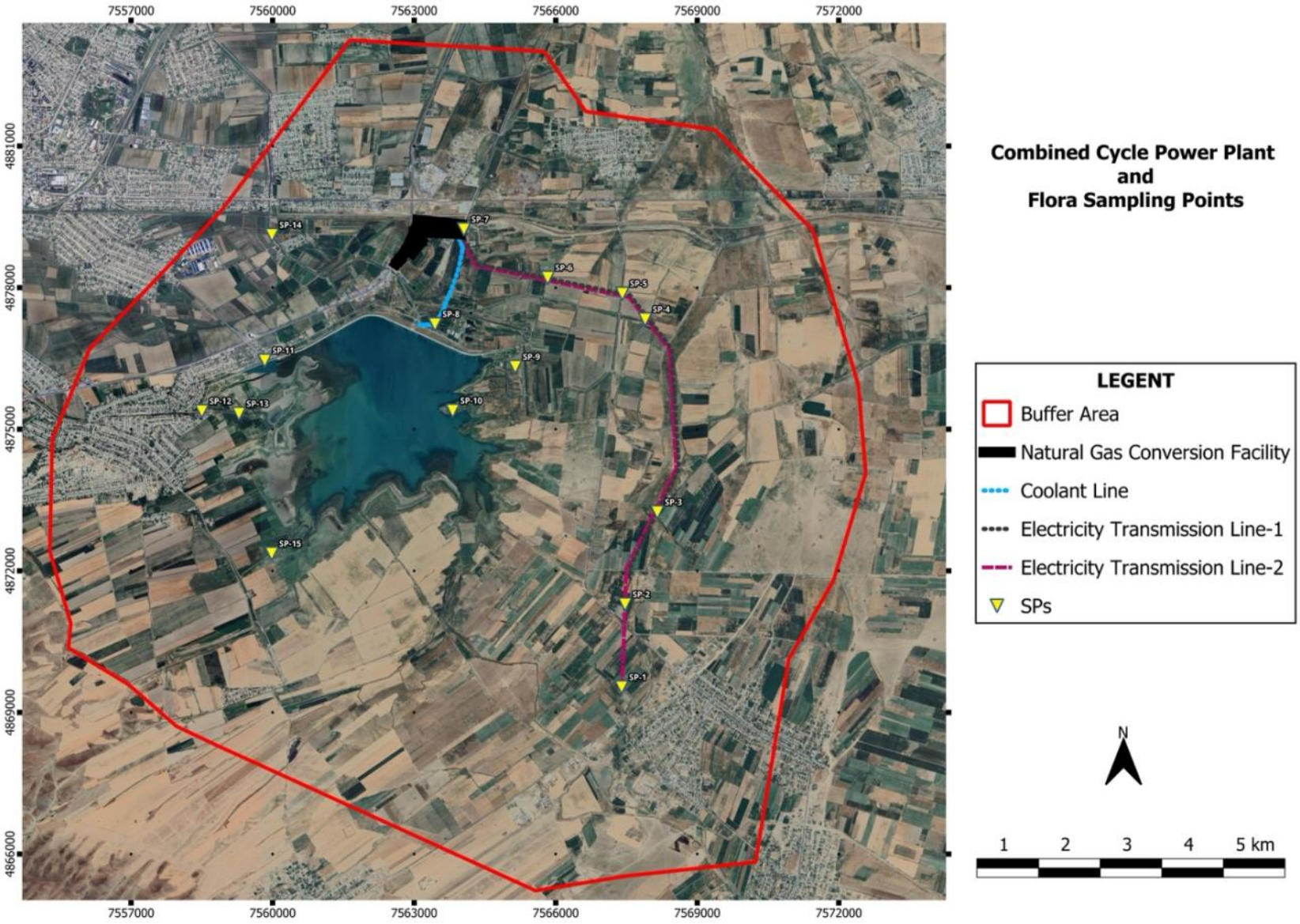
All habitats were assigned for:

- Rarity and integrity,
- Connectivity,
- Degree of modification,

The information and coordinates of the workstations are provided in Table IV.1, and their locations are shown in Figure IV.1. However, the exact location and final number of flora stations will be determined in the field by local experts, considering the purpose of the study, ecological values, physical accessibility, and security conditions of the area.

Table IV. 1. Flora sampling points coordinates

SP	Easting	Northing	SP	Easting	Northing
SP-1	412885	4430998	**SP-9**	411217	4436199
SP-2	412956	4432338	**SP-10**	410193	4435502
SP-3	413497	4433823	**SP-11**	407150	4436350
SP-4	413336	4436943	**SP-12**	406120	4435544
SP-5	412970	4437363	**SP-13**	406722	4435496
SP-6	411761	4437634	**SP-14**	407292	4438378
SP-7	410409	4438432	**SP-15**	407225	4433226
SP-8	409921	4436904			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SP-14
SP-7
SP-6
SP-5
SP-4
SP-8
SP-11
SP-9
SP-12
SP-13
SP-10
SP-3
SP-15
SP-2
SP-1
Combined Cycle Power Plant
and
Flora Sampling Points
LEGENT
Buffer Area
Natural Gas Conversion Facility
Coolant Line
Electricity Transmission Line-1
Electricity Transmission Line-2
SPs
N
1
2
3
4
5 km

Figure IV. 1. Study Area and Distribution of Quadrat Sampling Sites

IV.4. REPORTING

As a result of the flora field surveys, the following observations and data were compiled by the relevant experts:

Location and Physical Characteristics of the Reservoir:

The Jizzakh Reservoir is situated approximately 1.7 km south of the surveyed territory. The reservoir covers an area of 12.7 km^2, with a maximum depth of 26 m and a total water volume of 87.5 million m^3. The widest section of the reservoir extends to 5.1 km. Water is primarily collected from the Sangzor River, with an inflow rate of approximately 10 m^3/sec.

Irrigation and Water Use:

The reservoir provides irrigation water to over 15,000 hectares of agricultural land in the Jizzakh region. During the irrigation season, water from the reservoir is returned to the irrigation canals through the drainage system.

Land Use and Local Activities:

The population around the reservoir engages in various activities, including grazing (primarily horse breeding), apiculture, and crop cultivation. Commonly grown crops include corn, wheat, alfalfa, and melon. The largest local farmer manages 40 hectares of leased land, of which 30 hectares are designated for horse grazing, 5 hectares for wheat, and 5 hectares for alfalfa. This reservoir is a closed-to-public facility, and fishing, swimming, recreational activities, and grazing on the coastal territory are not permitted.

Vegetation Assessment:

Field surveys indicated that the **total vegetation coverage across all quadrats was 100%.** A total of **80 plant species** were identified on the site, comprising (Table IV.2):

- **66 wild species**
- **14 cultivated species**
- **14 weed species**

No **endemic or rare species** listed in the **national or international Red Book** were recorded. The surveyed area is **not a designated protected area** and has experienced significant development and human intervention. Among the surveyed zones, only the **western coastal zone (SP15)** retains characteristics of a **natural habitat.** This zone is

primarily used for **livestock grazing,** particularly horses. Notably, this area does **not appear to be directly impacted by the proposed facility.**

Table IV. 2. List of plant species

	Species Name	Family	English name	Conservation status	
1	*Amaranthus blitoides* S.Watson	Amaranthaceae	mat amaranth	LC	weed
2	*Amaranthus retroflexus* L.	Amaranthaceae	Redroot amaranth	LC	weed
3	*Echinophora sibthorpiana* Guss.	Apiaceae	Tarhana herb	LC	-
4	*Apocynum venetum* L.	Apocynaceae	sword-leaf dogbane	-	
5	*Artemisia subsalsa* Filatova	Asteraceae	wormwood	-	
6	*Artemisia annua* L.	Asteraceae	sweet wormwood	-	
7	Erigeron canadensis L.	Asteraceae	horseweed	LC	
8	*Karelinia caspia* (Pall.) Less.	Asteraceae	wild lettuce	LC	
9	*Xanthium strumarium* L.	Asteraceae	rough cocklebur,	LC	weed
10	*Xanthium spinosum* L.	Asteraceae	spiny cocklebur	LC	weed
11	*Cichorium intybus* L.	Asteraceae	Chicory	LC	
12	*Acroptilon repens* (L.) Hidalgo	Asteraceae	Russian knapweed	LC	
13	*Cirsium vulgare* (Savi) Ten.	Asteraceae	spear thistle	LC	weed
14	*Lactuca serriola* L.	Asteraceae	prickly lettuce	LC	weed
15	*Eclipta prostrata* (L.) L.	Asteraceae	false daisy	LC	
16	*Filago pyramidata* L.	Asteraceae	broadleaf cottonrose	LC	
17	*Asperugo procumbens* L.	Boraginaceae	German madwort	LC	
18	*Heliotropium europeum* L.	Boraginaceae	European turn-sole	LC	weed
19	*Descurainia sophia* (L.) Webb ex Prantl	Brassicaceae	flixweed	LC	
20	*Lepidium draba* L.	Brassicaceae	whitetop	LC	

	Species Name	Family	English name	Conservation status	
21	*Butomus umbellatus* L.	Butomaceae	flowering rush		
22	*Capparis spinosa* L.	Capparaceae	caper bush,	LC	
23	*Atriplex micrantha* Kar. & Kir.	Chenopodiaceae	small-fruited quinoa	LC	weed
24	*Halogeton glomeratus* (M.Bieb.) Ledeb.	Chenopodiaceae	saltlover		
25	*Salsola tragus* L.	Chenopodiaceae	common saltwort.		
26	*Convolvulus arvensis* L.	Convolvulaceae	field bindweed	LC	Weed
27	*Cuscuta campestris* Yunck.	Cuscutaceae	dodder	LC	parasit
28	*Schoenoplectus tabernaemontani (C.C.Gmel.) Palla*	Cyperaceae	softstem bulrush	LC	
29	*Cyperus rotundus* L.	Cyperaceae	nut grass,	LC	
30	*Elaeagnus angustifolia* L.	Elaeagnaceae	wild olive	-	
31	*Alhagi pseudalhagi* (M.Bieb.) Desv. Ex Wangerin	Fabaceae	false camel thorn, amber	LC	
32	*Sophora pachycarpa* Schrenk ex C.A.Mey.	Fabaceae	Siberian Pachycarpa	LC	
33	*Mentha longifolia* (L.) Huds.	Lamiaceae	horse mint	LC	
34	*Abutilon theophrasti* Medik.	Malvaceae	Velvetleaf	-	weed
35	*Malva neglecta* Wallr.	Malvaceae	buttonweed	LC	weed
36	*Dodartia orientalis* L.	Mazaceae	*Dodartia*	-	
37	*Fraxinus angustifolia* Vahl	Oleaceae	Ash	-	
38	*Epilobium hirsutum* L.	Onagraceae	great willowherb	-	
39	*Limonium otolepis* (Schrenk) Kuntze	Plumbaginaceae	ear-leaved limonium	-	

	Species Name	Family	English name	Conservation status	
40	*Phragmites australis* (Cav.) Trin. ex Steud.	Poaceae	common reed	LC	
41	*Cynodon dactylon* (L.) Pers.	Poaceae	couch grass, aeluropus	LC	
42	*Bromus tectorum* L.	Poaceae	downy brome	LC	
43	*Aeluropus littoralis* Gouan) Parl.	Poaceae		LC	
44	*Bromus scoparius* L.	Poaceae	paniculate brome	LC	
45	*Festuca ambigua* Le Gall	Poaceae		LC	
46	*Hordeum murinum* L.	Poaceae	wall barley	LC	
47	*Lolium arundinaceum (Schreb.) Darbysh.*	Poaceae	tall fescue	LC	
48	*Polypogon fugax (L.) Desf.*	Poaceae	beard grass	LC	
49	*Rumex dentatus* L.	polygonaceae	Aegean dock	LC	
50	*Persicaria amphibia* (L.) Delarbre	Polygonaceae	water knotweed	LC	
51	*Polygonum arenarium* Waldst. & Kit.	polygonaceae	common knotweed	LC	
52	*Portulaca oleracea* L.	Portulacaceae	little hogweed,	LC	weed
53	*Rosa canina* L.	Rosaceae	dog rose	LC	
54	*Galium spurium* L.	Rubiaceae	false galium	-	
55	*Galium tenuissimum* M.Bieb.	Rubiaceae	very slender bedstraw	-	
56	*Populus nigra* L.	Salicaceae	black poplar	LC	
57	*Solanum nigrum* L.	Solanaceae	black nightshade	-	weed
58	*Datura stramonium* L.	Solanaceae	thornapple	LC	
59	*Tamarix elongata* Ledeb.	Tamaricaceae	elongated tamarisk	-	
60	*Tamarix hohenackeri* Bunge	Tamaricaceae	Hohenacker's tamarisk	-	

	Species Name	Family	English name	Conservation status	
61	*Tamarix ramosissima* Ledeb.	Tamaricaceae	saltcedar	-	
62	*Typha latifolia* L.	Typhaceae	common bulrush	LC	
63	*Ulmus minor* Mill.	Ulmaceae	field elm	-	
64	*Verbena officinalis* L.	Verbenaceae	common vervain	LC	
65	*Peganum harmala* L.	Zygophyllaceae	wild rue	LC	
66	*Tribulus terrestris* L.	Zygophyllaceae	noxious weed	LC	invasive

The study area comprises **four distinct habitat types** (Figure IV.2):

- **J5.3 – Highly artificial non-saline standing waters**
- **J1.1 – Residential buildings of city and town centres**
- **E3.4 – Moist or wet eutrophic and mesotrophic grassland**
- **I1.1 – Intensive unmixed crops**

These habitat types were assigned following the **EUNIS classification system** to support ecological assessment and vegetation surveys.

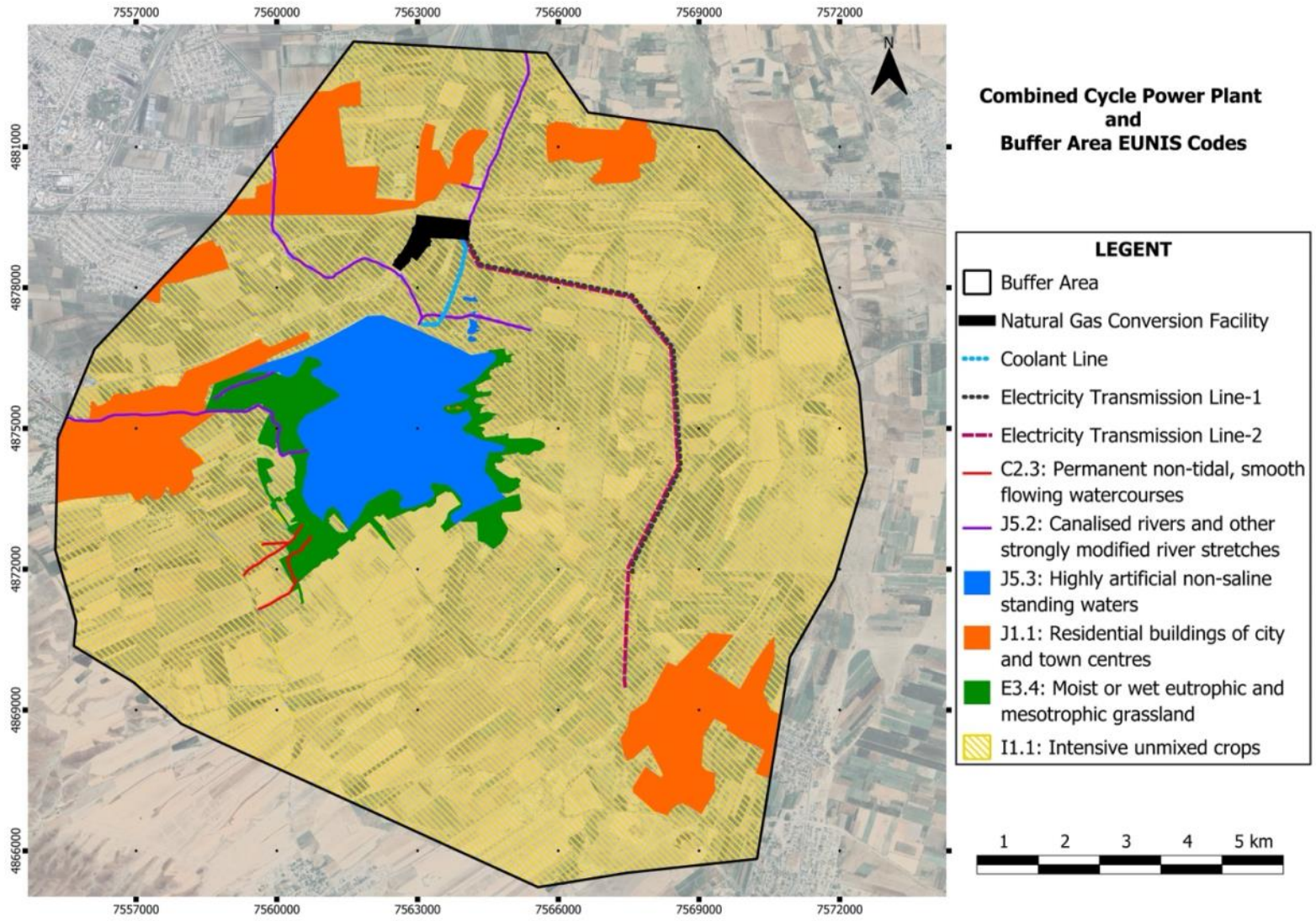

Figure IV. 2. Habitat types based on EUNIS classification system

I1.1 – Intensive unmixed crops

Around the Jizzakh Reservoir encompass a mosaic of land use types, ranging from cultivated fields to disturbed and abandoned natural areas. As shown in the Figure IV.2, a large proportion of the study area is occupied by the I1.1 – Intensive Unmixed Crops habitat. Cultivated plots in the area show a clear planting sequence, with alfalfa, maize, and wheat arranged from front to back. These areas are actively managed and provide limited habitat for wildlife (Table IV.3).

Since the majority of the study area corresponds to cultivated land, the Braun-Blanquet cover-abundance method was considered less informative for these fields. Therefore, crop types were recorded directly rather than estimating vegetation cover. In contrast, plant density and composition were assessed in the natural habitat areas.

In the study area, weeds were observed mainly between crop fields, along field edges, in uncultivated plots, and along roadsides. The dominant species include *Alhagi pseudalhagi* as well as other weeds such as *Amaranthus retroflexus*, *Cynodon dactylon*, *Atriplex micrantha*, *Heliotropium europeum*, and some fresh or dried Poaceae species.

These observations were recorded in SP1, SP2, SP3, SP4, SP5, SP6, SP8, SP9, SP11, and SP13. Especially SP1–SP6 stations were located along the facility's electric transmission line (Photograph IV.1), and all these quadrats were situated within cultivated fields. Photographs of all study quadrats are available, clearly indicating the type of crop present in each plot (Photographs IV.2 ve IV.3)

Table IV. 3. Cultivated plant list in survey area

	Species name	English name
1	*Gossypium hirsutum*	Cotton
2	*Solanum melongena*	Eggplant / Aubergine
3	*Capsicum annuum*	Pepper / Chili pepper
4	*Zea mays*	Maize / Corn
5	Triticum aestivum	Wheat
6	*Solanum lycopersicum*	Tomato
7	*Phaseolus vulgaris*	Common bean
8	Medicago sativa	Alfalfa / Lucerne
9	*Citrullus lanatus*	Watermelon
10	*Cucumis melo*	Melon
11	*Vitis vinifera*	Grape
12	*Ziziphus jujuba*	Juiube
13	*Cydonia oblonga*	Quince
14	*Malus domestica*	Apple

E3.4 – Moist or wet eutrophic and mesotrophic grassland

This area was classified into two main groups: (i) the coastal zone of the Jizzakh reservoir, and (ii) the canal system close to the project site, occasionally distributed near cultivated fields.

i- The coastal area of the Jizzakh reservoir

A thin line around the Jizzakh Reservoir and especially the west and southwest coastal areas of the Jizzakh Reservoir encompasses disturbed and abandoned natural areas. These areas are actively managed and provide limited habitat for wildlife.

The association of grain-amber-comb (*Tamarix elongata, T. hohenackeri, T. ramosissima, Alhagi pseudalhagi*, *Hordeum murinum ssp. leporinum*) on meadow saline soil.

The SP10 station contains 14 species along with other small aquatic plants growing in shallow water zones, offering habitat for invertebrates and other aquatic organisms besides plants. In contrast, the SP15 station represents a larger area with more than 17 species, primarily used for grazing by horses and other livestock. Being the farthest from the facility and other human infrastructure, this station remains the least affected by anthropogenic activities and retains elements of natural vegetation, including patches of Poaceae, Cyperaceae, and other native herbaceous species (Figure **IV.1**4 and **IV.**5, Table **IV.**4).

ii- Canal system near the project site.

Adjacent to the facility, including the discharge area (SP7), vegetation is generally sparse, dominated by members of Poaceae and Cyperaceae, with scattered plants such as *Typha latifolia, Phragmites australis, haloxylon* species and *Alhagi pseudalhagi* and various other weed species. Similarly, the canal banks near residential areas exhibit disturbed vegetation due to human activity, yet still support grasses, sedges, and small herbaceous plants. This area corresponds to EUNIS habitat type J1.1 – Residential buildings of city and town centres. Only a small amount of common aquatic vegetation is present along the canal margins.

Vegetation along the canal system such as (SP 12, 14), particularly near *Tamarix* shrubs, is dominated by a mixture of common reed and grasses, including *Phragmites australis*, *Hordeum murinum* ssp. *leporinum*, *Bromus* sp., *Karelinia caspia*, and *Artemisia* species. These species are typically found in close proximity to the canal margins, with other weed species occupying the space between the canal and adjacent cultivated fields. Overall, the canal system supports a mix of reed, grass, and herbaceous species, forming

a transitional habitat between aquatic zones and arable land, with moderate anthropogenic impact (Table IV.4, Photograph **IV.**4- **IV.**7).

There are no endemics or rare species listed in the national or international Red Book. The vegetation condition is moderately degraded.

The projective cover in these areas is substantial, indicating a well-established herbaceous layer, although the vegetation shows signs of moderate disturbance due to proximity to agricultural activity and human infrastructure. According to the EUNIS Habitat Classification Scheme, these areas fall under type V – Vegetated man-made habitats, specifically subtype V39 – Mesic perennial anthropogenic herbaceous vegetation. No endemic or Red Book-listed species were observed in the canal margins.

Overall, the study area illustrates a gradient of anthropogenic impact, from intensively cultivated and managed fields near the facility and residential zones, to relatively undisturbed grazing lands, providing a variety of habitats that support both terrestrial and aquatic plant species.

SP1: Cultivated area (wheat), Total vegetation coverage %100 	SP2: Cultivated area (corn), Total vegetation coverage %100 
SP3: Cultivated area (melon), Total vegetation coverage %100 	SP4: Cultivated area (wheat), Total vegetation coverage %100 
SP5: Cultivated area (Wheat), Total vegetation coverage %100	SP6: Cultivated area (Apple garden), Total vegetation coverage %100

Photograph IV. 1. Photographs of all surveyed quadrats and total vegetation cover_1

SP7 The area next to the facility, including the discharge area close to canal system, Total vegetation coverage %100 	SP8: Cultivated area (corn and alfalfa), Total vegetation coverage %100 
SP9: Cultivated area (corn), Total vegetation coverage %100	SP10 The coastal area of the Jizzakh Reservoir, Total vegetation coverage %100

SP11: Cultivated area (Cotton), Total vegetation coverage %100

SP12 Disturbed and abandoned natural area in north west saide, Total vegetation coverage %100

Photograph IV. 2. Photographs of all surveyed quadrats and total vegetation cover_2

SP13 Close to canal system, Total vegetation coverage %100

SP14, Close to canal system and residential area. Total vegetation coverage %100

SP15 The coastal area of the Jizzakh

Reservoir, Total vegetation coverage %100 	

Photograph IV. 3. Photographs of all surveyed quadrats and total vegetation cover_3

Sucul habitat:

Photograph IV. 4. The bank area of the Djizzakh reservoir, Persicaria amphibia population (SP 10)

Photograph IV. 5. The west and southwest coastal areas of the DJizzakh Reservoir are generally covered with members of Poaceae and Cyperaceae, along with Alhagi pseudalhagi and various other weed species (SP15)

Photograph IV. 6. Canal system in survey area.

Photograph IV. 7. In the Photograph, alfalfa, corn, and wheat are visible from front to back, and the area has been cultivated.

Table IV. 4. Plant species list and abundance based on the Braun-Blanquet method in natural habitats

SP12	Abundance	SP13	Abund ance	SP14	Abundance
Alhagi pseudalhagi	4	*Abutilon theophrasti*	1	*Aeluropus littoralis*	1
Amaranthus retroflexus	1	*Aeluropus littoralis*	1	*Alhagi pseudalhagi*	1
Atriplex micrantha	r	*Alhagi pseudalhagi*	1	*Atriplex micrantha*	1
Capparis spinosa	3	*Amaranthus retroflexus*	1	*Bromus scoparius*	1
Cirsium vulgare	3	*Artemisia annua*	2	*Karelinia caspia*	1
Halogeton glomeratus	r	*Atriplex micrantha*	r	*Cichorium intybus*	r
Heliotropium europeum	2	*Karelinia caspia*	1	*Cirsium vulgare*	1
Lactuca serriola	1	*Cirsium vulgare*	1	*Cynodon dactylon*	1
Peganum harmala	1	*Cynodon dactylon*	3	*Erigeron canadensis*	1
Peganum harmala	2	*Cyperus rotundus*	r	*Heliotropium europeum*	1
Polygonum arenarium	1	*Datura stramonium*	r	*Lactuca serriola*	+
Salsola tragus	r	*Descurainia sophia*	r	*Phragmites australis*	3
Tribulus terrestris	2	*Erigeron canadensis*	1	*Rosa canina*	3
Verbena officinalis	r	*Phragmites australis*	3	*Schoenoplectus tabernaemontani*	2
Xanthium spinosum	2	*Polygonum arenarium*	1	*Tamarix hohenackeri*	3
Xanthium strumarium	2	*Schoenoplectus tabernaemontani*	2	*Xanthium spinosum*	1
		Tamarix hohenackeri	4	*Xanthium strumarium*	1
		Typha latifolia	2	*Typha latifolia*	2
		Xanthium spinosum	1	*Xanthium spinosum*	1
		Xanthium strumarium	1	*Xanthium strumarium*	1
SP10	Abundance	SP15	Abundance		
Alhagi pseudalhagi	1	*Aeluropus littoralis*	2		
Xanthium strumarium	1	*Alhagi pseudalhagi*	2		
Abutilon theophrasti	r	*Artemisia annua*	1		
Artemisia annua	+	*Atriplex micrantha*	1		
Butomus umbellatus	1	*Bromus scoparius*	2		
Epilobium hirsutum	r	*Bromus tectorum*	3		
Persicaria amphibia	5	*Butomus umbellatus*	r		
Phragmites australis	4	*Cirsium vulgare*	1		
Polygonum arenarium	+	*Cuscuta campestris*	+		

Portulaca oleracea	r	*Cynodon dactylon*	3		
Rumex dentatus	1	*Lactuca serriola*	+		
Schoenoplectus tabernaemontani	4	*Karelinia caspia*	2		
Tamarix hohenackeri	2	*Phragmites australis*	3		
Typha latifolia	2	*Schoenoplectus tabernaemontani*	1		
		Tamarix hohenackeri	5		
		Typha latifolia	2		
		Xanthium spinosum	2		
		Xanthium strumarium	2		

IV.5. MITIGATION MEASURES / ACTIONS

During Project Installation (Construction Phase)

1. **Vegetation Clearance and Soil Management**

Restrict clearance activities strictly to designated construction zones to avoid unnecessary habitat loss.

Clearly mark “no-go zones” to prevent machinery from entering non-construction areas.

2. **Protection of Grazing Areas**

Prevent accidental encroachment into grazing areas by using warning signs and, if necessary, installing temporary fencing.

3. **Erosion and Dust Control**

Apply dust suppression (e.g., water spraying) on unpaved roads and stockpiles.

Stabilize soil stockpiles to prevent erosion and runoff into the reservoir.

4. **Water Resource Protection**

Establish buffer zones along the reservoir shoreline; no storage of materials or waste within this zone.

5. **Waste and Hazardous Materials Management**

Collect, store, and dispose of construction waste in licensed facilities.

Ensure fuel, oil, and chemicals are handled in designated containment areas.

6. **Worker Awareness and Training**

Provide training on biodiversity sensitivity, waste management, and emergency response.

Prohibit hunting, fishing, or plant collection by workers in the project area.

After Project Installation (Operational Phase)

1. **Habitat and Vegetation Restoration**

Rehabilitate temporarily disturbed areas (e.g., construction laydown areas) if needed using native or locally adapted plant species.

2. **Long-term Soil and Water Protection**

Maintain erosion control structures to ensure long-term stability of soil.

Monitor water quality in the reservoir to detect and mitigate any contamination.

3. **Biodiversity Monitoring**

Conduct periodic monitoring of flora and land use in the vicinity to verify no adverse effects on grazing or natural habitats.

4. **Community Engagement**

Maintain dialogue with local communities to ensure that grazing practices are not adversely impacted.

5. **Sustainable Land Use Practices**

Ensure operational activities remain confined to the project footprint.

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