Content

Introduction

The aim of this work is to adjust assessment of environmental impact of construction of two combined-cycle plants (CCGT No. 3, 4) of class J with total capacity of 1 300 MW at "Navoi TPP" JSC in connection with construction of 220 kV OHL for their power output to external 220/500 kV open switchyard at Navoi TPP.

EIS project of construction of two combined-cycle power plants (CCGT No. 3, 4) class J with total capacity of 1 300 MW at "Navoi TPP" JSC had been developed earlier and positive statement of the State environmental expertise № 01- 01/10-08-818 from 03.05.2019 was received. (Annex 1).

In order to accelerate implementation of the specified investment project, at the request of the Japanese side, this EIS project is supplemented with materials for the construction of 220 kV OHL for power output from CCGT No 3.4 to external 220/500 kV open switchyard at Navoi TPP.

Project of 220/500 kV open switchyard at Navoi TPP will be developed separately.

"Navoi TPP" JSC is one of the largest power plants of the Republic of Uzbekistan and belongs to the integrated power system of Central Asia, provides electricity to Navoi, Samarkand and Bukhara regions and heat-to Navoi region and Navoi city.

TPP construction was started in 1960. Start-up of the first turbo generator VPT- 25-4 with boiler TGM-151 was implemented in February 1963. Construction of the station finished in December 1981, and capacity of Navoi TPP amounted to 1 250 MW.

In early 2000-ies, there was a need to upgrade worn-out equipment of the station. Term of operation of existing 12 power facilities amounted to 20-35 years, which was the cause of continued equipment deterioration, reducing its reliability, and, as a consequence, low technical and economic indices and increasing risk of accidents with possible negative environmental effects. In connection with the situation in that time, course was taken on introduction of new equipment with the use of advanced technologies for fuel combustion of combined-cycle power plants.

In February 2013, the first CCGT with capacity 478 MW was put into operation, installed capacity of the plant reached 1728 MW.

In 2014, TG-1, 2 were decommissioned with capacity of 25 MW each, and TG-6 with capacity 60 MW. At the end of 2014, station installed capacity amounted to 1618 MW.

In 2011, another CCGT with capacity 450 MW was designed, construction of which was supported by the Gosecoexpertise of Goscomgeologiya (Environmental Agency) of the Republic of Uzbekistan (Statement No. 18/147z from 21.02.2012), with commissioning of which it was supposed to decommission boilers No. 3, 8. Construction of CCGT No. 2 is being completed now.

At the end of 2018, installed capacity of Navoi TPP amounted to 1618 MW.

Construction of CCGT No. 3, 4 class J will increase the overall power of Navoi TPP by another 1300 MW.

Implementation of this project is consistent with developed by the Institute of "Sredazenergosetproekt" JSC "Scheme for development of north-western part of the energy system of the Republic of Uzbekistan for 2020-2026 in conjunction with commissioning of new capacities of NGMK. Mains are 220-500 kV.

Design facility refers to category II of environmental impact in accordance with the Decree of the Cabinet of Ministers dated 22.11.2018 № 949 (average risk, p. 10).

The main objectives were, when developing EIS project:

- to assess the extent of environmental negative impact of the design facility;
- to undertake environmental analysis of the design solutions, identifying types, objects and nature of impact;
- to undertake analysis of accident risks after commissioning of construction facility;
- to make prognosis assessment of environmental impact of the construction facility after implementation of the project;

- . To develop programme of measures to reduce negative environmental impacts during construction and during the phase of OHL operation after implementation of the project.

Environmental impact assessment of construction of 220 kV OHL of CCGT No 3.4-220/500 kV open switchyard at Navoi TPP was based on the analysis of existing environmental conditions, designed process equipment, on identifying sources of emissions generation, discharges and waste during construction phase and operational phase of the design facility..

Calculation of atmospheric air pollution by emissions in all types of construction works (excavation, painting and welding) during route construction of 220 kV OHL from CCGT # 3.4 to external 220/500 kV open switchyard at Navoi TPP is made and its compliance with the requirements of Goscomecology (Environmental Agency) of the Republic of Uzbekistan is defined.

When performing work, they were guided by "Regulations on the State ecological expertise", approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan № 949 from 22.11.2018, and determining composition and volume of presented section on environmental impact assessment.

1 Characteristics of the current state of the environment in the area of the construction site

1.1 Physical and climatic conditions

Route of 220 kV OHL with total length of 6.3 km begins from CCGT # 3.4 and is laid on the territory of Navbakhor district of Navoi region of the Republic of Uzbekistan to external 220/500 kV open switchyard at Navoi TPP (Annex 2).

Along the whole line, constructed route crosses several irrigation ditches, water catches, canals, the Zerafshan River, grazing land in the Zerafshan Valley, field, gravel, asphalt roads, including highway A 379, farmlands

Basically, the route goes on arable lands, occupied by cotton and wheat crops.

From TPP route goes eastward, crosses garden plots, highway in the area of corner No. 1, turns to the North-West, then again crosses the garden plots, grasslands in the floodplain of the river Zeravshan, the Zerafshan River, once again goes on grazing lands. Then crosses the highway, grazing lands, canal from the Zarafshan River, and next to the corner # 2 through agricultural fields, planted with wheat. From corner no. 2, the route turns to the West and passes on arable lands with crops of wheat and cotton, crosses the channel field roads and edge of the orchard with Apple plantations (110 m). In the area of corner No. 3, the route turns to the North and along the route to the corner No. 4 crosses the cotton field, highway A 379 "Navoi-Uchkuduk, two channels, four gravel roads. With corners # 4-# , the route skirts eastern side of Metan village, following on arable lands with cotton and wheat plantations, crossing eight field roads. Then, the route passes in the North-East direction on agricultural fields with plantings of cotton to corner No. 8, from which it turns to the East and through agricultural fields comes to 220/500 kV open switchyard at Navoi TPP.

Distance to the nearest residential development of Metan village from designed OHL route in the area of corner No. 7 is 120 m, which corresponds to normative requirements for the establishment of sanitary-protective gaps for newly designed OHL according to p. 2.23.4 of SanPiN No. 0350 -17 «Sanitary norms and rules on protection of atmospheric air of inhabited places of the Republic of Uzbekistan.

When implementing the project, demolition of residential buildings is not planned

Tree plantations, in the form of poplars, mulberry and fruit trees are found on the territory of the transited garden plots, along canals, water catches, and irrigation ditches, crossed by the designed route.

The project provides for maximum preservation of trees in places of supports installation. In order to include the need for additional cutting of timber, trees, before the beginning of construction and during operation of OHL, are expected to be cut to permissible height, specified in the profiles

The territory of the designed route of OHL is situated in western part of the Zeravshan Valley, which is foothill plain, rising from the East to the West with a slight slope towards the river Zarafshan. From the West, the area of interest is limited by sandy areas of the Southeastern Kyzylkum Desert, in the North-Spurs of Nuratin ridge, from the East and the South-Spurs of Turkestan and Zerafshan ridges, and from the South - Karnabkul and Karshi steppe comes to it.

Position of the studied area deep in the continent specifies its climate: sharply continental, warm, with very dry summers and wet, relatively cold winters, as well as considerable annual and daily fluctuations in air temperature.

Mountain systems, limiting the studied area from the North, East and South, affect air currents and cause local climate peculiarities, and, in particular, the wind regime.

In the annual rose of winds, East direction prevails.

Analysis of climatic characteristics of the area of the design object location was conducted according to observations of Uzhydromet at the Ministry for emergency situations of the Republic of Uzbekistan on the weather station of Navoi city (table 1.1, Figure 1.1). Sampling of the climatic indicators was made from meteorological tables (TMS) for 2018.

Average annual temperature is plus 15,9 °C.

Average temperature of the coldest month (January) is plus 3,0 °C, average temperature of the hottest month (July) is plus 30,9 °C.

Average minimum temperature for the year is plus 9,2 °C, average maximum temperature is plus 22,8 °C.

The maximum temperature for the year is plus 40,0 °C, minimum temperature is minus 13,4 °C.

Table 1.1 Basic climatic characteristics

Characteristic	Unit rev.	Magnitude
Coefficient A, depending on the temperature stratification of the atmosphere		200
Average annual temperature	° C	+ 15.9
Average maximum temperature	° C	+ 22.8
Maximum temperature	° C	+ 40.0
Average minimum temperature	° C	+ 9.2
Minimum temperature	° C	- 13.0
January average air temperature	° C	+ 3.0
July average air temperature	° C	+ 30.9
Average surface temperature of the soil	° C	+ 18.0
Soil surface temperature	° C	- 5.0
Maximum temperature of the soil surface	° C	+ 69
Precipitation	mm	180,54
The average annual frequency of wind directions by points	%	C-3,4 CER-2.8 NE-16.8 VSV-0,9 B-23.9 VYuV-3,25 YuV-13,0 SJW-0.58 S-6.6 SW-0.58 SW-6.08 ZYUZ-0,5 Z-10,5 ZSZ-0,75 SZ-8.9 SSZ-1.08 calm - 11.8
The number of cases according to grades,%	m / s	

Characteristic	Unit rev.	Magnitude
	0-1	41,8
	2-3	27
	4-5	10.9
	6-7	8.5
	8-9	4.6
	10-11	0.16
	12-13	4.8
	> 15	0.64
Average wind speed	m / s	3.6
The highest wind speed, which exceeds 5%	m / s	u * = 7.0

Precipitation in Navoi falls all year round, the average annual precipitation is 180.54 mm.

Monthly maximum precipitation occurs in February, the minimum falls in July.

Fogs are very rare, 10 hours a year. Most often fogs are observed in the winter months, the average frequency of fogs does not exceed 0.5%.

The average monthly relative humidity during the year varies from 41 to 82%. The maximum values are observed in the winter months, the minimum - in June-July.

One of the meteorological factors determining the dispersion conditions of pollutants in the atmosphere is the direction and speed of the wind.

During the year, eastern (23.9%) and northeast (16.8%) winds are characteristic of the area under consideration (Figure 1.1.). Calms or still weather occur in 11.8% of cases, which contributes to the accumulation of pollutants in the surface layer of the atmosphere.

In the study area, the average wind speeds during the year vary from 2.7 to 5.1 m / s. Their highest values fall on July, the smallest - on September, November, December. The average annual wind speed is 3.6 m / s, the maximum - 30 m / s.

The city of Navoi as a whole is characterized by small values of average monthly wind speeds. The recurrence of winds at a speed of 0-1 m / s is 41.8%, which contributes to the accumulation of pollutants in the surface layer of the atmosphere. Winds with a slightly higher

speed (2–3 m / s, repeatability of 27%), which serve as a cleansing factor, are most frequent from March to July. Strong winds (8–9 and 10–13 m / s) are quite rare (frequency of 4.6 and 4.96%, respectively). Even less often squall winds occur at speeds of 14–15 m / s (1.16%), 16–17 m / s (0.6%) and 18–20 m / s (0.16%).

The high repeatability of weak winds does not lead to an increase in the pollution of the atmosphere of a city, since impurities mainly accumulate near the Navoi TPP. Frequently repeated increased wind speeds improve the dispersion of impurities from high hot springs, and transfer them over long distances.

From the south, the wind blows much less frequently, in winter its frequency is 8%, in summer it is 5.3%. The recurrence of the northwest wind direction blowing towards the city in winter is the smallest and amounts to 4.6%, in summer it increases to 15.6%, and the average annual rate does not exceed 8.9%.

Thus, for the area of construction of the projected route is characterized by significant variability of air temperature from winter to summer, and in summer - during the day, which is one of the main manifestations of the sharp continental climate.

Analysis of the physiographic and climatic features of the area where the design object is located shows that high air temperatures, low rainfall, and increased solar radiation contribute to environmental pollution.

1.2 Existing sources of exposure

The projected route of a 220 kV overhead line from PGU No. 3.4 to a 220/500 kV switchgear at the 6.3-km-long Navoi TPP passes through the arable land of the Novbakhor district of the Navoi region.

The main source of environmental pollution in the area of the initial part of the designed route is Navoi TPP JSC, located on the northern edge of the Navoi industrial zone.

In the industrial zone, which occupies the territory from the western, south-western and southern sides of the city of Navoi, are concentrated all the industrial enterprises-giants, which are the main sources of air pollution: the Uzgosconcern Uzzstroymaterialy enterprises (AOOT Kyzylkumcement), Uzbekbeko JSC (Navoi TPP "), Associations" Uzkhimprom "(PO" Navoiazot ", Navoi Electrochemical Plant), concern" Kyzylkumredmetzoloto "(Navoi Mining and Metallurgical Plant)," Uzghloploppromsbyt "(cotton processing plant).

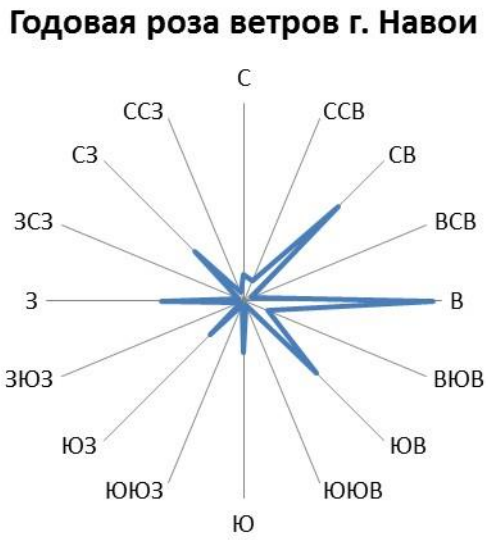

Figure 1.1

Along with large-scale production facilities, there are less powerful enterprises in the industrial zone: a petroleum depot, a car factory, concrete goods, RSMU, DZP, ABC, meat and dairy factories, bread products, timber trading base, tar-repair enterprise, including enterprises of the Karmaninsky district: a winery, TPO Khleboprodukt motor transport enterprises (ATP-22, ATP-2, Avtovaztekhohoshchivanie), enterprises of the construction industry (ELUABS, PMK-2, HRU). A total of about 19 large sites with more than 450 stationary sources of emissions to the environment.

Emissions from stationary sources of the city, including industrial zone enterprises, according to the latest published data of Uzhydromet under the Cabinet of Ministers of the Republic of Uzbekistan, amounted to 36,261 tons of harmful substances, of which: solids 19802 tons, sulfur dioxide - 2913 tons, carbon monoxide - 5002 tons, oxides nitrogen - 2146 tons, hydrocarbons (without VOC) - 4522 tons, volatile organic compounds - 231 tons, other gaseous and liquid - 1644 tons.

The largest share of gross emissions from all stationary sources of enterprises is accounted for Navoi TPP JSC, Kyzylkumcement OJSC and Navoiazot PA.

In 2018, Navoi TPP, according to the station's statistical reporting, 3180.0485 tons were released into the atmospheric air. The station has 46 sources of pollutant emissions. 22 items enter the atmosphere. The most powerful of the emission sources are pipes of boiler units, from which 99.37% of the total station's emissions come to the atmosphere. The leading role in the shaft of contaminants belongs to nitrogen dioxide - 2002.99 tons (62.9%).

The main harmful substances entering the city's atmosphere from the sources of Kyzylkumcement JSC are dust of cement, lime and gypsum; ON "Navoiazot" - oxides of nitrogen, carbon, ammonium nitrate, ammonia, acrylonitrile, hydrocyanic acid, ammonium sulfate. Among the emitted harmful substances sources NGMK emit dust ore, ammonia, oxides of carbon, nitrogen, inorganic and wood dust.

Total atmosphere of 78 various harmful substances are emitted to Navoi and its environs, among them a lot of tonnage and the most typical for the city are carbon monoxide, nitrogen oxides, sulfur dioxide, dust, hydrocarbons, nitrogen oxide, ammonia, ammonium nitrate, acrylonitrile, hydrocyanic acid, ammonium sulfate.

The main environmental pollutant is carbon monoxide, hydrocarbons are motor vehicles, all other harmful substances come mainly from industrial sources and energy facilities.

Since in the industrial zone all large enterprises are located along the perimeter, with the dominant wind directions (east and northeast), their emissions will spread in the direction opposite to the city, not reinforcing each other. With the south wind direction, the main sources of impact in the vicinity of the Navoi TPP will be Navoiazot and NGMK. With the south-west wind direction, emissions from Kyzylkumcement JSC and NGMK form a common field of concentrations that covers the territory of the city.

The background aggravating the state of the study area is high and hot sources of emissions from industrial enterprises and boiler houses in the central part of the city.

Sources of impact on the soil and plants in the area of the object of construction are emissions of vehicles, industrial enterprises, energy facilities described above. Harmful impurities in the soil and plants come from the atmosphere with precipitation, precipitation and direct absorption.

Of all the objects under consideration, the Navoi TPP, Navoiazot Production Association, some productions of NMMC, Kyzylkumcement AOOT should be highlighted in terms of the scale of environmental impact. These enterprises have powerful sources of emissions of harmful impurities, releases of industrial effluents into surface water, and unutilized solid waste.

Thus, the state of the environment in the area of the object under study is determined by emissions of high hot sources of enterprises in Navoi, Navoi TPP JSC, Kyzylkumcement AOOT, Navoiazot PO, NMMC, motor transport, as well as a dusty soil surface.

The greatest anthropogenic impact on the environment in the area of construction of the initial part of the projected route is exerted by the existing sources of Navoi TPP JSC.

1.3 Analysis of sources of environmental impact of Navoi TPP JSC

1.3.1 Analysis of sources of emissions of harmful substances into the atmosphere

Navoi TPP, as one of the largest power plants in Uzbekistan, is part of the integrated energy system of Central Asia. Navoi TPP generates electricity for consumers in the Navoi, Samarkand and Bukhara regions, steam, hot water for heating Navoi and adjacent villages.

The central element of the organizational structure of the management of JSC NTES is the Directorate headed by the General Director.

The general director organizes the entire work of the enterprise and bears full responsibility for his condition and activity.

In addition to the general management of the enterprise, the general director provides direct leadership:

- accounting;
- department of financial - economic analysis and forecasting;
- special part;
- information technology department;
- Department of Corporate Relations with Shareholders;
- civil defense; - legal counsel; - personnel department.

The enterprise is managed by the general director with the assistance of the trade union organization; through its directors and production directors, who are granted relevant rights in accordance with the Charter of Navoi TPP JSC.

The Production Director is the First Deputy Director and is responsible for the operation, maintenance and development of the plant, and also provides direct guidance to:

- head of service;
- head of repair service;
- chief of service of new equipment under construction;
- production - technical department;
- shift supervisor;
- the head of the labor protection, safety and health services;
- Senior Inspector;
- Senior Health and Safety Inspector;
- senior inspector for industrial safety of hazardous production facilities;

- fire safety inspector;
- wellness center;

The production director manages workshops, laboratories, contract repair and adjustment organizations through his deputies. Director of General Affairs;

1.. Manages the administrative and business issues and manages:

- motor vehicle shop;
- department of material and technical supply;
- administrative - economic department; - section of the special design bureau;
- Department of agricultural products.
- LFS;

2 Oversees the administration for:

- provision of watch a / transport;
- improvement of internal and adjacent territory, access roads and roads;
- the work of the pension affairs commission;
- work canteens and the state of diet;
- timely unloading of cars arriving for operational needs;
- the work of the medical center and the state of recreational activities.

3 Leads questions:

- registration of contracts and acts for the supply of rail and road materials;
- assistance to agriculture and the assigned area;
- organizing social events;
- providing living conditions for seconded personnel;
- visual agitation;
- control over the implementation of measures for the delivery of scrap metal.

The Director of Security and Security is responsible for managing security issues and providing guidance for:

- special part of the MAS;
- paramilitary security;
- guard guard;
- civil defense;

- material values of group II (state reserve).

The Director of Prospective Development and Investments is in charge of sales of heat and electricity:

- concludes contracts with consumers and manages the work of:
- inspectors;
- sales accountant.
- department of capital construction.
- department of attracting investments and implementation of investment projects.

The head of the operation department is in charge of the operation of equipment, buildings and structures, and manages the workshops:

- boiler and turbine No. 1 and 2, electrical, thermal automation and measurement, chemical, hydro, thermal networks, power supply, as well as contractual commissioning organizations.

The head of the repair service is responsible for the repair of equipment, buildings and structures in the workshops:

- boiler and turbine nos. 1 and 2, electrical, thermal automatics and measurements, chemical, hydro, thermal networks, power, transport and manages the work of:
- centralized repair shop;
- metal laboratories;
- all contracting repair organizations.
- RI and O.

Intrashop management is carried out on the basis of a clear distribution of rights and duties between managers and employees of the shop and control over their activities.

The placement and acquisition of workplaces at the station is carried out in accordance with the orders of Uzbekenergo JSC of the Republic of Uzbekistan.

The operational management of all personnel on duty is carried out by the shift manager of the station, who in turn is subordinate to the production director.

The installed electric capacity of the station at the end of 2018 was 1618 MW.

The structure of the installed electric power is given in table 1.2, thermal power - in table 1.3.

Table 1.2 Structure of installed electric power

equipment identification	Installed capacity, thousand kWh		Power as of December 31, 2018 t. kWh	
	on 01/01/2017	on 01.01.2018	slave	spread
2X R-50-130	100	100	72	72
2x K-160-130	320	320	217	217
2x PVK-150-130	300	300	201	201
2x K-210-130	420	420	292	292
PGU-478	478	4478	385	385
TOTAL:	1618	1618	1167	1167

Table 1.3 Structure of the installed thermal capacity

	Installed power Gcal / h		***Capacity on 12/31/2018 Gcal / h***	
	on 01/01/2017	***01/01/2018***	***Slave.***	***Available***
2X P – 50-130	***376***	***376***	***246.5***	***246.5***
K – 160–130	***99***	***99***	***99***	***99***
CCP-478 MW	***43***	***43***	***43***	***43***

In 2018:

- electricity generation amounted to 8 207.5 million kWh, with the plan 8,584.1 million kWh;

- heat output amounted to 2 106.7 thousand. Gcal, with a plan of 1,867 thousand Gcal.

For power generation, the station mainly operates in the base mode.

The level of electricity generation increases slightly in winter and falls in the summer due to power outages in repairs.

In 2018, the maximum power generation took place in December and amounted to 857,018,873 thousand. kWh

The maximum heat output in the amount of 307.0 thousand. Gcal occurred in the month of December and the minimum was 95.3 thousand. Gcal in the month of July.

The specific consumption of reference fuel amounted to 381.24 g / kWh for the supplied electric power and 185.84 kg / Gcal for the supply of thermal energy, respectively, against 379.8 g / kWh and 165.1 kg / Gcal on average for the power system.

The main technical and economic performance indicators of the Navoi TPP for 2018 are given in Table 1.4.

Table 1.4 Main indicators of production and technical activities of Navoi TPP JSC for 2018

№№ PP	Indicators	Units	2018			2017 year
			Plan	Fact	%	
one	Working power	MW	1026.7	1012.9	98.7	1176.1
2	Efficiency - electricity	%	61.2	57.9	94.6	59.9
№№ PP	Indicators	Units	2018			2017 year
			Plan	Fact	%	
	- thermal energy		40,8	46.4	113.7	40,8
3	Power generation	million kWh	8584.1	8207.5	95.6	8499.5
four	Heat supply	thousand Gcal	1867	2106.7	112.8	1849.1
five	Sales of heat energy - implementation of activities on liquor. debit of debt	million Sumy Col.-in merior		192719.2		45471.5
6	Ud. conditional fuel consumption: (standard) - on vacation e. energy - for heat release	g / kWh n / f kg / Gcal n / f	376.00 185.84	381.24 185.84		369.61 186.86
7	Consumption el. en.na own needs (standard) -the production of electric power. - for heat release	% kWh / Gcal	5.78 45.0	6.04 45.0		5.73 45.0
eight	Staff headcount	Person	1530	1532	98.9	1503

Sources of harmful emissions in the production of heat and electricity is the main and auxiliary process equipment TPP.

The station consists of cogeneration and condensation parts. The condensation part works according to the block principle.

Navoi TPP has two power units of 210 MW each, two power units of 150 MW each, two power units of 160 MW each, TPP - 140 with a capacity of 100 MW, combined-cycle CCP-478 MW.

The characteristics of TPP boilers, their main indicators are given in table 1.5.

Table 1.5 Characteristics of the boilers of Navoi TPP at rated load

Art. Boiler number	Type of boiler	Rated steam production Duration, t / h	Fuel consumption here / h	Heat output, Gcal / h	Boiler commissioning time
one	TGM-151	220	21.7	151.9	02.1963
Art. Boiler number	Type of boiler	Rated steam production Duration, t / h	Fuel consumption here / h	Heat output, Gcal / h	Boiler commissioning time
2	TGM-151	220	21.2	148.4	05.1963
3	TGM-94	500	62.5	437.5	10.1964
four	TGM-94	500	62.7	438.9	10.1965
five	TGM-84	420	41.2	288.4	09.1966
6	TGM-84	420	41.4	289.8	05.1967
7	TGM-84	420	41.5	290.5	09.1967
eight	TGM-94	500	62.5	437.5	07.1968
9	TGM-94	500	62.5	437.5	07.1969
ten	TGM-84	420	41.2	288.4	03.1972
eleven	TGME-206	670	71.7	501.9	06.1980
12	TGME-206	670	71.7	501.9	07.1981
TOTAL		5460	601,8	4212.6	

Gas-oil burners TKZ of a vortex type are installed on all boilers of TPPs. On boilers st. No 11, 12 burners are installed in two tiers on the back wall of the combustion chamber with six burners in each tier.

On the remaining boilers (station No. 3–10), the burners are located along the front wall of the furnace evenly in three tiers. The flue gas recirculation scheme laid down in the TGME-206, TGM-94 block boiler projects is periodically restored by the adjustment work carried out by the Uzenergosozlash unitary enterprise.

Navoi TPP uses gas from the Zevardy and Kultak fields with a calorific value of 8150 Gcal / nm³ and below as the main fuel, with a hydrogen sulfide content of 0.06 to 0.1 vol.%. Fuel oil is used as emergency fuel.

In 2018, gas consumption at TPPs amounted to 2,830,665.482 thousand. Nm³.

According to TPP data, CCG – 478 burns sulfur-free gas.

Gas is supplied to TPPs through three pipelines, two of them have a diameter of 700 mm, one - 500 mm.

The presence of gas condensate in the fuel leads to a significant distortion of the true gas flow. In addition, the combustion of this gas causes corrosion and contamination of the cold layer of RVP packings, low-temperature sections of gas ducts, clogging of gas distributing burner nozzles, which causes deterioration of technical and economic indicators, stopping for preventive measures to clean the heating surfaces and restore corroded elements.

Fuel oil is supplied mainly for M-100 grade with a sulfur content of 2.5% and a lower working heat of combustion of 9,365 kcal / kg.

Nitrogen dioxide, nitrous oxide, sulfur dioxide, carbon monoxide, benzo (a) pyrene, the main of which are nitrogen oxides, are added to the atmosphere during the operation of the equipment at the station, and additional fuel oil ash is burned when fuel oil is burned.

Currently, flue gases from existing boilers are emitted into the atmosphere through four chimneys from the existing five pipes. The boilers № 3-10 are connected to three pipes, 56 m high, № 11, 12 - to the pipe 180 m high, CCGT № 1 - to the pipe 60 m high.

Characteristics of flue pipes with nominal operation of boilers are given in table 1.6.

Table 1.6 Characteristics of chimneys for rated boiler operation

No. emission	Height, m	Diameter, m	Art. Boiler number	t uh gases, ° C	Coeff. excess air
2	56	9.18	3, 4	149	1.55

3	56	9.18	5, 6, 7	117	1.63
four	56	9.18	8, 9, 10	140	1.55
five	180	6	11, 12	154	1.47
44	60	8.5	PGU-478	126	2.0

Flue gas cleaning at Navoi TPP is not provided. In all TPP boilers, according to the NIPTI “Atmosphere” project, the technology of staged gas combustion was introduced through its redistribution between burner tiers, which should ensure a reduction in nitrogen oxide emissions of up to 30 percent or more. However, the design effect of reducing emissions of nitrogen oxides is not achieved.

The amount of power output for each boiler depends on the amount and type of fuel used, the design of the boiler, the state of the boiler equipment.

In addition to the main sources of emissions into the atmosphere at thermal power plants, there are emissions from the work of auxiliary units and equipment.

On the territory of the TPP in the repair units there are two forge furnaces connected to two pipes. Furnaces work on gaseous fuel, while they emit nitrogen dioxide, carbon monoxide.

Emissions of fuel oil facilities are carried out through the breather valves of the tanks for long-term storage of fuel oil, consumable tanks and receiving trays. The fuel economy of thermal power plants includes four tanks of 3,750 m³ and three of 15,000 m³ each. The receiving-drain device of liquid fuel is designed to accept railway tanks with a capacity of 120 tons. The maximum number of discharge tanks made 21 with an average amount of fuel oil in 1 tank 60 tons. In the atmosphere emitted limit and aromatic hydrocarbons, hydrogen sulfide.

When storing fuels and lubricants in the garage of thermal power plants in the amount of 164 tons / year (125 tons - gasoline, 25 tons - diesel fuel and 14.4 tons - engine oil) through breathing valves of eight tanks (3 × 25 m³ - for gasoline, 1 × 25 m³3 , 1 × 60 m³ - for diesel fuel, 1 × 3.5 m³, 1 × 5 m³ - for engine oil), as well as for storage of turbine (118 t / year) and transformer (228 m³) oils in ground metal tanks (9 pcs.) hydrocarbon vapors are released into the oil industry of the electrical workshop.

Unorganized emissions of pollutants include:

- emissions during unloading-loading and storage in storage facilities of table salt, anthracite, lime, cement, inorganic dust, quicklime, sulfuric acid, caustic soda, hydrazine hydrate, sulfuric acid, polyacrylamide, anion exchangers and cation resin, ammonia, used as reagents in chemical workshop;

- emissions from the production of electric welding and gas welding. Nitrogen dioxide, carbon monoxide, welding aerosol, iron, manganese oxides, fluoride compounds enter the atmosphere. There are 57 mobile and stationary welding stations at the station, but their simultaneous operation is excluded. The coefficient of simultaneity is 0.3-0.4. The consumption of electrodes at the station is 15 tons.

During gas purging before firing boilers, salvo emissions of natural gas through purge plugs take place. The duration of purging is 10 minutes.

The characteristics and parameters of the sources of atmospheric pollution of Navoi TPP JSC for the existing situation are given in Table 3.1 of Appendix 3.

The gross emission of pollutants in 2018 according to the statistics of TPPs amounted to 3,180.8893 tons, including:

- nitrogen dioxide - 2002.99 tons; - carbon monoxide - 748.20 t;
- carbon monoxide - 325.349 tons.

1.3.2 Water consumption and water disposal

Water at the Navoi Thermal Power Plant is used for technical and utility purposes.

Water for household use is used for drinking and for feeding the heating network, and is fed to the TPPs from the city pipeline.

For the production needs of the station water is taken from the river. Zeravshan and is spent on:

- cooling turbine condensers;
- cooling auxiliary equipment of turbines and power units;
- the needs of the water treatment plant (own needs and recharge of steam cycle boilers);
- production needs (irrigation of the territory, fire-fighting water supply, washing of industrial premises, etc.); - Vacation steam prom. consumers; - condensate return.

The scheme of cooling water supply to the station. № 11, 12 - reverse block. The design capacity of the circulating water supply is 335,456.0 thousand m³ per year, in fact, the circulating water supply was 193031.0 thousand. m³ per year.

According to the project, the power of cooling towers No. 1, 2 is 48 968.0 m³ / h, through cooling tower No. 1, the water consumption was 26 875.70 thousand. m³ / year, cooling tower No. 2 - 86,307.19 thous. m³ / year

In 2018 for industrial needs from r. Zeravshan collected 577 868,644 thousand m³. Water use limit - 860.0 million. m³. There was no over-limit water consumption in 2018.
Design capacity of re-supply (channel mix)-
28 500.0 m³ / year. The actual capacity of the re-supply-
1452,60 thousand m³ / year.

The main source of pollution of surface watercourses is the equipment for water treatment plants.

Water treatment and chemical regime

Replenishment of steam and water losses in the station cycle is provided by the distillate of the evaporators and desalinated water from the ion exchange unit equipped with pre-treatment.

The feed water of the evaporators is made by installing ion-exchange softening also with pre-treatment in clarifiers. A small part of the softened water with a lack of desalted and distillate is sent to the steam generator deaerators.

The source water for the TLU is taken from the Zarafshan River and is characterized by high mineralization, the presence of seasonal fluctuations and tendencies for the steady growth of the qualitative characteristics of the chemical composition.

1. Desalting unit.

Design capacity - 600 m³ / h.

The actual capacity is 660 t / h due to the lack of filtering materials.

Since May 1997, the desalting plant has been working on a mixture of waters: the Zeravshan River and the waters of the Damhodzhinsky water conduit.

The average annual amount of strong acid anions in the source water of the Zeravshan River was 12.43 mg-eq / dm³, in a mixture of water - 5.188 mg-eq / dm³.

Produced over the year - 3 739 742 m³ (426.9 m³ / h) of desalinated water.

2. Sodium cationization scheme.

Design capacity - 300 m³ / h, actual - 250 m³ / h.

The decrease in the capacity of the installation is due to the deterioration of the water quality of the Zerafshan River from the project by 2 times due to the physical deterioration of equipment that has developed the estimated useful life, part of which was dismantled.

Produced for the year - 1 537 217 m³ (175.48 m³ / h) of Na-cationized water.

3. Condensate purification scheme.

The design capacity is 250 m³ / h, the actual capacity is 250 m³ / h, due to the physical wear of the equipment and the replacement of stage II filters with filters of smaller diameter.

Cleared in a year - 1,135,614 m³ (129.64 m³ / h).

4. Installation of water preparation for heating networks in the HVO-1, 2. Design capacity is 570 m³ / h.

The actual capacity is up to 700 m³ / h due to an increase in the number of filters and calciners.

Due to equipment aging, a large number of defects on the trim and in the filter housings are formed.

The actual output per year in the HVO-1, 2, 3 - 8 675 191 m³ (990.32 m³ / h) of softened water to feed the heating network.

In 2018 filters were repaired in the amount of 20 pieces. In all installations of water preparation for feeding the heat network in the filters, there is underload of filtering material (sulfo coal) due to non-delivery, which leads to a decrease in plant performance, their reliability and efficiency.

Due to the periodic absence of chemical reagents hydrazine hydrate and trisodium phosphate, ulcer and oxygen corrosion and scale deposits appear in the composition in which calcium and magnesium deposits are present.

The decrease in the performance of the existing listed TLUs compared to the design one is explained by the following reasons: deterioration of the water quality of the Zerafshan River, physical deterioration of equipment that has developed an estimated service life (the main defects of water treatment plants are corrosive wear of H-cationite filter housings, a large number of filter strapping defects, mass violation chemical protection).

The operation of ion-exchange plants with the use of water of increased mineralization requires a large amount of reagents, which in the form of spent regenerative and washed streams flow into surface water. Due to the non-delivery of filter materials, the lack of reagent dosing at the automation station, disruptions in the dosing pumps, there are deviations in pH, the content of iron oxides, copper, hydrazine in the feed water. At the same time, with increased salinity of the source water, under loading of filter materials leads to a decrease in the performance of the TLU.

The consumption of reagents at the station is: H2SO4 - 27.5 tons / day, caustic - 12.5 tons / day, lime - 13.0 tons / day, table salt - 9.0 tons / day, coagulant - 0.165 tons / day. Wastewater from preparatory installations is contaminated with salts, bases and acids.

There are also industrial waste streams polluted with oil products, wastewater from water-chemical flushing of boilers and equipment conservation, effluent washing of RWP (acid and alkaline), from blowing cooling towers, industrial drains. Domestic discharges are sent to wastewater treatment plants of the city sewage system, industrial effluents through certain outlets are sent to the r. Zeravshan and Sanitary collector.

The complex of treatment facilities for industrial effluents of thermal power plants (KOPS), according to the project, includes:

- a building with a purification installation (neutralization, sedimentation) of waste water from washing of boilers and RAH;
- filter room installation of cleaning oily and oily waste and condensate purification;
- pretreatment of oily and oily effluent, which includes receiving tanks, an oil trap, floaters, pump fuel oil and sludge;
- the room of the sedimentation tanks condensate purification;
- pumping pumping wastewater;
- pipe racks: from the main building, the reagent warehouse to hydraulic structures;
- hydrotechnical constructions - sludge dumps, pond-evaporator, pumping.

From installations KOPS are:

The UZZSS is an installation for cleaning oily and oily effluents with a capacity of 100 m³ / h with an oil content of not more than 100 mg / dm³ in incoming water.

USPK is a purification plant for contaminated condensate with a capacity of 45 m³ / h with an oil content in the incoming condensate of not more than 10 mg / dm³. The circuit is in reserve due to the absence of contaminated condensate.

UOVK and RVP - installation of wastewater treatment for washing of boilers and RVP with evaporation ponds of neutralized effluent with an area of 18050 m².

The volume of regulatory-treated wastewater at the treatment plant, after which the wastewater is discharged into the Zeravshan River, amounted to 2182 thousand. m³ for 2018, of which: - physical and chemical cleaning - 1,832.0 thousand. m³ per year (sludge disposal plant KOPS); - mechanical cleaning - 350.4 thousand. m³ per year (oil trap number 1, 2).

The volume of regulatory clean flows received in the river. In 2018, Zerafshan without purification amounted to 577868.644 thousand. m³.

There are seven wastewater discharges at the station, the characteristics of which are given below.

Issue number 1. The warmed (heated) water after cooling the condensers and coolers of auxiliary mechanisms. Discharge to the river Zerafshan. Actual flow: 67360.927 m³ / h, approved flow rate - 106365 m³ / h. Water regulatory clean. Salt composition of waste water does not differ from the original, the temperature increase due to heating in the heat exchangers of Stage I-II of the TPP operating in a once-through system of water supply.

Issue number 2. Industrial drainage, drainage from blocks 8-12 through oil trap number 2 in the river. Zerafshan. Discharges are polluted with oil products, suspended particles, high mineralization. The actual discharge is at the approved level and is 35 m³ / h.

Issue number 3. Purge water cooling towers, regulatory clean. The content of calcium and magnesium salts is increased. Discharge to the collector "Sanitary". The actual discharge at the approved level is 254.5 m³ / h.

Issue number 4. Industrial drainage, main building, drainage from blocks of Art. No. 1-7. Discharge into the river Zerafshan after settling in the well. The drains are normatively purified. Approved and actual discharge - 5.0 m³ / h.

Issue number 5. Discharge to regulatory-treated effluent in the river. Zerafshan after KOPS (from the sludge collector of effluent from all water treatment plants, purification of contaminated condensates associated with ion exchange, in which, after exchange reactions, hardness salts to be removed from the make-up water accumulate in the filter material. In the process of recovery of ion-exchange filters, the trapped ions pass into waste water, contaminating them with hardness salts, iron impurities, silicic acid, sulfates, chlorides, etc.). The amount of actually discharged water is 209.13 m³ / h, the approved wastewater flow is 344.0 m³ / h.

Issue number 6. Discharge of regulatory clean water from the pumping interception of TLU drains in case of failure of the sewage transfer interception pumps (regeneration, washing of filters) to the terrain. The actual discharge at the approved level is 785 m³ / h.

In 2018, a discharge was made only in issues No. 1, 2.4.5.

Table 1.7 shows the quantitative and qualitative characteristics of each release in comparison with the allowed and maximum allowable concentrations for fishery watercourses, in table 1.8 - according to the station measurements compared to PDKr.h..

Background concentrations in the source water exceed the standards for the content of suspended substances, salts, sulfates, nitrite nitrogen, iron and petroleum products. A similar excess for the listed pollutants is available for issue No. 1. Iron salts, on other releases, except release No. 1, are not detected.

For all releases, the concentration of salts introduced into the surface watercourse is 1.4 - 1.7 times higher than the standard values for reservoirs of fishery importance, mainly due to sulfates, hardness salts accumulated in chemical filters.

The main source of pollution p. Zeravshan salts is the issue number 5 - wastewater after water treatment plants, including those settled in a sludge collector.

For release No. 4, there are excesses in suspended substances and oil products, the content of other pollutants has not been identified.

Thus, chemical pollution p. Zerafshan is mainly caused by the existing condition of the equipment of the CPC, in which the plant's production effluents exceed the permitted and standard values of pollutant concentrations for fisheries watercourses.

Table 1.7 Permissible concentrations of pollutants in the waste waters of the Navoi TPP, mg / dm³

No No	Name of the indicator	MPC r.h.	Release 1	Release 2	Release 3	Release 4	Issue 5	Release 6
1	Suspended substances	15	487	487	487	487	487	487
2	Mineralization	1000	1500	1500	1500	1500	1500	1500
3	Nitrites	0.08	3.3	3.3	3.3	3.3	3.3	3.3
4	Nitrates	40	45	45	45	45	45	45
5	Sulfates	100	500	500	500	500	1000	1000
6	Chlorides	300	350	350	350	350	350	350
7	Calcium	190	280.5	280.5	280.5	280.5	280.5	280.5
8	Magnesium	40	170.1	170.1	170.1	170.1	170.1	170.1
9	Oil products	0.05	0.234	0.1	0.1	0.1		
10	Common iron	0.05	4.62	4.62	4.62	4.62	4.62	4.62

Table 1.8 Composition of wastewater of JSC "Navoi TPP", mg / dm³

No payment order	Name of the indicator	Feed Channel (Background)	Issue number 1	Issue number 2	Issue number 4	Issue number 5	PDKr.h.
1	Suspended substances	791	759	192	181	183	15
2	Mineralization	1516	1516	1410	ots	1671	1000
3	Chlorides	91	90.3	86	ots	94.2	300
4	Sulfates	545	545	496	ots	634	100
5	Oil products	0.24	0.24	0.29	ots	ots	0.05
6	Nitrite nitrite	0.156	0.186	0.124	ots	ots	0.02
7	Nitrate nitrate	7,6	7,8	6.25	ots	ots	9.1
8	Iron	5.0	5.1	ots	0.27	ots	0.05
9	pH	8.25	8.23	8.1	7.9	8.15	6.5-8.5
10	Temperature, ° C	19.0	20.0	21.1	17.3	20.3	No more than 3 ° C

1.3.3 Solid waste generation and storage

Waste generated at TPPs differs in morphology, genesis, and hazard class.

Some types of waste are generated continuously, the formation of others is periodic.

Production wastes are generated at TPPs during the operation of the chemical, electrical, boiler-turbine, fuel and transport workshops, auto garages, and the repair and construction site.

When preparing feed water for power boilers in a desalting plant, during the process of coagulation with iron sulfate and filtration, mechanical sludge is formed on the mechanical filters, which is sent to the sludge dumps and contains 85% of suspended solids, 13% iron hydroxide, 2% silicic acid.

When cleaning water to feed the heating network on cationic filters of the TLU, when they are restored, sodium chloride is used, which comes as solid waste to the sludge collectors.

Liquid sludge, in addition to industrial wastewater treatment effluents, contains acid flushing of boiler equipment, drains after cooling of auxiliary equipment of power units and industrial sewage. For the purpose of sedimentation of a solid phase, liquid sludge enters 5 settling tanks-sludge collectors:

Two-section sludge disposal plant for wastewater of the HVO and lack of lime with sludge

pipelines and discharge port of clarified runoff in the r. Zerafshan;

Sludge disposal pit of oily sludge and sediment with sludge lines and return conduit of clarified water and a pumping station of clarified water;

Ponds-evaporators of acidic water washing of boiler equipment and wash water of RAH.

The two-section sludge dump of waste water of the HVO was designed unfiltered, the building height is 4.5 m, the laying of slopes is m = 2.5.

The area along the bottom of one section is 11,800 m² (sludge dump No. 1), the other 8,000 m² (sludge dump No. 2). The sludge pit is designed for a volume of 83,000 m³ of solid sediment. The water clarified in the sludge collector enters the mine water intake wells, the height of which is increased by installing a sandstone as the sludge dump is filled with solid fractions. From the water intake wells, water flows by gravity through a pipe with a diameter of 350 mm into the discharge channel. At the moment, both sections are on the verge of exhaustion. Often violated reset technology. In view of the failure of the equipment of the CPS (installation of the neutralization of the HVO), alkaline and acid waste flows separately into the dump. The environment is aggressive. There is an uneven interaction reaction at the discharge sites with a negative effect on the counter-filtering screen. Actually, the dump is partially filtered. In the asphalt surface there are cracks and breaks. Section cladding does not meet specifications. The dam coating is destroyed, it is dumped by dumping, and lime is not removed after the clarifiers.

Periodically, work is carried out on scooping up sludge and shipping it to sites designated in the area of city dumps. For the full disposal of HVO waste, a tap of about 40,000 m² of space is required. Given the presence of chemicals in the composition of waste, their migration into soils and groundwater is possible. Periodically sumps

№ 1, 2 are cleaned from reeds and vegetation. At the present time, the sludge dump No. 1 is covered for cleaning sludge, 20% of the total amount of sludge was removed. In the work there is a sludge dump number 2, filled to 50%.

Sludge waste enters the sludge disposal site of oily sludge and sludge after the installation for cleaning oily and oily sewage. The sludge pit is designed unfiltered, two-section. The height is 14.5 m, the area of each section is 1000 m2. The accommodating volume is 9600 m³. At the moment, the filling of the sludge collector is about 70%.

According to the project, the impervious screen of the ZIO slurry dumper is made of their fine-grained asphalt concrete. The surface of the bottom and slopes of the evaporation pond before facing them with asphalt concrete in order to avoid germination of vegetation is treated

with long-acting herbicides (douran, monuran). The solid fraction is to be incinerated in the boiler furnaces. The water clarified in the sludge disposal site enters the mine water intake wells, the height of which increases as the sludge disposal site is filled with solid fractions. From there, through the flow tube with a diameter of 200 mm, the clarified water through the pumping station returns to the COPS cycle.

Sludge containing metals (iron, nickel, copper, chromium, vanadium), as well as sulfuric, hydrochloric acids, ammonium compounds, which are formed periodically during chemical cleaning of heating equipment (steam generators) and cleaning of RVP surfaces.

Two sections of the evaporation pond for the project are provided unfiltered with a design similar to the sludge disposal plant oily sludge. Evaporator ponds are located on the site, which has a slope to the floodplain of the river Zerafshan. The area of one section is 11000 m², the other - trapezoidal - 6000 m². Construction height is 1,5 m. Sections of the pond fit into the terraced terrain with the elevation of the bottom of one section below the other 1.5 m. According to the project, wash water should be collected in acid washing tanks for mutual neutralization of acid and alkaline effluents. At the end of neutralization, to precipitate heavy metal ions, decompose hydrazine, ammonium compounds, the solution should be treated with lime milk, and then discharged into the pond. Due to the toxicity of the sludge, the water component is subject to complete evaporation (estimated at 101 cm per year), the sludge is deposited and compressed.

Estimated amount of wash water "43000 m³ / year. Of these, the solid component "2000 tons / year.

HVO sludge is characterized by increased mineralization of HVO sludge water, total salinity is about 6000 mg / dm³, pH - 7.8, sulfates (3939.759 mg / dm³) prevail among anions, magnesium (657.598 mg / dm³) prevail among cations.

The sludge from the evaporation pond after chemical cleaning of the equipment contains less soluble substances. The total mineralization of the aqueous extract is in the range of 300-2500 mg / dm³, pH - 7.8, sulfates are prevailing among the anions, the content of which is 5 times less than in the sludge from the settling tanks of chemical water treatment (783.750 mg / dm³) magnesium (141.866 mg / dm³).

Spectral analysis showed an increased content of magnesium, calcium, iron, sodium, and potassium in the sludge from HVO ponds. Iron, copper, vanadium, chromium, and zinc dominate in the sediment of evaporation ponds.

Thus, the analyzes confirm the addition of salts and metals formed in the process of water

softening and chemical cleaning equipment.

Solid waste is also generated during the regeneration of waste (transformer, turbine and other) oils.

The waste oils are cleaned at the station's oil facilities. Contaminated oil is collected in a special tank, up to 30 tons.

Regeneration is performed by passing the oil through a centrifuge and silica gel filters. Refined oil is collected in another tank and returned to the process cycle. After the centrifuge, the dirt is collected in a bucket and manually transported to the fuel oil facilities, from there all the waste goes to the CFC with oily wastewater.

The spent silica gel is poured into a tub, it is dried in an oven, and then returned to the process.

Non-ferrous metal wastes are generated in the electrical shop, auto garage, while repairing turbine and electrical equipment. The total amount of waste of non-ferrous scrap reaches 3 tons / year.

Spent fluorescent lamps are generated as waste from production workshops and office premises up to 500 pieces / year, they are stored under lock and key in corrugated boxes, and as they accumulate, they are transferred to a specialized organization for de-mercuration.

Waste ferrous metals are generated in the repair and maintenance of vehicles, in the repair of the station (replacement of sections of screen tubes, superheaters, water economizers as a result of corrosion), their amount is estimated at 513 tons / year, ferrous metal scrap is delivered to Vtorchermet.

When carrying out welding, residues of electrodes are formed.

In the garage, formed tires, used brake pads, waste batteries and electrolyte.

At all production sites, oily rags formed as a result of cleaning equipment and hands of personnel are formed as waste.

During construction, construction waste is generated as solid waste. Construction waste is transported to designated areas of the landfill, allocated by sanitary and epidemiological authorities.

Waste from the dining room is food waste, which is temporarily stored in a metal container and then transferred as feed to pet staff.

The TPP has a first-aid post whose waste is: waste dressings, used medical syringes and needles from them.

The TPP also has its own subsidiary farm, the waste of which manure is the product of

animal life.

Household waste is generated in all divisions of TPPs and consists of 47% paper, 1% wood, 1.8% leather and rubber, 0.5% bones, 4.5% metal, 29% food waste, 5% textiles, 4.9 % glass and stones, 2% plastics. Household waste is transported to the city landfill in coordination with the authorities of the Central State Sanitary Epidemiological Service.

A total of 37 items are generated at TPPs. Temporary storage facilities are provided for all wastes.

Some of these wastes are regenerated or reused at the enterprise, some are exported under contracts to specialized organizations for recycling and disposal.

Information on production and consumption waste of Navoi TPP JSC is given in table 1.9.

Table 1.9 Information on production and consumption wastes

No payment order	Waste name	Amount of waste, t / year		Hazard Class
		Norm	Limit	
1	Oily rags	0.097686	0.048	3
2	Waste paper	1.5	0.74	four
3	Ferrous metal scrap	513.05	253	four
4	The remains of welding electrodes	2,795	1,378	five
5	Non-ferrous scrap	3.0	1,479	3
6	Oil sludge	0.1006	0.0496	3
7	Lead waste batteries	0.374	0.184	one
8	Electrolyte	0.144	0.071	2
9.	Spent Plastic Battery Boxes	0.057	0.028	four
10	Spent PPE	10,716	5.284	four
11	Spent Fluorescent Lamps	6.829055	5.5926	one
12.	Used turbine oil	1.556	0.767	2
13.	Used tires	3.52	1,736	four
14.	Spent Oiled Filters	0.057	0.028	four

15.	Used brake pads	0.09	0.044	five
16	Metal shavings	18.0	8,877	five
17	Spent limestone material	119.0	58,685	four
18.	Construction waste	257.4375	126,956	five
19	Container from under paints and varnishes	16,0	7.89	3
20.	Spent dressing nurses	0.05	0.025	four
21.	Used medical syringes	0.0336	0,017	four
22	Used medical syringe needles	0,0044	0,002	four
23.	Used Transformer Oil	45.0	22,192	2
24	Waste thermal insulation materials	21.9	10.8	3
25	Oily mud	21.75	10,726	3
26	Turbine oil cleaning sludge	12.85	6.337	3
27.	Oily waste sludge	1.4016	0,691	3
28	Sludge from wastewater treatment plant (TLU)	5002,244	2466.86	3
29.	Sludge from pre-treatment of raw water	4264,508	2103.045	3
30	Silt from river water clarification	4500	2219,1781	four
31.	Precipitate from dry cleaning of capacitors and tubes of the screen system	18.0	8,877	3
32.	Spent lime	667.8	329,326	five
33.	Technical salt waste	89,84	44,305	four
34	Insulators Fight	0.1	0.049	four
35	Manure	2299.5	1134	four
36	Food waste	56,43		five
37.	MSW	265.75		five
	TOTAL	18221,4854	8827.0547	

Total generation of waste of hazard class 1 is 7.203055 tons / year, hazard class 2 - 46.7 tons / year, hazard class 3 - 9361.90889 tons / year, hazard class 4 - 7,537.371 tons / year, hazard class 5 - 1268.3025 t / year.

Thus, in the production of electricity and heat, thermal power plants have sources of pollutants entering the environment in the form of emissions, discharges and solid waste.

1.4 Atmospheric air condition

The state of the atmospheric air in the location of the economic object is determined by emissions of the sources listed in section 1.2 and depends on the conditions of their dispersion.

In the area under consideration, stationary observations of the state of the atmospheric air are not carried out.

The qualitative and quantitative input of polluting chemicals entering the atmosphere along with the flue gases of Navoi TPP JSC depends on the type of fuel used. When burning hydrogen sulfide gas, oxide and nitrogen dioxide, sulfur dioxide, carbon monoxide, benzo (a) pyrene enter the atmosphere. When burning fuel oil - additionally fuel oil ash.

The gross emission of pollutants during the operation of TPP equipment at maximum load, according to previous calculations, is 4976.6268 tons / year. The main air pollutants are nitrogen dioxide (3483.5658 tons / year), accounting for 70.0% of the total emissions into the atmosphere, carbon oxide (874.4503 tons / year) - 17.57% and nitrogen oxide (577.9607 tons / year) - 11.61%. The share of other pollutants in the amount of 19 ingredients drops 0.82%.

The list of atmospheric pollutants from emissions of the Navoi TPP to the current state is given below in Table 1.10.

Analysis of air pollution in the studied area showed that the highest concentrations outside the industrial site of Navoi TPP JSC are formed by nitrogen dioxide emissions and are 1.03 MPC, which exceeds the quota permitted by the State Committee on Ecology of the Republic of Uzbekistan for hazard class 2 substances and enterprises located in Navoi Oblast in 4 , 12 times.

Table 1.10 The list of air pollutants emissions of JSC "Navoi TPP" (current state)

No. pp	The name of the pollutant	MAC or OBUV, mg / m³	Hazard Class (SHOE)	Installed quota (in shares MPC)	Maximum concentration Traction in MPC fractions	Conformity established quota (+,-)	Emission of substances, tons / year	%
1	Ammonia	0.2	four	0.5	0,004	+	0.1490	0,003
2	Oil aerosol	0.05	four	0.5	0.04	+	0.0002	0,000004
3	Sulfuric acid aerosol	0.3	2	0.25	0.16	+	9.9944	0.20
4	Alkali aerosol	0.01	3	0.33	0.01	+	0,0081	0.0002
5	Benz (a) pyrene	0.000001	one	0.2	0.14	+	0.0393	0.0008
6	Nitrogen dioxide	0.085	2	0.25	1.03	-	3483,5658	70.00
7	sulphur dioxide	0.5	3	0.33	0.01	+	21.1547	0.43
8	Lime	0.03	3	0.33	0.24	+	0,0142	0.0003
9	Black Ash	0,002	2	0.25	See <0.1*	+	0,0031	0.0001
10	Manganese and compounds	0,005	2	0.25	0.05	+	0,0075	0.0002
11	Nitrogen oxide	0.6	3	0.33	0.03	+	577,9607	11.61
12	Iron oxide	0.2	3	0.33	0.03	+	0.1583	0,003
13	Silicon oxide	0.02	3	0.33	0.01	+	0,0196	0.0004
14	Carbon monoxide	five	four	0.5	0,005	+	874,4503	17.57
15	Gasoline Pairs	five	four	0.5	0.13	+	1.0347	0.02
16	Abrasive dust	0.04	3	0.33	0.08	+	0.0007	0.00001
17	Metal dust	0.2	3	0.33	0.23	+	0,0011	0,00002
18	Hydrocarbons	one	four	0.5	0.13	+	5.9609	0.12
19	Fluorides	0.2	2	0.25	0.001	+	0,0196	0.0004
20	Hydrogen fluoride	0.012	3	0.33	0.02	+	0,0140	0.0003
21	Hydrogen chloride	0.2	2	0.25	0.04	+	2.0563	0.04
22	Sodium chloride	0.5	3	0.33	0.02	+	0,0142	0.0003
	Total						**4976.6268**	**100.00**

* - The total maximum concentration created by the emissions of this substance is less than the coefficient of expediency of calculations E3 = 0.1 (no emission calculation was made for this substance)

Concentrations of all other pollutants meet the established requirements for the level of air pollution and do not exceed the quotas for pollutants of the corresponding hazard class and enterprises located in Navoi region.

Thus, the state of the atmospheric air in the area of the projected route of a 220 kV overhead line located in the zone of influence of Navoi TPP JSC, in accordance with the "Methodological guidelines on ecological and hygienic zoning of the territory of the Republic of Uzbekistan according to the degree of danger to public health" contaminated, causing concern for public health.

The gross emission of pollutants during the operation of TPP equipment at maximum load, according to previously carried out calculations, is 4976.6268 tons / year. The main air pollutants are nitrogen dioxide.

(3483.5658 tons / year), amounting to 70.0% of gross emissions into the atmosphere, carbon monoxide (874.4503 tons / year) - 17.57% and nitrogen oxide (577.9607 tons / year) - 11.61% The share of other pollutants in the amount of 19 ingredients drops 0.82%.

The list of atmospheric pollutants from emissions of the Navoi TPP to the current state is given below in Table 1.4.1.

To study the state of the atmospheric air, to identify the contribution of the Navoi TPP to the level of atmospheric pollution in the current state, the concentrations of pollutants generated by enterprise emissions were previously calculated.

The calculation was carried out according to the "Ecologist" program on an area of 8 × 5 km with a step of 0.5 km, taking into account the parameters of the sources of emissions of harmful substances, meteorological characteristics and coefficients determining the dispersion conditions of pollutants and described in section 1.1.

Analysis of air pollution in the studied area showed that the highest concentrations outside the industrial site of Navoi TPP JSC are formed by nitrogen dioxide emissions and are 1.03 MPC, which exceeds the quota permitted by the State Committee on Ecology of the Republic of Uzbekistan for hazard class 2 substances and enterprises located in Navoi Oblast in 4 , 12 times.

Concentrations of all other pollutants meet the established requirements for the level of air pollution and do not exceed the quotas for pollutants of the corresponding hazard class and enterprises located in Navoi region.

Thus, the state of atmospheric air in the zone of influence of Navoi TPP JSC in accordance with the "Methodological guidelines on ecological and hygienic zoning of the territory of the

Republic of Uzbekistan according to the degree of danger to public health" should be classified as moderately polluted, causing concern to public health.

1.5 Surface water

The hydrographic network of the area of construction of the 220 kV transmission line from the PGU No. 3.4 to 220/500 kV Navoi is represented by canals, small collectors, seasonal channels, and the Zerafshan River.

R.Zerafshan - the largest surface watercourse in the considered area of construction of the projected route of the OHL. The distance from the beginning of the projected route to the river. Zerafshan, flowing from the east and north, is 300 - 320 m. The width of the river bed at the junction is 38 m.

In the past, the Zerafshan River was a tributary of the r. Amu Darya. Currently, the Zerafshan River is drainless. Its waters are used entirely for national economic needs.

In the area of the village of Duguli, the river overlooks a desert-sandy plain. The catchment of the mountainous part of the river is 11722 km².

The Zerafshan River basin extends in the latitudinal direction from east to west and is bounded by the Turkestan and Zerafshan ranges. The river has a length of 750 km.

After leaving the mountains, the river is divided into two branches: the northern - Akdarya and the southern - Karadarya. When entering the Zerafshan valley, the sleeves again merge into one channel, 60 km downstream from the confluence of the sleeves, the water intake Navoi TPP is located.

The Zerafshan River glacier-snow supply. It is formed by the confluence of the rivers Matches and Fandarya.

The waters of the Zerafshan River are used entirely to irrigate the land of Tajikistan, the Samarkand and Bukhara regions of Uzbekistan.

The flow of the Zerafshan River is largely regulated by the Katta-Kurgan reservoir, built in 1947, with a capacity of 500 million. m³.

From the Zerafshan River in the area from p. Zaatdin to Four irrigation canals take water from Navoi: Kanimekh, Kalkon-Ata, Kasoba and Khanim with a maximum total withdrawal of up to 20 m³ / h. Residual stock r. Zaravshan is used to fill the Kuymazar reservoir located below the Navoi thermal power plant. The Zerafshan River belongs in its lower reaches to low-flow rivers. The entire length of the river to Navoi intensive water analysis takes place. River

flow, like all rivers of glacier feeding, depends on the season. Low flow (minimum flow) occurs from October to May. In June and July there is a flood, and in August-September there is a slow decline in the water level.

To date, the river's water balance in the annual course of time is close to long-term observations, and specifically depends on the amount of precipitation during the year.

There is a tendency to a decrease in the value of the minimum flow, which is associated with increased water intake during the low-flow period for agricultural needs.

The chemical composition of water p. Zerafshan is formed under the influence of pollution from industrial enterprises of the cities of Samarkand, Kattakurgan, Navoi and sewage from farmland with sewage. The qualitative composition of surface waters also depends on the meteorological, hydrogeological and morphological characteristics of the watercourse. In recent decades, the intensive growth of industry in the region of the valley r.

Zerafshan, the development of desert lands has led to a change in the flow of the river. Long-term observations of the chemical composition of river water indicate a tendency to increase mineralization (the content of sulphates, chlorides, hardness salts), which contributes to the development of salt-like organisms in aquatic biocenoses that affect periphyton values.

Analysis of the state of water in the river Zerafshan to wastewater discharges in Navoi and after industrial discharges of enterprises of the city showed the following.

The maximum water flow occurs in July - August. The maximum temperature of 24 ° C at the approach to the city was observed in June, July. The minimum flow of water is observed in November, December, and October. The minimum water temperature falls in January, February. With a decrease in the flow of the river, the mineralization and, accordingly, the content of sulphates, chlorides, carbonates, the content of hardness salts (magnesium, calcium, sodium) increase sharply. Chemical pollution of water increases in the autumn-winter period. When approaching the city, water contains above the permissible values of ions of magnesium, calcium, sulfates, phenol, chromates, and iron. In some months, there is an increase in nitrites, metals (copper, zinc, etc.).

The water quality criterion is the water pollution index (WPI). When the value of WPI to 1.0 water is considered clean. At 4> IZV> 2.5, water belongs to moderately polluted water of the third class of quality. In the gauging station before Navoi IZV is 8.5. This is due to the industrial indicators of industrial enterprises. Despite the pollution, water p. Zerafshan is used for drinking purposes of Navoi and the region, as the quality of groundwater does not meet the drinking water standards. Water quality after r. Navoi is getting worse. The concentration of

suspended solids, magnesium, chlorides, sulphates, total hardness, total nitrogen increases, the content of oil products, iron, copper, zinc, chromium, surfactants, phenols increases slightly, the water temperature increases by 2-4 ° C with average and maximum flow and up to 8 -9 ° C with a minimum flow (table 1.11).

Table 1.11 The chemical composition of water p. Zerafshan

Name of the indicator	Unit	Above the software "Navoiazot"	The gate below ON "Navoiazot"
Oxygen	mgO2 / dm3	10.2	10.55
BOD	mgO2 / dm3	1.86	2.36
COD	mgO / dm3	12.59	14.32
Ammonia nitrogen	mg / dm3	0.05	0.14
Nitrite nitrite	mg / dm3	0,019	0.037
Nitrate nitrate	mg / dm3	1.9	2.1
Iron	mg / dm3	0.02	0.04
Copper	µg / dm3	1.1	1.0
Zinc	µg / dm3	1.6	2.2
Chrome VI	µg / dm3	1.0	1.0
Phenols	mg / dm3	0,004	0,004
Oil products	mg / dm3	0.02	0.02
SPAV	mg / dm3	0.0	0.0
Suspended substances	mg / dm3	388.5	325.4
Mineralization	mg / dm3	1234.5	1308.5

* According to the Yearbook of Surface Water Quality in the territory of Uzhydromet's activities.

In its lower course, the waters of the Zerafshan River are characterized by a high content of suspended particles, especially during the flood period, a large mass of garbage passes along the river, the formation of which occurs due to the washing away of rhizomes of cotton, shrubs, etc. by stormwater. debris from the plowed slopes of the river, developed under agricultural fields.

The highest turbidity reaches 11,000 to 13,000 g / m³ in spring and summer. The smallest - 32 g / m³ in the autumn-winter season.

Thus, the quality of the water flow of the Zerafshan River indicates a change in its chemical composition, temperature and hydrological regimes under the influence of effluents of industrial enterprises. River water in the area of According to the content of petroleum products, phenol, heavy metal elements, nitrites exceed the MAC. Year by year the salt content increases. The temperature rises and water flow somewhat decreases. Navoi TPP is one of the main contributors to chemical pollution, temperature, and hydrological characteristics of the river flow. Zerafshan.

1.6 Ground, ground water

Geomorphologically, the described area is located on the right bank of the Zeravshan River. This is a flat plain with a slight bias towards the river, refers to the Golodnostepsky sedimentation cycle.

Wide spread valley r. Zerafshan along the axial part is cut by the modern riverbed, the banks of which are morphologically well expressed by the ledges of the first and third terraces above the floodplain.

Absolute elevations range from 328.27 to 335.0. The height of the terrace ledge above the low-water horizon in the river is 6–7 m.

Within the region from the surface, a stratum of quaternary deposits is developed, underlain everywhere by continental tertiary deposits — a layer of interbedded sand, argillite clay, sandstones, and conglomerates. More ancient rocks of Paleozoic and Cretaceous spread far beyond the industrial site.

Quaternary deposits of the Golodnostep complex are represented by alluvial-proluvial loams and sandy-brownish sandy loams, moist, dense, plastic, macroporous, with a thickness of 5-6 to 10 m and more, which decreases with distance from the river. The gravelly soils with gravel-clay aggregate, with interlayers and lenses of sand, gravel and less often conglomerates, lie below. Small pebbles, mostly flat, of shale, sandstone, limestone, etc. The gravel-pebble layer reaches 20-25 m and more.

Soil mineralization on average 0.12 - 0.22%, in horizons of high salinity 0.5 - 0.6% of dry matter.

From the surface, the relief of the site is complicated by ground dumps, crossed by small sprinklers, and excavations for various hydraulic structures (septic tanks for various purposes).

Analysis of stock materials on the chemical composition of water extracts of soils did not reveal sharp fluctuations in their pH values (7.4-7.6), the total content of easily and moderately soluble salts in the hydrochloric acid extract ranges from 1.461 to 3.3%, gypsum - from 1,401 to 2,799%, therefore the soils are non-saline.

Hydrogeological conditions of the region are complex due to geological, climatic and agricultural

factors.

The water-bearing complex of Cretaceous-Paleogene (Upper Cretaceous-Paleocene) sediments is represented by sandstones and limestones with interlayers of clays and siltstones. The group of streams of proluvial-alluvial deposits of foothill plains with a depression curve of a structural-lithological backwater. Area with a positive salt balance.

Hydrogeological conditions are characterized by the development of groundwater, confined to the Quaternary sediments of the valley. Zerafshan. Within the study area, the type of feeding is snow-rain, and in addition, groundwater receives additional nutrition due to infiltration of irrigation water. Genetic type of groundwater regime - irrigation-hydrological, riverine, drainage and drainage.

Since the area of the station is in the field of intensive development for irrigated agriculture, the fluctuation of the groundwater level is seasonal and depends on the frequency of irrigation of agricultural crops. The maximum level is observed in the summer period and is 3–5 m, increasing as it approaches the river.

Groundwater salinity is increased and varies from 3.4 to 9.2 g / dm³. The type of mineralization is sodium sulphate.

The filtration coefficient of clay rocks varies from 0.0045 to 0.2 m / day, pebble rocks - from 1.09 to 6.84 m / day.

The surface of the groundwater mirror has slight slopes, generally identical with the general slope of the relief. During the period of intensive irrigation, the groundwater level rises, water flows to the river and is drained everywhere in the riverbed. When the groundwater level drops, the reverse process takes place, so groundwater in the study area has a hydraulic connection with the surface water of the river, the groundwater flow varies depending on seasonal conditions, or pinches into the river or is fed from it.

The lithological structure of the station is as follows: bulk soil with a thickness of 1 to 7 m lies on the surface and is an indiscriminate mixture of loam, pebble, construction debris. Bulk soils are underlain by loams with rare inclusions of sand lenses with fragments of grout. The thickness of the layer ranges from 4 to 9 m. Sandy loam and sands with rare inclusions of gravel are also found in this layer. Clay soils, as a rule, lie above the groundwater level.

They are underlain by gravel-pebble sediments that form the aquifer. The revealed thickness of these deposits varies from 1.9 to 9 m. Conglomerate lenses are found in this layer.

The groundwater in the area under consideration has a high salinity. Dense residue ranges from 1190 to 2808 mg / dm³, rarely 3602 mg / dm³. The type of mineralization is sulphate-sodium with SO42 content up to 2164 mg / dm³. The depth of groundwater varies depending on the nature of the relief and the season of the year.

The chemical composition of groundwater indicates their high salinity and their classification as sulphate.

1.7 Soil, vegetation and wildlife

The initial section of the 220 kV overhead line under construction is located on light gray soils. Gypsum-bearing gray soils, as they develop on the gypsum-bearing weathering crust. Beyond the TPP territory, there are sierozems on loess-like loams and alluvial-meadow soils. The soils of the study area are characterized by a neutral and slightly alkaline medium with a pH value of 7.1–7.6, and a low content of humus (1–2%).

Soil solutions are characterized by an excess of calcium ions, sulfates and carbonates, the latter accumulate in the long dry season and increase due to emissions and discharges of enterprises of the Navoi industrial zone. In the elemental composition of the soil, not only an increased content of calcium, sulfur, but also iron is found. These elements can bind toxic substances present in the emissions of enterprises.

In the soils around the Navoi TPP, there is an increased content of calcium, sulfur, iron, arsenic, lead, strontium and barium in comparison with the regional background of the soils of Central Asia.

The geochemical anomaly of the listed microelements is confirmed by an increase in concentration with depth, and not towards the surface, as occurs in the case of technogenic pollution. In addition, elevated levels of strontium and barium (from 330 to 1300 mg / kg) are parallel to the increase in calcium content in horizons enriched with carbonates and sulphates at a depth of 10-30 and 20-50 cm. Thus, the concentration of many elements can be associated with a carbonate alkaline barrier.

The phosphorus content in soils is low (0.15 - 0.2%), moreover, due to the high carbonate content, it is contained mainly in the form of sparingly soluble and insoluble calcium phosphates. In soils, there is a lack of nitrogen (0.02 0.07%). The gross amount of calcium in irrigated sierozem reaches significant values - 2% or more. The main part of it is silicates, and exchangeable and water-soluble potassium is less than 1%. The upper soil layers are enriched with water-soluble calcium and magnesium salts.

In the study area there is no clear distinction between soil horizons due to the frequent displacement of the upper horizons during the planning work during the construction of communications and roads.

The mechanical effect on the soil cover in the area of the projected route is expressed in shallow recesses, which either overgrow or serve to dump various debris. The greatest deformation of the soil cover is observed on unorganized crossings, which contributes to the violation of integrity and dusting of the underlying surface.

The vegetation cover in the area of the 220 kV OHTL under construction is represented by ephemeroid-wormwood communities and agricultural crops.

Natural full-member communities of ephemeroid-wormwood communities with significant participation of bluegrass, campfire, annual astragalus, foxtail, and iris are preserved in areas near limestone quarries. However, used for unorganized grazing of livestock, they are largely enriched with weedy species: adraspanom, cousinia, grassy grapes.

Ephemeroid-weed-wormwood communities dominate around access roads. Dredging is overgrown with grass-meadow groups with patches of wormwood.

Saline-meadow coenoses with tamarisk and yantak are noted in the depressions; instances of reed are found singly. The rest of the space is occupied by a rarefied group of annual saltworts, indicating superficial salinization of the soil.

Along the roads and canals, along the numerous fields crossed by the highway under construction, there are plantings of mulberries, poplars, plane trees.

Among the tree species intersected by the projected road of the overhead line dacha plots and the nearby village of Methane are a variety of gas-resistant species: white mulberry, elm squat, poplar Bollé and Canadian poplar, sucker-leaved. From the mid-gas-resistant, maple-leaved and white willow are planted, from gas-resistant - Pennsylvanian ash, sycamore tree, pedunculate oak, and stone fruit trees - peaches, cherry, apricot. In addition, there are artificial planting of grapes, roses and other decorative flowers. Regular watering and care favorably affects the condition of the plants, although, according to evidence of stock materials, insignificant point necrosis was found on the leaves of trees growing on the territory of the power plant, and considerable amount of necrotic areas were found in the plant samples taken near Navoi exposure to atmospheric pollutants.

The most significant violations of the leaf surface were observed in ash, sycamore, acacia in artificial plantings in close proximity to TPP. The detected areas of destruction of cell walls on both sides of the leaf epidermis, gray granules between the cells indicate the effect of gas pollution and dust on the morphological and anatomical structure of the leaves of trees, shrubs and grasses.

The analysis of stock materials also revealed samples of vegetation taken from four sides of the TPP near the territory (200–300 m) and at a distance of 1 km and studied using the spectral analysis method in the vegetative part of such species as annual hodgepins and adraspan Cr concentrations

exceeding compared with the regional level 10 times or more, and the maximum allowable - 40 or more times. Significant exceedances of Cu and Ni concentrations were also detected (2-4 times higher than permissible).

When analyzing the samples, the following pattern was revealed: from the north and east of the TPP, the metal content in plant samples is much higher near the territory than at a distance, and in the southern and western directions, on the contrary, the concentration of metals near the territory is lower than at a distance. The analysis performed allows us to qualify the state of the soil and vegetation around the TPP as characteristic of a zone with a tense environmental situation.

There are no species of plants listed in the Red Book along the route under construction.

There are no lands for environmental protection and a nature reserve fund near the construction site.

Among the animals settling near the TPP, in an area characterized by significant dust and noise, only groups that can hide from the station's noise impact can be mentioned, such as insects (winter and cotton moth, caradrina, spider mite) and reptiles (desert gologlaz , rapid lizard, water snake, Central Asian tortoise), or species that can quickly leave unfavorable areas - birds (field sparrow, Little Turtle Dove, Common Starling, Killer Whale, Red-haired Swallow, Black Swift, Mynah, forty). In areas with stagnant or running water settle amphibians - toads and frogs. Among the mammals everywhere there are a house mouse, a baby hare, a bat-wolf, a combed gerbil, an eared hedgehog, and a small shrew.

The modern composition of ichthyofauna p. Zerafshan is represented by 30 species belonging to seven families, of which the Karpov family is the most widely represented (19 species). Six species of fish of the Vynov family were found, and one species of the family Somov, Gambuziev, Snakehead, Okunev and Bychkov. The ichthyofauna is represented mainly by local commercial species, however, there are also acclimatized commercial (white and black amur, tench, oriental bream, silver carp, white and big-nosed silver carp, pike-perch) and randomly introduced non-target species (rhinogobius, Balkhash perch, spotted goose Korean and common beetle).

Thus, soil pollution in the area under consideration is moderate, flora and fauna are permissible.

2 Socio-economic conditions

At present, Navoi TPP JSC provides electricity and heat to consumers in the Navoi, Bukhara and Samarkand regions and the population of Navoi.

To ensure reliable and continuous electricity and heat supply of enterprises, as well as to improve the environmental situation in the zone of influence of the Navoi Thermal Power Plant, it is necessary to create their own sources of power control. This problem is solved by building the third and fourth combined-cycle gas turbine plant of class J with a total capacity of 1,300 MW.

To supply capacity from PGU No. 3.4, it is planned to construct a 220 kV overhead line to an external 220/500 kV switchgear designed according to a separate project at Navoi TPP.

When carrying out work on the project for the construction of a 220 kV overhead line from 2 PGU No.3, 4 to a 220/500 kV open switchgear at the Navoi TPP, the problem of employment of the population will be partially resolved, including for unskilled labor, in particular, workers, dispatchers , chauffeurs, etc. from the local population

Project employment is not limited to the direct presentation of jobs. There will also be indirect incomes and employment of the population associated with the purchase of goods by the contractors and payment for services. There will also be employment created at the expense of the personal expenses of the project staff, but its scale will be insignificant. The other side of the emergence of opportunities for significant local purchases and businesses based on the implementation of this project is the influx of people from other parts of the region, which can provide a noticeable development of the local economy.

Thus, the main part of the socio-economic impacts associated with the construction of 220 kV high-voltage lines from CCGT No. 3, 4 at the Navoi TPP to the external 220/500 kV outdoor switchgear will be positive.

Mitigation measures should be taken to reduce negative impacts to a minimum, and the positive effects need to be extended. To this end, the following measures will be taken:

construction works will be managed so as to minimize the inevitable and short-term impacts (smoke, noise, vibration, dust, dirt, delays, accidents) of construction work on local residents and other road users;

operations will be managed so as to minimize the impact on the local residents, in particular, time limits for noisy work during the daytime hours will be introduced and a schedule of delivery of materials will be made in order to avoid traffic violations;

local employees will be given the opportunity to learn and master new technologies;

main equipment will be supplied from abroad.

Relocation due to planned construction is not expected.

The implementation of this project in conjunction with the planned construction of 220 kV overhead lines in the region (500 kV dimensions) to the Besopan bureau, the construction of the 500 kV Muruntau substation and the 500 kV Navoi substation will become a reliable source of power for NGMK loads the effect both for a large industrial enterprise - NGMK, for Uchkuduk - the Zerafshan energy center, as well as for the whole republic, will reduce the electric power deficit in the Republic of Karakalpakstan, Khorezm, Bukhara and Navoi regions.

3 Environmental Analysis of the Design Solution

3.1 Characteristics of technical solutions

Construction of 220 kV OHL route on this project is carried out from existing CCGT No. 3,4 on the territory of "Navoi TPP" JSC to designed on separate project external 220/500 kV open switchtyard at Navoi TPP.

Route location, intersection with engineering structures is carried out in accordance with existing regulations and will be coordinated with the interested organizations.

Description of adopted engineering solutions, given below, will be adjusted in further detailed design.

On designed OHL, wire of AC-400 brand is adopted.

Galvanized steel rope of brand TK - 70 (11.0-G-I-J-R-1176(120)) on GOST 3063-80 is adopted as ground wire .

Maximum voltages in the wire are adopted on the basis of bearing capacity of supports and foundations, maximum voltages in the cables-based on required by EIC vertical distance between the wire and the cable in the middle of the span.

Installation of wire and cable will be carried out according to tables of erection dip

Technical characteristics of OHL (supports and foundations) are defined according to the completed TTD project (Technical tender documentation) and clarified in specific design.

Material of 220 kV OHL supports:

Anchorage-angle supports – metal;

Intermediate – metal and reinforced concrete;

Insulators – polymer and glass (According to TTD).

For protection of wire fasteners from bird contamination, as well as for protection of birds from electric shock, over all supporting sets on rods, bird guards "Ruffs" of brand E5A are installed.

Characteristic of materials of supports structures .

For metal

structures carbon steel VSt-3 on GOST 380-94 is adopted.

For racks, foundations, slabs and beams reinforced concrete on sulphate-resistant cement is used.

Protection of building structures from corrosion.

Metal structures of supports, including supporting details of foundations F5-USU (250), are colored with paint BT-177 on OST 6-10-426-79 in two layers. Waterproofing of underground part of reinforced concrete racks (at an altitude up to 3.5 m from the butt), foundations, slabs and beams is performed by double layer reinforcement with crude fabric ART-4744 on oil bitumen of type II. Nefras «C4 -130/210» is adopted as solvent.

In order to prevent theft of elements of metal supports, welding of nuts to bolts bodies in three points is provided with subsequent painting of welding places. Welding of nuts with their painting is carried out to the lower traverse of support.

Insulation and overhead line hardware. Overvoltage protection. Earthing devices.

Line insulation is designed on the basis of specific effective length of creepage path λ=2,0 cm/kV, and is performed by glass insulators.

Protection of designed OHL from direct lightning strokes is carried out by two cables suspension.

Cable fasteners– insulated, with direct earthing. Supporting fasteners are equipped with a single insulator PSD70E, tensioning fasteners are equipped with a single insulator PS 120 B.

Supporting clamps for wire and cable- are dead clamps PGN -5-3 and PGN-1-11, respectively. Tensioning clamps are compression clamps: NAS-500-1-for wire AS500/26 and NS-70-3-for cable.

Actual strength factors of insulators and overhead line hardware correspond to the coefficients, specified by EIC.

The project provides for protection of wire and cable from vibration by vibration suppressor of brands: GPG-3,2-13-550/31 – for wire and GPG-1,6-11-400/13 – for cable in accordance with «Installation check-list of vibration suppressors ».

Connection of wires in spans and the plumes of anchor and angle tension towers is carried out by connecting clamps, mounted by solid extrusion method (one link-one connection clamp of type SAS-500-2).

In the places of damage to aluminium wires, repair clamps of type RAS-500-5A are installed.

Connection of cable in the spans is effected by connecting clamps of type SVS-70-3.

On
the designed 220 kV OHL, all supports are grounded by vertical electrodes (in loams) and long - length ground wires (in pebbles) from round steel Ø16мм (4 beams per support) with length 5 and 10 m, depending on soil resistivity.
Crossing of obstacles.

All crossings are made in compliance with required by EIC dimensions
Crossing the river Zeravshan
In general, hydrological conditions of laying the route of 220 kV OHL are favorable, the main part of crossed sprinklers and collectors are shallow, width of their channelss does not exceed 10-15 m, depth of channels cutting does not exceed 1.5 m.
The most difficult part of the route is OHL crossing of the river Zarafshan. 220 kV OHL crossing the river Zarafshan is positioned opposite the site of CCGT No. 3,4.
The left and right banks of the river are low (cutting depth is about 3 m above the water line), without major washouts, composed from surface by sandy loams and loam interlayers.
Width of the river channel in the place of crossing is 38 meters. The river channel is sustainable.
Floodplain of the river before and after its crossing by the route is used as pasture for livestock grazing.
Effects on surface water are not expected during project implenetation: crossings across the river Zeravshan and through channels are performed in one span without work execution in water protection zones.
During execution of the excavation works in close proximity to the Zarafshan River, anti-subsidence works and drainage are performed.

Operation organization

Repairs and maintenance of designed OHL are performed by personnel of specialized teams that are placed on repair- production bases.

Technical guidance of teams staff is performed by service of "National electric power network of Uzbekistan" JSC. OHL will be under responsibility of South -Western Regional dispatching service (TDS).

Repair and maintenance of the designed OHL will be performed by staff of specialized teams.

For performance of emergency recovery works on OHL according to the “Norms of emergency stock of materials and equipment for OHPL 110 kV and above” (HP-34-70-002-87), establishment of the minimum emergency supplies and equipment is provided.

Organization of construction.

Regarding object composition, constructive solutions and production conditions of construction-assembly works, this facilities complex is classified as of " medium complexity " of construction.

Local producers are expected to supply structural units and equipment:

Metal strucures (Chirchik metal constructions plant);

stubs, girders, reinforced concrete beams (plants if concrete products POESI, plants if concrete products -1,2);

wire, cable, FOCL (Tashkent);

for expansion of substations – equipment, produced by « Uzelectroapparat

– Electric Panel» JSC.

The nearest railway station for goods delivery is Navoi station. Construction bases are provided on vacant lands in the area of 220/500 kV open SWYD.

Delivery of electrical grid goods to the route is carried out by road transport by road, and accesses to the route-along field roads or off-road.

Complex of works on construction of transmission line consists of stages, performed sequentially:

preparatory works:

location of supports centres and OHL route axis,

reorganization of engineering structures on OHL route,

construction of sites for supports and distribution of materials along the route;

organization of temporary construction bases;

arrangement of temporary builders camps along the route or accommodation of workers in nearby villages;

- arrangement of temporary power supply and water supply of temporary construction bases and

residential settlements from existing mains in the area of construction;
provision of communications;
provision of fire safety of temporary construction bases, settlements of builders, operating sites;
construction works:
laying out of foundation pit, excavation works,
arrangement of foundations and grounding devices,
Assembly, installation, verification and anchoring of supports;
erection works:
rolling out and connection of wires and cables, their lifting on supports, stretching and mounting on supports
installation of vibration suppressors and distance spacers, mounting of hinges
suspension of ground wire and fiber optic cable;
OHL commissioning and putting into operation.

Such technology of OHL construction provides high productivity, shortens the term of line construction.

Provision of builders with housing is carried out due to temporary housing villages on construction bases. All temporary buildings and structures are of mobile type in minimum volume. Water supply of villages with drinking water is carried by imported water, and for technical and economic needs – from the local nearest sources.

Power supply of villages is provided from local low-voltage lines or through the use of mobile power plants.

In the production of works in the vicinity of the existing equipment, one should be guided by "Electrical safety instructions" section 23 "Admission of personnel of construction organizations to work in existing electrical installations and in the protective zone of power transmission lines. For this, Working plan must provide for all organizational and technical measures to ensure safety of all construction works.

3.2 Identifying sources of environmental impact

Analysis of design solutions did not reveal sources of emission of polluting substances in the atmosphere in operation of 220 kV OHL. OHL equipment is the source of noise and electromagnetic environmental impact.

During construction, environmental impact is determined by:

air pollution by exhaust gases of motor vehicles and construction equipment, used in delivering of equipment and construction materials, during construction and installation works for construction of supports; by inorganic dust and products of decomposition of explosives while conducting drilling and blasting operations; by welding aerosol, compounds of manganese during welding; by vapours of organic solvents, aerosols of paints and lacquers in conducting paint work. That is, emissions, are mostly carried out from mobile auto-transport and fugitive sources. Emissions source settings are shown in table 3.1 (annex 3). There are no stationary emission sources;

noise and vibration impact of construction machinery;

seizure of land resources for temporary use for placing of construction facilities, areas for storage of building materials and waste, generated during construction.

According to the list of basic vehicles and machinery, used in OHL construction (table 3.1), for construction works, related to emission of atmospheric pollutants, 11 units of basic vehicles and construction machinery of different lifting capacity and power, operating on diesel fuel and gasoline, will be used.

Table 3.1 List of basic vehicles and machinery, used in construction of 220 kV OHL on 220/500 kV open SWYD at Navoi TPP

№	Name of the motor vehicle (mechanism)	Type of fuel	Lifting capacity (power)
1.	Truck KRAZ, 1 pcs.	Diesel fuel	7 t
2.	Forklift, 1 PCs.	Diesel fuel	5 t
3.	Bulldozer T-100.1 PCs.	Diesel fuel	79 kW
4.	Mobile compressor, ZIF-55, 1 PCs.	Diesel fuel	35 kW

5.	Truck crane, KS-4501,1 PCs.	Diesel fuel	10 t
6.	Crawling tractor crane, 1PCs.	Diesel fuel	16 t
7.	Flusher truck, 1PCs.	Diesel fuel	6000 l
8.	Drilling machine MRK-750, 1PCs.	Diesel fuel	79 kW
9.	Semi-trailer truck, 1 Pcs	Diesel fuel	15t
10.	Shovel crawler, 1 Pcs	Diesel fuel	0,5 m^3
11.	Mobile power plant, 1 PCs	Diesel fuel	

List of raw materials and materials, use of which in construction work will lead to pollutants emission into the atmosphere, is presented in table 3.2.

Table 3.2 List of raw materials and materials, used in construction of 220 kV OHL on 220/500 kV open SWYD at Navoi TPP

№	Name	Unit of measurement	Quantity
	Painting work		
1.	Solvent P60	T	0,018
2.	Mastic	T	1,2
3.	Enamel PF-115	T	0,03
4.	Paint BT-177 Silver	T	0,182
5.	Nitrocellulose oil paint	T	0,021
	Installation of supports		
6.	Heavy-weight concrete	M^3	4,2
7.	Sand	M^3	45
8.	Crushed rock	M^3	122,5
9.	Mixture of sand and gravel	M^3	58,8

Totally, in OHL construction, polluting substances of 13 titles, listed in table 3.1 of annex 3, will come in the atmosphere.

During construction works, waste of 7 titles are generated,

including:

III hazard class - 1;

IV hazard class – 5.

Sources of waste are: construction work;

cleaning of temporary facilities and construction sites.

Waste, generated during construction: metal waste, betone, reinforced concrete (IV hazard class), waste of paints, wiping material, contaminated by oils (oil content is less than 15%, III hazard class), waste of heterogeneous mixture of solidified plastic (Paint containers, IV), SMW (waste from temporary facilities, excluding unsorted, large waste IV).

Norm of waste generation is determined by fact. For collection and temporary storage of waste, specially equipped places and containers are provided.

Construction organization-principal contractor collects and temporarily stores SMW and industrial waste, generated while conducting dismantling and construction works, in specially equipped places with subsequent exportation for recycling by specialized organizations, according to concluded contracts. Organization-principal contractor shall be fully responsible for sanitary-epidemiological and ecological conditions to the customer and inspecting bodies.

Environmental impact, when using arrangements for collection and disposal of waste during construction, will have small possibility.

4 Analysis of types of environmental impact

4.1Pollution of pollutants

During operation of 220 kV OHL to 220/500 kV open SWYD at Navoi TPP, atmospheric pollution does not occur

Temporary local air pollution is expected in construction works.

Calculation of pollutant emissions during construction (annex 3) was made in accordance with the requirements of the Guidelines for Inventory of pollution sources and regulation of contaminents emissions in atmosphere for enterprises of the Republic of Uzbekistan. (Reg. No. 1553 dated, since the Ministry of Justice, Tashkent, 2006).

Totally, when carrying out construction of 220 kV OHL, 4.164 tons/year of pollutants will come into atmosphere.

The greatest contribution in supply of polluting substances during operation of construction equipment is made by: carbon monoxide (0,815 t/year, 19,6% of the total emissions), hydrocarbons (0,849 t/year, 20,4% of the total emissions), nitrogen dioxide (0,81 t/year, 19,5% of the total emissions). Supply of other 10 ingredients is 40,5% of the total emissions.

To determine the level of emissions impact during the construction of 220 kV OHL on atmospheric air, calculation was made of concentrations of pollutants on program "Ecologist" on 2.0 x 2.0 square km in increments of 0.1 km. Technical characteristics of emission sources, meteorological characteristics and ratios that define the character of chemicals dispersion into atmosphere of the area of the planned route were used as the initial data, .

The results of calculation of pollutant emissions diffusion in the atmosphere during the construction of 220 kV OHL to 220/500 kV open SWYD at Navoi TPP in the form of maps of diffusion are shown in figure. 4.1-4.10 (annex4).

Analysis of diffusion calculations has shown that the greatest contribution to the level of atmosphere pollution is made by emissions of nitrogen dioxide, xylene, iron oxide and manganese compounds (fig. 4.1-4.3, 4.8), maximum concentrations of which do not exceed quota, approved by Goscomgeology RUz (table 4.1).

Table 4.1 ***Characteristics of substances that pollute the atmosphere and atmospheric pollution level***

Name of pollutant	LOC or SRLI, mg/m^3	Hazard class (SRLI)	Set quota (in MAC proportions)	Maximum concentration in MAC proportions	Compliance with quota (+,-)
1	2	3	4	5	
Aldehydes	0,02	2	0,20	<0,01	+
Benzo (a) pyrene	1*10^{-6}	1	0,20	<0,01	+
Nitrogen dioxide	0,085	2	0,20	0,20	+
Sulphur dioxide	0,5	3	0,25	0,01	+
Xylol	0,2	3	0,25	0,22	+
Manganese and its compounds	0,005	2	0,20	0,16	+
Nitrogen oxide	0,6	3	0,25	0,01	+
Iron oxide	0,2	3	0,25	0,18	+
Carbon oxide	5,0	4	0,33	<0,01	+
Inorganic dust	0,15	3	0,25	<0,01	+
Soot	0,15	3	0,25	0,01	+
Hydrocarbons	1,0	4	0,33	0,01	+
White spirit	0,2	2	0,20	0,04	+

Maximum concentrations of other pollutants, generated by emissions during construction of 220 kV OHL to external 220/500 kV open SWYD at Navoi TPP, also do not exceed quotas, allowed by Goscomecology RUz for pollutants of relevant hazard class and enterprises, located in Navoi region.

After commissioning of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP compared to existing state, maximum concentration of hazardous (polluting) substances in ambient air all over the route will remain at the same level, because generated concentrations of pollutants are temporary, only for the period of construction.

Fallout of the above ingredients on the soil, plants and surface watercourses is very small and the impact on these objects will be minor.

4.2Acceptance of acoustic noise and vibrations

Noise impact will not exceed the normative values: 45 dBA at night and 55 dBA during the day in housing development according to KMK 2.01.08-96 and 80 DBA at permanent workplaces during construction and repair works in operation of 220 kV OHL according to SanPiN no. 0325-16 «Sanitary norms of permissible noise level at the workplace ".

OHL noise is caused by corona discharge on wires. According to the project, the wires are chosen so that voltage stress on the wire surface does not exceed the initial voltage stress of corona discharge. However, irregularities on the wire surface due to mechanical damages (burrs, scratches), pollution (drops of the lubricating, solid particles), precipitation (rain, dew, snow, etc) lead to local increase in electrostatic field strength. As a result, corona discharge occurs on OHL wires under lower voltage than the voltage of self-sustained discharge on clean intact wires. Therefore, OHL noise can be heard in good weather too, but especially it is stronger in rainy weather.

Expected level of noise at a distance of 100 m from 220 kV OHL is 17.70 DBA, which is below allowable 45 DBA.

Noise barrier system is not required, because the noise level at the border of the nearest houses does not exceed allowable level according to KMK 2.01.08-96.

Noise impact during construction will take place in three stages:

– When making concrete mixture;

– When installing 220 kV OHL supports.

Typical levels of expected noise at a distance of 15 m from the construction equipment during the construction phase are shown in table 4.2.

Table 4.2 ***Typical noise impact during construction***

Equipment	The maximum level of expected noise at a distance of 15 m (dBA)
Concrete mixers	87
Cranes	86
Paint Sprayer	89
Excavators	90

Welding machines	73
Dumpers	87

All the most noisy construction operations for supports installation near residential housing, in particular, all work for soil the movement, are limited by daytime hours
Thus, noise associated with construction activities will have temporary and periodic nature, will not exceed noise standards.
Impact of vibration is expected:

– in soil compaction;
– when working jack hammers;
– in compaction of concrete mixtures;

When working transporters to move bulk materials, e.g. sand.
Vibrations, related to construction work, will have temporary and periodic nature, beyond the boundaries of the working platform vibration effects will not be distributed.

4.3 Impact of magnetic field

Expected level of maximum magnetic field strength will make up 7.76 a/m, far below acceptable standards. MAL of magnetic field strength is established depending on people presence in it. In accordance with hygenic requirements, eight-hour stay of the personnel in the magnetic field with strength up to 80 a/m is allowed at overall impact (the entire body) and up to 800 a/m at local impact (on limbs).
Consequently, environmental impact of OHL on level of magnetic field strength is within normal limits, measures for protection of personnel and the public from the magnetic field, created by EMF sources of OHL wires VL are not required.

4.4Effect of electric current

Construction of 220 kV OHL is carried out in such a way that impact of electrical voltage and current is limited by the size of the sanitary protection zone.

Object of the electric current impact along OHL route can be service personnel as well as people and animals-when removal of potential from grounding devices when short circuit currents flowing in them and lightning.

Damaging effect of electric current on the human body is characterized by cessation of work of heart, respiratory system, nervous system, and in extreme cases, it is fatal.

According to GOST 12.1.038 – 82 norm of electic-current passing through the human body without harmful effects for health – 0,3 mA in trouble-proof mode of operation and duration of impact more than 1.0 s.

Design of supports meet the requirements of occupational safety standards system. For security of repair and maintenance of 220 kV OHL protective earthing device is provided.

Design of supports meet the requirements of occupational safety standards system.

4.5 Impact on vegetation and land

Damage to the woody vegetation during construction of desiged 220 kV OHV is not expected, felling of trees along the route is not provided. Gardens and ornamental trees in roadside plantings, crossed by the route, are preserved. It is assumed for high ornamental trees to trim crown to comply with the necessary conditions to have gaps between wires and trees not less than 4 m. Fruit trees are not subject to trimming and extraction during the project's implementation because route supports are installed on the heights of the terrain before and after the territory of the crossed garden between corners # 2 and # 3, and the distance from dwarf varieties of fruits trees to OHL wires meets standards.

OHL route does not go through the plant array, value of which is determined by the stocks of valuable timber species and medicinal plants. The route does not affect lands, occupied by valuable agricultural crops, natural reserves and wildlife reserves. The main types of land, crossed by the route, are farmlands under cotton and wheat crops. When laying the route on arable lands, route direction is selected in direction of fields handling and on the boundaries of the fields with a view to minimizing the damage.

Thus, damage to woody vegetation during construction of designed route of 220 kV OHL

is not expected.

Indicators on areas of land allocation for construction of 220 kV OHL are discussed in the next section when analysing seizure of natural resources. Supports will be installed mainly on agricultural lands- on the border of arable land, out of the land of industrial enterprises, roads, irrigation-drainage network. Free sites between the fields and field boundary will be used for the installation of equipment, as well as cart tracks. On irrigated ploughed field, construction work is performed after harvesting.

The project provides for restoration of lands, seized for temporary use: reclamation and restoration of soil-vegetation layer, backfilling of pits and trenches, facing of slopes and side slopes with vegetable soil.

To save the most fertile topsoil before the beginning of construction, complex of measures on mechanical and biological reclamation is provided. It includes preliminary removal of top soil and turf, storing it in small heap of ground next to the construction venue and upon completion of the construction works - laying it on top of slope of OHL supports, or bodies of existing roads as recultivation layer. In addition, around the pit in loose soil, sod grains overseeding is carried out.

Compensation for seized in permanent use lands will be made directly prior to construction. Costs will be determined on actual basis.

4.6. Effect on relief, soils and groundwater

Mechanical infringement of relief occurs during construction of foundation pits for supports foundation, at the arrangement of installation sites and temporary roads.

In the conditions of plain relief along the route, impact is assessed as minimum.

Temporary formation of foundation pit with following filling and soil compaction excludes creation of additional forms of micro-and meso-relief. Impact on the relief on the plain part of the territory was estimated as reversible. Removal of soils is excluded due to full use of the soil from the pit in backfilling, planning and return of upper humus horizon as recultivation layer at the place of filled foundation pit.

Slipping of soil and reduction of supports sustainability is not expected, and as a consequence, Foundation surcharging and additional soil compaction are not provided.

Thus, along 500 kV OHL route (unsoldering plot), impact on soils and groundwater is not expected.

During construction of a small shelf for the support in the loess soil, the most dangerous processes are drawdown and erosion. the following measures will facilitate reduction of

erosion and subsidence processes at the site, meant for support :
Arrangement of sites, at the watershed;
outside the notoriously erodible slopes and erosive furrows;
ground compaction in the pit during backfill.
Significant event is the preservation of fertile humus layer and sod. For this, before the beginning of works on the site, meant for support, it is supposed to remove the top 10-15 centimetre soil layer, in which basic mass of roots of ephemers and ephemeroids, sod grasses preserves. Layer preserves in the heap on the edge of the work area, and after installation of foundations, pit backfilling and tamping backfill soil, it is placed above as recultivation horizon. Around the pit site, where maneuvers of machines have taken place, sod grasses shall be sown.
Due to the extensive development of plots along the route of 220 kV OHV for irrigated arable land, irrigation water drainage is stipulated, filtered in the upper two-three meter thickness from the foundations of the piers by construction of drainage ditches.
Implementation of water drainage from the support installation sites, located on irrigated farmlands or near them, will prevent development of such dangerous processes as soil erosion and creeping.
In general, along the route, impact on relief, loess soils and groundwater, is allowable.
In the course of regular inspections of OHL equipment along the route, in its operation, soil stability control is required, with a view to the timely identification of manifestations of shrinkage processes, creeping, erosion, in the case of detection of negative processes –it is necessary immediately to undertake work for soils strengthening.
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4.7 Effects on surface watercourses

At sites of crossing of floodplains and the river Zeravshan and multiple channels by 220 kV OHL, width of watercourses is less than 100 m, which eliminates installation of intermediate supports in long-channel part. The lack of works in long-channel part of watercourses will eliminate the effects on morphology of river, groundwater and surface water, as well as floodplain biocenoses and fish fauna.
Arrangement of OHL supports on marks above maximum flood discharges will reduce the likelihood of accidental supports fall when passing mudflow discharges of the Zerafshan River.
Thus, design solutions regarding selection of transition plot through surface watercourses

of 220 kV OHL route will exclude impact on surface water in construction work and safe operation of the route in the coastal zone.

4.8 Animal Impact

Along the entire length of the route during OHL construction and operation, impact is expected on certain groups of animals and birds. The intensity, the extent and scope of impact on individual species will differ because of differences in ecology, habitats, forage, mode of life.

During 220 kV OHL operation, impact of high voltage can become apparent, mostly for birds that use supports for rest and less often -for creation of nests. In general, OHL supports are not favourable spot for nesting birds, because the high-voltage electric field causes disturbance of some physiological processes.

Negative consequences to birds that use OHL supports for temporary rest appear at the time of take-off and touch of wires and beams by the wings. In this case, the birds are killed by the electrical discharge. Such an example is characteristic mainly for lines with voltage 35-220 kV, where the distance between the wires is small.

To exclude the death and disease of birds that use OHL supports for rest and creation of nests, setting of special bird-scaring devices on supports is provided, in the form of Ruffs, spiny three-core tridents, spring constructions, creating temporary vibrating effects. Specified structures are fastened to traverse belts with wire or special metal cuffs before lifting the supports. Recently, special obstructing colored umbrellas have been accepted for execution, which are fixed over the set of insulators. They not only scare birds by bright color, but also protect set of insulators from pollution by droppings that extends OHL operation without additional cleansing and emergency shut-offs.

Direct impact, associated with the violation of housing and partially with destroying of forage base can be associated with such species as small birds, rodents, mdium and small mammals.

Impact, associated with the destruction of animal shelters, will be limited and local, as construction sites of ditches and road shelves occupies small areas. However, when conducting works on arrangement of sites for supports and road shelves, it is necessary to avoid the sites with holes and other types of animals dwellings.

In order to reduce impact on young animals when breeding the offspring and their feeding, construction work should be carried out in late summer and autumn.

On all groups of fauna, impact of noise is expected during construction. Impact of noise from construction machinery will be periodic, not intensive, weakly increasing after equipment importation to the site. Thanks to gradual ramp up of scope of work, associated with supply of machinery, noise, as a factor of disturbance, will allow animals to migrate at safe distance from the place of construction works.

Impact on the fish fauna of the river Zeravshan along OHL route is excluded due to usage of the single-span transition, without construction of transitional supports and construction works outside of water, at a distance of 60-100 metres from the water's edge.

Impact on animals of agriculture irrigated zone is weak on intensity, since there are no valuable objects of wildlife among the agricultural lands. To preserve animal biodiversity, living near irrigation lands and among the fields, OHL route construction work shall be carried out in spring, prior to plowing on sites, allocated for spring crops, and in autumn, prior to agricultural work at sites, allocated for winter crops.

5.Assessment of impact types determined by the removal of natural resources from the environment

Commissioning of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP will be accompanied by withdrawal of lands, natural raw materials in the form of construction materials, supplied in quantities from 4.2 to 122.5 m3 according to table 3.2, as well as petroleum products in the form of diesel fuel and gasoline for auto-transport and construction machinery operation.

Alienation of lands for designed OHL is made in accordance with KMK 2.10.08-97 " Norms of land allocation for electric networks with voltage 0,4 – 750 kV".

The project identifies areas of land, allocated for permanent use for OHL supports and land plots, provided for temporary use during construction, which are defined as the sum of areas of the sites for installation of supports and strips along OHL route (According to table. № 1, 2 of KMK).

Table 5.1 ***Alienation of lands for supports of designed OHL***

Land allocation	Area of land allocation, ha
for constant use	0,284
for temporary use	16,62

Upon expiry of the construction term, lands, identified for temporary user, shall be returned to land user after carrying out necessary work on re-cultivation of disturbed lands.

Area of agricultural lands allocation (arable land) for construction of 220 kV OHL route for permanent use (for supports) is 0.284 ha that 58 times less than area of lands, allocated for temporary use.

Lands allocation for temporary use (for laying temporary roads and Organization of construction bases) is 16.62 hectares.

Calculation of land allocation is made by virtue of the norms of land allocation for electic networks with voltage 0.4-750 kV according to KMC 2.10-08-97), given the distance between supports 300-350 m. Permanent allocation per support of 220 kV is from 21 to 100 m2,

depending on the type of supports, temporary allocation for the construction period with a strip width 18 m: for the site for mounting of reinforced concrete supports – 0,06 ha, of metal intermediate support – 0,056 ha, metal anchor and angle tension tower – 0,07 ha.

When constructing OHL, protective zone is provided in the form of a strip with a width of 18 m (9 m in each direction from the outer conductor), within which to conduct any types of construction works is forbidden. However, it is allowed to have wood-shrub planting 3-5 m high with a width of operating corridor under OHL 2.5 m. The main range of woody plants, developed for these purposes, includes local flora species as the most environmentally resistant to soil and climatic conditions of Navoi region (tamarix), as well as cultivars of fruit trees and bushes (apricot, peach, plum, apple, quince, oleaster). Agrotechnics of soil preparation, fruit trees planting, care of them along OHL route is similar to that one, adopted in industrial horticulture. Specifics here is just in the selection of fruit trees range and determining planting density.

It is recommended to divide orchards into lots, using method of mixing by lots, i.e. in certain areas trees of the same type are planted with mixing varieties by alternate rows. Rows of fruit trees are planted along OHL route, leaving in the centre unoccupied installation and maintenance corridors, so that the crowns of trees on the edges of the corridor completely screened it

The distance between rows of trees and shrubs with small crowns (oleaster, blackthorn) is 2 m, with broader crowns (plum-cherry, Apple)-3m. Distance between the trees and shrubs in rows 1-1, 5 m, mixing of wood species-by alternate rows.

Thus, for construction of 220 kV OHL, mainly arable lands are allocated. Lands, withdrawn for temporary use, are subject to reclamation: fertile layer of soil, removed while performing construction works, is used to arrange bodies of existing highways or is laid on top of support slope for its consolidation.

At the time of construction work, it is expected to withdraw natural resources, used as construction materials (gravel, sand, pebble gravel). Building materials consumption is listed in table 3.2.

Delivery of gravel, sand, pebble gravel is supposed by motor transport mainly when purchasing from trade organizations.

6.Alternative design options

«Zero version». As "zero version" let us consider abandoning the project solution implementation. This excludes:

- Power generation from CCGT № 3,4;

- possibility of establishing reliable power supply of HGMK loads in full in conjunction with the planned construction of 220 kV OHL in the region (in dimensions 500 kV to SS "Besopan", construction of 500 kV Muruntau SS and 500 kV Navoi SS

- receipt of great socio-economic effect both for large industrial enterprises-NGMK, for Uchkuduk-Zerafshanskogo electrical generation system, and for the entire Republic;

- possibility of reducing electricity deficit in the Republic of Karakalpakstan, Khorezm, Bukhara and Navoi regions

Alternative route options. The most economical options for construction of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP are options on maximum straighten lines. However, natural barriers and engineering communications along the route give it a form of broken line with turning angles.

On the considered project, 220 kV OHL route has 8 corners, according to alternative version, specified in Fig. 1 in Annex 2-4. However, the disadvantage of the route option 1 in the area of cotton plant is constrained conditions due to passing here of existing 110 kV OHL and planned 220 kV OHL «X-4».

Thus, selected route of 220 kVOHL to external 220/500 kV open SWYD at Navoi TPP has advantages in terms of environmental impact and development of accident risks

7.Environmental impact assessment of possible emergencies

Accident risks in operation of 220 kV OHL to external 220/500 kV open SWYD at Navoi TPP relate, mainly, to falling of supports and breakage of wires.

Negative environmental impacts in the case of such accident increase multiple times with the fall of the support on intersected roads, as a result of which damage to the passing car tank will cause fire and subsequent explosion. Nitrogen oxides, sulphur, carbon will enter the atmosphere. Their concentration within radius of up to 0.1 km will exceed permitted concentration multiple times.

To prevent this kind of accidents, protection of OHL supports by parapet walls is provided at the sides of roads from motorways transport run into it, welding of nuts to shank of bolts in the nodes of support at 10 m height against vandalism.

In addition, to reduce accidental risks, given the specificity of OHL work, in accordance with the applicable “Electrical installation code”, equipment of high-frequency protection and anti-damage automatics is executed.

Thus, negative environmental consequences for the environment in emergency situations on 220 kV OHL route from CCGT # 3.4 to external 220/500 kV open SWYD at Navoi TPP are eliminated by activities, aimed at strengthening the supports, observance of needed gaps between OHL and engineering communications, by application of equipment of high-frequency protection and anti-damage automatics.

8. Character and types of environmental impact

By the nature of the environmental impact, influence of high voltage lines is characterized as mechanical influence and impact on atmospheric air through supply of pollutants during construction.

Construction of transmission lines is connected with the alienation of land that can affect agriculture. Unordered OHL location can disrupt integrity of fields and grassland.

This project provides for land allocation for permanent use on average 58 times less, than for temporary use. The project provides for the restoration of lands, seized for temporary use: recultivation and restoration of soil-vegetation layer, sod revetment of slopes and slants..

The projected route of OHL does not pass through vegetable arrays, value of which is defined by reserves of valuable species of wood and medicinal plants, wild fauna. The route does not affect lands, occupied by valuable agricultural cultures, nature reserves and national parks. The main types of land, through which route passes, are arable lands, cotton crops. When laying route through arable lands, route direction is selected in direction of fields handling and on the fields borders with a view to minimizing the damage. Supports will be installed mainly on agricultural lands (on the border of arable land), and on uncultivated lands, outside the lands of industrial enterprises, roads, irrigation-drainage network. Free plots between fields and headland will be used for the installation of equipment, as well as farm roads. On irrigated ploughed field construction work is performed after harvesting.

Analysis of lands, crossed by 220 kV OHL from CCGT # 3.4 to external 220/500 kV open SWYD at Navoi TPP shows that the bulk of the crossed land constitute arable land (90%), the share of pasture is 7 %, gardens – 3 %.

Damage to the woody vegetation when laying the projected route of 220 kV OHL to external 220/500 kV open SWYD is not expected: trees felling along the route is not provided.

Ornamental trees in roadside plantings and gardens, crossed by the route, are preserved, and it is expected to trim the Crown of high trees to comply with the necessary conditions for gaps between wires and trees not less than 4 m.

The project provides for restoration of lands, seized for temporary use: reclamation and restoration of soil-vegetation layer, backfilling of pits and trenches with soil, sod revetment of slopes and slants.

To preserve the most fertile topsoil, before construction work complex of measures is stipulated on mechanical and bio-logical reclamation, it includes prior removal of the upper humus and sod soil, storing it in small heap of ground next to the construction venue and upon completion of the construction works - laying it on top as the recuktivatiob layer. Additionally, around the foundation pit in mellow soil, sod grasses are sown.

Compensation for permanent use of the Lands will be made directly before construction. Costs will be determined upon completion..

When operating OHL, impact on atmospheric air in the form of pollutants supply is not expected.. During construction, temporary local air pollution is expected.

Polluting emissions during construction occur when construction transport and mechanisms work, in conducting paint work, when dealing with bulk materials.

Atmospheric air will be polluted by emissions of polluting substances of 13 titles, the main of which are carbon monoxide, hydrocarbons, nitrogen dioxide.

Emissions of pollutants will not change the state of atmosphere during construction.

Impact on atmospheric air during construction is assessed as temporary and local.

Acoustic environmental impact at the border of residential development during realization of construction-assembly works and operation of 220 kV OHL will not exceed rated value (not more than 45 DBA at night and 55 decibels in the daytime on the border of residential development according to KMC 2.01.08-96) and not more than 80 DBA at permanent workplaces according to SanPiN № 0325-16 «Sanitary norms of permissible noise in the workplace”.

Impact levels of electric and magnetic components, created by wires of 220 kV OHV electromagnetic fields are within acceptable standards.

Project activities exclude damaging impact electric current to people and animals.

Thus, impact on atmospheric air from emission sources of construction facility would not change its status.

Environmental impact of the researched object will increase significantly at the expense of suppy of nitrogen dioxide, carbon monoxide and soot in case of fire with following explosion in case of emergency situations, discussed above.

Guarantee of trouble-free operation of OHL is qualitatively performed construction work and strict compliance with provided project solutions

Impacts on surface waters and groundwater, soil and vegetation are not expected.

System of organization on construction sites of collection, temporary accumulations and movement of waste would exclude their impact on soil.

Thus, construction and operation of 220 kV OHL from CCGT # 3.4 to external 220/500 kV open SWYD at Navoi TPP, when complying with environmental activities- when selecting the route, carrying out construction works and operation are connected with insignificant environmental impact, meeting normative values.

9.Measures to prevent adverse environmental impacts

Technical project provides a number of actions to reduce environmental impact of the construction facility, as well as to eliminate possibility of emergencies.

It is expected to exercise permanent control over execution of construction-assembly works, with the aim of identifying violations of the general requirements for nature conservation: movement of construction machines and mechanisms in unidentified places, warehousing of designs on territories, not intended for these purposes, discharge of technical oils and domestic water in reservoirs, destruction of grass

addition to the proposed technical solutions, it is necessary to provide special containers for collection and temporary placement at construction sites of each kind of waste, generated during OHL construction, with subsequent exportation in specialized organizations and MSW landfills, established by sanitary and epidemiological inspection service.

On excavating sites for supports installation, fertile layer is removed and exported to the locations, defined by land user, and in the future, is used to improve and restore the land

In areas with presence of ravines and natural pits, installation supports is not performed.

To protect the supporting wires fasteners from bird contamination, as well as for protection of birds from hitting them with electric shocks over all supporting suspension sets on braces, barriers aiainst birds "Ruffs" of brand E5A are installed.

Accident risks are eliminated by means of protection and automation in 220 kV OHL operation.

The project provides for the protection of cables against vibrations and grounding of cable supports according to EMF.

To reduce dusting during construction work, hydraulic dust control with the use of one flushing machine is provided.

All transitions via surface watercourses are carried out in one span, without construction of pillars in water protection areas and carrying out construction works at a distance of 100 m from watercourses.

At the intersection of engineering structures and natural obstacles: roads, watercourses according to required by EIC (Electrical installations code) dimensions, when crossing them, use of higher supports or reconstruction of crossed OHL are supposed.

Thus, environmental risks, when implementing technical solutions, laid in project, and environmental activities, is minimized.

When complying with the above recommendations and activities, there will be no negative impacts on atmospheric air, surface water and groundwater, soil, vegetation and population.

Environmental quality management

Construction of 220 kV OHL requires preparation of Environmental management plan (EMP), which will provide environmental protection. EMP purpose – to help organization in achieving their environmental objectives and fulfilment of obligations in maintaining environmental quality. EMP describes methods and plans that are used to reduce environmental impact, and also defines indicators, using which it is possible to evaluate the progress of EMP implementation. Proposed EMP is General in nature, though all expected impacts are taken into account, it is not specific for specific routes of transmission line (ETL). As soon as EIA has been approved, this EMP will then be used as a basis for the preparation of specific EMP.

Most of the impacts, associated with the construction and operation of projected OHL, will occur during construction. Therefore, EMP focuses to a large extent on this phase of the project. However, recommendations of the environmental management during operation are taken into account, which are also included in EMP.

EMP is the basis for implementation of mitigation measures at each stage of the project.

Implementation of the environmental management plan

Before the beginning of the construction works, detailed project of environmental conditions and mitigation measures must be approved and coordinated with experts competent organizations.

The contractor will assume primary responsibility for the proper implementation and realization of plans, measures, controls, etc., in accordance with the terms and conditions, specified in the relevant resolutions and Plans for environmental management and monitoring.

During construction, the customer and designer (field supervision) will monitor implementation of solutions, defined in the project.

After commissioning, environmental monitoring and regular maintenance should be organized by "National electric network of Uzbekistan" JSC.

Environmental monitoring plan

Environmental monitoring plan includes schedule of monitoring and institutional arrangements. Environmental monitoring plan will show the way of taking precautionary measures during and after OHL construction so that one could take necessary steps to remedy the defects or deficiencies.

During construction, monitoring will focus on guarantees of the implementation of environmental mitigation measures, and some performance indicators will be tested in order to establish environmental effectiveness of the project and maintain any recovery actions to prevent unexpected effects. Monitoring of actions during operation of the project will focus on fixing environmental effectiveness and proposal of remedial measures to avoid unexpected impacts.

Institutional set-up

PIU of "National electric network of Uzbekistan " JSC will be responsible for overall EMP implementation.

"National electric network of Uzbekistan " JSC will conclude a contract with a third party for OHL construction. Other parties that will be involved in EMP implementation are as follows:

Public institutions: such as the State Committee of the Republic of Uzbekistan on ecology and environmental protection (Goscomecology),

territorial nature protection bodies (Regional Department of ecology and environmental protection of Navoi region), bodies of local administration and municipalities (to the extent of project concern). As regulators, ecology and environmental protection bodies at various levels will carry out environmental protection policy during construction and operation on the project, and will be responsible for implementing the laws, regulations, standards and application of environmental practices by all organizations within their respective jurisdiction. In particular, in the structure of the State Committee of the Republic of Uzbekistan on ecology and environmental protection there is Regional Committee for environmental monitoring and administration of the project, their role and responsibilities are as follows:

– EMP implementation supervision;

– implementation of applicable laws, regulations and standards;

– coordination of efforts for environmental protection between interested divisions;

– inspection and supervision of construction, completion and maintenance of environmental facilities.

Project Implementation UNIT (PIU): "National electric network of Uzbekistan " JSC bears the ultimate responsibility for environmental effectiveness of the project both during construction and during operation. PIU, as immediate management organization to manage all aspects of the preparation and construction of the project, is responsible for environmental management, but is not limited to, the following responsibilities:

– guarantee that all relevant EMP requirements (including environmental design and mitigation measures) are duly included in the tender documents for the project;

– obtaining necessary authorizations and/or approvals, as needed, from Goscomecology and other relevant governmental agencies, with the necessary compliance with the condition that all necessary permission documents have been received prior to the start of any construction work on the project;

– ensure that contractors understand their responsibilities to mitigate environmental protection problems, associated with the construction and training of their personnel to EMP implementing;

– monitoring of EMP implementation by the contractor in accordance with the plan of environmental monitoring.

Construction supervision engineers (CSE)

Construction supervision engineers are responsible for supervision of construction works on the project and monitoring of other works and actions, taken by the contractor to ensure compliance with specifications and contractual requirements. CSE responsibilities include:

– to guarantee conformity to technical design on the project and EMP regarding environmental protection and impact mitigation. Construction could start only when CSE is satisfied with environmental protection activities;

– regular monitoring of the work of the contractor ecologists with verification of monitoring methodology and its results. If CSE believes that the contractor ecologists do not perform their duties or do not comply with the contractual requirements, the contractor (s) shall be instructed to replace the contractor ecologists

– instructing contractors to adopt measures to eliminate consequences during certain CSE period. If there is a breach of contract terms or serious complaints from the population on environmental effectiveness of the contractor, CSE requires the contractor to correct, change, or stop the work, simultaneously informing relevant agencies and client;

– supervision of the Contractor activity and ensuring that EMP requirements and technical requirements of the contract are fully performed;

– instructing the Contractor to take measures to reduce impact and to comply with the required EMP procedures in the event of detection of non-compliance /inconsistencies;

– compliance with procedures for complaints consideration.

Contractor

Contractor's obligations include, but are not limited to, the following:

– strict implementation of the measures listed in EMP;

– compliance with the requirements of environmental legislation;

– work within the framework of the contractual requirements and other tender conditions;

– check of presence of valid licenses for work and any necessary environmental permits for all suppliers of building materials;

– provision of effective EMP implementation during construction;

– in the case of non-compliance or inconsistencies regarding EMP implementation, study and provision of proposals on mitigation measures and implementation of corrective measures.

Documentation and regulation

All environmental strategies, policies, responsibilities and procedures are clearly documented for each contractor..

Documentation-useful information for management and staff, and is preferably in the form that may be provided to third parties such as regulators, concerned citizens, or even shareholders as proof of the company liability on environmental protection..

Environmental quality management plan and environmental quality monitoring are given in appendices 5 and 6.

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10.Forecast of environmental change as a result of identified impacts

Evaluation of environmental change as a result of performed work showed the following results.

Atmospheric air. Commissioning of 220 kV OHL route from CCGT # 3.4 to external 220/500 kV open SWYD at Navoi TPP does not change the State of atmospheric air. During operation of the newly built 220 kV OHL route, the State of the atmosphere will still be acceptable.

Surface water.. State of surface waters will not change, impact on surface watercourses is not expected.

Soils, vegetation. State of soil and vegetation after implementation of the project will not change.

Soils and groundwater. Operation of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP in normal mode will not affect the quality of soils and groundwater. Groundwater state will remain acceptable.

Implementation of the project will reduce accidental risks during operation of the projected electricity supply network facility.

Conclusion

Assessment of the impact of construction of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP is made on the basis of an analysis of the current state of the environment, socio-economic aspects and technical solutions.

OHL route with a total length of 6.3 km will take place on the territory of Novbahor district of Navoi region. In general, considered area refers to the zone with acceptable environmental situation However, along the route there are also areas of potential ecological risk in connection with the intersection of engineering communication and proximity of residential development. There are no protected natural areas, preserved areas near the route under construction. Distance to residential development meets regulatory requirements.

This work gives characteristic of impact types of construction facility when operation and carrying out construction works. It is shown that the operation of OHL is associated with physical pressure (acoustic, electromagnetic) and accident risks. Analysis of technical solutions demonstrated their adequacy to prevent accident risks, by using automated system of control and protection as well as by choice of supports types and technologies of their installation that allowed to remove negative consequences for environment in the case of development of considered in EIS project scenarios of accidents.

Impact on atmospheric air at OHL operation is not expected, in construction work, impact is assessed as temporary and local. The project provides for mechanized excavation, installation of reinforced concrete and metal supports, painting, welding works, with risk of Negative environmental impact. EIS project evaluated technology and scope of all kinds of works, as well as their consequences.

This work evaluate suppy of polluting substances in the environment during construction, physical impact, removal of natural resources, forecast of environmental change is made as a result of identified impacts.

Impact, associated with the removal of land, is defined as constant in the form of land allotment for supports with area of 0.284 HA and temporary (for laying temporary roads, organization of construction bases) with area of 16.62 hectares.

Impacts on surface water are not expected: transitions across the river Zeravshan and across channels are carried out in one span, without carrying out work in water protection zones.

The system of organization on the territory of construction sites during construction works, temporary accumulation and movement of waste will allow excluding their impact on ground, soils, groundwater and surface water

Analysis of alternatives of design solution has shown that the proposed route is optimal in terms of negative implications for the environment.

EIS project has analyzed sufficiency of the environment protection activities, preventing negative environmental impacts, in addition to proposed in technical project activities, complex of measures on reduction of negative environmental impact of construction of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP is offered.

Thus, construction of 220 kV OHL route to external 220/500 kV open SWYD at Navoi TPP does not lead to environmental degradation and is possible subject to compliance with environmental protection activities, proposed in the base project and present work.

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Appendix

Annex 1

***Conclusion of Goscomexpertise №* 01 – 01/10-08-818 *from* 03.05.2019 .**

THE STATE COMMITTEE FOR ECOLOGY AND ENVIRONMENT PROTECTION OF THE REPUBLIC OF UZBEKISTAN

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May 3, 2019 No. 01-01/10-08-818 Tashkent City

CONCLUSION

Of the State Environmental Review

Facilities: Environmental impact assessment of the construction of 2 combined-cycle plants (Nos. 3,4), Class J, with a total capacity of 1,300 MW at Navoi TPP JSC, located in the Karmaninsky district of the Navoi region (Draft Environmental Impact Statement)

Customer: "Navoi TPP JSC."

TIN: 201169179

Category: I, p.35. Resolution of the Cabinet of Ministers RUz No.949 of 21.11.2018

Developer: «TeploElektroProekt» JSC

Expert: Zhdapov A.V.

To the Director of the Capital Construction of «Navoi TPP" JSC T.G. Nazarov

Copy: To the Department for Ecology
and Environmental Protection
of the Navoi Region.

The materials of the first stage of the environmental impact assessment of the construction at Navoi TPP JSC of 2 combined-cycle plants (Nos. 3, 4),class J, with a total capacity of 1,300 MW, located in the Karmaninsky District of the Navoi Region have been presented to the State Environmental Review.

The main production activity of the TPP is the generation of electric energy intended to meet the needs of the national economy of the Republic of Uzbekistan. The Navoi TPP JSC is one of the largest power plants in the Republic of Uzbekistan. It provides the Navoi, Samarkand, Bukhara regions with electricity and the Navoi region and the town of Navoi with heat, as well.

The Navoi TPP JSC was built in the period of 1960 - 1981 with a capacity of 1,250 MW.

In the early 2000s, there was a need to modernize the worn-out station equipment. The service life of Nos. 1, 2 power plants of the TPP was 20-35 years and this fact became the cause of the continuing deterioration of the technological condition of the equipment, a decrease in its reliability and, as a consequence, a deterioration of technical and economic indicators of the TPP, an increased probability of accidents with possible negative consequences for the environment.

In February 2013, the first combined-cycle gas turbine unit with a capacity of 478 MW was commissioned, while installed power capacity of the plant reached 1,728 MW.

In 2014, TGs-1, 2 (turbine-generators) with a capacity of 25 MW each and TG-6 with a capacity of 60 MW were decommissioned; by the end of 2014, the installed power capacity of the plant had become 1,618 MW.

In 2011, another 450 MW CCP was designed with the commission of which it was supposed to decommission boilers Nos. 3, 8. The construction of CCP No. 2 is currently being under completion.

At the end of 2018, the installed power capacity of the Navoi thermal power plant was 1,618 MW.

The construction of CCP Nos. 3, 4 of class J considered in this draft will make it possible to increase the total power capacity of the Navoi Thermal Power Plant by 1,300 MW, to reduce operating costs, to increase the energy conversion efficiency, and to increase the reliability of providing electricity to consumers, improve the environmental situation in the zone of plant influence.

650 MW CCPs of class J that are planned to introduce have a high power generation efficiency (above 60%), low specific consumption of reference fuel for electricity supply - 215g / kWh (specific fuel equivalent consumption for Navoi TPP JSC based on the operation results for 2018 was 381.24 g/kWh).

The main environmental advantage of the project, when realized, is reducing the maximum concentrations of pollutants in the atmospheric surface layer created by emissions of the Navoi TPP JSC by 4.3 times compared with the existing situation, with the achievement of the established standards for the level of air pollution. The commissioning of two CCPs, Nos. 3,4, with a total capacity of 1,300 MW in addition to the 478 MW CCP No. 1 and 450 MW CCP No. 2 which is at the completion stage of construction, with the decommissioning of obsolete process equipment (boilers TGM-94 No. 3.4; boilers TGM-84 No. 5.7; boilers TGM-94 No. 8.9; boiler TGM-84 No.10; boilers TGME-206 No.11.12; peak boiler house) will lead to an improvement in the environmental situation in the zone of influence of the plant - a reduction in gross emissions from thermal power plants by 1,070.3209 tons/year.

Navoi TPP JSC occupies an area of 100 hectares, located at the address: Navoi region, Karmaninsky district, CFI! "Yangi-arik", 6 km. north-west of the city of Navoi.

The site for the construction of 2 new power units of CCPs Nos. 3, 4 with a total capacity of 1,300 MW is scheduled in the eastern part of the Navoi TPP. Partly it will be on the sites currently occupied by hydrotechnical structures (septic tanks), partly- on the lands adjacent to the territory of the TPPs used for summer cottages and gardens, and the sites occupied by a military unit’s structures and access roads.

For the construction of 2 new CCP units Nos. 3, 4, an area of 22.9 hectares will be required, of which 8.6 hectares are located in the existing territory of the enterprise; 14 hectares are located on a separate area.

The boundaries of the site for the proposed construction shall be: in the west - the territory of the Navoi TPP, in the east - the Zeravshan River, in the north - abandoned summer cottages, in the south - auxiliary facilities of the TPP.

The distance to the residential buildings located in the southeast of the territory of the CCPs Nos. 3, 4 construction site is 400 meters, the distance from the nearest residential building to the chimneys - 550 m, which is consistent with the requirements of

SanPiN No. 0350-17 "Sanitary Rules and Norms on Atmospheric Air Protection in the Settlements of the Republic of Uzbekistan."

The size of the water protection zone of the Zeravshan River in the area of construction of additional CCPs, in accordance with Resolution No. 174 of the Cabinet of Ministers of RUz of April 07, 1992. “Regulations on water protection zones of reservoirs, rivers and main canals and collectors, as well as the sources of drinking and domestic water supply, of medical and cultural and recreational purposes in the Republic of Uzbekistan”, is established 300m, based on the 162 m3/sec. water flow of the river.

The TPP territory is located in the western part of the Zeravshan valley, which is a piedmont plain, rising from west to east with a slight slope towards the Zeravshan River. The mountain systems that surrounds the area under investigation from the north, east, and south affect the air currents and determine the local climatic features, and in particular, the wind regime.

In the annual wind rose, the eastern direction is predominant, at which the emissions from the Navoi TPP and other large enterprises of the industrial zone are spreading in the direction opposite to the city that is the industrial site of the station is located in the light of the wind rose.

Navoi HPP JSC is located on the third right-bank over-flood terrace of the Zeravshan River. This flat plain with a slight slope towards the river refers to the Hungry-steppe cycle of sediment accumulation. Within the region, a stratum of quaternary deposits is developed on the surface underlain by the continental tertiary deposits.

Hydrogeological conditions are characterized by the development of groundwater, confined to the Quaternary sediments of the Zeravshan river valley. The maximum level of groundwater is observed in the summer and amounts to 3-5 m. The groundwater level increases as it approaches the river. Groundwater salinity is higher than normal and varies from 3.4 to 9.2 g/dm3, the type of mineralization is sulphate-sodium. The territory of the station has a network of piezometric wells, the groundwater level and groundwater composition being monitored.

The soils of the territory of the TPP are light sierozems; they are distinguished by a weakly alkaline medium, a low content of humus, and a high content of calcium, sulfur, and iron.

The vegetational cover in the area of TPP location is represented by ephemeroid-wormwood communities and by agricultural plantings just at the territory of station. The site allocated for construction works is covered with green plantings that will be cut down during the process of preparation for the construction operations. According to a survey of the construction site, 536 trees are to be cut down (204 juniper-trees, 48 plane-trees, 60 apricot trees, 45 elm-trees, 34 poplar-trees, 4 plum-trees, 130 apple-trees, 2 mulberry-trees, 3 pomegranate and 6 purple willows).

In accordance with Resolution No. 290 of the Cabinet of Ministers "Regulation on the use of plants and the procedure for getting permissions for using plants" of October 20, 2014, in the process of further design, it is necessary to obtain a permit for the cutting of trees and shrubs that are located in the area of the facility construction.

Among the animals residing near the TPP, in the area characterized by significant dust and noise, it is possible to mention only those that are able to quickly escape the noise impact of the station. Among them are insects and reptiles that can hide in the soil and birds which can quickly leave unfavorable areas.

The installed electric power of the station at the end of 2018 is 1,618 MW.

There are five turbine generators operated at the TPP: 2X R-50-130 (installed capacity - 100 thousand kWh). 2X K-160-130 (installed capacity - 320 thousand kWh). 2X PVK-150-130 (installed capacity - 300 thousand kW h), 2X K-210-130 (installed capacity - 420 thousand kWh), CCGT unit -478 (installed capacity - 478 thousand kWh).

The station consists of a cogeneration part and a condensation part. The condensation part works according to the building-block principle.

Navoi TPP JSC has two power units of 210 MW each. Two units of 150 MW each, two power units of 160 MW each, TPS -140 with a capacity of 100 MW, a combined-cycle gas turbine unit (CCGT) with a capacity of 478 MW.

The following boilers are operated at Navoi TPP JSC: TGM-151 (2 pcs.). TGM-94 (4 pcs). TGM-84 (4 pcs.). TGME -206 (2 pcs.).

All boilers are equipped with gas-oil burners TKZ of the vortex type.

In 2018, electricity generation amounted to 8207.5 million kWh with the plan of 8584.1 million kWh; heat output amounted to 2106.7 thousand Gcal, while the plan was 1867 thousand Gcal.

The boilers used at the enterprise are the main sources of emission at the enterprise under consideration. When the equipment is operating on gaseous fuels, nitrogen oxides, carbon monoxide, benzapilene, sulfur dioxide are entering the atmosphere, as well as fuel oil ash when fuel oil is burned.

As a main fuel, the Navoi TPP uses gas from the Zevardy and Kultak fields with a calorific value of 8150 Gcal /nm3, hydrogen sulfide content being 0.06-0.1 vol. %; fuel oil of M-100 grade with sulfur content of 2.5% and a low calorific efficiency of 9365 kcal/kg. This fuel is used as an emergency one.

Fuel oil is delivered by rail, the fuel depot consists of four tanks of 3750m3 each and three tanks of 15,000 m3 each. The capacity of the oil depot is designed to store fuel reserves for 25 days.

Currently, flue gases from existing boilers are emitted into the atmosphere through four chimneys from the existing five chimneys. Boilers No. 3-10 are connected to three chimneys with a height of 56 meters each. Boilers Nos. 11, 12 are connected to a chimney with a height of 180 meters. CCP No.1 is connected to the chimney of 60m high.

In all TPP boilers, according to the project of NIPTI "Atmosphere" (Research and Design Technological Institute "Atmosphere"), the technology of stepwise combustion of gas was introduced through its redistribution between burner tiers, which should ensure a reduction in emissions of nitrogen oxides to 30% and more. However, the designed effect of reducing nitrogen oxide emissions has not been achieved yet.

In addition to the main sources of emissions to the atmosphere, the TPP produces emissions from the operation of auxiliary units and equipment such as repair units, fuel oil facilities, and fuel and lubricant materials, storage units. During gas purging before firing boilers, peak emissions of natural gas through purge plugs take place, the duration of purgings constitutes 10 minutes.

At the current time, pollutants of 22 types come from 46 emission sources at the enterprise under consideration.

The gross emission of pollutants during the operation of the equipment of hydroelectric power stations at maximum load is 4,976.6268 tons/year. The main air pollutants are: nitrogen dioxide (3,483.5658 tons / year), accounting for 70.0% of the total emissions into the atmosphere; carbon monoxide (874.4503 tons / year), accounting for 17.57% of the total emissions into the atmosphere; nitric oxide (577.9607 tons / year), which is 11.61% of the total emissions to the atmosphere, the remaining pollutants account for 19 items constituting 0.82% of the total emissions of the enterprise.

The zero-dispersion model of pollutants in the atmospheric air of the plant's location shows that there are no observed concentrations exceeding emission quotas at no one source of enterprises except for nitrogen dioxide. The concentration of nitrogen dioxide outside the industrial site of the enterprise is 1.03 MPC with an emission quota of 0.25 MPC. The quota for the emission of nitrogen dioxide is exceeded by 4.4,2 times.

Water at the Navoi TPP is used for technical and household needs.

Water of drinking quality used for household and domestic needs and to feed the heating network is supplied to the TPP from the municipal water pipeline.

For the station’s production needs water is taken from the Zeravshan River. In respect of production purposes water is used for: cooling turbine condensers; cooling auxiliary

equipment of turbines and power units; auxiliary needs of the water treatment plant and the feeding of steam cycle boilers; watering the territories, making up for losses in the fire-fighting reservoir, production facilities washing; steam supply to industrial enterprises.

The cooling water supply scheme is a reusing block water system. The design capacity of circulating water supply is 335,456.0 thousand m3 per year, the actual circulating water supply is 193,031.0 thousand m3 per year.

In 2018, for production needs 577,868.644 thousand m3 of water was taken from the Zeravshan River (water use limit is 860.0 million m3), there was not over-limit water consumption in 2018.

The design capacity of water recycling (sub-channel) is 28,500.0 thousand m3/year. The actual capacity of the repeated water supply is 1,452.60 thousand m3/year.

The main source of pollution of surface watercourses is the equipment for water treatment plants.

The water treatment system includes: a desalting plant: a sodium cationization plant, a condensate purification plant, a water treatment plant for feeding thermal networks in a chemical water treatment process.

There are also industrial waste streams polluted with petroleum products, the drains from water-chemical washing of boilers and from conservation of equipment, the drains of washing RAH (regenerative air heater), the drains from cooling towers and stormwater drainage.

Domestic wastewater is directed to the sewage treatment plant of the municipal sewage system, the industrial effluents are directed to the Zeravshan River and to the collector “Sanitarnyi” through certain outlets.

The complex of sewage treatment plants for TPP production runoffs (KOPS) includes the following operating installations: UOZZS - an installation for cleaning of oiled and fuel oiled wastes with a capacity of 100 m3 / hour; UOSK – an installation for cleaning oily condensate with a capacity of 45 m3 / hour; UOVK - an installation of treatment of wastewater after washing of boilers and RAH (regenerative air heater) with ponds-evaporators of neutralized effluents with an area of 18,050 m2.

The volume of normatively treated wastewater discharged into the Zeravshan River in 2018 amounted to 2182 thousand m3.

The amount of partially clean flows coming to the Zeravshan River in 2018 without

purification amounted to 577,868.644 thousand m3. There are seven wastewater outlets at the station.

At the present time, 37 items of waste are generated on the territory of the TPP, temporary storage facilities are provided for all types of waste, some of the waste is regenerated or reused at the enterprise, and part of the waste is exported under contracts to special organizations for recycling.

In total, the generation of wastes of 1st hazard class is 7.203 tons / year. 2nd hazard classes - 46.7 tons / year, 3rd hazard classes – 9,361.91 tons / year, 4th hazard classes – 7,537.371 tons / year, 5th hazard classes – 1,268.3 tons / year.

Each of the power units of the additional CCPs has a capacity of 650 MW, being a monoblock combined-cycle plant designed to produce electricity in the basic mode of operation, simultaneously covering the heat schedule of production and heating loads.

The equipment configuration of the 650 MW CCP is as follows: a gas turbine unit with an electric generator; a waste heat boiler; a steam-turbine plant with an electric generator; a deaerator; a gas-booster compressor station with three gas-booster compressors; an air compressor, a nitrogen generator, an electrolysis plant with receivers, an emergency diesel generator; an installation of chemical water treatment for recharging the unit, the heating network and circulating water supply system; an industrial wastewater treatment complex; tank facilities: cooling towers with a pumping station for water supply to the CCP; a warehouse for oil in containers.

It is assumed that additional CCPs will be operated with the use of natural gas as a fuel. Gas will be supplied to the site of 2 CCPs with a total capacity of 1,300 MW along newly constructed gas pipelines.

It is expected that the efficiency of new GT will be 42.3%. The efficiency of the CCP - 62.3%. The maximum hourly fuel consumption per CCP will be 120,323.09 m3/h.

The annual consumption of natural gas per CCP – 1,564.2 million m3/year; natural gas consumption by two CCPs will be 3128.4 million m3 / year.

The power units under design are combined-cycle power units, that is, they combine two cycles: the steam cycle and the gas cycle; thermal energy available in the gases generated during the combustion process of the fuel is used to produce steam with energy sufficient for use in a steam turbine. Each CCP consists of one gas turbine, a heat recovery boiler (HRB) and one steam turbine. The first cycle is represented by a gas turbine in which the rotor is driven by gases generated during combustion of the fuel. The electric generator of the gas turbine generates about 2/3 of the electricity. The second cycle: the gases generated in the first cycle are fed into the waste heat boiler (WHB) in which the heat energy of the flue gases is transferred to water to produce a high-pressure steam, this steam is used to drive the steam turbine. The electrical generator of the steam turbine generates about 1/3 of the electricity. The exhaust steam, immediately after expansion in the steam turbine, is directed

condenser where a heat exchange takes place between the steam and the cooling water. The condensate is pumped out to the WHB, where it is re-converted into steam. At this point the steam cycle is closed.

The use of combined-cycle plants makes it possible to use the energy available in the gases resulting from the combustion of fuel, which significantly reduces the cost of energy and, ultimately, a negative impact on the environment.

To remove flue gases, the newly built CCPs are planned to equip with individual chimneys of 112 m. high and 0.7 m. mouth diameter.

The project implementation with complete conservation of outdated equipment (peak boiler house: boilers TGM-94 No. 3.4, TGM-84 No. 5.7. TGM-94 No. 8.9. TGM-84 No. 10. TGME-206 No. 11.12) will allow achieving annual savings of natural gas in the amount of 587 million m3 and, as a result, to reduce gross emissions of pollutants by 1070.3209 tons /year (from 4976.6268 tons / year at present situation to 3906.3059 tons / year after the project implementation), including nitrogen dioxide by 787.345 tons / year (from 3483.5658 to 2696.2208 t / year), carbon oxide by 165.5808 tons / year (from 874.4503 to 708.8695 tons / year).

Modeling of the dispersion fields of pollutants in the air showed that the highest concentrations outside the industrial site of the Navoi TPP after project realization will be observed for nitrogen dioxide - 0.24 MPC, not exceeding the established quota (0.25 MPC) for the release of this ingredient.

It should be noted that entry into the quota in terms of the level of air pollution will be achieved only if all existing worn-out boilers of the TPPs are shut off.

Water supply to the CCPs Nos. 3, 4 for drinking and production needs is planned to realize from the existing Navoi TPP's networks.

Operation of the CCPs Nos. 3, 4 will be accompanied by water withdrawal from the Zeravshan River and the use of tap water. To meet the technological needs of the CCPs, a circulating water supply system with cooling on cooling towers has been adopted. Approximate consumption of industrial water from the Zeravshan river for the needs of two units of CCPs Nos. 3.4 will be 1350 m3 h or 11705 thousand m3 /year, the expected consumption of tap water for drinking needs of two CCPs - 15.093 thousand m3 / year; the total water consumption for the needs of CCPs No. 3.4 will be 11,720,093 thousand m3 / year.

Discharge of purge water from cooling towers into the Zeravshan River is projected at the level of 501 m3 / hour (4008.0 thousand m3 / year).

The rated capacity of water treatment plants (WTP) for the Navoi TPP is sufficient to provide the station with water after the competition of new CCPs, but given their physical wear and tear, the project envisages the construction of a new WTP.

According to Law of the Republic of Uzbekistan No. 837-XII of September 6, 1993 “On Water and Water Use”, a system of circulating technical water supply is provided for two additional CCP units. Fan cooling towers are planned to install for the plants, the technical characteristics of which will be refined with detailed design. Replenishment of losses in the circulating system (droplet entrainment, evaporation, purging) is provided for by supplying water from the Zeravshan River.

After construction of the CCPs Nos. 3, 4 the number of water outlets will remain the same ~ 7 outlets. The estimated additional amount of treated wastewater sent for discharge to outlet №1 will be 5 m3 / hour. The quality of the effluent from the CCP differs from the effluent of the existing power plants with a lower content of suspended solids.

A significant reduction of thermal waters discharge into the Zeravshan River through the use of recycled process water supply systems will reduce the supply of heat to the surface waters.

The commissioning of new CCP No. 3,4 will not require the organization of additional sources of water supply - water consumption by thermal power plant from the Zeravshan River in 2018 amounted to 577868.644 thousand m3 / year with a limit of 860,000 thousand m3 / year.

Regenerated wastes from water treatment plants is planned to supply to chemical treatment water plant (CTW) and then to the KOPS installation (Integrated Treatment of Industrial Wastewaters) which includes a unit of neutralization of acid and alkaline effluents of WTP of feeding steam cycle and a unit of treatment of saline waste from WTPs. Treatment of saline waste is planned to carry out according to the following scheme: dosing of soda into averaging tanks, filtration of separated water at mechanical filters with the following treatment at a reverse osmosis unit. Saline wastes (salt liquor), after reverse osmosis treatment will be sent to the evaporation pond, the purified water will be returned to the WTP cycle to feed the circulating system and the steam-water cycle.

After commissioning 2 additional CCPs, the same types of waste will be generated at the Navoi TPP as it is at the present conditions, i.e. no additional types of waste are expected

with respect to those produced at present time. The changes concern the norms of formation and the limits of disposal of all types of wastes. These values need to be clarified in the process of further environmental design.

Prior to the commissioning of the facilities in question, an environmental impact statement should be submitted for consideration in which environmental standards should be developed for all types of environmental impact of the proposed activity.

The State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection shall coordinate a draft Statement on Environmental Impact on the construction of 2 combined-cycle plants (No. 3.4) of class J with a total capacity of 1,300 MW at Navoi TPP JSC located in the Karmaninsky district of the Navoi Region.

The Directorate for Ecology and Environmental Protection of Navoi Region needs to take control of compliance with the requirements of environmental legislation during the construction period.

It is not allowed to commission the facilities without a positive opinion on the Statement of Environmental Effects.

Chairman signed B. Kuchkarov.

Annex 2

SITUATIONAL PLAN

Annex No 3

Parameters of pollutant emissions sources

ollutant emission sources parameters

Name of Shop, section	Sources of pollutants emission Name	Number of work Hours per construction	Name of source of atmosphere pollution	№ source On map	H Of source selcted m	Diameter Of pipe m	Parameters of gas-air mixture Volume m3/s	Speed m/s	Temp. degree .C	Coordinates of sources on map-scheme, m X1	Y1	Name of pollutant	Emissions of pollutants g/s	mg/m3	t/year
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Site for	Excavator	1232	unorganized	1	2,0	0,50	1,000	5,09	35	1003	1002	Dust	0,0100	10,0	0,044
supports	KRAZ	1232	unorganized	2	2,0	0,50	1,000	5,09	35	1003	1003	Carbon oxide	0,0471	47,1	0,209
												Nitrogen dioxide	0,1131	113,1	0,502
												Nitrogen oxide	0,0184	18,4	0,082
												Hydrocarbons	0,0147	14,7	0,065
												Soot	0,0042	4,2	0,018
												Sulphur dioxide	0,0217	21,7	0,096
	Bulldozer	1232	unorganized	3	2,0	0,50	1,000	5,09	35	998	998	Dust	0,0036	3,6	0,016
												Carbon oxide	0,0683	68,3	0,303
												Nitrogen dioxide	0,0453	45,3	0,201
												Nitrogen oxide	0,0074	7,4	0,033
												Hydrocarbons	0,0583	58,3	0,259
												Soot	0,0072	7,2	0,032
												Sulphur dioxide	0,0150	15,0	0,067
	Mobile electric	1232	pipe	4	3,0	0,20	0,950	30,24	250	1005	1005	Nitrogen dioxide	0,1373	144,56	0,609
	Power lant											Nitrogen oxide	0,0223	23,49	0,099
												Hydrocarbons	0,0600	63,16	0,266
												Ben (a) pyrene	2,2E-07	0,00	9,6E-07
												Soot	0,0117	12,28	0,052
												Aldehydes	0,0025	2,63	0,011
												Sulphur dioxide	0,0183	19,30	0,081
	Crane	1232	unorganized	5	2,0	0,50	1,000	5,09	35			Carbon oxide	0,0683	68,33	0,303
												Nitrogen dioxide	0,0453	45,33	0,201
												Nitrogen oxide	0,0074	7,37	0,033
												Hydrocarbons	0,0583	58,33	0,259
												Soot	0,0072	7,22	0,032
												Sulphur dioxide	0,0150	15,00	0,067
	Heap	1232	unorganized	6	2,0	8*8				1000	1013	Dust	0,0007		0,003
Installation	Welding	240		7	2,0	0,50	1,000	5,09	35	1005	1015	Iron oxide	0,02901	29,01	0,025
Of supports												Manganese and its compounds	0,00306	3,06	0,003
	Painting	240		8	2,0	0,50	1,000	5,09	35	1005	1015	Xylene	0,014465	14,46	0,112

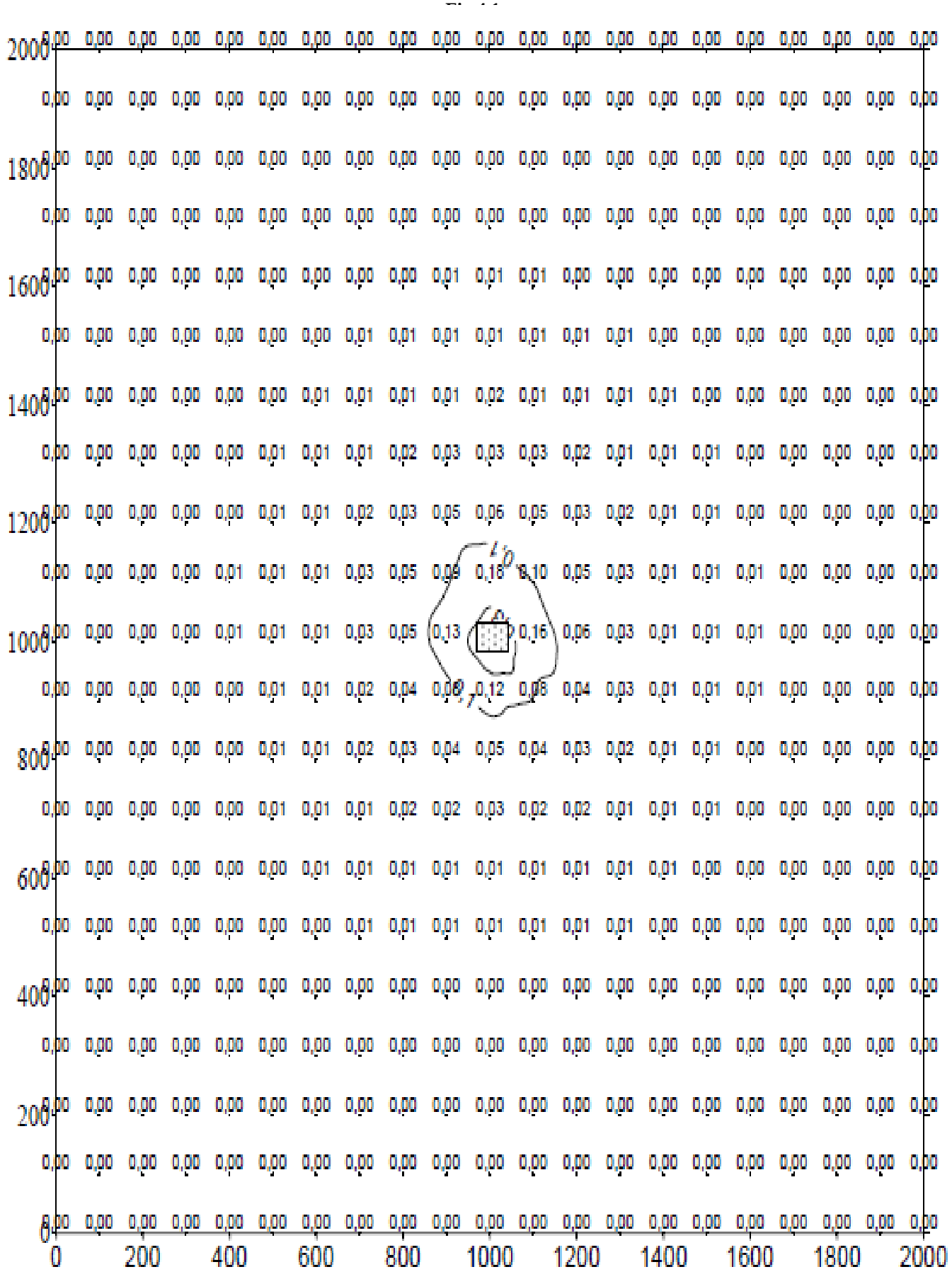
												White spirit	0,010735	10,74	0,083
												total	**0,9460**		**4,164**

Annex No 4

Calculation of the level of air pollution

Level of atmospheric pollution

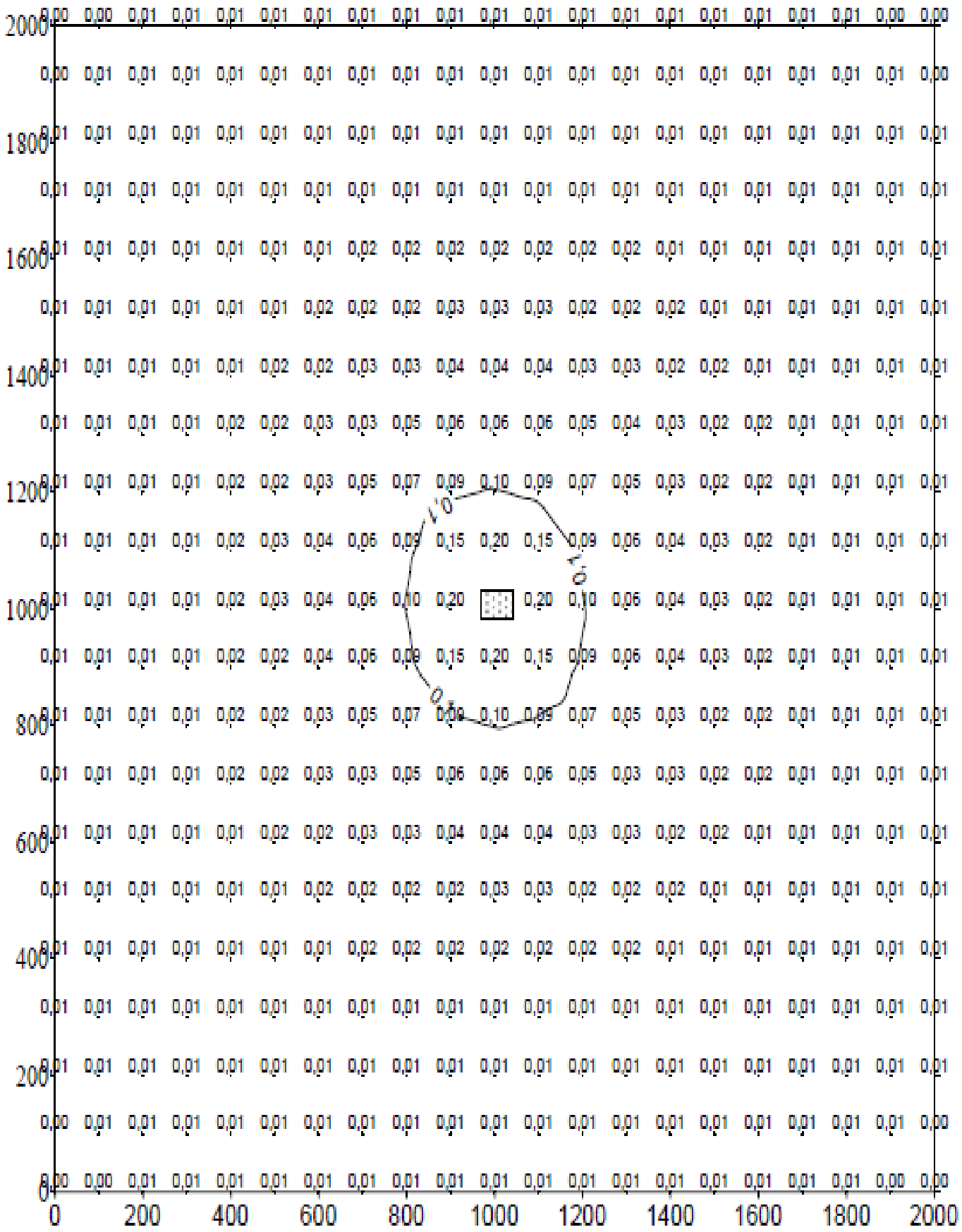
Iron oxide



Level of atmospheric pollution
Manganese and its compounds

Fig.4,2

Level of atmospheric pollution
Nitrogen dioxide



Level of atmospheric pollution
Nitrogen oxide


2000
1800
1600
1400
1200
1000
800
600
400
200
0
0,00
0,01
0
200
400
600
800
1000
1200
1400
1600
1800
2000

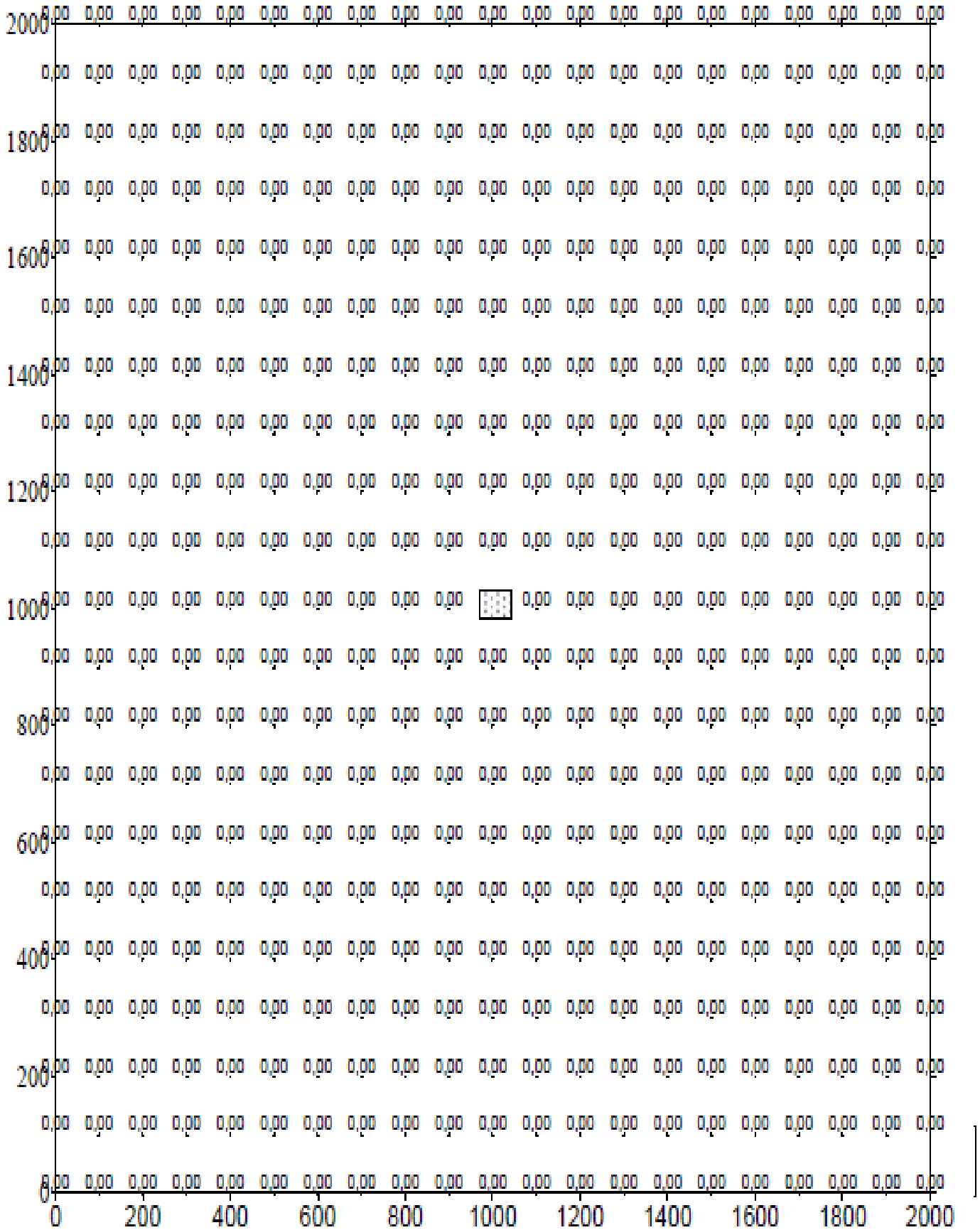
Fig.4,4

Level of atmospheric pollution
Soot

Level of atmospheric pollution
Sulphur dioxide

Fig.4,6

Level of atmospheric pollution
Carbon oxide



Level of atmospheric pollution
Xylene

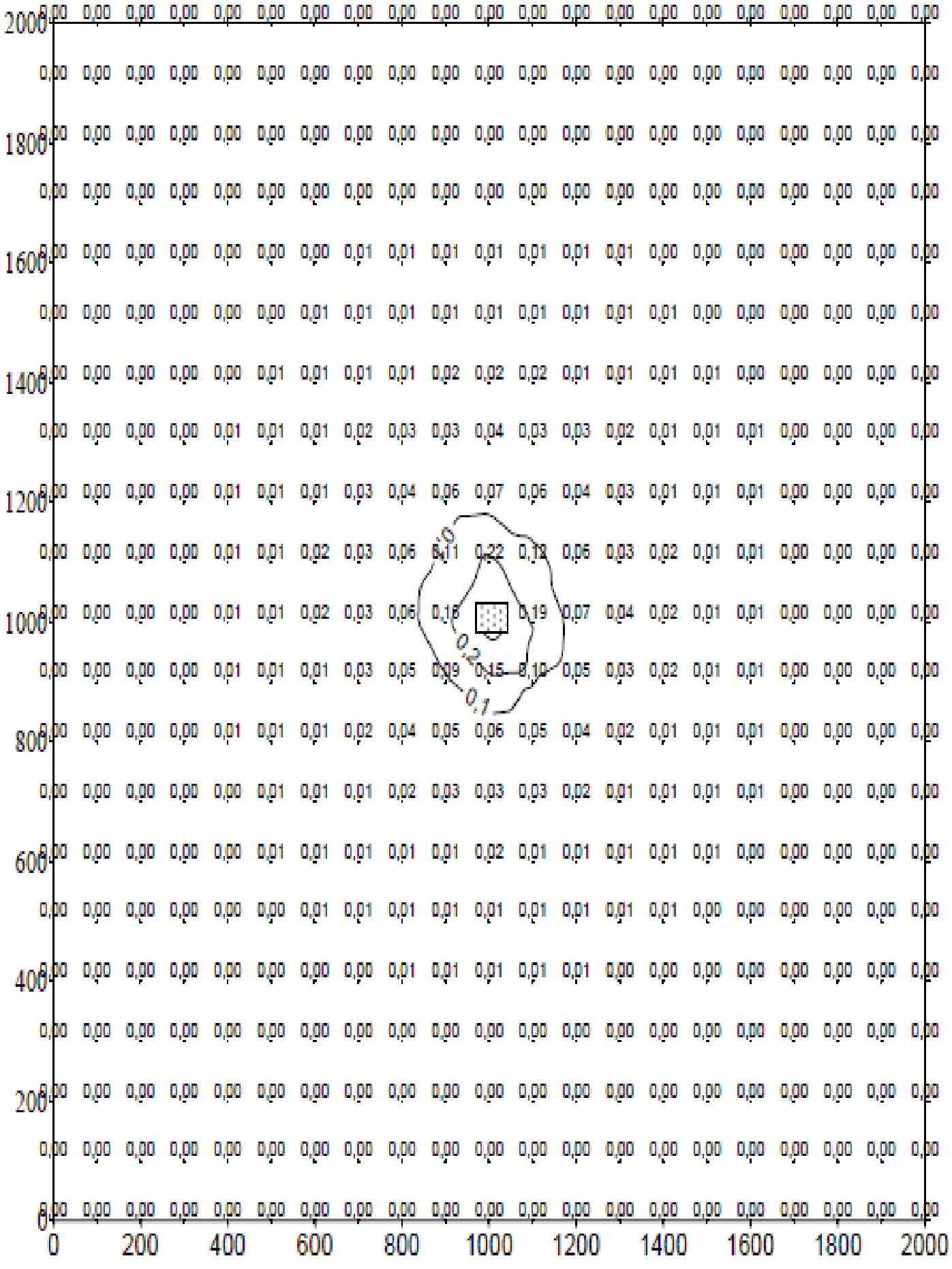
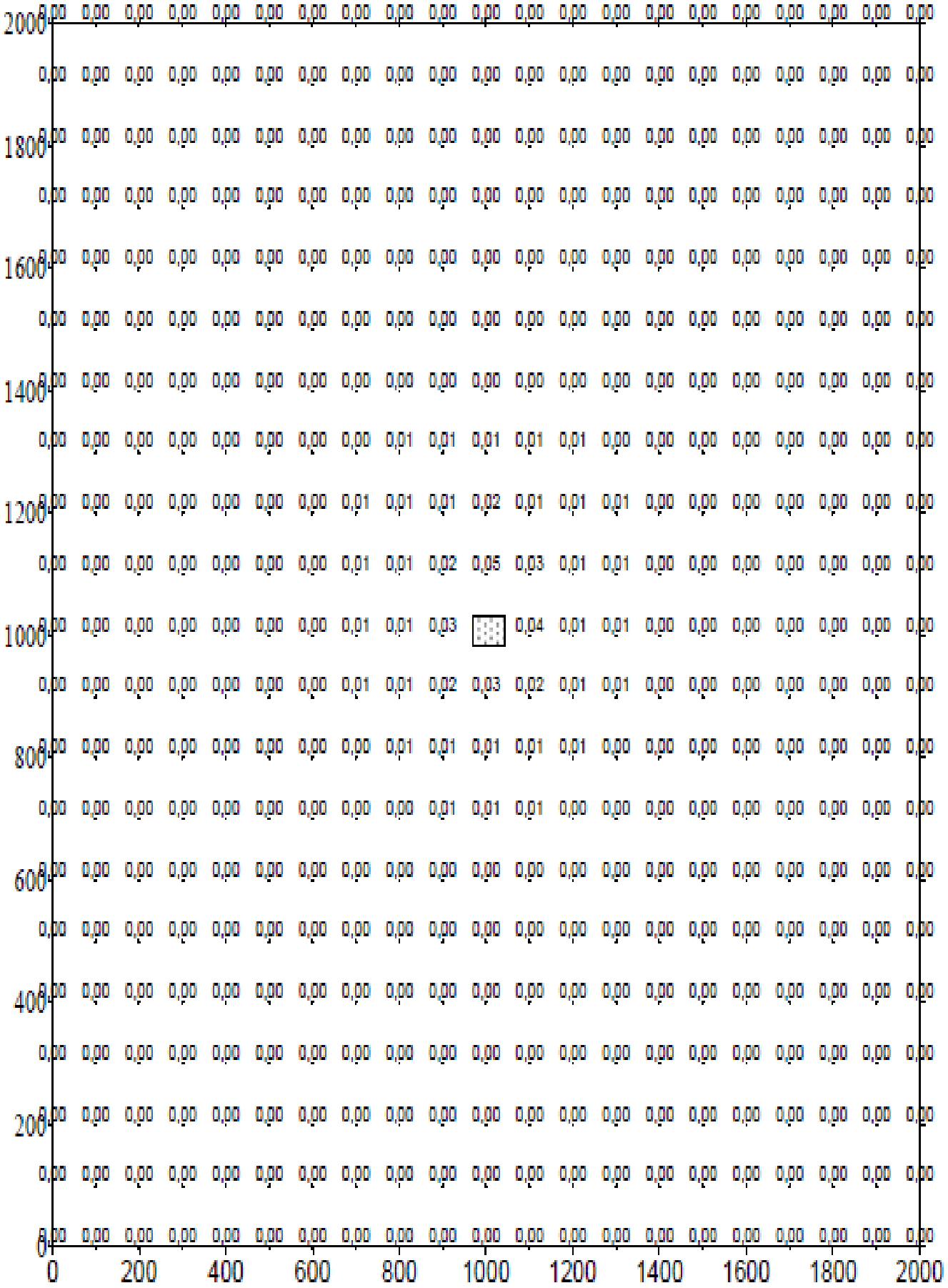


Fig.4,8

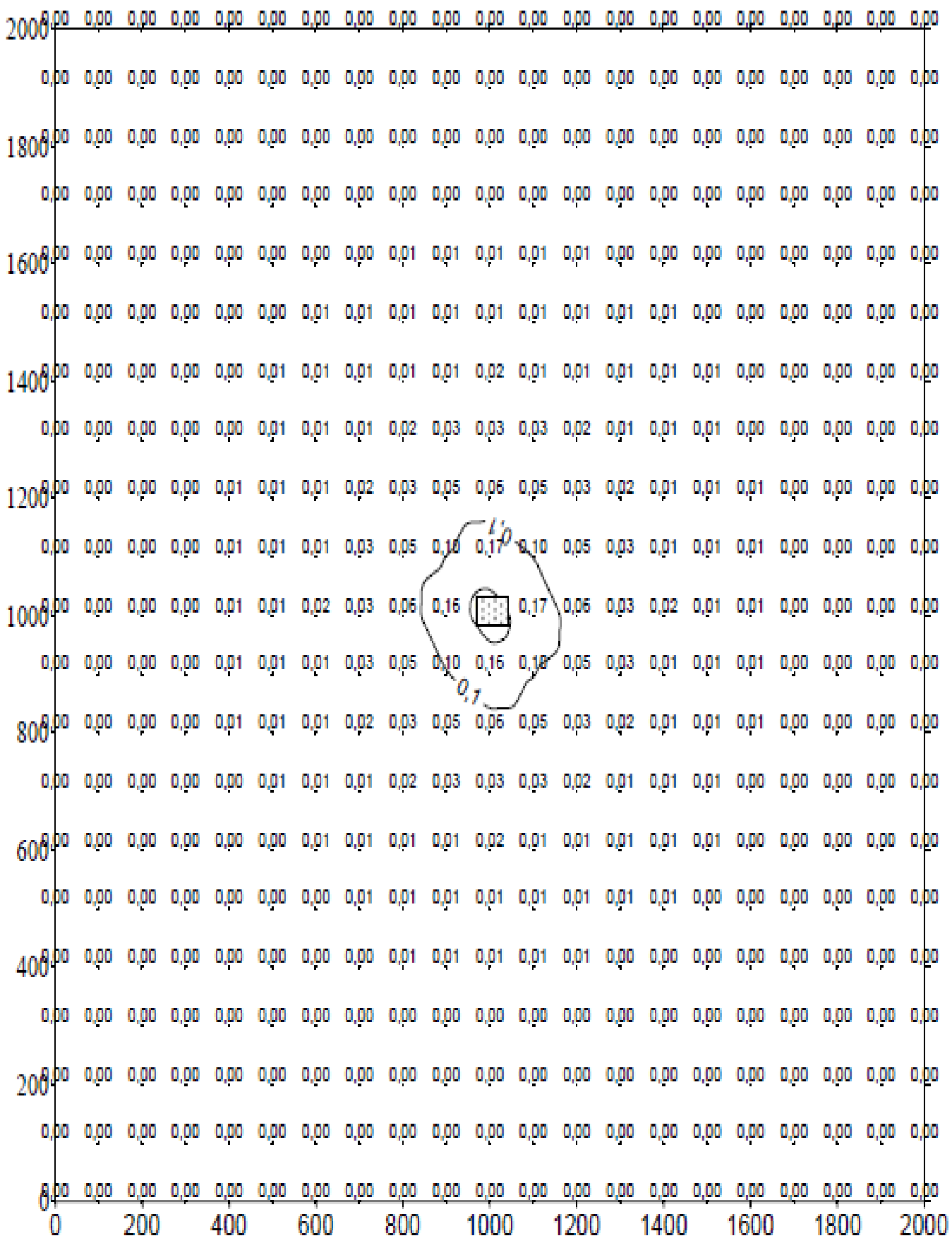
Level of atmospheric pollution
White spirit



Level of atmospheric pollution
Hydrocarbons

Fig.4,10

Level of atmospheric pollution
Inorganic dust



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Serial number 12-34-5678, " Teploelectroproect "JSC

Enterprise number 106; Construction of 220 rV OHL to external 220/500 kV open SWYD in Navoi TPP

Location: Navoi region

Version of the source data: 1, construction Calculation option: 1, construction

Calculation is carried out for summer

Estimated module: "OND-86 Standard "

Estimated constants: E1= 0,01, E2=0,01, E3=0,1, S=999999,99 sq. km.

rameters of emission sources

Accounting:
"%" - source is accounted with exception from background;
"+" - source is accounted without exclusion from background;
"-" - - source is not accounted and its contribution is excluded from background.
In marks absence source is not accounted

Types of sources:
1 – point source
2 - linear;
3 - unorganized;
4 – block of point sources, united for calculation in one areal source;;
5 - unorganized with Nonstationary by time emission intensity;
6 - point, with umbrella or horizontal direction of emission;
7 - combination of point sources with umbrellas or horizontal direction of emission;
8 - Highway.

Acc. when calc..	Site №.	Shop №	Source №.	Source name	Var.	Type	Source height. (m)	Mouth diam. (m)	GAM volume (cu m/s)	GAM speed (m/s)	GAM temp. (°C)	Coeff. rel.	Coor. X1-axis. (m)	Coor. Y 1-axis. (m)	Coor. X2-axis (m)	Coor. Y2-axis. (m)	Source width (m)
%	0	0	1	Excavator	1	1	2,0	0,50	0,99942	5,09000	35	1,0	1003,0	100	1003,0	1002,0	0,00

Sub. code	Substance name	emiss, (g/s)	emiss, (t/g)	F	Summer: Cm/MAC	Xm	Um	Winter: Cm/MAC	Xm	Um
2908	Inorganic dust: 70-20% SiO2	0,0100000	0,0000000	3	0,422	18,9	1,7	0,388	19,7	1,8

%	0	0	2	KRAZ	1	1	2,0	0,50	0,99942	5,09000	35	1,0	1003,0	100	1003,0	1003,0	0,00

Sub. code	Substance name	emiss, (g/s)	emiss, (t/g)	F	Summer: Cm/MAC	Xm	Um	Winter: Cm/MAC	Xm	Um
0301	Nitrogen (IV) oxide (nitrogen dioxide)	0,1131000	0,0000000	1	5,613	37,7	1,7	5,169	39,3	1,8
0304	Nitrogen (II) oxide (nitrogen oxide)	0,0184000	0,0000000	1	0,194	37,7	1,7	0,179	39,3	1,8
0328	Carbon black (Soot)	0,0042000	0,0000000	1	0,118	37,7	1,7	0,109	39,3	1,8
0330	Sulfur dioxide	0,0217000	0,0000000	1	0,183	37,7	1,7	0,169	39,3	1,8
0337	Carbon oxide	0,0471000	0,0000000	3	0,119	18,9	1,7	0,110	19,7	1,8
2754	Hydrocarbons saturated C12-C19	0,0147000	0,0000000	1	0,062	37,7	1,7	0,057	39,3	1,8

%	0	0	3	Bulldozer	1	1	2,0	0,50	0,99942	5,09000	35	1,0	998,0	99	998,0	998,0	0,00

Sub. code	Substance name	emiss, (g/s)	emiss, (t/g)	F	Summer: Cm/MAC	Xm	Um	Winter: Cm/MAC	Xm	Um
0301	Nitrogen (IV) oxide (nitrogen dioxide)	0,0453000	0,0000000	1	2,248	37,7	1,7	2,070	39,3	1,8
0304	Nitrogen (II) oxide (nitrogen oxide)	0,0074000	0,0000000	1	0,078	37,7	1,7	0,072	39,3	1,8
0328	Carbon black (Soot)	0,0072000	0,0000000	1	0,202	37,7	1,7	0,186	39,3	1,8
0330	Sulfur dioxide	0,0150000	0,0000000	1	0,127	37,7	1,7	0,117	39,3	1,8
0337	Carbon oxide	0,0683000	0,0000000	3	0,173	18,9	1,7	0,159	19,7	1,8
2754	Hydrocarbons saturated C12-C19	0,0583000	0,0000000	1	0,246	37,7	1,7	0,226	39,3	1,8
2908	Inorganic dust: 70-20% SiO2	0,0036000	0,0000000	3	0,152	18,9	1,7	0,140	19,7	1,8

%	0	0	4	Electric station	1	1	3,0	0,20	0,95002	30,24000	250	1,0	1005,0	100	1005,0	1005,0	0,00

Sub. code	Substance name	emiss, (g/s)	emiss, (t/g)	F	Summer: Cm/MAC	Xm	Um	Winter: Cm/MAC	Xm	Um
0301	Nitrogen (IV) oxide (nitrogen dioxide)	0,1373000	0,0000000	1	1,526	77,7	5,8	1,522	77,6	5,8
0304	Nitrogen (II) oxide (nitrogen oxide)	0,0223000	0,0000000	1	0,053	77,7	5,8	0,053	77,6	5,8
0328	Carbon black (Soot)	0,0117000	0,0000000	1	0,074	77,7	5,8	0,073	77,6	5,8
0330	Sulfur dioxide	0,0183000	0,0000000	1	0,035	77,7	5,8	0,034	77,6	5,8
0703	Benz/pyrene (3.4-benzo [a] pyrene)	0,0000002	0,0000000	1	0,021	77,7	5,8	0,021	77,6	5,8
1325	Formaldehyde	0,0025000	0,0000000	1	0,067	77,7	5,8	0,067	77,6	5,8
2754	Hydrocarbons saturated C12-C19	0,0600000	0,0000000	1	0,057	77,7	5,8	0,057	77,6	5,8

%	0	0	5	Crane	1	1	2,0	0,50	0,99942	5,09000	35	1,0	998,0	99	998,0	998,0	0,00

Sub. code	Substance name	emiss, (g/s)	emiss, (t/g)	F	Summer:	Cm/MAC	Xm	Um	Winter:	Cm/MAC	Xm	Um
0301	Nitrogen (IV) oxide (nitrogen dioxide)	0,0453000	0,0000000	1		2,248	37,7	1,7		2,070	39,3	1,8
0304	Nitrogen (II) oxide (nitrogen oxide)	0,0074000	0,0000000	1		0,078	37,7	1,7		0,072	39,3	1,8
0328	Carbon black (Soot)	0,0072000	0,0000000	1		0,202	37,7	1,7		0,186	39,3	1,8
0330	Sulfur dioxide	0,0150000	0,0000000	1		0,127	37,7	1,7		0,117	39,3	1,8
0337	Carbon oxide	0,0683000	0,0000000	3		0,173	18,9	1,7		0,159	19,7	1,8
2754	Hydrocarbons saturated C12-C19	0,0583000	0,0000000	1		0,246	37,7	1,7		0,226	39,3	1,8

%	0	0	6	Dump	1	3	2,0	(,00	0	0,00000	0	1,0	996,0	100(	,(	1004,0	1000,0	8,0(
	Sub. code			Substance name			emiss, (g/s)	emiss, (t/g)	)	F	Summer :	Cm/MAC	Xm	Um	Winter:	Cm/MAC	Xm	Um
	2908			Inorganic dust: 70-20% SiO2			0,0007000	0,0000000		3		0,200	5,7	0,5		0,200	5,7	0,5
%	0	0	7	Welding	1	1	2,0	(,50	1	5,09296	35	1,0	1005,0	101!	,(	1005,0	1015,0	0,0(
	Sub. code			Substance name			emiss, (g/s)	emiss, (t/g)	)	F	Summer :	Cm/MAC	Xm	Um	Winter:	Cm/MAC	Xm	Um
	0123			Iron oxide			0,0290100	0,0000000		3		0,917	18,9	1,7		0,845	19,7	1,8
	0143			Manganese and its compounds			0,0030600	0,0000000		3		3,869	18,9	1,7		3,564	19,7	1,8
%	0	0	8	Painting	1	1	2,0	(,50	1	5,09296	35	1,0	1005,0	101!	,(	1005,0	1015,0	0,0(
	Sub. code			Substance name			emiss, (g/s)	emiss, (t/g)	)	F	Summer :	Cm/MAC	Xm	Um	Winter:	Cm/MAC	Xm	Um
	0616			Xylene (isomers mixture)			0,0144650	0,0000000		3		0,914	18,9	1,7		0,842	19,7	1,8
	2752			White spirit			0,0107350	0,0000000		3		0,136	18,9	1,7		0,125	19,7	1,8

Emission sources by substances

Accounting:
"%" - source is accounted with exception from background;
"+" - source is accounted without exception from the background;
"-" - - source is not accounted and its contribution is excluded from background.
In marks absence source is not accounted

Types of sources:
1 – point ;
2 - linear;
3 - unorganized;
4 – block of point sources, united for calculation in one areal source;;
9 - unorganized with Nonstationary by time emission intensity;
10 - point, with umbrella or horizontal direction of emission;
11 - combination of point sources with umbrellas or horizontal direction of emission;
12 - Highway.

Substance: 0123 Iron oxide

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	7	1	%	0,0290100	3	0,9169	18,8694	1,6552	0,8447	19,6665	1,8350
Total:					**0,0290100**		**0,9169**			**0,8447**		

Substance: 0143 Manganese and its compounds

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	7	1	%	0,0030600	3	3,8687	18,8694	1,6552	3,5642	19,6665	1,8350
Total:					**0,0030600**		**3,8687**			**3,5642**		

Substance: 0301 Nitrogen (IV) oxide (nitrogen dioxide)

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,1131000	1	5,6126	37,7169	1,6543	5,1692	39,3173	1,8347
0	0	3	1	%	0,0453000	1	2,2480	37,7169	1,6543	2,0704	39,3173	1,8347
0	0	4	1	%	0,1373000	1	1,5260	77,7476	5,7764	1,5217	77,5891	5,8277
0	0	5	1	%	0,0453000	1	2,2480	37,7169	1,6543	2,0704	39,3173	1,8347
Total:					**0,3410000**		**11,6347**			**10,8317**		

Substance: 0304 Nitrogen (II) oxide (nitrogen oxide)

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,0184000	1	0,1940	37,7169	1,6543	0,1787	39,3173	1,8347
0	0	3	1	%	0,0074000	1	0,0780	37,7169	1,6543	0,0719	39,3173	1,8347
0	0	4	1	%	0,0223000	1	0,0527	77,7476	5,7764	0,0525	77,5891	5,8277
0	0	5	1	%	0,0074000	1	0,0780	37,7169	1,6543	0,0719	39,3173	1,8347
Total:					**0,0555000**		**0,4028**			**0,3750**		

Substance: 0328 Carbon black (soot)

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,0042000	1	0,1181	37,7169	1,6543	0,1088	39,3173	1,8347
0	0	3	1	%	0,0072000	1	0,2025	37,7169	1,6543	0,1865	39,3173	1,8347
0	0	4	1	%	0,0117000	1	0,0737	77,7476	5,7764	0,0735	77,5891	5,8277
0	0	5	1	%	0,0072000	1	0,2025	37,7169	1,6543	0,1865	39,3173	1,8347
Total:					**0,0303000**		**0,5967**			**0,5552**		

Substance: 0330 Sulfur dioxide

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,0217000	1	0,1831	37,7169	1,6543	0,1686	39,3173	1,8347
0	0	3	1	%	0,0150000	1	0,1265	37,7169	1,6543	0,1165	39,3173	1,8347
0	0	4	1	%	0,0183000	1	0,0346	77,7476	5,7764	0,0345	77,5891	5,8277
0	0	5	1	%	0,0150000	1	0,1265	37,7169	1,6543	0,1165	39,3173	1,8347
Total:					**0,0700000**		**0,4707**			**0,4362**		

Substance: 0337 Carbon oxide

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,0471000	3	0,1192	18,8585	1,6543	0,1098	19,6586	1,8347
0	0	3	1	%	0,0683000	3	0,1729	18,8585	1,6543	0,1592	19,6586	1,8347
0	0	5	1	%	0,0683000	3	0,1729	18,8585	1,6543	0,1592	19,6586	1,8347
Total:					**0,1837000**		**0,4649**			**0,4282**		

Substance: 0616 Xylene (isomers mixture)

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	8	1	%	0,0144650	3	0,9144	18,8694	1,6552	0,8424	19,6665	1,8350
Total:					**0,0144650**		**0,9144**			**0,8424**		

Substance: 0703 Benz/pyrene (3.4-benzo [a] pyrene)

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	4	1	%	0,0000002	1	0,0208	77,7476	5,7764	0,0207	77,5891	5,8277
Total:					**0,0000002**		**0,0208**			**0,0207**		

Substance: 1325 Formaldehyde

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	4	1	%	0,0025000	1	0,0675	77,7476	5,7764	0,0673	77,5891	5,8277
Total:					**0,0025000**		**0,0675**			**0,0673**		

Substance: 2752 White spirit

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		
							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	8	1	%	0,0107350	3	0,1357	18,8694	1,6552	0,1250	19,6665	1,8350
Total:					**0,0107350**		**0,1357**			**0,1250**		

Substance: 2754 Hydrocarbons saturated C12-C19

№ site	№ shop	№ source	Type	Acc.	Emission (g/s)	F	Summer			Winter		

							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	2	1	%	0,0147000	1	0,0620	37,7169	1,6543	0,0571	39,3173	1,8347

0	0	3	1	%	0,0583000	1	0,2459	37,7169	1,6543	0,2265	39,3173	1,8347
0	0	4	1	%	0,0600000	1	0,0567	77,7476	5,7764	0,0565	77,5891	5,8277
0	0	5	1	%	0,0583000	1	0,2459	37,7169	1,6543	0,2265	39,3173	1,8347
Total:					**0,1913000**		**0,6105**			**0,5666**		

Substance: 2908 Inorganic dust **70-20% SiO2**

№ site	**№ shop**	**№ source**	**Type**	**Acc.**	**Emission (g/s)**	**F**	**Summer**	**Winter**

							Cm/MAC	Xm	Um (m/s)	Cm/MAC	Xm	Um (m/s)
0	0	1	1	%	0,0100000	3	0,4218	18,8585	1,6543	0,3885	19,6586	1,8347
0	0	3	1	%	0,0036000	3	0,1519	18,8585	1,6543	0,1399	19,6586	1,8347
0	0	6	3	%	0,0007000	3	0,2000	5,7000	0,5000	0,2000	5,7000	0,5000
Total :					**0,0143000**		**0,7737**			**0,7284**		

Calculation was carried out on substances (summation groups)

Code	Name of substance	Maximum Allowable Concentration			Coeff. of ecological situation	Background concentration	
		Type	Reference value	Corrected calculation.		Accounting	Interp.
0123	Iron oxide	MAC d/a * 10	0,04	0,4	1	No	No
0143	Manganese and its compounds	MAC ot	0,01	0,01	1	No	No
0301	Nitrogen (IV) oxide (nitrogen dioxide)	MAC ot	0,085	0,085	1	No	No
0304	Nitrogen (II) oxide (Nitrous oxide)	MAC ot	0,4	0,4	1	No	No
0328	Black carbon (soot)	MAC ot	0,15	0,15	1	No	No
0330	Sulfur dioxide	MAC ot	0,5	0,5	1	No	No
0337	Carbon oxide	MAC ot	5	5	1	No	No
0616	Xylene (isomers mixture)	MAC ot	0,2	0,2	1	No	No
0703	Benz/pyren (3,4-Benzopyren)	MAC d/a * 10	0,000001	0,00001	1	No	No
1325	Formaldehyde	MAC ot	0,035	0,035	1	No	No
2752	White spirit	SRLI	1	1	1	No	No
2754	Hydrocarbons saturated C12-C19	MAC ot	1	1	1	No	No
2908	Inorganic dust: 70-20% SiO2	MAC ot	0,3	0,3	1	No	No

Calculated fields

Calculated sites

№	Type	Site full description				Width, (m)	Stroke , (m)		Height, (m)	Comment
		Coordinates of middle part of 1 side (m)		Coordinates of middle part of 2 side (m)						
		X	Y	X	Y		X	Y		
1	assigned	0	1000	2000	1000	2000	100	100	2	

Calculated points

№	Point coordinates (m)		Height (m)	Point type	Comment
	X	Y			

1	900,00	1000,00	2	User’s point	
2	1000,00	1100,00	2	User’s point	
3	1000,00	900,00	2	User’s point	
4	1100,00	1000,00	2	User’s point	

Substances, calculation for which is not appropriate

Criterion of calculation advisability E3=0,1

Code	Name	SUM Cm/MAC
0703	Benz/pyrene (3.4-Benzopyrene)	0,020784
1325	Formaldehyde	0,06748

Calculation results and contributions by substances (calculated points)

Типы точек:

0 – user's calculated point
1 - point on the boundary of protective zone
2 - point on the boundary of industrial zone
3 - point on the boundary of sanitary protection zone
4 - on the boundary of residential zone
5 - point on the boundary of the building

Substance: 0123 Iron oxide

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
2	1000	1100	2	0,18	177	2,88	0,000	0,000	0
		site	shop	Source Contrib. in MAC fractions			Contr %		
		0	0	7		0,18	100,00		
4	1100	1000	2	0,16	279	2,88	0,000	0,000	0
		site	shop	Source Contrib. in MAC fractions			Contr %		
		0	0	7		0,16	100,00		
1	900	1000	2	0,13	82	2,88	0,000	0,000	0
		site	shop	Source Contrib. in MAC fractions			Contr %		
		0	0	7		0,13	100,00		
3	1000	900	2	0,12	2	2,88	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contri%		
		0	0	7		0,12	100,00		

Substance: 0143 Manganese and its compounds

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
2	1000	1100	2	0,16	177	2,88	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contr %		
		0	0	7		0,16	100,00		
4	1100	1000	2	0,14	279	2,88	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contr %		
		0	0	7		0,14	100,00		
1	900	1000	2	0,12	82	2,88	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contri%		
		0	0	7		0,12	100,00		
3	1000	900	2	0,11	2	2,88	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contr. %		
		0	0	7		0,11	100,00		

Substance: 0301 Nitrogen (IV) oxide (nitrogen dioxide)

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
2	1000	1100	2	0,20	179	2,19	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contribution %		
		0	0	2		0,10	51,96		
		0	0	3		0,04	19,44		
		0	0	5		0,04	19,44		
4	1100	1000	2	0,20	271	2,19	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contribution %		
		0	0	2		0,10	51,96		
		0	0	3		0,04	19,44		

				0	0	5	0,04	19,44	
1	900	1000	2	0,20	89	2,52	0,000	0,000	0
		site	Shop	Source Contrib. in MAC fractions			Contribution %		

		0	0	2		0,10	49,19		
		0	0	3		0,04	19,86		
		0	0	5		0,04	19,86		
3	1000	900	2	0,20	1	2,52	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	2		0,10	49,19		
		0	0	3		0,04	19,86		
		0	0	5		0,04	19,86		

Substance: 0304 Nitrogen (II) oxide (nitrogen oxide)

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
2	1000	1100	2	0,23	179	2,19	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	2	0,12		51,89		
		0	0	3	0,05		19,49		
		0	0	5	0,05		19,49		
4	1100	1000	2	0,23	271	2,19	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	2	0,12		51,89		
		0	0	3	0,05		19,49		
		0	0	5	0,05		19,49		
1	900	1000	2	0,23	89	2,52	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	2	0,11		49,12		
		0	0	3	0,05		19,92		
		0	0	5	0,05		19,92		
3	1000	900	2	0,23	1	2,52	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	2	0,11		49,12		
		0	0	3	0,05		19,92		
		0	0	5	0,05		19,92		

Substance: 0328 Carbon black (soot)

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
1	900	1000	2	0,35	90	2,49	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	5	0,12		35,32		
		0	0	3	0,12		35,32		
		0	0	2	0,07		19,57		
3	1000	900	2	0,35	0	2,49	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	5	0,12		35,32		
		0	0	3	0,12		35,32		
		0	0	2	0,07		19,57		
2	1000	1100	2	0,34	180	2,49	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	5	0,12		34,71		
		0	0	3	0,12		34,71		
		0	0	2	0,07		20,79		
4	1100	1000	2	0,34	270	2,49	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contribution %		
		0	0	5	0,12		34,71		
		0	0	3	0,12		34,71		
		0	0	2	0,07		20,79		

Substance: 0330 Sulfur dioxide

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
1	900	1000	2	0,28	90	2,29	0,000	0,000	0

			site	Shop	Source	Contrib. in MAC fractions		Contribution %		
			0	0	2		0,11	38,58		
			0	0	3		0,08	28,09		
			0	0	5		0,08	28,09		
3	1000	900	2	0,28	0	2,29	0,000	0,000	0	
			site	Shop	Source	Contrib. in MAC fractions		Contribution %		
			0	0	2		0,11	38,58		
			0	0	3		0,08	28,09		
2	1000	1100	2	0,28	180	2,29	0,000	0,000	0	

Пл Источник Вклад в В

		0	0	2		0,11	40,48		
		0	0	3		0,08	27,18		
		0	0	5		0,08	27,18		
4	1100	1000	2	0,28	270	2,29	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	2		0,11	40,48		
		0	0	3		0,08	27,18		
		0	0	5		0,08	27,18		

Substance: 0337 Carbon oxide

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
1	900	1000	2	0,13	90	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	5		0,05	37,95		
		0	0	3		0,05	37,95		
		0	0	2		0,03	24,09		
3	1000	900	2	0,13	0	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	5		0,05	37,95		
		0	0	3		0,05	37,95		
		0	0	2		0,03	24,09		
2	1000	1100	2	0,12	180	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	5		0,05	36,66		
		0	0	3		0,05	36,66		
		0	0	2		0,03	26,69		
4	1100	1000	2	0,12	270	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	5		0,05	36,66		
		0	0	3		0,05	36,66		
		0	0	2		0,03	26,69		

Substance: 0616 Xylene (isomers mixture)

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
2	1000	1100	2	0,22	177	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	8		0,22	100,00		
4	1100	1000	2	0,19	279	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	8		0,19	100,00		
1	900	1000	2	0,16	82	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions		Contrib. %		
		0	0	8		0,16	100,00		
3	1000	900	2	0,18	2	2,88	0,000	0,000	0
		site	Shop	Source	Contrib. in MAC fractions				
		Contrib. % 0					0		
		80,15	100,00						

Substance: 2752 White spirit

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type

2	1000	1100	2	0,05	177	2,88	0,000	0,000	0

site Shop Source Contrib. in MAC fractions Contrib. %
0 0 8 0,05 100,00

4	1100	1000	2	0,04	279	2,88	0,000	0,000	0

site Shop Source Contrib. in MAC
0 0 fractionsContribution%
8 0,04 100,00

1	900	1000	2	0,03	82	2,88	0,000	0,000	0

site Shop Source Contrib. in MAC fractions Contribution %

3	1000	900	2	0,03	2	2,88	0,000	0,000	0

Sit Source Contr. In MAC C

				0	0	8	0,03	100,00	

Substance: 2754 Saturated HydrocarbonsC12-C19

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
1	900	1000	2	0,36	91	2,37	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	5	0,15	41,92		
			0	0	3	0,15	41,92		
			0	0	2	0,04	9,64		
3	1000	900	2	0,36	359	2,37	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	5	0,15	41,92		
			0	0	3	0,15	41,92		
			0	0	2	0,04	9,64		
2	1000	1100	2	0,35	181	2,37	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	5	0,15	41,56		
			0	0	3	0,15	41,56		
			0	0	2	0,04	10,34		
4	1100	1000	2	0,35	269	2,37	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	5	0,15	41,56		
			0	0	3	0,15	41,56		
			0	0	2	0,04	10,34		

Substance: 2908 Inorganic dust: 70-20% SiO2

№	Coord. X(m)	Coord Y(m)	Height (m)	Concentr. (MAC)	Wind Direct.	Wind speed	Background (MAC)	Background to excl.	Point type
4	1100	1000	2	0,17	271	2,60	0,000	0,000	0
			site	Shop			Source Contrib. in MAC fractions		
			Contribution %						
			0	0	1	0,12	71,83		
			0	0	3	0,04	23,24		
			0	0	6	0,01	4,93		
2	1000	1100	2	0,17	179	2,60	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	1	0,12	71,45		
			0	0	3	0,04	23,56		
			0	0	6	0,01	5,00		
3	1000	900	2	0,16	1	2,60	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	1	0,11	69,28		
			0	0	3	0,04	25,58		
			0	0	6	0,01	5,13		
1	900	1000	2	0,16	90	2,60	0,000	0,000	0
			site	Shop	Source	Contrib. in MAC fractions	Contribution %		
			0	0	1	0,11	68,37		
			0	0	3	0,04	26,43		
			0	0	6	0,01	5,20		

Annex 5

Environmental management plan **(*EMP*)**

Activities	Potential environmental impact	Mitigation measures	Institutional responsibility	
			Implementation	Monitoring
Stage of construction				
Hydrology	Ensure proper implementation of all requirements of Goscomgeolgy to protection of surface water and groundwater, particularly in places of close occurrence of groundwater and taking into account spills and pollution.	Taking into account weather conditions during construction, in order to minimize leakage of pollutants into the soil. Digging depth restrictions in the area of supply for the use of materials or placement of excavated soil Use landscaping as an integral component of construction as erosion controls around supports if necessary. Minimizing removal of vegetation as possible and its recovery, where construction sites have been cleaned up.	Contractor	"National electric power network of Uzbekistan» JSC Goscomgeology
Air quality	Effectively minimize and avoid complaints due to airborne solid particulates, emitted into the atmosphere..	All heavy equipment and machinery must be adjusted in full compliance with State standards. Technique on petrol and diesel fuel should be preliminary tested in one of several well equipped inspection stations before use. Visible smoke in the exhaust pipes shall be excluded categorically. Fuel-saving and well-maintained trucks shall be used in order To minimize exhaust emissions Trucks should also be checked at inspection station. Trucks with visible smoke in the exhaust pipe must be excluded from work. Stocks of soil and sand should be moistened prior to loading, especially in windy conditions. Vehicles, transporting soil, sand and other building materials, should be covered. It is necessary to limit the speed of vehicles with bulk materials, that must be established and controled Transportation should be avoided through densely populated areas, especially near schools. Plan minimization of dust near gardens and fruit farms. Water dusty surfaces with water. For any plan of spraying it is necessary first to evaluate required amount of water and water availability on site, in order to avoid overspending of water and resource scarcity in the area for	Contractor	"National electric power network of Uzbekistan» JSC Goscomgeology

		Population. Cement plants (if necessary) must be managed in accordance with statutory requirements and must not be close to sensitive receivers.		
Water quality	Prevent adverse Impact on water quality Due to Negligence of successful environmental practice. Ensure effective Control of inevitable impacts. Minimize Adverse Impact On water quality As a result of construction	Make a temporary plan of drainage management one month before the beginning of works. Proper installation of temporary drainage and erosion control before work within 50 m from watercourses. Proper construction of temporary drainage and erosion control measures, maintenance and management, including training of operators and other workers to avoid contamination of watercourses as a result of the operation of construction machinery and equipment (machine transport fleet with drainage system) Storage of lubricants, fuels and other petroleum products in the individual special tanks at a distance of more than 50 m from the water. Proper disposal of solid waste from construction sites and logging towns (construction bases). Cover stockpiles of building material and soil with suitable material to reduce loss of material and deposition of sediment and avoid their accumulation near reservoirs. Cut material of topsoil should not be stored in places c destruction of natural drainage. Career (if necessary) should not be located close to sources of drinking water and human settlements.	Contractor	National electric power network of Uzbekistan» JSC Goscomgeology
Noise/Vibration of soil	Minimize the increase of noise level and ground vibration during construction	All heavy machinery and equipment must be adjusted in full compliance with national and local regulations and with the installation of effective silencers for noise minimization. If necessary, equipment with excessive noise should additionally be encaopsulated, and silencing screens shall be installed to minimize noise As a rule, operation of heavy equipment should be carried out in daytime; during the night, shock work should be forbidden Well-maintained trucks should be used with speed regulator. The contractor shall take appropriate measures to minimize noise impact around construction sites through application of available acoustic methods. Accounting and compliance with sanitary norms according to relevant standards of noise	Contractor	National electric power network of Uzbekistan» JSC Goscomgeology

		Level at permanent workplaces and in residential area in daytime and nighttime (КМК 2.01.08-96. Protection against noise.The State Committee RUz on architecture and construction. Tashkent, 1996;SanPiN №0325-16 «Sanitary standards for acceptable levels of noise at the workplace»		
Soil erosion/Landslides	Prevent adverse effects on water quality due to negligence of the expected impacts and provide effective management of the inevitable impacts. Minimize soil erosion as a result of supports construction, stretching wires and creating access roads for vehicles of the project	Temporary erosion control plan within one month prior to the beginning of works for special sensitive areas, particularly in irrigation zones. Proper installation of temporary drainages and erosion control before work within 50 m from reservoirs and canals. Monitoring of water quality downstream and upstream on any territory of supports installation within level of subsoil waters and near surface watercourses (reservoirs, canals, irrigation ditches) during construction Backfilling of the excavation must be carried out by layers (as it was before the implementation of the project), and compacted properly in accordance with the rules of design and aligned to their original contours, where possible. Excavation area must be seen against acceleration of the flow, while areas of filling must be carefully designed to avoid inappropriate drainage. Mounds should not be formed within such distances behind Digged or natural slopes that reduce stability of slopes. Mounds should be covered, if possible, drainages around Mounds must prevent spills and erosion. In the nearest perspective, temporary or permanent drainage works must protect all areas prone to erosion. Measures shall be taken to prevent accumulation of surface water in the form of ponds and washout of slopes. Destroyed in construction channels should be back filled and returned to former contours. The contractor shall take proper measures in order minimize soil erosion during construction and soil erosion Around supports during supports operation by application appropriate systems for drainage and vegetation, protecting soil.Regular soil monitoring during operation is required. The contractor shall consult with interested authorities on the ground before applying mitigating measures Cleaning of grass surface will be minimized during preparation of the site.	Contractor	National electric power network of Uzbekistan» JSC Goscomgeology

		If trees are cut down or removed, they should be replanted before the plot will be cleared, and corresponding trees (or other vegetation) shall be returned to ensure collection of rainwater and slow down landslides.		
Construction waste utilization	Minimizing impacts from construction waste utilization	waste utilization plan, which will be presented to Goscomgeology and approved one month prior to the beginning of works. Estimation of the number and types of construction waste, which will be performed by the contractor. Study if waste can be again used in a project or by other interested parties. Identification of potentially safe MSW landfill near the project area or places of waste storage, defined in the contract Study of environmental conditions of existing MSW landfill and recommendation of the most appropriate and safest places. Accumulation of granular materials should be in individual Accumulation of granular materials should be in individual regions to avoid soil wash-out Construction waste cannot be left there, where it can be washed off downstream by water flow to bottom lands, dams, rivers, channels, etc. Waste oil and lubricants should be restored and reused or removed from the site in full compliance with the national requirements Waste oils must not be burnt! The location of a landfil will be coordinated with local authorities and Goscomecology Waste transformer oil, which is subject to recycling, recovery or re-use in relevant structures with the permission and under the public control Control of Waste transformer oil on PCB content is obligatory by Forces of engaged specialized accredited laboratories. Equipment must be properly maintained, to minimize spills of petroleum products during construction. Solid waste/domestic waste must be collected and disposed by agreement With Khokimiat on MSW landfill, agreed with Centre for sanitary and epidemiologic supervision. Open burning of any material is illegal and categoricallyfirbidden as contradicting to good environmental practices. All liquid materials and lubricants must be stored in closed containers or casks.	Contractor	National electric power network of Uzbekistan» JSC Goscomgeology

Tension of OHL wires	Possible obstacle and disturbance of wildlife by materials, stored along OHL	Remove all stored material, once the work is finished. Inform local residents beforehand about the schedule of work.	Contractor	National electric power network of Uzbekistan» JSC
Operation and location of construction bases (If necessary)	Guarantee of absence of environmental negative impact and impact on population when operating temporary construction bases	Determine location of construction bases after consultation with local authorities. Location must be approved by territorial bodies of Goscomecology. питьевой воды. Where possible, temporary construction bases should not be located near settlements, or near drinking water intakes. Avoid felling trees, removal of vegetation must be minimised - on the contrary, working villages should be planted with trees. Workers should be provided with facilities of water supply and sewerage (connected with septic systems). Territory of construction of bases should be restored by grubbing the soil, , planting vegetation after clearing the plot. Solid waste and waste water Must be managed according to existing requirements, , better within existing formal system of removal and utilization of waste. The contractor must organize and maintain a system of sorting, collection and transportation of waste. Usually, solid waste must not be dumped, burried or burned at or near construction site, they must be disposed of at the nearest MSW landfill, after receipt of the necessary permits from local authorities and Centre for sanitary and epidemiological supervision. The contractor shall monitor, that all liquid and solid hazardous and non-hazardous waste is separated, collected and transported in accordance with the existing requirements and instructions. On the project completion, all construction waste should be removed. All temporary buildings, including office buildings, cabins and toilets must be removed. Open territory must be planted with appropriate vegetation.		National electric power network of Uzbekistan» JSC
Destruction of trees and vegetation Cover for supports And temporary working	To avoid certain negative impacts due to the removal of boundaries, trees, and also grassy green vegetation And surface cover	Compensation shall be paid to owners of the land for cut down trees in accordance with the established prices and market rates. Landowners are allowed to save firewood of affected trees. They will also be supported in planting of suitable new trees outside 50m corridor of each transmission line instead of cut tree.	Contractor	National electric power network of Uzbekistan» JSC

space		Staff and workers of the contractor will be strictly ordered not to damage any vegetation, such as trees or shrubs. Clearing of Green surface coatings for construction, felling of trees and destruction of other vegetation in the form of shrubs and grass during construction should be minimized. Landscape and roadsides should be restored upon completion of the works		
Safity measures for workers	To ensure safety of workers	Provision of appropriate warning signs. Provision of workers with protective helmets or hardhats. Contractor shall instruct their workers on health and safety and shall demand from workers to use provided protective devices and equipment for safety. To take all appropriate measures to ensure safety in accordance with the law and good engineering practice. Compliance with all guidelines and Rules of Building Safety norms**,** providing detailed provisions on Hygene and labour protection of Builder. Workers must be trained to occupational health and safety and certain risks of their work.	Contractor	“National electric power network of Uzbekistan» JSC
Status of traffic	Minimization of violations of vehicles and pedestrians traffic during transport of construction materials, excavated soil, equipment and machines by blocking access roads during the work; damage/probles of maintenance of roads and bridges, used by trucks,inconvenience due dust near transportation routes, especially near schools and hospitals	Provide a plan for temporary access roads one month prior to the commencement of the works. Formulate and implement a plan of spare routes for trucks. Proximity of the schools and hospitals should be taken into account. Installation of warning road signs and compliance with traffic rules during transportation of materials, equipment and machinery. Condition of roads and bridges shall be taken into account. Installation of culverts on channels and drainages. Expansion/updating of driveways/acces roads. Take into account damage to rural houses from vibration (old houses of clay bricks or hand-formed brick) along narrow and not paved rural roads.		“National electric power network of Uzbekistan» JSC
Impact on flora and fauna during		Definition of necessary location plans along with foreman and ecologist, to prevent removal of vegetation.		National electric power network of Uzbekistan» JSC

construction		Coaching of staff for the purpose of carrying out construction work so as not to disturb the animals. Hunting should be banned altogether. Vegetation should be replanted on unused territory to prevent weathering of sand and exclude violations of Habitat for birds, reptiles and insects.		
Social impact	To ensure minimal impact from construction workers. To ensure minimal impact on the health of the population. Ensure minimum consequences of indirect effects of construction on the people, who live close to constrcted OHL. Minimize impact of dust, noise, vibrations. Minimizing access problems for local people during construction. Solve the problem with new acquisition of land. Mitigate impact on farmland in the light of the expected loss of income.	Avoid the possibility of the proliferation of spreading and infectious diseases from temporary construction bases (it is necessary to regularly inform workers and maintain appropriate hygiene). Claims/complaints of people about inconvenience/damage from construction near OHL should be addressed and satisfied in the shortest possible time by Contractor The contractor shall arrange temporary access and make alternative preparation to avoid impact on the local population and avoid such short-term negative impacts. Reparation plan should be completed within the detailed design. . Logistics on land acquisition and land seizure should include provision of temporary replacement. Compensation according to the schedule, taking into account the minimum concern of affected by project people.	Contractor	National electric power network of Uzbekistan» JSC
Stage of operation				
Incomplete removal of project materials	Risk of waste impact on soil, groundwater and surface water as a result of construction waste, left after completion of the project	• Clean all work platforms/working towns after completion of the project; • Revegetation in all working areas.		National electric power network of Uzbekistan» JSC
OHL Operation and maintenance	Risk of electric shock of maintenance workers and locals	• Inform local residents about conducting maintenance work with OHL; • Train officials and local residents to the risks of OHL		National electric power network of Uzbekistan» JSC

Injury of birds by current	Occasional injury of birds by OHL, leading to wounds and death	• Placing of color/fluorescent strips on supports;sufficient distance from phase to phase and phase-to Earth.		National electric power network of Uzbekistan» JSC
Accident	Risks and hazards of disasters	• Choice of territories, designs and materials of the Foundation supports, based on detailed geological surveys; • Felling of trees, that could fall on transmission line from slopes above		'' National electric power network of Uzbekistan» JSC
		• Apply the relevant building regulations and infrastructure design; • Public awareness of disasters, emergencies; • Conduct regular OHL inspections and maintenance.		

Annex 6

Environmental monitoring plan (*EMP*)

Environmental Monitoring Plan

Problem	Monitoring option	Location of monitoring	Type of monitoring	Time/frequency of monitoring	Institutions, responsible for monitoring
PERIOD OF CONSTRUCTION					
Preservation of topsoil	Storage of materials and protection tools	Construction site	Inspection; monitoring	After preparation of the construction site, after stockpiling materials and after completion of work on shoulders	" National electric power network of Uzbekistan» JSC / Goscomgeology
Maintenance and refuelling of equipment	Oil and fuel spill prevention	Contractor's site	Inspection; monitoring	Sudden inspections during construction	" National electric power network of Uzbekistan» JSC / Goscomgeology
Hygiene and security of workers	Official approval Of location Of temporary Construction bases Presence Of relevant Personal protective Equipment of personnel Organization Of movement on the site.	Construction site Enterprise campus	Inspections, interviews, comparison with methods, Stated by the contractor	Sudden inspections during construction and In case of complaints	" National electric power network of Uzbekistan» JSC / Goscomgeology
Protection of surface waters	Compliance of the Contractor with his approved method	Work near surface watercourses (canals, reservoirs, irrigation ditches)	Inspection	Sudden inspections during works near rivers and reservoirs	" National electric power network of Uzbekistan» JSC / Goscomgeology
Protection of trees	If applicable, I.e. Preservation of trees near the construction site, Installing fencing Of trees	In areas where the trees are located along the construction site	Supervision	After the start of construction works on the relevant site	" National electric power network of Uzbekistan» JSC / Goscomgeology

Air pollution from improper maintenance of equipment	Exhaust gases, dust	On the plot	Visual inspection	Sudden inspections during construction	" National electric power network of Uzbekistan» JSC
Damage to drainage or uncontrolled erosion	Leaks in the drainage system and damage from erosion	Culverts and drainage structures	Documentation	During year	" National electric power network of Uzbekistan» JSC / Goscomgeology