

Surgil ESIA Report - Volume III

Appendices

November 2011

Uz-Kor Gas Chemical

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C	08/11/2011	Tom Streather	L. Chapman	D Boyland	Final

Content

Appendix A. Supplementary Project Information

A.1. Overview

The following section provides additional project information that is intended to supplement the project description provided in Chapter 2 of Volume II. It provides further technical details of key upstream and downstream (UGCC) component processes of the Project which have been used to inform the ESIA.

A.2. Upstream Component – Surgil Field

A.2.1. Well Design

Production wells will target production from the Surgil Field gas-condensate reserves contained within Terrigenous deposits of the Middle Jurassic (J_2) and Upper Jurassic (J_3). Sixteen productive zones (seams) are contained within these deposits (5 Upper Jurassic and 11 Middle Jurassic seams), in depths between 1,590 metres and 3,006 metres. The Surgil Field gas-condensate wells are a vertical design with a maximum depth of 2,950 metres.

A.2.1.1. Well Casing

Wells are drilled in sequence through various geological strata. Once each well section of the hole is drilled, well casing is installed in the hole to provide structural integrity to the wellbore, and where necessary isolate any high pressure zones from each other and from the surface. Well casing is important as it provides a conduit to allow hydrocarbons to be extracted without intermingling with other fluids and formations. It is instrumental in preventing blowouts allowing the formation to be sealed in the event of a 'blowout'. Deeper well sections are drilled once the previous section above is cased and this continues until the gas-condensate production zone is reached.

The type of casing depends on the sub-surface characteristics of the well. Typically there are four different types of casing. Table A.1 provides the casing design for a typical Surgil Field well, including a description of the purpose of the different casing type.

Table A.1: Casing Design for Typical Surgil Field Well

Casing Type	Casing Interval Depth	Casing Diameter	Description
Conductor	0 – 9 m	53.0 cm (20.9")	Installed first and is typically cemented into place. It serves as a support during drilling operations, and to prevent collapse of any loose soil near the surface.
Surface Casing	0 – 50 m	42.6 cm (16.8")	Installed below conductor, the primary purpose of surface casing is to protect any freshwater deposits near the surface of the well from being contaminated by leaking hydrocarbons or salt water from deeper underground. It also serves as a conduit for drilling mud returning to the surface. The thickness of the casing is determined to ensure that there is little or no possibility of freshwater contamination. Like conductor casing it is cemented into place
Intermediate Casing	50 – 400 m	29.8 cm (11.7")	Intermediate casing is the longest section and is designed to minimise hazards from any known or unknown surface formations that might contaminate the well. For Surgil wells the intermediate casing will isolate Noegene-Quaternary and Cretaceous deposits which are prone to formation caving.
	400 – 1,500 m	21.9 cm (8,6")	
Production Casing	1,500 – 2,950 m	14.0 cm (5.5")	Production casing is installed last and is the deepest section of casing in a well. This casing provides a conduit from the petroleum producing formation to the surface of the well.

Source: Uz-Kor

Cement is commonly placed between the outside of the casing and the borehole to set the casing. The cementing intervals for a typical Surgil well will be the following:

- 0 – 50m;
- 0 – 400m;
- 0 – 1,300m;
- 1,300 – 1,500m;
- 0 – 1,450m; and
- 1,450 – 1,950m

A.2.1.2. Well Completion and Control

Once the casing has been set proper lifting equipment is installed. The well is then 'completed' according to the requirements and type of gas. Completion is the process in which the well is enabled to produce the gas-condensate.

The wellhead consists of the pieces of equipment mounted at the opening of the well to manage the extraction of hydrocarbons. The wellhead consists of three components, the casing head, the tubing seal and the 'Christmas tree' which is the most visible part and typically about 6' in height. Figure A.1 provides an example of a typical wellhead for the Surgil Field. The wellhead has the following functions:

- Prevention of outflow of gas should there be a failure in the integrity of the well casing and also to provide protection of the well against excesses of pressure through installation shutoff;
- Allow short-term diversion of gas stream to wellhead flare during periods of maintenance;
- Allow well closure in the event of an emergency situation.

Figure A.1: Surgil Field Wellhead

Source: MML

Well control equipment is sited at a minimum distance of 25m from the well and flares for abnormal operation / maintenance periods are provided at a minimum distance of 100m from the wells.

A.2.2. Drilling Muds

The drilling process will use drilling fluids/muds to remove drilled cuttings (rock chippings) from the wellbore and control of formation pressures. The drilling fluids will also seal permeable formations, maintain well bore stability, cool and lubricate the drill bit, and transmit hydraulic energy to the drilling tools and bit.

Both water-based drilling fluids (WBDF) and non-aqueous based fluids (NABF) (with bentonite clays as a thickener) will be utilised. WBDF will be used for the first 50m of the well bore and NABF for depths below 50m. The use of NABF is required due to the geological characteristics of the ground through which the drilling will advance, with the NADF acting as a greasing additive to improve the drilling process by reducing freeze-in danger, increase chisel operating efficiency and decrease hydraulic resistance. Additional reagents, including caustic and ash soda, graphite and other reagents, will be added as required to achieve the required properties for drilling depending on the nature of the strata through which the well bore is being advanced.

Table A.2 provides a summary of the drilling mud components to be used for a Surgil well, by well interval.

Table A.2: Surgil Well Typical Drill Mud Components

Well Interval (m)		Mud Type	Mud Components
From	To		
9	50	WBDF	Clay Polymer; Bentonite; Soda Ash; Caustic Soda; K-4
50	400	NABF	Clay Polymer; Bentonite; Soda Ash; Caustic Soda; K-4, Oil
400	1,500	NABF	Clay Polymer; Mud Powder; Soda Ash; Caustic Soda; K-4, KMTs-600, Oil, Graphite Silver
1,500	2,950	NABF	Lignosulphonatic; Mud Powder; Soda Ash; Caustic Soda; K-4; KLMs-600; Ferrocromelignosulphonate; Oil; Graphite Silver

Source: Uk-Kor

The required volumes of the above mud components per Surgil well is summarised in Table A.3.

Table A.3: Predicted Amount of Drill Mud Components per Surgil Well

Mud Component	Total Tonnes per Well
Bentonite	24.3
Clay	64.9
Soda Ash	6.9
Caustic Soda	4.3
K-4	37.4
KMTs-600	5.6
Ferrocromelignosulphonate	7.8
Oil	27.3
Graphite Silver	2.7

Source: Uz-Kor

A.2.3. Gas and Condensate Composition

Table A.4and Table A.5 provide the design case composition of gas and condensate feedstock from the Surgil and East Berdakh Fields, respectively.

Table A.4: Composition of Natural Gas Received from Project Gas Fields

Index	Surgil Field (molar proportion, %)	East Berdakh Field (molar proportion, %)
CH_4	90,318	91,694
C_2H_6	4,545	4,265
C_3H_8	2,146	1,600
iC_4H_{10}	0,286	0,268
nC_4H_{10}	0,341	0,232
C_5+	0,340	0,216
H_2O	0,005	0,005
N_2	1,126	1,294
CO_2	0,893	0,426

Source: Duty Specification (GSP)

Table A.5: Composition of Condensate Received from Project Gas Fields

Index	Surgil Field (molar proportion, %)	East Berdakh Field (molar proportion, %)
CH_4	6,897	11,600
C_2H_6	4,849	5,172
C_3H_8	9,796	7,499
iC_4H_{10}	2,908	3,070
nC_4H_{10}	5,247	5,296
C_5+	69,872	67,026
H_2O	0,071	0,069
N_2	0,008	0,028
CO_2	0,352	0,240
H_2S	0,000	0,000

A.2.4. Gas Gathering Stations

Following extraction, gas and condensate are piped from the wells to one of six Gas Gathering Stations (GGS). Each site and configuration of the GGS will be slightly different; however each one will be equipped with a main inlet pipe collection block, an overload relief valve to protect against excess pressure, a flare for periods of abnormal operation, drainage facilities, lighting arrestors and an operator house. Each GGS will collect gas from 20 individual wells.

The exact design and layout of the gas gathering system is based on the average operational production, expected field pressure of wells and also thermal and pressure conditions at the well heads. Each one will be developed in accordance with international construction norms and regulations. Table A.6 provides a summary of key features for a GSS.

Once collected, the gas and condensate is transported via pipeline to the Surgil CGTU. Maximum distance from GGS to CGTU is 4km.

Table A.6: Key features of GGS

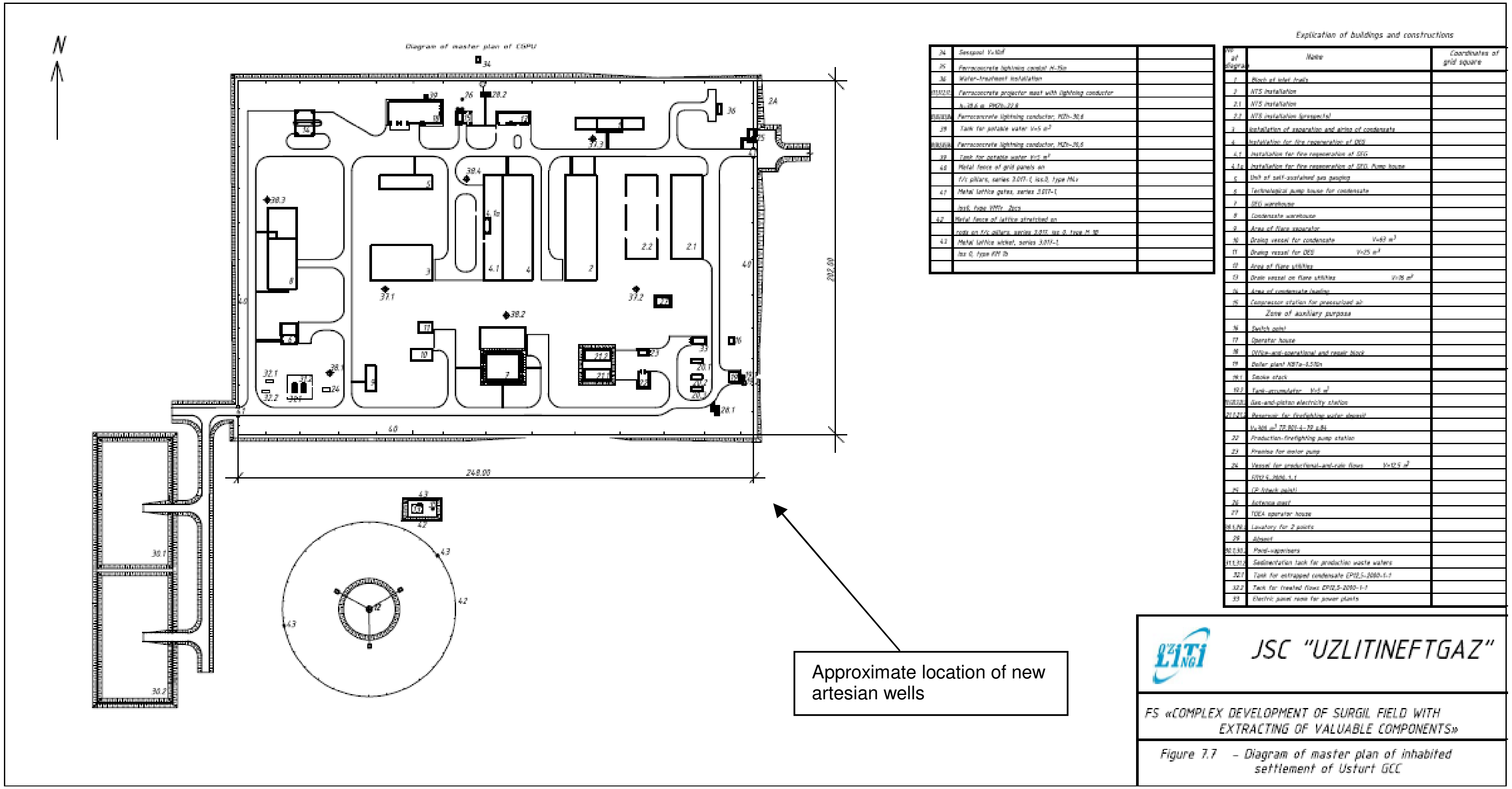
Infrastructure	Dimensions
Plot size (hectares)	0.14 – 0.20
Building area (hectares)	0.03 – 0.04
Building density (%)	20-25
Area of flare facilities (hectares)	0.79

Source: JSC “O” Zlitineftgaz – PFS “Complex Surgil Field construction with extraction of valuable components!”

A.2.5. Complex Gas Treatment Unit

Figure A.2: presents the Surgil CGTU Layout.

Figure A.2: Complex Gas Treatment Unit (CGTU) Layout



Source: JSC "O'ZLITINEFTGAZ", Complex development of Surgil Field With Extracting of Valuable Components, Feasibility Study, 2009

Figure A.3 and Figure A.4 depict some existing related facilities in the Surgil CGTU. The evaporation pond shown has recently been upgraded and has been sized to accommodate all planned wastewater flows from the full Surgil Field development.

Figure A.3: Existing Surgil CGTU Evaporation Pond

Source: MML

Figure A.4: Existing Surgil CGTU Flare

Source: MML

A.2.6. Upstream - Camp Settlement

Construction and operational workers camp for the CGTU and ancillary infrastructure works will be housed in the camp settlement being developed as part of the related facilities prior to this camp being utilised for operational staff. Whilst the camp is being developed, construction and operational staff will be housed in the existing UNG camp at Uchsay (under rental agreement). During periods of high construction activity additional temporary worker camp facilities will be provided to accommodate construction workers on site.

The Surgil Field camp settlement will be built 500 metres from the Surgil CGTU. The camp will be designed to comply with the requirements advocated by the IFC and EBRD guidance note “Workers' accommodation: processes and standards” dated August 2009. Key requirements of this will be outlined in the social management and mitigation plan. As a minimum, the camp will include the following:

- Living quarters for 72 people with a maximum of 4 people per room
- Medical facilities
- Kitchen and canteen facilities
- Leisure facilities including television and internet
- Ablutions
- Sauna
- Security checkpoint

Typical example facilities (based on the Urga Field camp which is also in the Aral Sea basin) are presented in Figure A.5 to Figure A.10

Figure A.5: Laundry Facilities

Figure A.6: On-site Ambulance

Figure A.7:Kitchen Facilities

Figure A.8: Food Storage Facilities

Figure A.9: Medical Facilities and Doctor

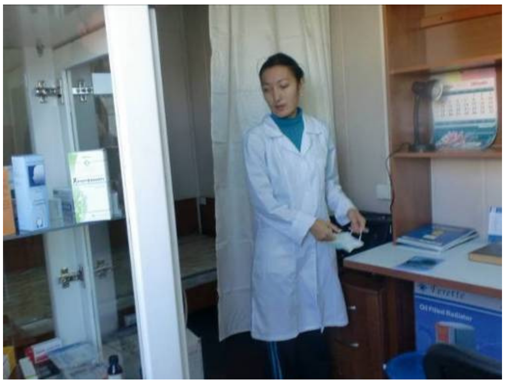
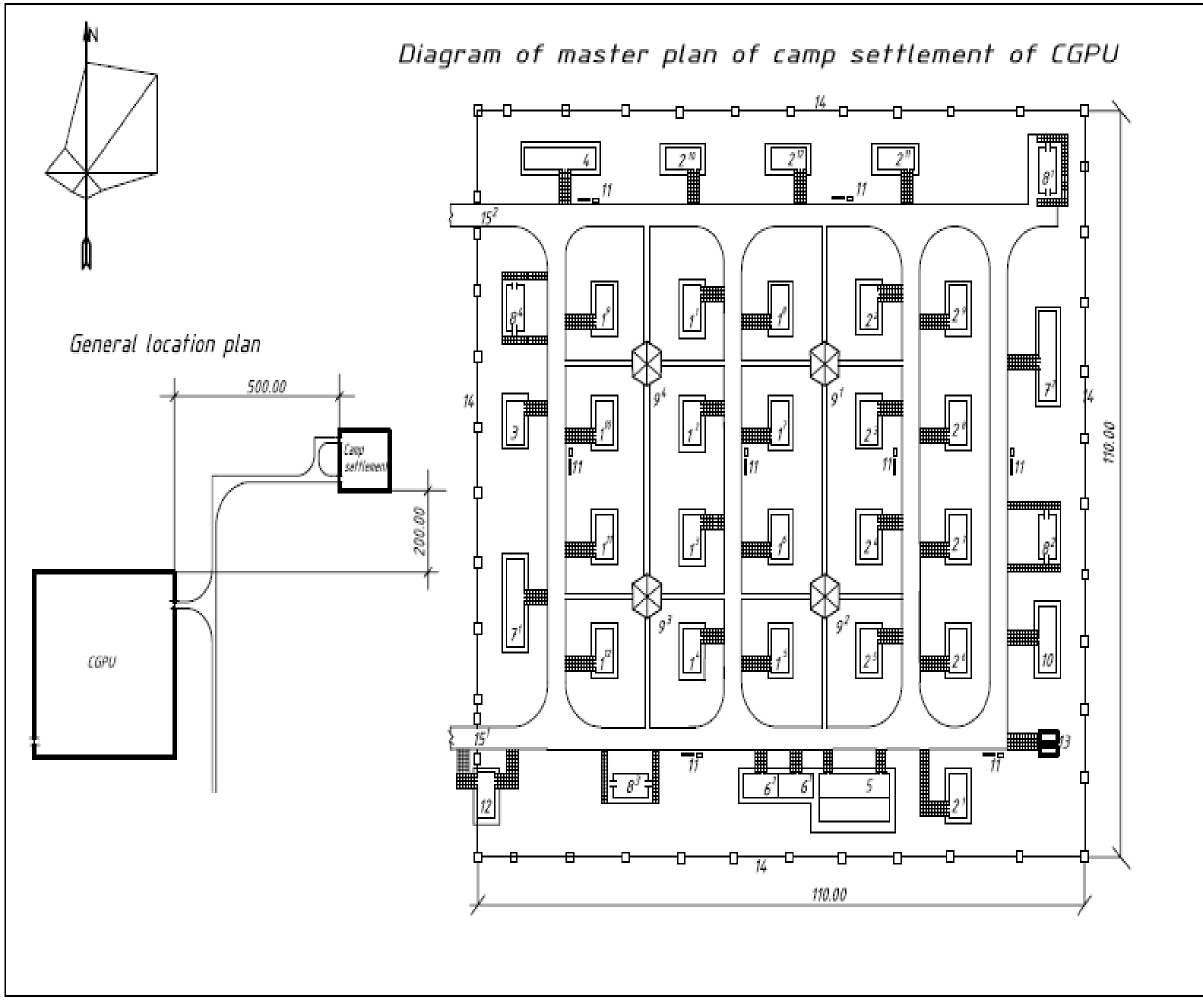


Figure A.10: Potable Water Storage

Figure A.11 sets out the proposed layout of the camp settlement.

Figure A.11: Layout of the proposed Surgil CGTU Camp



Explication of buildings and constructions

No by M.P	Name	Comment
1^{1-11}	Inhabited block-box for 4 men.	
1^{12}	Block-box for travelled specialists for 4 men.	
2^{1-10}	Inhabited block-box for 2 men.	
$2^{11,12}$	Block-box for travelled specialists for 2 men.	
3	Sauna (block-box)	
4	Medical station	
5	Kitchen dining room for 24 men (block-box)	
6^{1-2}	Products storehouse (block-box)	
7^{1-2}	Rest room (block-box)	
8^{1-4}	Lavatory and shower house of container type	
9^{1-4}	Shadow pavilion	
10	Electric panel couse (block-box)	
11	Fire shield with chest for sand 8 pcs	
12	Control post (block-box)	
13	Diesel electric station, 2 pcs	
14	Metal barrier of grid panels	
	h=1.65m on f/c pillars, series 3.017-1	
15^{1-2}	Metal lattice gates and wicket	
	on f/c pillars. Series 3.017-1	

JSC "UZLITINEFTGAZ"

FS «COMPLEX DEVELOPMENT OF SURGIL FIELD WITH EXTRACTING OF VALUABLE COMPONENTS»

Figure 7.8 - Diagram of master plan of inhabited settlement of Usturt GCC

Source: JSC "O'ZLITINEFTGAZ", Complex development of Surgil Field With Extracting of Valuable Components, Feasibility Study, 2009

A.3. Downstream Component – Ustyurt Gas Chemical Complex

A.3.1. Introduction

The new UGCC facility will be designed to receive natural gas and un-stabilised condensate via pipelines from the Surgil Field as well as from the North and East Berdakh Fields, which will then be processed to form high-density polyethylene (HDPE) and polypropylene (PP).

As outlined in Volume II, the UGCC consists of a number of process activities culminating in the production of HDPE for the production of polyethylene pellets and HDPE for the production of HDPE pellets. These pellets, plus any associated sales gas, will then be exported to international and national markets. The key processes involved in the production of the above include and are illustrated in Table 2.9 of Volume II;

- Gas separation plant (GSP);
- Ethylene plant (EP);
- HDPE plant; and
- PP plant.

The following sections provide further details of the processes undertaken within the above plants. Details of the supporting utilities and offsite (U&O) infrastructure are provided in Volume II.

A.3.2. Gas Separation Plant

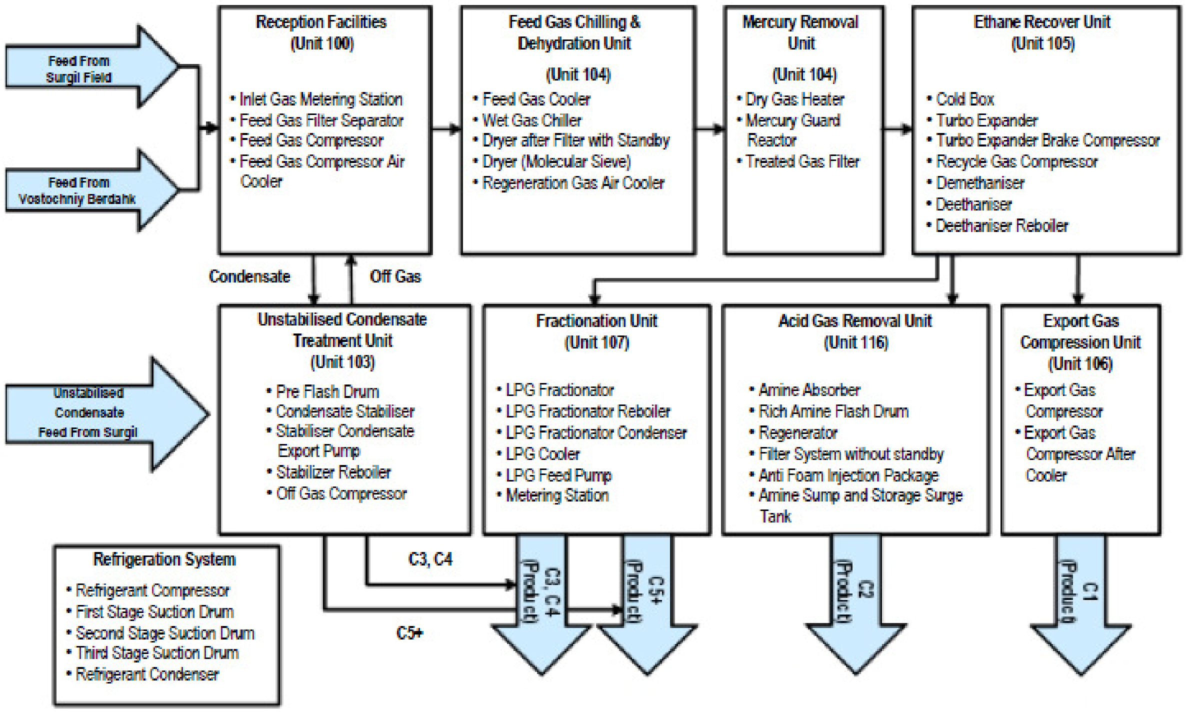
The purpose of the Gas Separation Plant is to condition the gas stream and stabilize the condensate stream from the new pipelines, recover ethane (C2) from the feed gas and to separate out heavier components (C3-C4) and (C5+) as liquid petroleum gasoline, as well as methane (C1). The GSP plant will be designed for three cases relating to the average feedstock gas composition: Minimum, Maximum and Design.

The GSP process flow diagram is illustrated in Figure A.12. The Gas Separation Plant includes a number of process units, as follows:

- Gas Inlet / Reception Facilities;
- Acid Gas Removal Unit (AGRU);
- Feed Gas Chilling, Dehydration and Mercury Removal Unit (MRU);
- Ethane Recovery Unit (ERU);
- Fractionation Unit;
- Condensate Treatment Unit;
- Export Gas Compression Unit; and
- Refrigeration System.

The Surgil gas is considered 'sweet' as it does not contain any hydrogen sulphide and as such the GSP plant configuration does not require a hydrogen sulphide removal step.

Figure A.12: GSP Process Schematic



Source: Technical Review Report, Nexant, Feb 2011

A.3.2.1. Reception Facilities

The volume of the combined feed gas from Surgil and East Berdakh Fields will be measured with a new inlet gas metering station. Downstream of the metering station, there will be a feed gas inlet filter separator, where entrained hydrocarbon liquids are separated from the feed gas and are routed to the Unstabilized Condensate Treatment Plant. The gas will then be re-compressed with a feed gas compressor and sent to Feed Gas Chilling, Dehydration & Mercury Removal Unit.

A.3.2.2. Feed Gas Chilling, Dehydration and Mercury Removal Unit

Molecular sieve technologies will be used for the dehydration and mercury removal process steps. Molecular sieves are adsorbents composed of aluminosilicate crystalline polymers (zeolites) which efficiently remove low concentrations of polar or polarisable contaminants such as water, methanol, hydrogen sulphide, carbon dioxide, COS, mercaptans, sulfides, ammonia, aromatics and mercury down to trace concentrations. Molecular sieves will also reduce water concentration to less than 1ppm which is necessary for further downstream processing.

Mercury is typically removed to prevent risk of metal embitterment of downstream plant. The exact process design is not fully confirmed at this point and may include the mercury removal facility being placed after the dehydration unit, or combined with the dehydration unit.

A.3.2.3. Ethane Recovery Unit

NGL and LPG liquids recovery will be undertaken through use of low temperature turbo-expander technology which is currently the most efficient process for obtaining high ethane and propane recoveries. The ERU plant will produce the following streams:

- Sales gas (mainly methane) sent to Export Gas Compression Unit;
- Ethane gas sent to Acid Gas Removal Unit; and
- Residue gas (C3+) sent to Fractionation Unit.

In general, the plant will consist of the following key equipment:

- Cold Box
- Turbo Expander
- Turbo Expander Brake Compressor
- Recycle Gas Compressor
- Demethaniser
- Deethaniser
- Deethaniser Reboiler

The demethaniser will strip all methane from the condensed liquid and produce a methane-free stream at the bottom of the tower. This will contain most of the recovered ethane and heavier components. The liquid from the bottom of demethaniser will be pumped and heated through exchangers before being introduced to the deethaniser to produce purified ethane from the column overhead which is then routed to the acid gas removal unit.

A.3.2.4. Fractionation Unit

Within the fractionation unit the LPG stream and C5 products or heavier will be fractionated from the ERU residue stream containing C3 products or heavier.

A.3.2.5. Acid Gas Removal Unit

In the AGRU, acid gases (generally CO_2 and hydrogen sulphide (if any)) are removed using amine adsorption from the ethane stream recovered in the ERU. Removal of acid gases serves to avoid a reduction in heating value due to excess CO_2 and limits CO_2 freezing on exchanger surfaces in the demethaniser, which is known to reduce the efficiency of the process and block heat exchangers.

The removal of CO_2 from the ethane stream is carried out by a chemical reaction which occurs between the amine solution and the acid gases. This occurs in an absorption column where the gas contacts the amine solution. The second stripper column separates absorbed acid gases from the amine solution. The acid gas produced from stripper will be flared as it does not contain hydrogen sulphide.

A.3.2.6. Condensate Treatment Unit

Within the Condensate Treatment Unit, the condensate stream is stabilised in a flash drum to remove light hydrocarbons (mainly methane) which is then routed to the reception facilities. In addition, a heavier hydrocarbon stream is routed to a condensate stabiliser, where LPG is separated from C5+ material. LPG product is recovered from the top of the condensate stabiliser and routed to ethylene plant, whilst the bottom product, consisting mainly of C5 products or heavier, is mixed with the NGL product and routed to ethylene plant for further processing.

A.3.2.7. Export Gas Compression Unit

The export gas compression unit will consist of a reciprocating export gas compressor which will export out the sales gas (mainly methane) from the plant's battery limits.

A.3.3. Ethylene Plant

Ethane, LPG and NGL is delivered from the GSP via pipeline to the ethylene plant for production of high purity ethylene and smaller amounts of propylene. The plant process will involve use of steam cracking technology (thermal pyrolysis in the presence of steam) and reaction temperatures in the steam cracker will be around 850°C.

Within the steam cracking plant the saturated hydrocarbons are converted to smaller, often unsaturated hydrocarbons, with ethylene as the key product. This plant will produce approximately 387 KTA of polymer grade ethylene and 82 KTA of polymer grade propylene. Modern steam crackers such as those to be used in this process ensure a short reaction time that improves yield and minimises the production of associated by-products.

After the cracking temperature has been reached the gas is quickly quenched in the recovery section (cold-end) of the plant to stop the reaction in a transfer line heat exchanger. This process also recovers and separates the olefin products produced and recycles saturated hydrocarbons to cracking. The recovery section includes:

- A compression unit to compress the cracked gas for the fractionation of hydrocarbon;
- Caustic-washing in a caustic tower to remove acid gases, and
- Drying prior to carrying out low temperature separation.

Separation of products will be conducted using demethaniser, deethaniser and depropaniser columns in a sequence tailored to the feedstock being cracked.

In addition to the recovery of ethylene and propylene, the chilling train of the ethylene plant will produce a mixed light hydrocarbon stream, hydrogen, pyrolysis gasoline and pyrolysis oil. The light hydrocarbon stream is recycled to the plant furnace and cracked to extinction whilst the gasoline and oil is pumped to the plant site boundary for export.

The steam cracking process results in the slow deposition of coke and de-coking is required every few months. De-coking requires the furnace to be isolated and then a flow of steam or a steam / air mixture is passed through the furnace coils. This converts the hard solid carbon layer to CO and CO_2 which are vented to atmosphere.

The ethylene and propylene products of the ethylene plant, together with butene-1 and hydrogen are then fed to two separate processes:

- HDPE plant for the production of polyethylene pellets; and
- PP plant for the production of PP pellets.

A.3.4. HDPE Plant

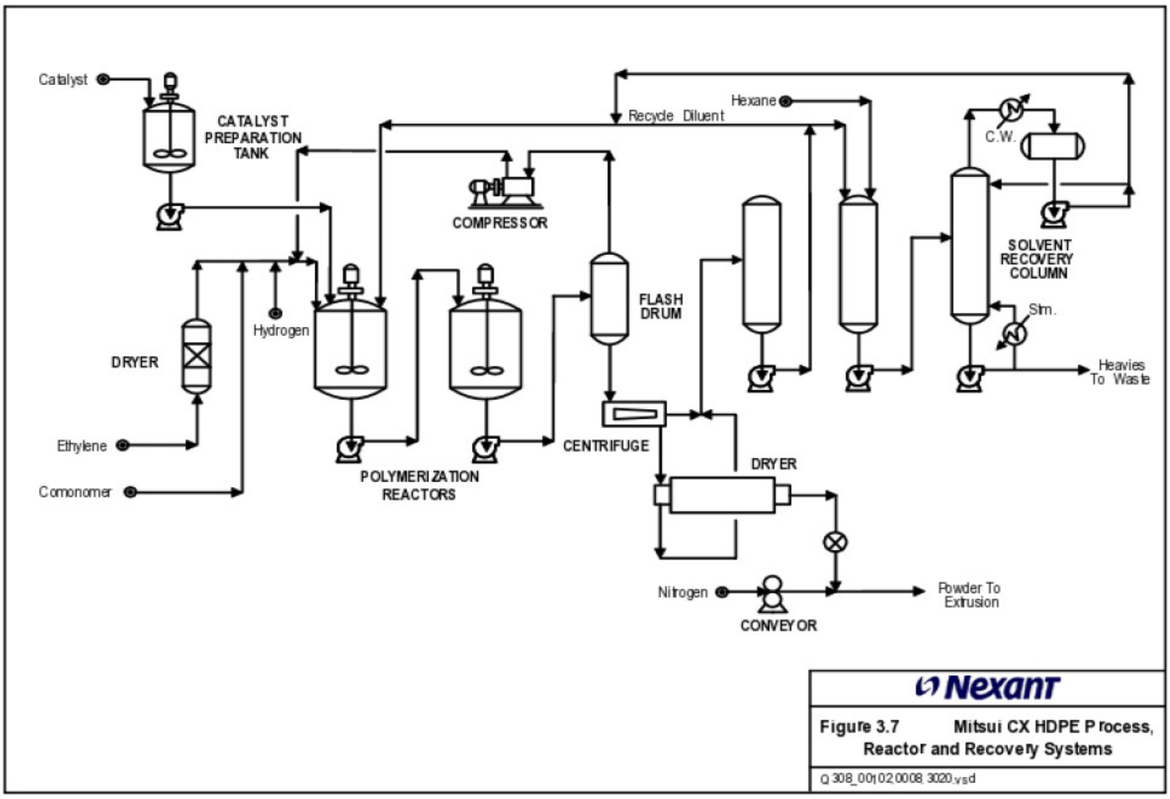
A.3.4.1. Overview

HDPE will be produced by catalytic polymerisation of ethylene in bimodal slurry (suspension) reactors. The ethylene, propylene and hydrogen processed in the ethylene plant will feed the HDPE plant to produce a guaranteed 30 tonnes per hour (per train) of HDPE pellets along two trains.

The HDPE plant can produce varying grades of polymer and includes the following components as outlined in Figure A.13

- Catalyst Preparation Section;
- Polymerization Section;
- Separation and Drying Section;
- Pelletizing, Storage and Packing Section;
- Solvent Recovery Section; and
- Process Auxiliary Section.

Figure A.13: HDPE process overview



Source: Technical Review Report, Nexant, Feb 2011

A.3.4.2. HDPE Process

The HDPE process employs stirred-tank reactors in series. The polymerisation reactors include provision for reaction and a mechanical stirrer to ensure uniform mixing, and the reactor system operates in a continuous mode with a cascade of two or three reactors.

The reactor system is charged with polymerisation grade ethylene, recycle and make-up hexane diluent, hydrogen, comonomer, catalyst and an activating agent. Ethylene, comonomor, dehydrated hexane and catalyst are continuously fed to the reactors. Hydrogen, propylene and butene-1 are continuously premixed with gas and fed to the recycle line leading to the reactors.

The polymer slurry leaving the final polymerisation reactor is depressurised into a flash vessel where unconverted ethylene is vaporised from the solvent and collected for recycle. The flashed slurry is fed to a centrifuge where the polymer cake is separated from the hexane diluent. The wet polymer is then fed to the dryer and dried to yield a polymer powder which can be compounded and pelletised.

Hexane recovered from the centrifuge is combined with hexane vapour liberated in the drying operation. It is then sent to either the polymerisation section or to the solvent recovery system where the hexane is distilled and re-circulated to the polymerisation reactors. A low quantity (circa 500 ton/yr) of low molecular weight polymers will be generated as a by-product wax which can be recycled back to the ethylene plant.

The polyethylene powder is combined with additives and processed in a compounding extruder. Pellets are then produced in an underwater pelletiser. Finally the product pellets are pneumatically conveyed to bagging silos by a pellet transfer blower.

A.3.5. PP Plant

A.3.5.1. Overview

The ethylene, propylene and hydrogen processed in the ethylene plant will feed the PP plant to produce PP pellets. The guaranteed production design capacity will be 16 ton/hr. A bulk reactor system will be used to enable the polymerisation of homopolymer and random copolymer, followed by a gas phase reactor system for the sequential production of impact copolymer. As such, the plant is to be designed but not limited to produce the following products:
- Homopolymer;
- Random copolymer; and
- Impact copolyemer.

The PP plant includes units described below, as outlined in Figure A.14:
- Catalyst preparation and feeding;
- Prepolymerisation and polymerisation;
- Degassing and monomer recovery;
- Copolymerisation;
- Polymer finishing;
- Blowdown and process auxiliaries;
- Monomer treating; and
- Pelletising, storage and packing system.

A.3.5.2. PP Process

The PP plant consists of a single train made up of a catalyst feed system and a reactor system followed by monomer flash, recycling, stripping, and polymer finishing and handling.

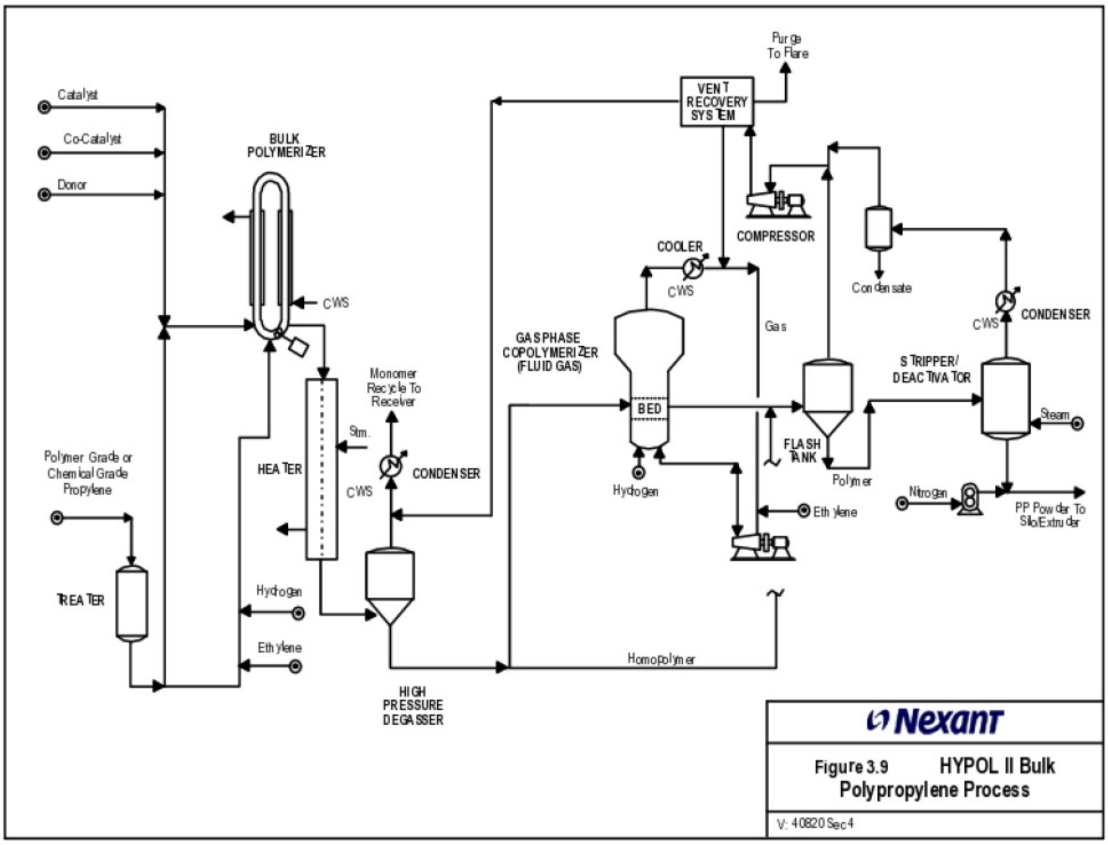
With reference to Figure A.14, the plant will include a series of two reactor systems for homopolymer and impact copolymer production. The first reactor system is comprised of two loop type reactors operating in series followed by one fluid-bed gas phase reactor as the second reactor system.

The bulk polymeriser has a residence time of about 1 to 1.5 hours which will produce about 50% conversion per pass of propylene. The gas phase fluidised bed reactor has a 0.5 – 1.0 hour residence time.

The polymer leaving the flash tank is purged with steam at the condenser to recover the residual monomer and to deactivate the remaining catalyst. The polymer powder is then sent to the downstream powder storage and finishing sections where the powder and stabilisers are homogenised, extruded and pelletised. Pellets are dehydrated, dried and separated from coarse and fine and then transferred to silos.

HP and LP blowdown systems plus a guard cyclone are provided for emergency flare relief, the latter of which prevents polymer entrainment to flare.

Figure A.14: Schematic of Generic PP process



Source: Technical Review Report, Nexant, Feb 2011

Appendix B. Cuttings Management Procedure

This Appendix includes a translation of the Uz-Kor drill cuttings and muds management procedure.

CONTENTS

1. INTRODUCTION

1.1. Oil and gas wells drilling is connected with formation of considerable volumes of wastes to which concern drilling mud, drilling cuttings or drilling rock, drilling mud-polluted drilling sewage wastes, chemical reagents, oil products. Chemical reagents in the drilling mud, containing in the structure a broad spectrum of the mineral and organic nature substances, can impact on the biosphere objects during their ingress in environment.

1.2. Drilling mud carry out various functions: washout, drilling rock lifting, heat removal from chisel, maintenance of wells walls integrity, lessening of drill pipes friction on well walls, etc. One of the basic components of any drilling mud is always bentonite (Montmorillonite clay). Effect of this component is explained by features of its physical and chemical nature, interaction with the disperse medium with formation of stable colloid system in it.

1.3. Surface-active substance (SAS) concern to the reagents decreasing surface tension on three-phase border "layer-water-oil". Main purpose of SAS is maintenance of the collectors’ natural permeability. Their penetration into drilling mud sharply reduces wells productivity and considerably extends their adaptation terms. There are used various substances as SAS: sulfanole, disolvane, carbozoline, stearox, azolyte and various oxy-ethylated spirits. Imperfection of SAS is their intensive adsorption at solid phase of drilling mud and also intensive foaming.

1.4. There are uses reagents-defoaming for degassing of the drilling mud: soastoc, carbolineum, fusel oil, polymethylsilosales, solid oil, synthetic fatty acids, etc. There are uses reagents- fluid loss reducer for drilling mud quality maintenance (coal-alkali reagent, carboxymethyl cellulose, condensed the sulfite-spirit slop, hydrolyzed polyacrylimide) and thinning agents (ferrochrome lignosulfonate, nitrolignin, sunil, igetane).

1.5. Besides, there are applied: thermal stabilizers, amendments, lubricant additives, emulsifying agents and other components. There is applied caustic soda all over the world as practically unique reagent – alkalinity controller. Caustic soda ($NaOH$) is colorless crystal mass, well water-soluble with large quantity heat release. Small alkali additives cause temporary clay particles dispersion, electrokinetic potential increase and, as consequence of it, decrease in drilling mud viscosity and fluid loss.

1.6. Apparently from the aforesaid, drilling mud toxicity level depends on presence in its composition of the various organic and mineral components added in mud for giving to it those or other properties demanded at drilling. Drilling cuttings and drilling sewage waters acquire toxicity owing to contact with drilling mud. During ingress in environment the drilling mud and drilling cuttings cause local changes of the ecosystems chemical and biological parameters.

1.7. This Management Procedure is developed for drilling wastes recycling during production wells construction in Surgil field and corresponds to uniform rules and requirements producible by laws of the Republic of Uzbekistan, and also to the international rules in relation to environmental protection during overland wells drilling, to their moving, warehousing and drilling wastes storage.

2. WORK OBJECTIVE

Management Procedure objective is:

2.1. Studying of the legislative acts and regulations of the Republic of Uzbekistan on storage, recycling and disposal of the wastes generated during drilling.

2.2. Data review on geographical and climatic features of Ustyurt region and analysis of drilling sites condition for the purpose of studying of drilling wastes disposal possibility immediately in cuttings storage barns provided by wells drilling working drafts.

2.3. Analysis of library materials, literature, patent designs and other content on drilling wastes neutralization and giving recommendations about drilling wastes neutralization generated during production wells construction in Surgil field.

2.4. Definition of drilling mud danger class recommended for drilling by the Group working draft for production wells construction in Surgil field, and also carrying out of experiments for detection of probable danger class of the drilling cuttings (waste drilling mud plus drilling rock).

2.5. Technology engineering of drilling cuttings neutralization immediately in the drilling rig area in cuttings storage barn.

2.6. Technology engineering of drilling cuttings neutralization/hardening immediately in the drilling rig area in cuttings storage barn.

2.7. Technology engineering of neutralized/hardened drilling cuttings disposal immediately in the drilling rig area in cuttings storage barn provided by the Group working draft for production wells construction in Surgil field.

2.8. Master plan of the design production wells position in Surgil field and order of their commissioning is presented in figure P1.1 and table P1.2 (Appendix 1).

3. FIELD OF APPLICATION

3.1. This Management Procedure establish uniform rules and order of carrying out of the techno-technological measures package directed to prevention of environmental pollution by the wastes, generated during drilling of production wells in Surgil field with use of drilling mud recommended by the Group working draft.

3.2. This Management Procedure cover drilling cuttings neutralization and disposal (waste drilling mud plus drilling rock) and drilling sewage waters formed during wells drilling immediately in cuttings storage barns installed in the drilling rigs areas according to Group working draft for production wells construction in Surgil field.

3.3. Cuttings storage barns used for temporary storage of drilling rock and waste drilling mud are a part of the drilling rig area developed scheme

3.4. According to given by the customer project of wells design, formed on all wells of Surgil field drilling cuttings amount will make 29.7 thousand cubic meters, including 12.9 thousand cubic meters of drilling rock and 16.8 thousand cubic meters of WDM. Amount of formed DSW will make 33.5 thousand cubic meters. Formed drilling cuttings amount calculations are resulted in Appendix 2.

3.5. Management Procedure is intended for industrial-engineering services of environmental protection of “Ustyurtgaz” USE.

4. NORMATIVE REFERENCES AND ANALYSIS OF THE CURRENT LEGISLATION OF THE REPUBLIC OF UZBEKISTAN CONCERNING DRILLING WASTES RECYCLING

4.1. According to the Law “On nature conservation” of the Republic of Uzbekistan, “Ustryurtgaz” USE obliged to conduct oil and gas operations effectively and safely, following the legislation of the Republic of Uzbekistan with observance of the working standards in the international oil and gas industry. Any possible negative environmental impacts, including atmospheric air, ground surface, interior, lakes, rivers, forests, flora and fauna, crops and other natural resources, should be minimized.

4.2. List of the Republic of Uzbekistan’s Laws, Cabinet of Ministers’ Decisions and regulations of the Republic of Uzbekistan regulating enterprises activity in questions of environmental protection is presented below:

- Law of the RUz “On nature conservation” № 754-XII from December, 9. 1992 (with the following amendments).
- Law of the RUz “On flora protection and use” № 543-I from December, 26. 1997
- Law of the RUz “On especially protected natural territories” № 871-XII from May, 7. 1993
- Law of the RUz “On atmospheric air protection” № 353-I from December, 27. 1996
- Law of the RUz “On radiation safety» № 120-II from August, 31. 2000
- Law of the RUz “On environmental impact assessment” № 73-II from May, 25. 2000
- Law of the RUz “On water and water use» № 837-XII from May, 6. 1993
- Law of the RUz “On state land cadastre” № 666-I from August, 28. 1998
- Law of the RUz “On order of the Republic of Uzbekistan’s Land code consummation” № 598-I from April, 30. 1998
- Law of the RUz “On wastes” № 362-P from April, 5. 2002
- Law of the RUz “On interior” № 444-P from December, 13. 2002
- Decision of Supreme Soviet “On consummation of the Republic of Uzbekistan’s Law “On interior” from September, 23. 1994
- Decision of OM of the RUz “On Regulations about the nature conservation State committee of the Republic of Uzbekistan” № 232-I from April, 26. 1996
- Decision of OM of the RUz “On approval of the Land code of the Republic of Uzbekistan” № 599-I from April, 30. 1998
- Decision of CM of the RUz “On national strategy and program of the Republic of Uzbekistan on biological variety preservation” № 139 from April, 1. 1998 (with amendments).
- Decision of CM of the RUz “On approval of Regulations on order of creation and conducting of Uniform system of the state cadastres of the Republic of Uzbekistan” № 255 from July, 17. 1996 (with amendments).
- Decision of CM of the RUz “On questions of the organization of activity of land resources State committee of the Republic of Uzbekistan” № 314 from July, 27. 1998
- Decision of CM of the RUz “On limited water use in the Republic of Uzbekistan” № 385 from August, 3. 1993
- Decision of CM of the RUz “On approval of Regulations on order of development and conducting of state water cadastre of the Republic of Uzbekistan” № 11 from January, 7. 1998 (with amendments).
- Decision of CM of the RUz “On approval of the rates for calculation of the collection amount for damage caused to flora of the Republic of Uzbekistan” № 293 from July, 27. 1995
- Decision of CM of the RUz “On approval of statutory acts according to the Republic of Uzbekistan’s Law “On interior” № 19 from January, 13. 1997 (with amendments).

- Decision of CM of the RUz “On approval of the Regulations on order of conducting of state cadastre of especially protected natural territories of the Republic of Uzbekistan” № 104 from March, 10. 1998
- Decision of CM of the RUz “On approval of the Regulations on order of creation and conducting of Uniform system of the state cadastres of the Republic of Uzbekistan” № 255 from July, 17. 1996 (with amendments).
- Appendix № 1 to the decision of CM of the RUz “Regulations on order of allotments granting for mineral deposits development” № 20 from January, 13. 1996
- Appendix № 1 to the decision of CM of the RUz “Regulations on order of conducting of the state cadastre of flora objects of the Republic of Uzbekistan” № 343 from September, 5. 2000
- Appendix № 1 to the decision of CM of the RUz “National strategy on decrease in greenhouse gases emission (fundamentals)” № 309 from October, 9. 2000
- Appendix № 2 to the decision of CM of the RUz “Measures for realization of National strategy for decrease in greenhouse gases emission” № 389 from October, 9. 2000

4.3. Analysis of the currently in force acts and regulations in the territory of Republic of Uzbekistan show that:

- Enterprises, organizations, establishments, separate persons are obliged to introduce non-waste and low-waste technologies, to reduce production and domestic wastes generation, to make their neutralization, processing, to observe rules of their sorting, warehousing, disposal and recycling. There is forbidden wastes storage and disposal on the settlements lands of nature-conservative, health-improving, recreational and historical and cultural purpose, within water protection zones and zones of water objects sanitary control, in other places where there can be danger to citizens’ life and health, and also especially protected natural territories and objects.
- Water protection zones are the protected natural territories adjacent to rivers’ channels, lakes, reservoirs, channels, collectors and other water objects. These zones are formed with a view of prevention of pollution, contamination, desiccation and silting of water objects by products of soils erosion, and also for maintenance of the favorable water regime.
- Wastes disposal in interior is supposed in exceptional cases by results of special researches with observance of requirements on maintenance of citizens’ life and health security, environmental safety, natural resources safety.
- Landfills for wastes neutralization and disposal should be placed according to hydrogeological conditions, as a rule, in sites with poorly filtering grounds (clay, loams, slates), with ground waters occurrence during their maximum lifting, taking into account water lifting during landfill operation, not less than 4m from the lower level of land-buried wastes.
- At placing of cards in grounds, characterized by filtration factor 10^{-7} sm/s (for substances of *I* and *II danger class*), disposal of the toxic wastes is supposed without special measures for watertight diaphragms installation. There is provided watertight diaphragm at more permeable grounds or their instability (decompaction) to infiltrate.
- "Industrial wastes storages” construction is not supposed in the areas of fresh underground waters fields, in areas of influence of the centralized underground waters intakes, in areas underground waters discharge (thinning) in surface reservoirs and drains. "Industrial wastes storages” should be placing in the flood-free territories, formed by poorly filtering rocks with a glance of seasonal fluctuation of the ground waters level with its maximum occurrence.
- Departmental ecological monitoring of "industrial wastes storages” influence on environment is carried out by their owners. Water, air and soil sampling frequency from checking points for chemical analyses is determined by the enterprise by recommendation of bodies of

Goskomprirody RUz. Wastes *of I toxicity class* is subject to obligatory processing and neutralization at specialized landfills before their disposal. State ecological monitoring over industrial wastes placement in "industrial wastes storages" is carried out by bodies of Goskomprirody RUz.

4.4. Thus, on the basis of legislative acts and regulations analyses accepted in the Republic of Uzbekistan concerning to production wastes handling, it is possible to assert, that the drilling wastes disposal (waste drilling mud plus drilling cuttings) immediately in cuttings storages, developed according to the Group working draft for production wells construction throughout Surgil field, under condition of wastes conformity to *III and to IV danger class - moderately and low-hazard wastes*.

5. REVIEW OF LIBRARY MATERIALS, LITERATURE, PATENT DESIGNS AND OTHER CONTENT ON EXISTING DRILLING WASTES RECYCLING TECHNOLOGIES AND PRACTICE IN THE TERRITORY OF THE REPUBLIC OF UZBEKISTAN

5.1. Drilling cuttings represents a mix of drilling rock with drilling mud. Drilling rock by mineral composition, as a rule, is nontoxic, but, dispersing in medium of drilling mud processed by chemical reagents, its particles is adsorb toxic components on the surface and hereupon, also becomes pollutant of environment components.

5.2. Waste drilling mud is a mud used in technological process and unsuitable for further drilling, and also, drilling mud and formation fluid, ejected from well onto earth surface during emergency flowing.

5.3. Drilling sewage waters are the waters which have been acquired during well construction and equipment operation, representing drilling mud diluted with process water and atmospheric precipitation.

5.4. Classification of WDM and DC by certain qualitative and quantitative characters has great importance for the decision of their recycling tasks. The most essential characters are the aggregative state, component composition and physiochemical properties.

5.5. Specified wastes can be classified by their aggregative state as liquid (fluid), semi-fluid (paste-like) and hard. Thus, the basic character of their reference to this or that kind in the given classification is the content of hard and liquid phases. So, at the hard phase content to 35% the wastes keeps the mobility and fluidity and concerns to liquid wastes (WDM). At the hard phase content from 35 to 85% the wastes has a paste-like view and concerns to semi-fluid (WDM with drilling cuttings). And, finally, at the liquid content in wastes composition less than 15% it is necessary to concern them to category of hard wastes (drilling rock or drilling cuttings). Wastes classification by such character allows reasonable approach to a choice of their transportation and mixture with other components method.

5.6. Drilling wastes by component composition should be classified as clay, carbonate, haloid-sulfate. This classification basically concerns to hard and semi-fluid wastes. Wastes which hard phase is presented by rocks of clay fraction (clay, mudstones, and marls) concern to clay. Carbonate are the wastes which hard phase mainly composed of carbonate rocks (limestone, dolomite). Haloid –sulfate wastes contains the hard phase basically composed of rock salt, gypsum and anhydrite. Such classification allows estimating suitability of these wastes as secondary raw materials at their recycling.

5.7. Economic reasonability of this or that nature-conservative measure is defined at each concrete enterprise with a glance of its economic possibilities. Often construction of wastes neutralization units is non-value-added for one enterprise, as far as volumes of wastes generation are below the minimum capacities of the typical units which are manufactured by the industry.

5.8. The decision of this problem should be or at regional level by construction of wastes processing units for all enterprises, or at local level by making of the units of low capacity for wastes neutralization immediately on the sector objects. In this connection, it is necessary to carry the organization and maintenance of research and engineering developments of such units, creation of effective remedies and methods of wastes processing and neutralization to number of priorities both at regional level, and at level of the enterprises.

5.9. Drilling wastes qualitative and quantitative composition is basic at a choice of their recycling method. Drilling wastes recycling technologies choice is carried out proceeding from principles of a state policy in the field of the handling *with* production and consumption wastes which is directed to reduction of wastes amount, their involving in economic circulation and fuller use of natural resources.

5.10. Now the most known technologies of drilling wastes processing are based on the following methods:

- ***Thermal*** – incineration in open barns, furnaces of various types, reception of bituminous leavings.
- ***Physical*** – disposal in special burials, separation in a centrifugal field, vacuum filtering and filtering under pressure.
- ***Chemical*** – extraction by solvents, hardening with application (cement, liquid glass, clay) and organic (epoxy and polystyrene resins, polyurethanes, etc.) additives.
- ***Physiochemical*** - application of specially selected reagents changing physiochemical properties, with the following processing on the special equipment.
- ***Biological*** - microbiological decomposition in soil immediately in storage places, biothermal decomposition.
- ***Mechanical*** - drilling wastes pumping in lost circulation horizons.

5.11. Now it is known about application of the following methods (and their combinations) of drilling wastes neutralization and processing:

- drilling cuttings incineration in the form of aqueous emulsions and recycling of released heat and gases;
- drilling cuttings dewatering or drying with return of oil products to production, and sewage waters in turnaround circulation and the following disposal of the hard leavings;
- drilling cuttings hardening by special consolidating compositions with the following use in other sectors of the national economy, or disposal in special landfills;
- drilling cuttings use as raw materials (components of other sectors of the national economy);
- drilling cuttings physiochemical separation (solvents, demulsifying agents, SAS, etc.) on component phases with the following use.

5.12. Works basic directions in the field of semi-fluid drilling wastes neutralization (drilling cuttings and WDM hard phase) concentrate on physiochemical neutralization and hardening. A priority direction of neutralization is their hardening, realized by special hardeners.

5.13. Neutralizing effect is achieved at the expense of drilling wastes transformation into the inert consolidated mass in which structure the basic polluting components are fixed. Such mass can be buried in lands for alignment of the lay of land, for filling in body of roads under construction, etc., without environmental damage. Adding to wastes such active additives allows, besides, to receive hardened mass enduring a load which is created by the transport.

5.14. Solid preservative matrix formed at hardening prevents dissolution of toxic substances under the influence of environment components, additionally fix them physically and chemically, reduces surface contact area with environment.

5.15. Cuttings neutralization is carried out by mixture in certain proportions with sorbent and cement. As a result of such processing, the organic substances which are presented in cuttings fixed by added sorbents. Cement and sorbent at mixture with cuttings in the water presence keep up high value pH (to 12) in system. Thus, heavy metals cations containing in cuttings, turning into sparingly soluble hydroxides composition.

5.16. Following wastes hardening, proceeding as a result of cement hydration processes added to the system, leads to more firm fixing of the neutralized toxic compounds and prevention of their following dissolution during environmental impact. The product received as a result of neutralization can be used in construction.

5.17. At the drawing up of this Management Procedure, there are realized following technologies of drilling recycling and cuttings barns liquidation in the territory of the Republic of Uzbekistan:

- in “LUKOIL Uzbekistan Operating Company” Co. Ltd., – drilling wastes recycling of Khauzak Site on specialised Landfill with production output according to TSh 64-19577541-01:2008 “Reinforced anthropogenic grounds” and TSh 64-19577541-02:2008 “Treated drilling sewage water”;
- in “LUKOIL Uzbekistan Operating Company” Co. Ltd., - drilling wastes recycling and cuttings barns liquidation at objects of the Southwest Gissar according to “Management Procedure of drilling cuttings (DC) neutralization and hardening for its following disposal in cuttings barns (CB) in the contract territories of the Southwest Gissar (correction)”;
- in “LUKOIL Uzbekistan Operating Company” Co. Ltd., - drilling wastes recycling and cuttings barns liquidation on the Site of Kandym group of deposits according to “Management Procedure of drilling wastes recycling during production wells construction on the site of Kandym group of deposits”;
- In “LUKOIL Uzbekistan Operating Company” Co. Ltd., - drilling wastes recycling during production wells construction on the Shady Site according to “Management Procedure of drilling wastes recycling during production wells construction on the Shady site”.

6. KARADJID-GUMKHANIN INVESMENT BLOCK GEOGRAPHIC-CLIMATIC FEATURES DATA REVIEW

6.1. In the geomorphological relation the field is concern to semi-desert. In the lithological relation the considered area is formed by combined aeolian sands, fixed sand dunes, with not clearly expressed loams interlayers. There has received development saline soil in the south of a site. Modern engineering-geological processes are presented in the form of sand deflation.

6.2. The nearest settlement is at 30km to the southeast from Surgil GCF - small settlement Uchsay with camp of gasmen. Area of the future Akchalak GCC is located in the East Chink of Ustyurt at 5.0km to the northeast from Kyrkkyz railway station. From the northwest at 1.0km and the northeast at 2.0km is limited by HV line – 110kV, and from the south at 2.0km by HV line – 35kV. Area is located on plane place with the heights difference to 2m. There pass the railway and highway Kungrad-Beyneu in the southwest.

6.3. The region climate is characterized as acutely continental climate. The following factors are specifying it: first, the considerable air temperature amplitude – peak daily amplitude makes in January 22^{0}C, and in July 24^{0}C; secondly, by small enough amount of precipitations throughout year; thirdly, considerable humidity decrease in air during the warm period of year and increase during the cold period.

6.4. Air temperature annual average value makes 10.2^{0}C. Air temperature average monthly value of the coldest month (January) equal to – 5.9^{0}C, air temperature average monthly value of the warmest month (July) equal to 26.6^{0}C (table 6.1). Absolute lowest air temperature air makes - 31^{0}C, absolute peak air temperature - 44^{0}C. Period duration with daily average temperature less 0^{0}C - 104 days.

*Table 6.1 –***Daily average data of air temperature by long-term observations at Muynak meteorological station**

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**During the year**
Air temperature by Muynak meteorological station, ^{0}C	– 5.9	– 5.5	0.1	9.4	18.1	23.7	26.6	25.0	19.1	10.8	3.2	– 2.4	10.2

6.5. Average peak temperature of the hottest month July 35.5^{0}C, average lowest temperature of the coldest January – 9.0^{0}C. Absolute peak was observed in July 44.6^{0}C, absolute low - in January – 34.2^{0}C. Average and peak daily amplitude of air temperature change data is resulted in table 6.2.

Table 6.2 – **Average and peak daily amplitude of air temperature change by long-term observations at Muynak meteorological station**

Average daily temperature amplitude by months, ^{0}C												Peak daily temperature amplitude, ^{0}C	
I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**	**I**	**VII**
6.8	7.7	8.1	9.2	9.8	10.2	9.7	9.5	9.6	9.1	7.3	6.0	22.0	23.7

6.6. Soils frost line makes 72sm. Soils frost line possible once in 10 years - 117sm, once in 50 years - 138см.

6.7. Average annual relative air humidity makes 70%, average monthly relative air humidity for January makes 83%, for July - 58%. Data on absolute air humidity by months is resulted in table 6.3.

Table 6.3 – **Average monthly data on absolute air humidity by long-term observations at Muynak meteorological station**

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Absolute air humidity by Muynak meteorological station, mb.	3.6	3.7	5.1	8.2	12.5	16.5	20.2	19.0	13.9	9.0	6.2	4.4

6.8. Annual amount of precipitations makes 121mm. In annual variation of precipitations this area concerns to transitive zone between northern latitudes for which prevalence in a year of precipitations of the warm period is characteristic, and more southern where precipitations mainly during the cold period of year. Maximum amount of precipitations in April - 18mm that makes 16% from the annual rainfall, less precipitations in July, August and September. Peak daily amount of precipitations in some day - 66mm. Snow cover does not exceed 17sm, days with snow cover equal to 27.

6.9. The important meteorological factor influencing on atmospheric pollution level is the wind conditions formed under the influence of atmospheric pressure and circulating processes and defining a direction and transport range of harmful impurities. From that follows, that air pollution characteristic in this zone is the raised natural origin dust content at the expense of a strong wind.

6.10. There are prevailed winds of northern, northeast and east directions in annual rainfalls. There are prevailed winds of east, northeast and western directions in January. There are prevailing winds of northern and northeast directions in July. Average monthly wind speed in January is 4.2km/s, in July – 4.8km/s (table 6.4). Annual peak wind speed observed at Muynak meteorological station made 25km/s.

Table 6.4 – **Wind directions and speeds characteristic by months (January and July)**

Wind direction	**Months**			
	January		**July**	
	Average speed, m/s	**Repetition, %**	**Average speed, m/s**	**Repetition, %**
N	4.2	10	4.8	32

NE	4.7	23	4.8	27
E	4.8	23	4.5	11
SE	4.1	6	4.4	4
S	3.9	9	3.8	4
SW	4.9	8	3.8	3
W	4.3	15	3.7	10
NW	4.2	6	4.3	9
Calm	-	10	-	9

6.11. Days with dusty storm and drifting dusty for a year equal to 57.

6.12. According to division into districts of the territory of Uzbekistan by climatic characteristics, this territory concerns to 1 region by wind pressure with standard value 0.38kPa and to 1 area by snow loads with standard value 0.5kPa. Ground surface icing standard thickness with repeatability once in 5 years makes 15mm, once in 10 years - 20mm.

6.13. There are resulted in the appendix 3 the calculations evaporating water sheet thickness for average climatic conditions of Ustyurt region which makes more than 1.4m, including 105sm for warm months (May-September).

6.14. Irreversible changes in the Aral area climate are connected with the Aral Sea drying. Now, there are characteristic for the Aral area climate large big solar energy inflow in warm season, large-scale regional circulating processes and features of underlying surface. Under cumulative impact of these factors there is formed acutely continental, arid climate in the Aral area, with hot summer with seasonal fluctuations of air temperature plus 40-45^{0}C (July-August) and with little snow winter with hard frosts alternation minus 30-35.5^{0}C with thaws.

6.15. Thus, considering meteorological parameters and Surgil field production wells drilling region factors (air and soil temperature, wind direction, amount of precipitations and evaporation), for carrying out of technological operations on drilling cuttings neutralization/hardening and its disposal in cuttings storage barns, it is recommended to spend from May till June and from September till October as to achieve effective carrying out of the given technological operation out-of-doors at obligatory observance of labor safety conditions at frozen ground and plentiful precipitations or at ambient temperature above 40^{0}C practically impossible.

7. ANALYSIS OF DRILLING MUD DESIGN COMPOSITION AND PARAMETERS. DEFINITION OF DRILLING MUD AND FORMED DRILLING CUTTINGS DANGER CLASS

7.1. There is apply as materials to drilling mud preparation and regulation of its properties: bentonite, caustic and ash soda, KMS K-4., and etc. All technological processes package is meant technology of flushing-out of well with operations on drilling mud preparation, clearing, treatment and circulation with use of the equipment and devices for their performance and control. Wells flushing-out technological process is realized so that to achieve best technical and economic indexes of drilling with observance of measures for environmental protection.

7.2. Drilling process consists in rock failure by chisel with drilling rock transportation (flushing) by drilling mud onto surface. Type of drilling mud and its formula are selected proceeding from miming and geological conditions of hole making, with a glance of their least harmful impact on soils and underground waters in accordance with current CD.

7.3. There are applied the following technological materials for drilling mud preparation and treatment during well drilling and fixing: gel material, soda ash, caustic soda, K-4, oil, CMC, FCLS, graphite, cement and others. All above-stated materials basically are nontoxic and transported in compact bags and barrels. They are stored in specially allotted places under shelters and in sheds on the oilrig.

7.4. Gel materials represent dry and ground clay with chemical reagents or without them. For drilling mud preparation there is used basically gel materials from bentonitic, hydro micaceous (local) and palygors-kite clays, each of which contains various impurities of other minerals. There is 70% and more of the montmorillonite mineral in bentonitic gel materials.

7.5. It is accepted to subdivide of bentonites into alkaline (sodium), alkaline-earth (calcium). There are prevailed univalent metals Na^+ and K^+ in composition of the sodium bentonite exchange capacity. Sodium bentonites possess high osmotic pressure, good swelling and dispersed in water, can turn into calcium (by liming), have high slurry yield. Calcium bentonites have low osmotic pressure, poorly swelled and dispersed in water, can turn into sodium (soda ahs additive), have low slurry yield.

7.6. Oil is the organic substance containing various solid hydrocarbons and tarry matters. Depending on their composition the oil divided into high-gravity and heavy. It is applied in drilling mud composition as greasing additive to improvement of drilling process: reduction of freeze-in danger, increases of chisel operating efficiency, decrease in hydraulic resistance.

7.7. Caustic soda is colorless opaque crystal mass. It is used basically for regulation of drilling mud pH. Drilling mud treatment is carried out by 5-10% caustic soda solution, as the large additives lead to bodying and filter loss increase and deterioration of drilling mud properties. It is delivered in a hard form in iron barrels (drums) by mass of 100-200kg or in the form of 40-47% concentration solution. NaOH strongly absorbs moisture and carbonic gas in air, turning into carbonate. During dissolution allocates of heat considerable amount. It does not form dust. MPC is $0.5/m^3$.

7.8. Soda ash represents a powder of white color by density of 2.5/sm^3. Soda is received from $CaCO_3$. Its additives make to 0.5% in dry and 2-3% in the form of 5-15% concentration solution. Sometimes it applies as alkali substitute during lignin-alkaline reagent preparation or for nitrolignin dissolution, wood-chemical polyphenol and other reagents. It is also applied during mud preparation from calcium clays for improvement of wettability of clay particles and as clay peptizing agent.

7.9. Graphite represents the crystal silver powder which is not dissolved in water. It is formed by foam concentration of natural graphite ores and blast-furnace scraps. Graphite additives make to 1% from solution bulk. Graphite is delivered in bags by 30-35kg.

7.10. FCLS - ferrochrome lignosulfonate, non-caking loose powder of dark brown color, completely soluble in water, is applied for drilling mud dilution, thickening from clay, various salts and temperature effect, and also for decrease in filtration of fresh and medium mineralized mud. Described effect it shows at pH 8.5-9.5. FCLS can be applied in the form of 30-40% water solution or in the form of dry powder. Dry FCLS is nontoxic and does not cause allergy. It is necessary to use rubber gloves and safety glasses during work with FCLS water solution. It is stored in bags, there is possible considerable dispersion during bags opening; dust is non-explosive to concentration 250/m^3. Pack into four-layer paper bags with the varnished layer by 40 kg weight.

7.11. Reagent K-4 receives by incomplete hydrolysis of polyacrylonitrile with caustic soda under mixture ratio 2.5:1. It is developed by IGIRNIGM, produced in the form of 10% water solutions. During introduction of small amount (0.1-0.5%) of reagent K-4 in mineralized drilling mud their water loss in limiting static shear stress is sharply decreases. With K-4 concentration increase in the drilling mud over 0.3% the water loss continues to decrease, and limiting static shear stress increases in contrast to CMC effect.

7.12. CMC is the powder of white or cream color which is rather slowly dissolved in cold water. Solubility can be accelerated it several times by the adding in water to 1% from reagent sulfonal weight.

7.13. Calculation of drilling mud toxicity class provided by the Group working draft for production wells construction in Surgil field is carried out by method stated in “Criteria of wastes reference to danger class for environment” confirmed by the order № 511 of the Ministry of Natural Resources of the RF from June, 15, 2001

7.14. Results of calculations are resulted in tables P4.2-P4.5 (Appendix 4). These calculations show, only on well drilling interval under direction the recommended drilling mud is *IV danger class – low-hazard wastes* (waste danger degree index for E K = 96.0 <100). Below 50m drilling is carried out on drilling mud with addition of oil and recommended for drilling mud concern to *III danger class - moderately dangerous waste* (waste danger degree index for E K = 100 < 205.1 … 279.4 < 1000), that, in turn, allows assuming, that drilling cuttings, formed during wells drilling on this drilling mud also should be low-hazard or moderately dangerous waste.

7.15. As it has been specified above, item 4.3., during cards placement in grounds, characterized by filtration factor 10^{-7} sm/s (for substances of *I, II* and *III danger class*), toxic wastes disposal is allowed without special measures for the watertight diaphragms installation. There is provided watertight diaphragm at more permeable grounds or their instability (decompaction) to infiltration.

7.16. Considering that the Group working draft for production wells construction in Surgil field in cuttings storage barns provides installation of special screening layer, and also results of laboratory analyses on neutralizations of the oil-polluted soils/grounds, there is possible WDM disposal in cuttings barns immediately in the territory of drilling site.

8. RECYCLING TECHNOLOGY OF THE DRILLING WASTES (CUTTINGS BARNS) OF THE SURGIL FIELD PRODUCTION WELLS

8.1. Drilling waste (waste drilling mud + drilling rock + drilling sewage waters), concerning as it is specified above, to *III and to IV danger class - moderately dangerous and low-hazard dangerous wastes*, collects in cuttings storage barn. It is not allowed during drilling and after drilling works termination to dump in cuttings storage barn other wastes generated during drilling, namely the leavings of alkalis and acids, fluorescents, lubricant and similar materials (materials concerning to *I* and *II danger class*), scrap metal.

8.2. For the purpose of pollutants migration exception from drilling wastes (drilling cuttings) their neutralization is carried out immediately in cuttings storage barn. Neutralized wastes will be buried immediately in the oilrig territory, in cuttings storage barn without damage to environment as the last have insulating layer.

8.3. Physicochemical methods with application of specially selected reagents changing physicochemical properties of drilling cuttings, based on hardening of drilling cuttings by special consolidating compositions with the following disposal, are estimated for recycling and disposal of drilling cuttings immediately in cuttings storage barn only at strict observance of drilling technological process.

8.4. In case of breakdown in drilling technological process and other materials presence in cuttings storage barn concerning to *I* and *II danger class*, prior to the beginning of works on recycling it is necessary carrying out of wastes certification actually present on the drilling site, their recycling or transportation to specially allotted storehouses.

8.5. Therefore, prior to the beginning of work on drilling cuttings neutralization and its disposal in cuttings storage barns, there is carried out analysis of component composition of oil-containing drilling cuttings and selection of neutralization technology for each individual case.

8.6. <u>Drilling cuttings neutralization and disposal with oil/oil products content to 7%</u>.

8.6.1. At strict observance of drilling technology and use of cuttings storage barn according to its intended purpose (see item 8.1), oil content in drilling cuttings total amount (WDM + drilling rock) should not exceed 5.9% as according to the Group working draft for production wells construction in Surgil field total amount of oil added in drilling mud makes 27.3t.

8.6.2. Practice shows, that drilling cuttings neutralization, containing oil/oil products, by neutralization/hardening by existing and standard hardeners effectively under condition when the oil/oil products content does not exceed 7%.

8.6.3. Therefore, for recycling of generated drilling wastes recommended method of their neutralization is hardening method by binding substances: Portland cement or hardener ECO-2 with bentonite addition as filling agent.

8.6.4. Carried out calculations during development “Management Procedure of drilling wastes recycling during production wells construction on Shady site” show that the optimal addition to drilling cuttings (WDM + drilling rock) at which there is achieved drilling cuttings hardening/neutralization by their mechanical mixing in open tank is 32% addition of Portland cement or 9 % addition of hardener ECO-2.

8.6.5. Reagent choice (Portland cement or hardener ECO-2) as drilling cuttings hardener for each concrete case remains a prerogative of the customer – “Ustyurtgaz” USE, and will start from economic reasonability as, in spite of exceeding efficiency of ECO-2 hardener effect over Portland cement, its cost also exceeds cement cost.

8.6.6. As practice shows, after well drilling works termination there is remain fixed part of thickened leaving at the bottom of cuttings storage barn (25-30%), over (45-50%) – moving part of thickened leaving, and more over fluid semi-fluid and liquid phase. It is also possible the lenses presence in moving part of thickened leaving consisting of fluid semi-fluid and liquid phases. Layout view of drilling cuttings content (waste drilling mud + drilling rock + drilling sewage waters) in cuttings storage barn after drilling works termination is resulted in the figure 8.1.

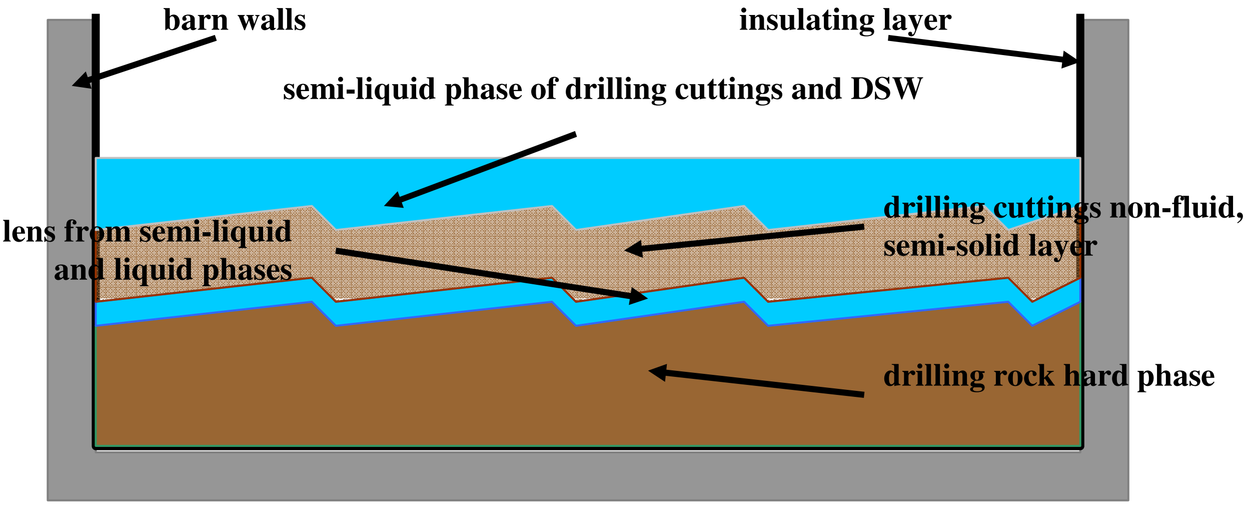


Figure 8.1 – **Drilling cuttings layer-by-layer incision in cuttings storage barn after drilling works termination**

8.6.7. Considering climatic conditions of drilling area, execution of work on drilling cuttings hardening and disposal in cuttings barn, with a glance of allowed period of drilling wastes temporary placement in cuttings barns, is recommended to begin in May. It is caused by the following factors;

- According to Decision of Cabinet of Ministers № 199 from May, 1, 2003 “On improvement of payments system for environmental pollution and drilling wastes placement in the Republic of Uzbekistan territory” it is allowed, in certain conditions, temporary storage of production wastes (up to six months) without compensatory payments.
- According to long-term meteorological observations, the days with minus temperature in this region exceeds 100, i.e. December, January, February and the beginning of March, and average depth of seasonal frost penetration in the region reaches 0.7m (peak - 115sm), that does not possible drilling cutting mixing process with binding substances in the open area.
- Practice shows, that after drilling works termination, there is collects in cuttings storage barn liquid phase layer above drilling cuttings (formation, drilling and storm sewage waters) by thickness to 35-40sm and execution of drilling cuttings hardening in the open area in time when the peak annual amount of precipitations is in the April, can lead to considerable ex-

tent of operations terms, to complications connected with use of the additional technique and rise in price of technological process, in view of repeated increase in consumables and man-hours.

8.6.8. Before the beginning of works on drilling cuttings neutralization and disposal there is checked the volume content of cuttings hard and liquid phase in barn and is made calculation of materials and chemical reagents requirement.

8.6.9. There are resulted calculations of drilling wastes amount generated during drilling in appendix 2. However, the liquid phase quantity which has remained in barn (formation, drilling and storm sewage waters) can mismatch to design value and to be is much less, depending on: volumes of their use in technical needs during drilling and evaporations for this period, depending on season of drilling works execution.

8.6.10. After definition of the liquid phase volume, last is clarified by coagulant (it is recommended application of aluminium sulfate in quantity of 150kg on 25 cubic m of water). This operation can be executed by tank truck with preferable tank capacity up to 10 cubic m and by the pump unit (sprayer), thus, there is filled in the tank truck 60 kg of aluminium sulfate for one liquid phase sampling and is made mixing.

8.6.11. Depending on the period of drilling works termination there is made a decision on further use of clarified DSW, thus, recommended method is use of clarified (cleared) DSW on-site for technical needs, for example, for humidifying of earthen embankments and highways for dust-depressing purpose. 3 persons will be involved in DSW clarification (technologist, unit driver and operator), duration of operation is 3-5 days (depending on DSW volume).

8.6.12. Further, on the expiry of permissible time within the limits of the allowed period of drilling cuttings temporary placement in cuttings barns (right after DSW recycling or after 1-2 months depending on evaporation conditions), start drilling cuttings neutralization. Drilling cuttings storage in cuttings storage barn in the summer months at ambient temperature more 30^0C can lead to occurrence of the side negative effects connected with development of sulfate reducing bacteria (SRB) in which result there is allocated hydrogen sulfide which is extremely dangerous to human life and is capable to be dissolved in WDM.

8.6.13. In the cases of hydrogen sulfide smell occurrence in cuttings barn, for the purpose of exception of working personnel poisoning possibility by hydrogen sulfide it is necessary to execute of works on cuttings barn processing by reagents biocide effect and hydrogen sulfide neutralizers. Therefore, prior to the beginning of works on drilling cuttings neutralization/hardening, there is carried out suppression of sulfate reducing bacteria in cuttings storage barn with application of reagents: blue copperas - $(CuSO_4)$ x$5H_2O$ or manganese oxide - MnO_2 with SAS addition. Reagents consumption on 1m^3 of drilling cuttings (moving, fluid phase): blue copperas - 0.1kg or manganese oxide - 2kg and SAS - 2kg.

8.6.14. Time of hydrogen sulfide neutralization reaction in cutting barn by blue copperas makes 30-45 min, and by manganese oxide - from several hours to several days. Therefore, it is recommended application blue copperas in the form of 10% water solutions which will be sprayed in regular intervals through full surface of cuttings storage barn.

8.6.15. For execution of works on suppression of sulfate reducing bacteria in cutting storage barn it is required additionally a water carrier with preferable tank capacity up to 6 cubic m and the pump unit (sprayer). 3 persons will be involved in suppression of sulfate reducing bacteria in cuttings storage barn (technologist, unit driver and operator), duration of operation is 1 day. Scope and types of works, and also required quantity of materials for suppression of sulfate reducing bacteria in cuttings storage barn are resulted in table 8.1.

Table 8.1 – **Required quantity of materials, scope and types of works for suppression of sulfate reducing bacteria**

№№	Parameter name	Unit	Numerical value
1	2	3	4
1.	Drilling cuttings treatment (moving, semi-liquid, fluid phase)	m^3	345
2.	Blue copperas $(CuSO_4)x5H_2O$	kg	34.5
3.	SAS	kg	690
4.	Process water	m^3	0.7
5.	Tank truck with tank capacity to $6m^3$	pcs.	1
6.	Reagent preparation for work (mixing in tank truck)	un.	1
7.	Drilling cuttings surface treatment by 10% blue copperas and SAS solution	un.	1
8.	Set in operation labor content	person	2
9.	Duration of operation	day	1
10.	Tank truck transportation	under own power	

8.6.16. After realization of measures for drilling cuttings neutralization from hydrogen sulfide, on the expiry of 2 days, there are begins works on drilling cuttings neutralization/hardening. Whereas that drilling cuttings contains oil products in small amounts, it is necessary to add to binding substance – Portland cement quicklime in quantity to 20% from cement. Also, for reduction of consumable it is allowed bentonite addition in drilling cuttings, concerning to *IV danger class – low-hazard dangerous wastes*. In the case of ECO-2hardener use there is not required consumables.

8.6.17. This stage of neutralization/hardening of the upper, moving, fluid layer of drilling cuttings is carried out manually or mechanically, at contractor discretion, under condition of strict observance of labor safety rules and operational experience on drilling wastes disposal in cuttings storage barn in the Southwest Gissar and Kandym fields.

8.6.18. With a glance of DSW clarification and time of drilling cuttings sludge for DSW evaporation, it is accepted, that before the beginning of works on drilling cuttings neutralization/hardening, the liquid phase practically is absent and there is to 40-50sm of semi-fluid paste-like phase on barn surface (calculations of thickness volume of evaporation of water are resulted in Appendix 3).

8.6.19. Prior to the beginning of works there is carried out preliminary survey of the barn territories, one of the barn sides near which there is the plain and cleared area for engineering, is accepted for base and there is made hollows excavation by excavator from three opposite sides into the perimeter of barn (in 3-4 hollows from each side) for liquid phase leavings running off from lenses. All works on drilling cuttings mixing and cuttings storage barn alignment are executed from the base side.

8.6.20. During mechanically drilling cutting mixing, there is removed by portion the surface layer of drilling cuttings by excavator (to 50sm) and its mixing is executed in concrete mixer, quantity of added binding substance on each ton of processed drilling cuttings is calculated according to the following conditions:

- at hardening by Portland cement - 325kg of Portland cement plus 65kg of quicklime;
- at hardening by hardener - 90kg of ECO-2.

8.6.21. Processed mix pours out back in cuttings barn with the help of mobile pump unit with sleeves, thus, as is specified in item 8.6.19, this operation: sampling of drilling cuttings surface layer and runoff of the neutralized/hardened mix in a barn is executed from base side with the following movement deep into barn.

8.6.22. During manually drilling cuttings mixing, bentonite, Portland cement and quicklime or hardener ECO-2 is equal distributed trough all barn surface and mixing with semi-fluid phase of drilling cuttings.

8.6.23. For maintenance of equal distribution of binding substances through all barn sites, procedure of their mixing with drilling cuttings is executed 2-3 times with interval to 2 days under condition of addition each time of additional quantity of bentonite, Portland cement and quicklime or hardener ECO-2. Thus, each time (only three operations) on each square meter of barn there is added following quantity of reagents which mixing with drilling cuttings on depth to 50sm immediately in cuttings storage barn:

- at hardening with the help of Portland cement - 65kg of Portland cement plus 13.5kg of quicklime;
- at hardening with the help of hardener - 18kg of ECO-2.

8.6.24. Required quantity of materials for drilling cuttings neutralization/hardening by binding substances for each well is calculated individually and is resulted below. About 15 persons will be involved in this operation. Duration of operation is till 13 days (two days mixing operation and two days interval between operations). Scopes and types of works, and also required quantity of materials for drilling cuttings neutralization/hardening are resulted in table 8.2.

Table 8.2 – **Required quantity of materials, scopes and types of works on drilling cuttings neutralization/hardening**

№№	Parameter name	Unit	Numerical value
1	2	3	4
1.	Drilling cuttings semi-fluid phase treatment	m^3	260.0
2.	Cement of 400 mark (hardener ECO-2)	t	84.5 (23.4)
3.	Quicklime (in the case of cement use)	t	16.9
4.	Bentonite (at contractor discretion)	t	84.5
5.	Quantity of operations on drilling cuttings manually neutralization/hardening	un.	3
6.	Set in operation labor content	person	15
7.	Duration of operation	day	13
8.	Use of technics (mechanically)	at contractor discretion under condition of the observance PFF and LP regulations	

8.6.25. Parallel with operations on drilling cuttings neutralization/hardening, from earlier dug holes (on three sides of barn perimeter) there is executed operation on their clarification by aluminium sulfate and tank truck with the pump unit (sprayer) according to above described technology (see items 8.6.10-8.6.11). Clarified water is used immediately on-site for humidifying of hard phase during its mixing with binding substances or for territory spraying.

8.7. <u>Drilling cuttings neutralization and disposal with the oil/oil products content more than 7%</u>.

8.7.1. At presence of oil/oil products in cuttings storage barn over 7%, neutralization of oil-containing drilling cuttings is made by technology resulted in Appendix 5, based on oil/oil products transfer in insoluble calcium salts and their capsulation with use of quicklime, providing exothermal heating-up for the purpose of increase of process efficiency of oil products calcium salts formation oil and introduction of silicates in the form of liquid glass, for prevention of process of the following washing-out of the fixed oil products from leaving.

8.7.2. Considering that components correlation in neutralizing mix and its dose depend on drilling cuttings humidity and oil products percentage, therefore, prior to the beginning of work on drilling cuttings neutralization and its disposal in cuttings storage barns, there is carried out analysis of component composition of oil-containing drilling cuttings and there is carried out selection of oil-containing drilling cuttings neutralization technology for each individual case.

8.7.3. Prior to the beginning of works on oil-containing drilling cuttings neutralization there is executed operation on DSW clarification and suppression in cuttings storage barn of sulfate reducing bacteria according to items 8.6.10-8.6.15.

8.7.4. With the help of technics (excavator) or manually (at contractor discretion) there is carried out loading of oil-containing drilling cuttings in concrete mixer and its mixing according to technology described in Appendix 5. Thus, drilling cuttings withdrawal and its refilling in cuttings storage barn by mobile pump unit with sleeves is carried out by method resulted in item 8.6.19.

8.7.5. Required quantity of materials for oil-containing drilling cuttings neutralization is calculated individually and is resulted below. About 7 persons will be involved in this operation. Duration of operation is till 5 days. Scopes and types of works, and also required quantity of materials for drilling cuttings neutralization/hardening are resulted in table 8.3.

Table 8.3 – **Required quantity of materials, scopes and types of works on drilling cuttings neutralization/hardening**

№№	Parameter name	Unit	Numerical value
1	2	3	4
1.	Drilling cuttings semi-fluid phase treatment	m^3	260.0
2.	Quicklime according to GOST 9179-77 “Construction lime”	t	130-325 *
3.	Liquid glass according to TS 6-18-68-75. Module not less than 2.45	t	26-78 *
4.	Process water	t	52-130 **
5.	Quantity of operations on drilling cuttings manually neutralization/hardening	un.	1

6.	Set in operation labor content	person	7
7.	Duration of operation	day	5
8.	Use of technics (mechanically)	at contractor discretion under condition of the observance PFF and LP regulations	

* - according to conclusions of Appendix 5 there are specified limits of changing of required quantity of this material
** - it is allowed using early clarified DSW

8.7.6. During execution of works on drilling cuttings neutralization from oil products, for the purpose of neutralization of the existing heavy metals which are present in drilling cuttings, there is executed operation on drilling cuttings hardening by binding materials, in time of drilling cuttings turns into inert consolidated mass, and heavy metals cations into composition of sparingly soluble hydroxides.

8.7.7. In three days after the beginning of works on drilling cuttings neutralization from oil products there are executed operations on drilling cuttings hardening according to items 8.6.19-8.6.25. Thus, in case of use for drilling cuttings neutralization/hardening of Portland cement there is not required additional quicklime addition.

8.8. After execution of operations on drilling cuttings neutralization/hardening there are executed operations on disposal of non-fluid leaving of drilling cuttings immediately in cuttings storage barn in the oilrig territory after preliminary drying of barn contents. Time for drying of the barn contents is till 15 days. Layer-by-layer incision of drilling cuttings in cuttings storage barn will have the following view - figure 8.2.

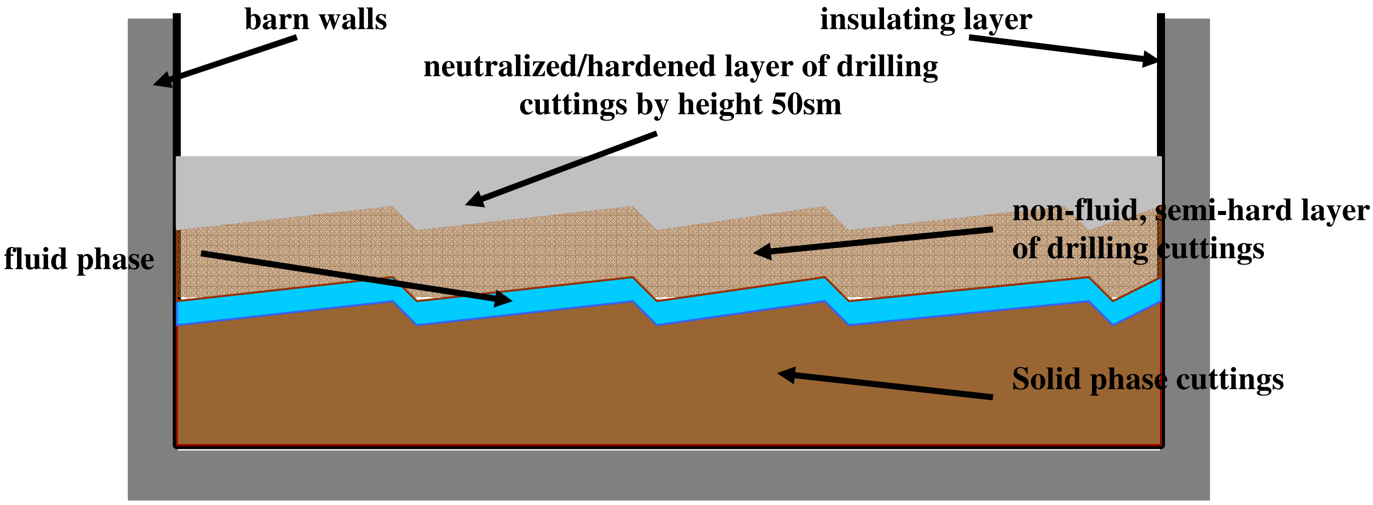


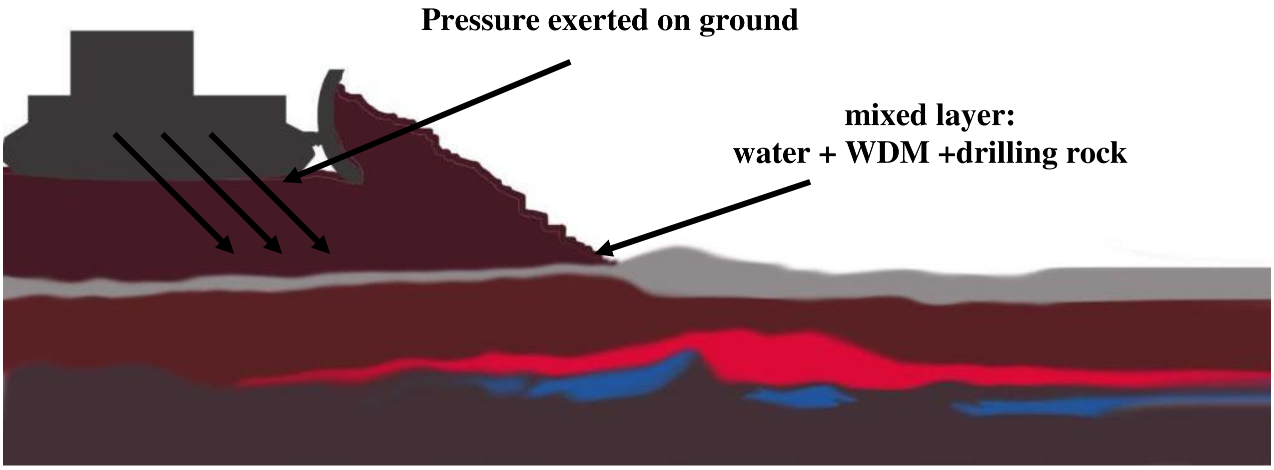
Figure 8.2 – **Layer-by-layer incision of drilling cuttings in cuttings storage barn after execution of works on neutralization/hardening**

8.9. As a result, there is formed the neutralized/hardened layer of drilling cuttings on the barn surface by thickness to 50sm. There is located semi-hard layer of drilling cuttings below, and at the barn bottom – hard phase of drilling rock. However, as a rule, as a result of blocking of liquid phase of the waste drilling mud, and also rain and sewage waters, there is formed liquid phase between them which can further overflow onto barn surface.

8.10. Therefore, for the purpose of the further insulation of the upper layer in cuttings storage barn there is applied screen from clay by thickness of 0.3m on the processed after neutralization/hardening layer with use of heavy technics (for example, bulldozer T-170). Clay filling and its lay-out are made from the barn base side where excavation of hollows has not been carried out during previous operation.

8.11. At the expense of bulldozer weight (22 tons) there is occur squeezing-out of the liquid phase sheet located between non-fluid, semi-hard layer of drilling cuttings and hard phase of drilling rock, towards the hollows prepared before it. This operation is resulted schematically in figure 8.3.

8.12. During accumulation of liquid phase in these hollows, there is executed its treatment according to the above-stated operations. After the liquid phase will be completely squeezed-out and clarified, there is carried out alignment of insulating layer by corresponding road technics. Required cal quantity for each operation is calculated below. Duration of this operation is till 5 days.



A

B

Figure 8.3 – **Scheme of squeezing-out of drilling cuttings semi-fluid phase sheet**
A – operation initial phase;
B – operation completion phase.

8.13. After operation termination the drilling cuttings height with insulating layer from clay in cuttings storage barn will reach 1.5m. Remained cutting storage barn capacity is filled by ground or mineral ground (earlier removed during barn construction), is aligned and planned by corresponding road technics. This operation is executed right after termination of operation on creation of insulating layer from clay. Its duration is till 5 days.

8.14. Total time of works on drilling cuttings neutralization, hardening and disposal with a glance of time for delivery and transportation of technics and materials will make 35-40 days.

Appendix 1

MASTER PLAN OF THE DESIGN PRODUCTION WELLS POSITION IN SURGIL FIELD AND ORDER OF THEIR COMMISSIONING

Table P1.1 –**Order of wells commissioning according to variant 2.1 in the Surgil – North Aral field**

Years	Wells total quantity at the beginning of year	Commissioned wells quantity	Wells number	Wells total quantity at the end of year
1	2	3	4	5
2008	14	7	32, 33, 37, 31, 47, 48, 50	21
2009	21	18	54, 36, 41, 65, 42, 69, 73, 71, 74, 75, 86, 43, 77, 40, 46, 78, 79, 38	39
2010	39	18	39, 49, 51, 80, 52, 53, 58, 59, 55, 81, 82, 56, 60, 61, 62, 45, 63, 64	57
2011	57	18	66, 57, 67, 68, 83, 84, 85, 70, 72, 76, 87, 88, 89, 90, 91, 92, 93, 94	75
2012	75	3	95, 96, 97	78

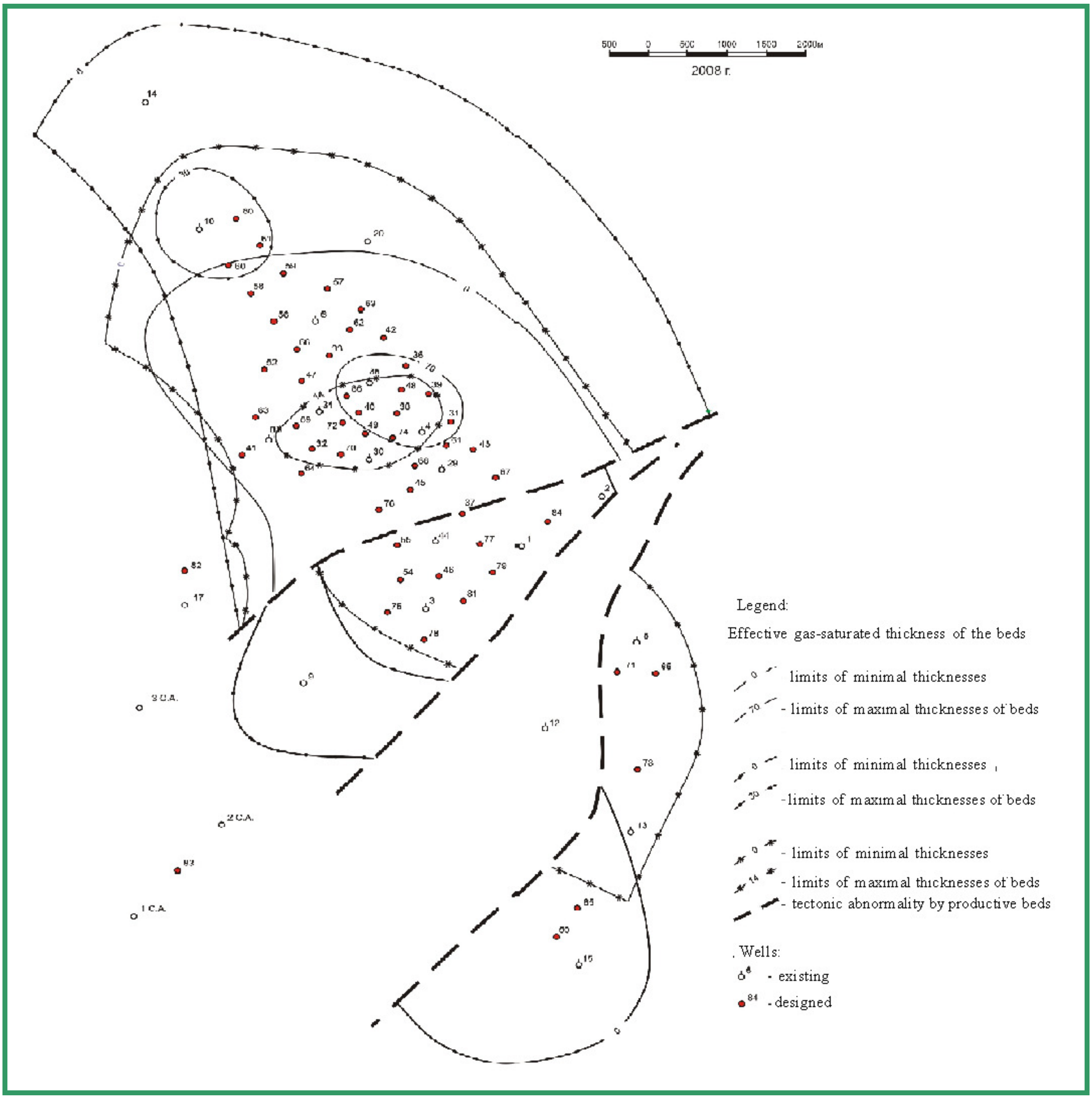


Figure P.1.1 – **Master plan of designed production wells location according to variant 2.1 for the pilot development period in the Surgil – North Aral field**

Appendix 2

GENERATED DRILLING WASTES AMOUNT CALCULATION IN ACCORDANCE WITH WELLS DESIGN DEVELOPED BY GROUP WORKING DRAFT FOR WELLS CONSTRUCTION THROUGHOUT SURGIL FIELD

Volume if drilling rock during wells construction according to RD 39-133-94. "Instruction on environmental protection during oil and gas wells construction, is calculated by formula:

$$\mathbf{V}_{Ш} = \mathbf{V_1 + V_2 + \ldots + V_i},\ m^3 \quad \text{(P2.1)}$$

where: $\mathbf{V_{1.}\ V_{2.}\ \ldots,\ V_i}$ – volume of drilling rock by drilling intervals:

$$\mathbf{V_i = 1.2 \times 1.3 \times 0.785 \times 10^{-6} \times D_i^2 \times L_i},\ m^3 \quad \text{(P2.2)}$$

where: **1.2** – factor, considering softening of drilling rock;
1.3 – quiddity factor;
$\mathbf{10^{-6}}$ – dimension factor;
$\mathbf{D_i}$ – chisel diameter at this well drilling interval, mm;
$\mathbf{L_i}$ – length of borehole section, m.

Waste drilling mud volume is defined by formula:

$$\mathbf{V}_{WDM} = \mathbf{V}_C \mathbf{\ x\ K_1 + 0.5V}_C,\ m^3 \quad \text{(P.2.3)}$$

where: $\mathbf{K_1 = 1.052}$ – factor considering drilling mud losses, departed with cuttings during treatment on vibrosieve, sand separator and cyclon separator;
$\mathbf{V}_C$ – drilling rig circulating system volume (for drilling rig with drilling depth to 3000m, $V_Ц = 120$ м^3).

Drilling sewage waters volume ($\mathbf{V}_{DSW}$) is calculated by formula:

$$\mathbf{V}_{DSW} = \mathbf{2\ x\ V}_{WDM},\ \mathbf{m^3} \quad \text{(P2.4)}$$

There is resulted of production wells design of Surgil field in the figure P2.1. Calculations made by formulas P2.1-P2.4 and according to data resulted in fig. P2.1. show that during one well drilling there is formed: 243.7 cubic m of drilling rock; 316.4 cubic m of waste drilling mud and 632.8 cubic m of drilling sewage waters.

Thus, the quantity of formed drilling cuttings during drilling of all 53 production wells of Surgil field (see tab. P1.1) will make 29.7 thousand cubic meters, including 12.9 thousand cubic meters of drilling rock and 16.8 thousand cubic meters of WDM. Formed DSW quantity will make 33.5 thousand cubic meters.

Depth, m	Well name				Drilling interval	Chisel diameter, mm	String diameter, mm	CL, m
	direc-tion	conduc-tor	tech-nical	produc-tion				
150								
300					0-50	490	426	0
450								
600								
750					50-400	393.7	298.4	0
900								
1050								
1200					400-1500	269.9	219.1	0
1350								
1500								
1650					1500-2950	190.5	139.7	0
1800								
1950								
2100								
2250								
2400								
2550								
2700								
2850								
3000								

Figure P.1.1 – **Scheme of production well design of Surgil field**

Appendix 3

CALCULATION OF LIQUID EVAPORATION THICKNESS FROM SURFACE LAYER IN THE REGION OF SURGIL FIELD

Calculation of evaporation from turbid and saline reservoirs and storages of industrial drains is carried out according to method resulted in "Instructions on calculation of evaporation from reservoirs surface". L. Gidrometeoizdat, 1969 - by formula:

$$E_m = r \times E_o, \quad (P3.1)$$

where: E_p – mud evaporation from industrial drain;

E_o – pure fresh water evaporation for the same period of time;

r – conversion factor from evaporation with pure fresh water to evaporation from mud.

Evaporation volume from reservoir E_o (mm) located in the plain territory is defined by formula:

$$E_o = 0.14 \times n \times (e_п - e_{200}) \times (1 + 0.72 \times v_{200}), \quad (P3.2)$$

where: n – number of days in design time space (month);

$e_п$ – average value of maximal steam tension, mb. It is defined according to tables in Appendix 3 ("Instructions on calculation of evaporation from reservoirs surface". L. Gidrometeoizdat, 1969);

e_{200} – average value of steam tension (absolute air humidity) over reservoir at the height of 200sm, mb;

v_{200} – average value of wind speed over reservoir at the height of 200sm, m/s.

Average value of steam tension (absolute air humidity) reservoir at the height of 200sm e_{200}(mb) is calculated by formula:

$$e_{200} = e'_{200} + (0.8 \times e_п - e'_{200}) \times M, \quad (P3.3)$$

where: e'_{200} – average for design time space of air humidity measured at nearby meteorological station, mb;

M –transformation ratio considering average air humidity and temperature change depending on the reservoir capacity. Defined under table 4 ("Instructions on calculation of evaporation from reservoirs surface". L. Gidrometeoizdat, 1969). In our case, transformation ratio changes depending on season of year from 0.01 to 0.003.

Average value of wind speed over reservoir at the height of 200sm v_{200} (m/s) is calculated by formula:

$$v_{200} = K_1 \times K_2 \times K_3 \times v_ф, \quad (P3.4)$$

where: K_1 – factor considering degree of meteorological station security. It is defined according to table 1 of Appendix 2 (“Instructions on calculation of evaporation from reservoirs surface”. L. Gidrometeoizdat, 1969). In our case, the factor considering degree of meteorological station security is equal to 1.3;

K_2 – factor considering relief character in observation point of. It is defined according to table 2 of Appendix 2 (“Instructions on calculation of evaporation from reservoirs surface”. L. Gidrometeoizdat, 1969). In our case, the factor considering degree of meteorological station security is equal to 1.0;

K_3 – factor considering average length of air stream speeding-up over reservoir at its various security. It is defined according to table 3 of Appendix 2 (“Instructions on calculation of evaporation from reservoirs surface”. L. Gidrometeoizdat, 1969). In our case, the factor considering degree of meteorological station security is equal to 0.55;

$v_ф$ – wind speed at the height of weathercock for design period of time (month), m/s.

Conversion factor is calculated by formula:

$$r = (K \times e_п - e_{200}) / (e_п - e_{200}), \quad \text{(P2.4)}$$

where: K – factor considering relative reduction of steam tension over mud and depending on chemical compound and concentration of dissolved substances. For binary mud the volume of factor considering relative reduction of steam tension over mud is defined depending on the nature of the dissolved substance, its concentration expressed in weight percent and temperature according to Appendix 11 (“Instructions on calculation of evaporation from reservoirs surface”. L. Gidrometeoizdat, 1969). In our case, the factor considering relative reduction of steam tension over mud is equal to 0.94.

calculations of water thickness evaporation from cuttings storages by months, carried out by formulas P3.1-P3.4. by months are resulted in table P3.1.

table P3.1 – **Calculations of water thickness evaporation from cuttings storages by months**

Parameter name	Months											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1	2	3	4	5	6	7	8	9	10	11	12	13
T	-5.9	-5.5	0.1	9.4	18.1	23.7	26.6	25.0	19.1	10.8	3.2	-2.4
e'_{200}	3.6	3.7	5.1	8.2	12.5	16.5	20.2	19.0	13.9	9.0	6.2	4.4
$v_ф$	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.6	4.5	4.5	4.4
K_1	1.3											
K_2	1.0											
K_3	0.97											
v_{200}	5.55	5.55	5.67	5.67	5.80	5.80	5.93	5.93	5.80	5.67	5.67	5.55
n	31	28	31	30	31	30	31	31	30	31	30	31
1	2	3	4	5	6	7	8	9	10	11	12	13
$e_п$	3.9	4.0	6.1	11.8	20.7	29.4	34.9	31.7	22.1	12.9	7.7	5.1
M	0.03		0.02			0.01			0.02			0.03
e_{200}	3.59	3.69	5.10	8.22	12.6	16.6	20.3	19.1	14.0	9.03	6.20	4.39
E_o	6.73	6.08	22.0	76.4	182.1	285.0	333.9	288.2	176.2	85.3	32.0	15.4
K	0.94											
r	0.60	0.69	0.80	0.86	0.88	0.90	0.89	0.88	0.87	0.84	0.77	0.68
E_p	**6.3**	**5.7**	**20.7**	**71.8**	**171.2**	**267.9**	**313.9**	**270.9**	**165.6**	**80.2**	**30.1**	**14.5**

Thus, thickness of evaporated water sheet for medium climatic conditions of the region Karadja-Gumkhanin investment block exceeds 1.4m, including 105sm for warm months (May-September).

Appendix 4

CALCULATION OF DRILLING MUD DANGER/TOXICITY CLASS USED DURING WELLS CONSTRUCTION IN ACCORDANCE WITH GROUP WORKING DRAFT FOR SURGIL FIELD

Calculation of drilling mud toxicity class provided by Group working draft for production wells construction in Surgil field is carried out by method stated in “Criteria of wastes reference to danger class for environment”, approved by the order № 511 MPR of Russia from June, 15, 2001. This criteria is developed according to the Federal law of the Russian Federation “On production and consumption wastes” from June, 24, 1998 № 89-F3 (article 14).

Model based on use of the systematized set of environmental safety parameters which is formed for each waste component is put in a basis of calculation of waste danger class. The system of environmental safety parameters for each component is formed with a glance, that maximum number of environmental safety parameters necessary for definition of waste danger class is established equal to 12. The number of parameters which can be included in system can be any from 1 to 12.

The system, as obligatory parameter, include additional dataware index. Dataware index characterizes formed system from the point of view of initial information sufficiency for assessment of waste environmental danger and is defined by division of number of parameters included in system (n) (i.e. parameters on which there is information in corresponding regulations and official reference books), into number of parameters for full system (N=12).

This index equally with other environmental safety parameters considers the danger caused by data deficiency on parameters for this or that waste component. At presence in information sources the several values for environmental safety parameters (for example, LD_{50} for different species of animals) is selected volume corresponding to the maximum danger, i.e. the least value of LD_{50}. In the absence of necessary data it is possible to take the nearest by meaning index: for example, instead of LD_{50} at peroral inflow to take the similar data received at intravenous, intraabdominal, etc. xenobiotic introduction in organism. In the absence of MPC it is possible to take SNRL, ОДУ, temporary design parameter (standard).

Waste reference to danger class for E is carried out by calculation method on the basis of index (K), characterizing waste danger degree during its environmental impact, calculated by the sum of indexes of substances danger making a waste (further waste components), for E (K_i). List of waste components and their quantitative content are defined by initial raw materials composition and technological processes of its treatment or by results of the quantitative chemical analysis.

Waste components danger degree index (K_i) is calculated as concentration correlation of waste components (C_i) with factor of its danger degree for E (W_i); danger degree factor of waste component for E is the conditional index numerically equal to waste component quantity less which it does not render environmental negative impact. Dimension of danger degree factor for E conditionally is accepted as mg/kg.

For definition of danger degree factor of waste component for E on each waste component there is defined degrees of their danger for E for various environments according to table 2 (see order № 511 Ministry of Natural Resources of the Russian Federation from June, 15, 2001).

List of the indexes used for calculation W_i, include dataware index for the account of lack of information on primary indexes of waste components danger for E. Dataware index is calculated by division of number of the defined indexes (n) into 12 (N - quantity of the most significant primary indexes of waste components danger for E). Points are gave to the following turndowns of dataware index (table P4.1)

Table P4.1 – **Points by turndowns of dataware index**

Turndowns of dataware index (n/N)	Point
1	2
<0.5 (n<6) 0.5-0.7 (n=6-8) 0.71-0.9 (n=9-10)	1 2 3

By defined danger degrees of waste components for E in various environments there is calculated relative parameter of waste component danger for E (X_i) by division of the points sum by all parameters into number of these parameters.

W_i factor is calculated by one of the following formulas:

$$\text{for } 1 < Z_i < 2 \quad – \quad \mathbf{lg\ W_i = 4 - 4/Z_i;}$$

$$\text{for } 2 < Z_i < 4 \quad – \quad \mathbf{lg\ W_i = Z_i;}$$

$$\text{for } 4 < Z_i < 5 \quad – \quad \mathbf{lg\ W_i = 2+4/(6 - Z_i),}$$

where: $Z_i = 4X_i/3 - 1/3$.

Waste component danger degree index for E K_i is calculated by formula:

$$\mathbf{K_i = C_i/W_i},$$

where: C_i – concentration of i-component in danger waste (waste mg/kg);
W_i – factor danger degree of i-component of danger waste for E (mg/kg).

Waste danger degree index for E K is calculated by formula:

$$\mathbf{K = K_1 + K_2 + \ldots\ldots\ldots + K_n},$$

where: K – waste danger degree index for E;
K_1. K_2. ..., K_n – individual waste components danger degree indexes for E.

Calculations results are listed in tables P4.2-P4.5. These calculations show, only on well drilling interval under direction the recommended drilling mud is *IV danger class – low-hazard wastes* (waste danger degree index for E K = 96.0 <100). Below 50m drilling is carried out on drilling mud with addition of oil and recommended for drilling mud concern to *III danger class - moderately dangerous waste* (waste danger degree index for E K = 100 < 205.1 … 279.4 < 1000).

During definition of primary indexes of drilling mud components danger there were used the following sources:

1) Hygienic regulations of chemical substances in environment//V.V.Semenova, G.I.Chernova, A.V.Moskin, etc. S.-Pb: ANO SEO "Professional", 2005. – p.764
2) List of fish and economic regulations: maximum-permissible concentration (MPC) and suggested no-adverse-response levels (SNARL) of harmful substances for water, water objects having fish and economic value. M: Publishing house VNIRO 1999. – p.304
3) List and codes of the substances polluting atmospheric air: Seventh edition. S.-Pb.: "Integral" Company, 2008. – p.438
4) Addition № 2 to the List of fish and economic regulations: maximum-permissible concentration (MPC) and suggested no-adverse-response levels (SNARL) of harmful substances for water, water objects having fish and economic value.
5) HS 2. Maximum permissible concentration (MPC) of chemical substances in water, water objects of household and domestic water use.
6) Sanitary-and-epidemiologic conclusion № 34.12.01.223. P.000780.08.04 from 25.08.2004 for chemical reagent MC PAC HV.
7) Sanitary-and-epidemiologic conclusion № 77.01.16.249. P.033600.04.08 from 29.04.2008 for drilling detergent IKD.

Table P4.2 – **Calculation of drilling mud danger class used for interval drilling 9-50m of the production well in Surgil field (mud type – clay, polymer)**

Serial number	Component	MPCg, mg/kg	Danger class in soil	MPCw, mg/l	Danger class in water of household use	MPCf.e., mg/l	Danger class in water of fish reservoirs	MPCa.d.(m.c.) mg/m^3	Danger class in atmos-pheric air	Lg (S/MPC)	LD_{50}
1	2	3	4	5	6	7	8	9	10	11	12
1.	Bentonite	-	-	-	-	10	4	0.1	3	-	-
2.	point	-	-	-	-	4	4	2	3	-	-
3.	Soda ash	-	-	200 by Na^+	2	120 by Na^+	3	0.05	3	-	>5000
4.	point	-	-	4	2	4	3	2	3	-	4
5.	Caustic soda	-	-	200 by Na^+	2	120 by Na^+	4	0.01	-	-	<1400
6.	point	-	-	4	2	4	4	2	-	-	3
7.	К-4	-	-	2	2	1	4	-	-	-	-
8.	point	-	-	4	2	4	4	-	-	-	-
9.	Water	-	-	-	-	-	-	-	-	-	-
10.											
11.											

Table P4.2 continuous

Serial number	Persistence	Bioaccumulation	Dataware index	Points sum	Relative safety parameter, X_1	$Z_1=4/3X_1-1/3$	LgW_1	W_1	C, mg/kg	Danger degree index, Ki
1	13	14	15	16	17	18	19	20	21	22
1.	Toxicity close to initial	no	0.5 6/12	22	3.14	3.85	3.85	7079.46	440841	62.3
2.	3	4	2	-	-	-	-	-	-	
3.	-	no	0.667 8/12	28	3.11	3.81	3.81	6456.54	45946	7.1
4.	-	4	2	-	-	-	-	-	-	-
5.	Formation of less toxic products	no	0.667 8/12	29	3.22	3.96	3.96	9120.11	34234	3.8
6.	4	4	2	-	-	-	-	-	-	-
7.	-	-	0.333 4/12	15	3.0	3.67	3.67	4677.35	106306	22.7
8.	-	-	1	-	-	-	-	-	-	-
9.	-	-	12		4.00	5.00	6.00	10^6	99100	0.1
10.										96.0
11.	K = 96.0 < 100. *IV danger class*									

Table P4.3 – **Calculation of drilling mud danger class used for interval drilling 50-400m of the production well in Surgil field (mud type – clay, polymer with oil addition)**

Serial number	Component	MPCg, mg/kg	Danger class in soil	MPCw, mg/l	Danger class in water of household use	MPCf.e., mg/l	Danger class in water of fish reservoirs	MPCa.d.(m.c.) mg/m³	Danger class in atmos-pheric air	Lg (S/MPC)	LD_{50}
1	2	3	4	5	6	7	8	9	10	11	12
1.	Bentonite	-	-	-	-	10	4	0.1	3	-	-
2.	point	-	-	-	-	4	4	2	3	-	-
3.	Soda ash	-	-	200 by Na^+	2	120 by Na^+	3	0.05	3	-	>5000
4.	point	-	-	4	2	4	3	2	3	-	4
5.	Caustic soda	-	-	200 by Na^+	2	120 by Na^+	4	0.01	-	-	<1400
6.	point	-	-	4	2	4	4	2	-	-	3
7.	К-4	-	-	2	2	1	4	-	-	-	-
8.	point	-	-	4	2	4	4	-	-	-	-
9.	Oil	500-1000	-	0.3 (н/пр)	3	0.05 (н/пр)	-	-	-	-	-
10.	point	4	-	3	3	2	-	-	-	-	-
11.	Water	-	-	-	-	-	-	-	-	-	-
12.											
13.											

Table P4.3 continuous

Serial number	Persistence	Bioaccumulation	Dataware index	Points sum	Relative safety parameter, X_1	$Z_1=4/3X_1-1/3$	LgW_1	W_1	C, mg/kg	Danger degree index, Ki
1	13	14	15	16	17	18	19	20	21	22
1.	Toxicity close to initial	no	0.5 6/12	22	3.14	3.85	3.85	7079.46	560360	79.2
2.	3	4	2	-	-	-	-	-	-	-
3.	-	no	0.667 8/12	28	3.11	3.81	3.81	6456.54	36036	5.6
4.	-	4	2	-	-	-	-	-	-	-
5.	Formation of less toxic products	no	0.667 8/12	29	3.22	3.96	3.96	9120.11	27027	3.0
6.	4	4	2	-	-	-	-	-	-	-
7.	-	-	0.333 4/12	15	3.0	3.67	3.67	4677.35	138739	29.7
8.	-	-	1	-	-	-	-	-	-	-
9.	-	In some sections	0.41	15	2.5	3.0	3.0	1000	138739	138.7
10.	-	2	1	-	-	-	-	-	-	-
11.	-	-	12		4.00	5.00	6.00	10^6	149099	0.1
12.										256.3
13.	К = 100 < 256.3 < 1000. *III danger class*									

Table P4.4 – **Calculation of drilling mud danger class used for interval drilling 400-1500m of the production well in Surgil field (mud type – clay, polymer with oil addition)**

Serial number	Component	MPCg, mg/kg	Danger class in soil	MPCw, mg/l	Danger class in water of household use	MPCf.e., mg/l	Danger class in water of fish reservoirs	MPCa.d.(m.c.) mg/m^3	Danger class in atmospheric air	Lg (S/MPC)	LD_{50}
1	2	3	4	5	6	7	8	9	10	11	12
1.	Bentonite	-	-	-	-	10	4	0.1	3	-	-
2.	point	-	-	-	-	4	4	2	3	-	-
3.	Soda ash	-	-	200 by Na^+	2	120 by Na^+	3	0.05	3	-	>5000
4.	point	-	-	4	2	4	3	2	3	-	4
5.	Caustic soda	-	-	200 by Na^+	2	120 by Na^+	4	0.01	-	-	<1400
6.	point	-	-	4	2	4	4	2	-	-	3
7.	К-4	-	-	2	2	1	4	-	-	-	-
8.	point	-	-	4	2	4	4	-	-	-	-
9.	CMC-600	-	-	5	3	12	4	0.15	-	-	-
10.	point	-	-	4	3	4	4	3	-	-	-
11.	Oil	500-1000	-	0.3 (н/пр)	3	0.05 (н/пр)	-	-	-	-	-
12.	point	4	-	3	3	2	-	-	-	-	-
13.	Silver graphite	-	-	-	-	-	-	-	-	-	-
14.	point	-	-	-	-	-	-	-	-	-	-
15.	Water	-	-	-	-	-	-	-	-	-	-
16.											
17.											

Table P4.4 continuous

Serial number	Persistence	Bioaccumulation	Dataware index	Points sum	Relative safety parameter, X_1	Z_1=4/3X_1-1/3	LgW_1	W_1	C, mg/kg	Danger degree index, Ki
1	13	14	15	16	17	18	19	20	21	22
1.	Toxicity close to initial	no	0.5 6/12	22	3.14	3.85	3.85	7079.46	500000	70.6
2.	3	4	2	-	-	-	-	-	-	-
3.	-	no	0.667 8/12	28	3.11	3.81	3.81	6456.54	21368	3.3
4.	-	4	2	-	-	-	-	-	-	-
5.	Formation of less toxic products	no	0.667 8/12	29	3.22	3.96	3.96	9120.11	17949	2.0
6.	4	4	2	-	-	-	-	-	-	-
7.	-	-	0.333 4/12	15	3.0	3.67	3.67	4677.35	184615	39.5
8.	-	-	1	-	-	-	-	-	-	-
9.	-	-	0.416 5/12	19	3.17	3.89	3.89	7762.47	25641	3.3
10.	-	-	1	-	-	-	-	-	-	-
11.	-	In some sections	0.41	15	2.5	3.0	3.0	1000	86325	86.3
12.	-	2	1	-	-	-	-	-	-	-
13.	-	-	12		4.00	5.00	6.00	10^6	17949	0.02
14.	-	-	-	-	-	-	-	-	-	-
15.	-	-	12		4.00	5.00	6.00	10^6	146153	0.1
16.										205.1
17.	К = 100 < 205.1 < 1000. *III danger class*									

Table P4.5 – **Calculation of drilling mud danger class used for interval drilling 1500-2950m of the production well in Surgil field (mud type – lignosulphonate with oil addition)**

Serial number	Component	MPCg, mg/kg	Danger class in soil	MPCw, mg/l	Danger class in water of household use	MPCf.e., mg/l	Danger class in water of fish reservoirs	MPCa.d.(m.c.) mg/m^3	Danger class in atmospheric air	Lg (S/MPC)	LD_{50}
1	2	3	4	5	6	7	8	9	10	11	12
1.	Bentonite	-	-	-	-	10	4	0.1	3	-	-
2.	point	-	-	-	-	4	4	2	3	-	-
3.	Soda ash	-	-	200 by Na^+	2	120 by Na^+	3	0.05	3	-	>5000
4.	point	-	-	4	2	4	3	2	3	-	4
5.	Caustic soda	-	-	200 by Na^+	2	120 by Na^+	4	0.01	-	-	<1400
6.	point	-	-	4	2	4	4	2	-	-	3
7.	К-4	-	-	2	2	1	4	-	-	-	-
8.	point	-	-	4	2	4	4	-	-	-	-
7.	FCLS	-	-	0.3	4	1.0	4	0.5	-	-	-
8.	point	-	-	3	4	4	4	3	-	-	-
9.	CMC-600	-	-	5	3	12	4	0.15	-	-	-
10.	point	-	-	4	3	4	4	3	-	-	-
11.	Oil	500-1000	-	0.3 (н/пр)	3	0.05 (н/пр)	-	-	-	-	-
12.	point	4	-	3	3	2	-	-	-	-	-
13.	Silver graphite	-	-	-	-	-	-	-	-	-	-
14.	point	-	-	-	-	-	-	-	-	-	-
15.	Water	-	-	-	-	-	-	-	-	-	-
16.											
17.											

Table P4.5 continuous

Serial number	Persistence	Bioaccumulation	Dataware index	Points sum	Relative safety parameter, X_1	$Z_1=4/3X_1-1/3$	LgW_1	W_1	C, mg/kg	Danger degree index, Ki
1	13	14	15	16	17	18	19	20	21	22
1.	Toxicity close to initial	no	0.5 6/12	22	3.14	3.85	3.85	7079.46	280672	39.6
2.	3	4	2	-	-	-	-	-	-	-
3.	-	no	0.667 8/12	28	3.11	3.81	3.81	6456.54	39496	6.1
4.	-	4	2	-	-	-	-	-	-	-
5.	Formation of less toxic products	no	0.667 8/12	29	3.22	3.96	3.96	9120.11	18487	2.0
6.	4	4	2	-	-	-	-	-	-	-
7.	-	-	0.333 4/12	15	3.0	3.67	3.67	4677.35	184874	39.5
8.	-	-	1	-	-	-	-	-	-	-
7.	-	-	0.416 5/12	19	3.17	3.89	3.89	7762.47	39496	5.1
8.	-	-	1	-	-	-	-	-	-	-
9.	-	-	0.416 5/12	19	3.17	3.89	3.89	7762.47	86555	11.2
10.	-	-	1	-	-	-	-	-	-	-
11.	-	In some sections	0.41	15	2.5	3.0	3.0	1000	175630	175.6
12.	-	2	1	-	-	-	-	-	-	-
13.	-	-	12		4.00	5.00	6.00	10^6	14286	0.01
14.	-	-	-	-	-	-	-	-	-	-
15.	-	-	12		4.00	5.00	6.00	10^6	150420	0.2
16.										279.4
17.	К = 100 < 279.4 < 1000. *III danger class*									

Appendix 5

DRILLING CUTTINGS (CUTTINGS BARNS) NEUTRALIZATION TECHNOLOGY CONTAINING OILY SOILS (GROUNDS)

Introduction. There is formed drilling cutting during oil-well drilling, containing oil products. This cutting is stored in cuttings barns and after filling should be neutralized, i.e. is transferred into leaving of IV danger class that will give the possibility to execute of works on its disposal. There occur stratifying drilling cuttings during its storage. Most heavy clay fraction collects at the bottom, and on the surface there is formed the layer consisting of oil products and clay mix.

Drilling cuttings humidity and oil products content depends, in particular, on clay type and composition in each separate field which define its sorption property to oil products absorption and to moisture emission.

Analysis of cuttings barns surface layer composition in Surgil field has shown that during oil-well drilling there is formed drilling cuttings of the following composition:

- humidity - 65%;
- inorganic part (clay of the waste drilling mud, sand, etc.) - 5.2%;
- oil products - 29.8 %.

There is film of free oil products on cuttings surface.

Characteristic of the processes taken as a principle of neutralization technology. Basic method of oil-containing cuttings neutralization is conversion of petroleum- and oil products to insoluble calcium salts and their capsulation.

Basically, such compounds as lime, gypsum, alabaster are used for this purpose. Use of quicklime provides exoteric heating-up that improves efficiency of formation calcium soaps of oil products. Introduction of gypsum (alabaster) promotes acceleration of hardening of neutralized oil cuttings at the expense of moisture binding.

The important condition of maintenance of efficiency of oil-containing cuttings neutralization is calculation of required and enough water amount with a glance of free and binding water in cuttings. Water volume should provide liming and generation of paste-like mass with the minimum free water content that promotes reduction of hardening time.

For prevention of the following washing-out of the binding oil products from leaving there is used introduction of silicates in the form of liquid glass or modifiers in which capacity there use such compounds as triglyceride, synthetic surface-active substances or flocculants.

Method of researches carrying out. Laboratory researches on development of drilling cuttings neutralization method were carried out with use of cuttings sample, presented by “VOLGOURALINGENERING - CENTRALNAYA AZIYA” Co. Ltd., in laboratory TAHITI "SUVGEO".

For components mixing there was used "Dzhar-test" unit supplied with arm mixers. Optimum rate of stirring - 30 r.p.m. Researches were carried out in cylindrical tanks from Plexiglas by capacity of 0.5l. Cuttings characteristics are defined by the following method:

- humidity – Method of the technological control of the municipal sewerage treatment facilities operation. M, 1997.
- oil products content - RD 118.3839485.11-92 "Method of oil products definition in natural and sewage waters by column chromatography with the weight end”.

Variants of methods for cuttings neutralizations. Considering, that cuttings humidity high enough, the neutralization was spent without introduction of additional water by the following variants of methods:

- **1st variant.** There was loaded into tank 100 weight parts of drilling cuttings, 115 weight parts of quicklime and 50 weight parts of water and mixed up within 5-10 minutes up to formation of uniform mass. Received mix by humidity of 25-30% was unloaded in specially allotted place. Cuttings humidity after 24 hours made 20-25%. Cutting was in paste-like condition.
- **2nd variant.** There was loaded into tank 100 weight parts of drilling cuttings, 125 weight parts of alabaster and 50 weight parts of water and mixed up within 5-10 minutes up to formation of uniform mass. Received mix by humidity of 25-30% was unloaded in specially allotted away place. Cuttings humidity after 24 hours made 20-25%. Cutting was in paste-like condition.
- **3rd variant.** There was loaded into tank 100 weight parts of drilling cuttings, 115 weight parts of quicklime and 50 weight parts of water and mix up within 5-10 minutes up to formation of uniform mass. Then, there were added 30 weight parts of liquid glass and mixed up within 5-10 minutes. Received mix by humidity of 20-25% was unloaded in specially allotted place. Drilling cuttings hardening time is 24 hours. Cuttings humidity after hardening is 10%.
- **4th variant.** There was loaded into tank 100 weight parts of drilling cuttings, 125 weight parts of alabaster and 50 weight parts of water and mixed up within 5-10 minutes up to formation of uniform mass. Then, there were added 30 weight parts of liquid glass and mixed up within 5-10 minutes. Received mix by humidity of 20-25% was unloaded in specially allotted place. Drilling cuttings hardening time is 24 hours. Cuttings humidity after hardening is 10%.

Technological parameters of process by 3 variant. Analysis of drilling cuttings neutralization conditions and availability of technology realization in the conditions of oil field (on drilling site, after drilling works termination and disassembly of the drilling equipment) by all four considered variants has shown that the most reasonable is the technology providing use of quicklime and liquid glass (3rd variant). Drilling cuttings parameters (per 100 weight parts of drilling cuttings):

- Drilling cuttings humidity - 65-67%.
- Quicklime dose - 115w.p.
- Water dose – 50w.p.
- Quicklime and drilling cuttings mixing time - 5-10 minutes
- Liquid glass dose – 30w.p.
- Time of mixing with liquid glass - 5-10 minutes
- Received mix humidity - 20-25%
- Hardening time - 24 hour.
- Humidity after hardening - 10 %.

Thus, the characteristic of auxiliary materials is selected on the basis of the following standards:

- Quicklime according to GOST 9179-77 “Construction lime”.
- Liquid glass according to TS 6-18-68-75. Module not less than 2.45.

Drilling cuttings composition after neutralization and hardening is presented in table P5.1.

Table P5.1 **– Drilling cuttings composition after neutralization and hardening by 3rd variant**

Component name	Content, %
1	2
$Ca(OH)_2$	**64.0**
Oil products	**12.0**
Inorganic clay part	**2.0**
Liquid glass	**12.0**
Water	**10.0**
TOTAL	**100**

According to O'zRH 84.3.8.2004 “Method of the integrated assessment of wastes danger” and the Wastes qualifying catalogue, neutralized drilling cuttings will concern to *IV danger class – low-hazard waste*.

Similar researches have been carried out on drilling cuttings selected in the North Berdakh and East Berdakh fields. By results of researches of oil-containing drilling cuttings of the Surgil, North Berdakh and East Berdakh fields there have been drawn the following conclusions:

- Results of the chemical analysis of the drilling cuttings of three various fields of Ustyurt region have shown that drilling cuttings humidity and oil products content depends, in particular, on clay type and composition in each separate field which define its sorption property to oil products absorption and to moisture separation.
- Results of research of various variants of drilling cuttings neutralization allow drawing a conclusion that treatment by calcium-containing reagents provides conversion of drilling cuttings to leaving of IV danger class irrespective of chemical compound. For prevention of the following washing-outs of the binding oil products from leaving and reduction of neutralized leaving humidity there is used introduction of silicates in the form of liquid glass.
- Important condition of maintenance of efficiency of oil-containing cuttings neutralization is calculation of required and enough water amount with a glance of free and binding water in cuttings. Water volume should provide binding of calcium-containing reagent and formation of paste-like mass with the minimum free water content that promotes decrease in hardening time.
- Optimum quantity of entered calcium-containing reagent, water and liquid glass depends on drilling cuttings chemical compound and should be defined in each concrete case on the basis of data of the laboratory researches.

Therefore, further, it is recommended for each concrete well of Surgil, North Berdakh and East Berdakh, prior to the beginning of work on oil-containing drilling cuttings neutralization there is necessary to carrying out of laboratory analyses on each concrete well.

Appendix C. National EIA's

This appendix includes translations of the following documents:

- Concept Statement for the Surgil Field and Pipelines (UzLITIneftgaz, 2006);
- Concept Statement for the Surgil UGCC (UzLITIneftgaz, 2006); and
- Statement on Environmental Impact for UGCC (UzLITIneftgaz, 2009).

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INTRODUCTION

This project of the statement for environmental impact (EIS project) is developed as ecological support (EIA I stage) of the pre-feasibility study (PFS) of the investments for "Surgil field complex construction with valuable components retrieval" object

The reason for PFS development is decision of the President of the Republic of Uzbekistan from April, 11, 2006 and Memorandum of mutual understanding between "Uzbekneftegaz" NHC and "KOGAS" Korean Gas Corporation, from March, 29, 2006.

PFS is executed according to task of "Uzbekneftegaz" NHC and "Uzgeoburneftegazdobycha" SC ("Ustyurtgaz" USE) approved by Cabinet of Ministers of the Republic of Uzbekistan on June, 12, 2006.

There are solved the designing questions of Surgil GCF construction and gas main transport for gas and chemical processing. There are considered two variants of producing capacity of the design constructions – for 2 and 3 billion cubic m per annum.

PFS purpose is definition of technological and economic rates of gas production and transport; definition of volumes of capital investments and an economic substantiation of investments into building constructions and definition of their efficiency.

There is achieved completely use of the valuable components containing in natural gas of Surgil field during realization of this project (further with GCC putting into operation): ethane, propane-butane fraction, gas condensate. Also, there is achieved finest tank gas dewatering.

Thus, necessity for urgent designing and object construction is actually and does not require additional proofs.

Design object has character as resource-saving. Though, it is important to carry out the analysis of ecological aspects of planned activity on the earliest and following design stages.

Procedure of the work execution was based on the standard methods of EIA procedure carrying out and took into consideration the features of considered object. There has been analyzed the information on emissions, dumps of pollutants into environment from operating in the region of construction during project execution.

There are carried out calculations of the emissions and dumps as well as defined areas of their spreading and impact degree on the Environment on the basis of the received information on sources of negative impact.

There are used design documents, library materials, literary resources in this work, as well as “Rule of the state ecological assessment in the Republic of Uzbekistan” confirmed by the decision of Cabinet of Ministers of the Republic of Uzbekistan from December, 31, 2001 № 491, regulating structure and volume of the "EIS Project” and other current regulations in the field of environmental protection.

1 ENVIROMENTAL CONDITIONS BEFORE THE BEGINNING OF PLANNED ACTIVITY

In administrative relation Surgil GCF is in the territory of Muynak region and the terminal point of gas transport (design GCC) - within Kungrad region of the Republic of Karakalpakstan.

Surgil gas condensate field and the next fields North Aral, East Berdakh, North Bardakh and Uchsay are located in the southern part of the former water area of Aral Sea (Figure 1).

Muynak peninsula in east part of territory has the greatest absolute heights up to 86 m. Grounds are sandy (ridge-hilly sand).

In the geomorphological relation the field is timed to semi-desert. In lithological relation the considered area is formed aeolian sands, fixed dunes with not clearly marked bands of loams. Saline has evolution in the south of the site. Modern engineering-geological processes are presented in the form of sand deflation.

The nearest settlement is in 30 km to the southeast from Surgil GCF – Uchsay small settlement with gasmen camp.

The area of expected GCC Akchalak is located on East Chinl of Ustyurt in 5.0 km on the northeast from Kyrkkyz railway station. It is limited by OTL – 110kV from the northwest in 1.0 km and the northeast in 2.0 km, and from the south in 2.0 km by OTL – 35kV. Area is located on the plain place with the heights drop up to 2 m. There are pass the railway and motorway Kungrad – Beyneu in the southwest

1.1 CLIMATIC CHARACTERISTIC

The climate of the “Northwest part of the territory of Uzbekistan and coast of Aral Sea” region is well studied due to long-term supervision on meteorological stations (constant supervision from 1936), located in close to objects placing.

It is characterized as acutely continental climate. It is specified by the following factors: first, considerable amplitude of the air temperature - maximum daily range is: in January 22^0C, in July 24^0C; secondly, by sufficiently small amount of precipitations throughout year; thirdly, considerable decrease of air humidity during warm period of year and increase during the cold period.

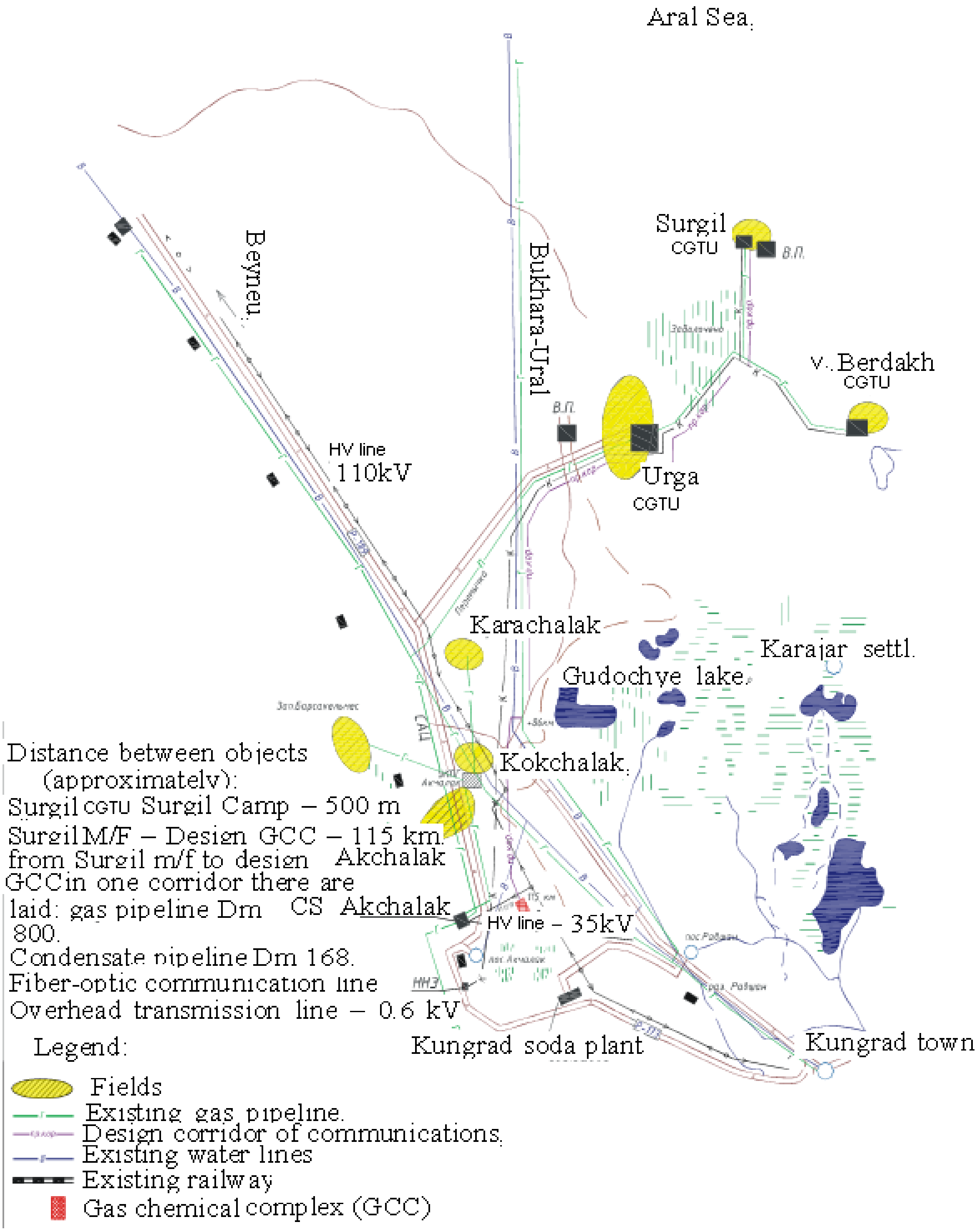

Figure 1: Layout chart of Surgil GCF and GCC

Annual average of air temperature is 10.2^{0}C. Monthly average of air temperature of the coldest month (January) equally -5.9°C, monthly average of air temperature of the warmest month (July) equally 26.6°C. Absolute minimal air temperature is -31^{0}C, absolute maximal air temperature - 44^{0}C. Duration of the heating period is 167 days. Duration of the period with daily average temperature less than 0^{0}C - 104 days.

Annual average of atmospheric pressure is 1010 kPa.

Table 1 – Monthly average and annual soil temperature on 1.6 m depth as follows:

January – 9.3	February – 8.0	March – 8.0	April – 9.7
May – 13.6	June – 17.4	July – 20.7	August – 22.6
September – 22.8	October – 20.4	November – 16.9	December – 12.8
Annual – 15.2			

The overall depth of frost penetration is 72m. Frost line is possible, once in 10 years – 117sm, once in 50 years – 138sm.

There are prevailing the winds of northern, northeast and east directions in annual distribution. There are prevailing the winds of east, northeast and western directions in January. There are prevailing the winds of northern and northeast directions in July. Monthly average wind speed in January and July is 4.1m/s. Annual maximum wind speed is 25 m/s (Muynak m.s.) and 35m/s (Kungrad m.s.).

Annual average relative air humidity is 70%, monthly average relative air humidity for January is 83%, for July - 58%.

Annual amount of precipitations is 121mm. In annual variation this region concerns to transition zone between northern latitudes for which prevalence of the precipitations of warm period in a year is characteristic and more southern where precipitations mainly drop out during the cold period of year. Most amount of precipitations is drop out in April - 18mm that makes 16% from the annual rainfall, least of all precipitations is drop out in July, August and September. Maximum daily amount of precipitations is 66mm.

Snow cover does not exceed 17sm, number of days with snow cover equally 27.

Number of days with dusty storm and drifting dust is equal to 57 during the year. Number of hours with a thunderstorm is – 9 during the year.

According to division into districts of the territory of Uzbekistan under the climatic characteristics this territory concerns to 1 area by wind pressure wind with standard value 0.38 kPa and to 1 area by snow loads with standard value 0.5 kPa.

The standard thickness of ground surface icing wall with periodicity once in 5 years is 15mm, once in 10 years - 20mm.

Irreversible changes in Aral area climate are connected with Aral Sea drying. There is a deterioration of hydrogeological mode in the region, and registered the tendency to strengthening of air pollution by harmful substances.

Now there are characteristic the large inflow of solar energy in warm season, large-scale regional circulating processes and features of underlying surface for Aral area climate. There is formed in Aral area the acutely continental, dry climate, with hot summer with seasonal air temperature disturbance plus 40-45^{0}C (June-August) and little snow winter with alternation of hard frosts minus 30-35.5^{0}C with thaws under aggregate exposure of these factors.

Thus, the arrangement of the main sources of harmful emissions in atmospheric air can promote formation of the raised contamination levels of air basin pollution under any wind directions. Hence, during any season the meteorological factors can also influence on activization of scattering power of the atmosphere excluding formations of the intensive contamination zones.

The climate makes essential impact on all aspects of human life and environment as a whole. Climate changes, such as the global warming caused by increase of hothouse gases concentration in atmosphere and various local man’s impacts, can break existing balance in the nature and to cause a number of negative consequences. In this connection, the activity directed on intensification of climate observing system and climate regional monitoring has the special importance.

According to data of the World Meteorological Organization (WMO) global average air temperature in 2000 was above the climatic norm of 1961-1990 on 0.32^{0}C.

Average global air temperature in the new century beginning was approximately above on 0.6^{o}C than in the previous XX century beginning.

Comparison of observed tendencies of global and regional (the Republic of Uzbekistan) air temperature changes shows their principal conformity, especially last decade. Concerning the annual rainfall it is necessary to notice, there is registered tendency to climate dryness increase in Uzbekistan last years.

There is conducted monitoring for emissions of three gases with direct hothouse effect: carbon dioxide, methane, nitrous oxide. In addition, there is calculating gases emission with indirect hothouse effect: carbon oxide, nitrous oxide, sulfur dioxide, non-methane hydrocarbons (NHC).

1.2 EXISTING SOURCES OF THE ANTHROPOGENIC IMPACT ON THE ENVIRONMENT

The main sources of impact on environment in Surgil GCF region and pipelines for transportation of field production are drilling production wells, building objects under construction of Surgil field, existing constructions East Bardakh CGTU and Urga CGTU.

Feature of Surgil CGTU location is absence near large industrial objects.

Complex gas treatment plant (CGTU) East Berdakh is putted into operation in 2002.

Plant operating mode is continuous. Raw stock of CGTU is gas wells production of East Berdakh, Uchsay field. Unstrapped combustible natural gas represents a multicomplex mix of hydrocarbons and small quantity non-hydrocarbon components.

Table 2 – Natural gas composition arriving from East Berdakh CGTU to gas link of CGTU East Berdakh-GMP Bukhara-Ural

Comp.	C_1H_4	C_2H_6	C_3H_8	$ICaH_{10}$	nC_4H_{10}	C_5H_{12}	C_6H_{14}	$C_{7+highest}$	H_2S	CO_2	N_2	Σ
% mole	94,24	2.73	0.78	0.114	0.14	0.1072	0.0621	0.0346	-	1.438	0.351	100.0

Gas of East Berdakh field according to its methane and homologs concentration is dry, methane: according to non-hydrocarbon components content is nonsulfurous, carbon dioxide (1.438%ab.). Methane content in gas is 93.837%ab. Nitrogen content is low (0.495%ab.). Gas molecular weight is 17.3. Gas density at temperature 20^0C is 0.791 kg/m^3.

Presence of carbonic gas in raw stock defines its corrodibility, presence of hydrocarbons – its explosion fire hazard.

The impact sources on environment are flare, tank farm and condensate pumphouse, fire regenerator of DEG, fields of expulsion of produced formation waters.

Together with gas there are retrieved associated waters (formation water) on earth surface. In the course of gas treatment the water is separated. The total volume of formation water is 6570 m3/year. After water treatment on treatment facilities it will be dumped on ponds-evaporators. The impact on environment rendered by sewerage will be limited by the area of ponds-evaporators.

Emissions of harmful substances of East Berdakh CGTU in atmosphere do not create a dangerous air gas contamination by one of components of pollutants, especially at distance in Surgil GCF region.

Now there are 20 gas wells in operation in Urga gas condensate field. Gas gathering is carried out according to the beam scheme by individual trails by diameter 159x11mm, length 1250-3477m with gas transport to Urga GSP for the purpose of its treatment.

Urga GSP is intended for non-sulfurous gas pre-treatment from dropping liquid, mechanical impurities and providing its normal pipeline transport through Bukhara-Ural gas pipeline by diameter 1020mm.

Ecological feature of Urga field regional location is its dislocation in deserted region characterized absence of industrial projects owing to the environment does not feel considerable man’s impact.

One of the large objects affected formation of atmospheric background level in the considered territory is preliminary gas treatment plant (GSP) of Urga field in which structure there is the torch farm consisting of low and high pressure torches, intended for popping of weathering gases formed at technological process of gas and condensate treatment.

Tank farm is the second by importance from the objects located in the given area, consisting of six tanks for gas condensate reception, measurement, storage and shipment. Sources of hydrocarbons emissions in atmosphere are six tanks; two pumps and gas condensate loading station in tank lorries.

The ponds-evaporators located in close proximity to GSP are possible to characterize as object with rather insignificant hydrocarbons emissions in atmosphere.

The boiler house of camp which working on natural gas concerns to additional pollution sources of atmosphere. There is emitted the insignificant amount of harmful substances in atmospheric air such as: nitrous dioxide and carbon oxide.

Quality of atmospheric air is defined both amount and conditions of emissions, and scattering power of atmosphere.

There have been carried out the early calculation of stray fields under operation of field for definition of existing situation of atmospheric air pollution, from which it is visible that emissions of the harmful substances of Urga GSP in atmosphere do not create a dangerous air gas content not by one of components of pollutants.

The concentrations created by emissions of harmful substances in atmosphere on components are following:

- **carbon** oxide **-** peak concentration in atmosphere have no exceeding of established norms in one of design point of the given area which values are less than 0.01 MPC;
- **hydrocarbons –** peak concentration in atmosphere have no exceeding of established norms in one of design points of the given area which values does not exceed maximum-permissible norms of MPC;
- **nitrous dioxide** – peak concentration in atmosphere have no exceeding of established norms in one of design points of the given area which value is 0.12-0.04 of MPC;
- **nitrous oxide –** peak concentration in atmosphere have no exceeding of established norms in one of design points of the given area which value does not exceed maximum-permissible norms of MPC.

Thus, due to distance of Surgil GCF from sources on Urga field there not be felt te man’s impact.

1.3 NATURAL ENVIRONMENT FEATURES ANALYSIS

The environment quality coefficient is the condition of a surface layer of atmosphere which is characterized by the peak concentration of harmful substances within the considered area. There is usually carried out the calculation of surface concentration of the pollutants containing in emissions of sources of the given and near located enterprises for definition of formation conditions of background atmospheric air pollution (if necessary).

Water objects condition is characterized by qualitative water composition from the point of view of use for one or several kinds of water supply, and also by water regime and water ability to self-cleaning.

Estimation of the land resources condition is characterized by their fertility (soil) and from the point of view of building constructions by grounds types.

Interiors are characterized by study degree of region, by cross-section structure on the concrete area, gas content, detail of prospecting works and scores of gas, condensate reserve and also indexes of experimental-industrial operation.

From the point of view of environmental protection the great importance have characteristic of representatives of fauna of investigated region (reptiles, mammals, birds, insects), and also flora which is the sensitive indicator, correlation of all environment in their totality.

Visual landscape qualities should not change in strong degree by industrial activity, and whenever possible should remain.

1.3.1 ATMOSPHERIC AIR

The stated climatic features of considered area predetermine necessity of the account of impact of the sources which are in considered area at definition of air modern condition estimation.

Atmospheric air condition is in close dependence on climate indexes of considered region.

The most typical feature of Surgil GCF is its location in sparsely populated deserted area with a small amount of sources of the artificial pressure on environment owing to there is rather low level of anthropogenic impact on the natural complexes.

The main nearby sources of atmospheric air pollution is East Berdakh field. During extraction and treatment of hydrocarbon raw stocks on the given field the sources of pollutants emissions are: emergency-torch farm, tank farm and pump house for condensate transfer, DEG regeneration plant and a boiler house. From the given sources there are ingress in atmosphere the hydrocarbons (by methane), and also products of firing on torches and boilers.

The quantitative characteristic of emissions on the given sources of atmospheric air pollution is presented in table 3.

Table 3 - Pollutant emissions near Surgil field construction region, t/year

Components	Emissions, t/year (East Berdakh)
Methane	94,25
Carbon oxide	85.65
Nitrous dioxide	3,17
Nitrous oxide	0.79
Carbon black	0.8
Total	**184,66**

Peak pollutants concentration created by emissions of East Berdakh field have local spreading and practically do not impact on atmosphere contamination level in the region of Surgil field. Thus, atmospheric air condition in the designed region is satisfactory that is important factor for further designing of the construction objects of Surgil GCF. It is possible to say so about objects of Urga field and also about existing objects of Surgil GCF.

1.3.2 SURFACE AND UNDERGROUND WATERS

There are absent large surface waterways within the area of Surgil field, the region of field concerns to arid category.

There are some channels of irrigation purpose in the region of location and small lakes which are salt gathering sources.

The features of underground waters have great importance for anthropogenic processes of natural environment pollution in connection with development of hydrocarbons fields.

The territory is considered practically drainless under conditions of the common drain of underground waters.

Weak inclination of the sea bottom defines spreading of sea hydrostatic pressure distribution at the considerable distance, and weak permeability of deposits provides close from a surface underground waters occurrence. In the considerable areas of the sea drained part this level are bedded near to ground surface.

This process causes high degree of underground waters mineralization. As a result of infiltration, capillary raising and evaporating processes the waters mineralization fluctuates from 10 to 80g/l.

On separate sites of geo-morphological declines in a relief the salts concentration in underground waters can reach 200-300g/l and more.

Surface deposits of low power (to several meters) on Ustyurt overlie more ancient and are arid. Depth of underground waters occurrence level is 5-8 and more. Waters mineralization is very high, sometimes reaches to 75-80g/l, composition is sodium chloride.

Underground waters are opened by short wells, rare rise in the form of descending sources. To the summer end almost all sources and wells are dry up. During this period the mineralization exceeds level of MPC for potable water and reaches 3 and even 7g/l.

In spring the waters are freshened by an atmospheric precipitation to 1.5g/l and less. Water containing rocks are dated to lake and dealluvial facies. In the conditions of construction of new objects in the Ustyurt territory and other close areas of the republic this factor demands the especial account in development of nature-conservative measures and a geological estimation of a modern situation.

Underground waters of Surgil field concern to Sudoch'ye hydro-geological area which is in northern part of huge Ustyurt basin.

In cross-section of this basin there are allocated 2 hydro-geological stories. Ground storey represents a zone of the complicated water cycle and includes uppertrias-jurassic, neocom-aptsk and alb-turon water bearing complexes.

The upper storey is in a zone of free water cycle in cross-section of deposit of neogene-quaternary water bearing complex. The ground and upper hydro-geological complexes are divided by regional very reliable clay confining beds upper jurassic, upperaptsk and senon-palaeogene.

The chemical underground waters composition is characterized by the wide range of mineralization from 17 to 200g/l, water density 1.082 – 1.106/sm^3.

The sharp aggravation of ecological conditions in region is connected with pollution of a drain of the Amu Darya and Syr-Darya rivers. Waters pollution in the rivers and reservoirs occurs owing to dump of industrial and household sewage waters. There are ingress the large amount of phosphorus, nitrogen and other substances compounds from objects of agriculture, including toxic, containing in defomants, insecticides. Dump in the rivers of highly mineralized collector-drainage waters causes the raised river flow mineralization. Objects of “Ustyurtgaz” USE are located at considerable distances from surface water objects.

Source of potable water supply of area is the Amu Darya River, which only in the Karakalpakstan territory is polluted by 16 large collector-drainage and industrial drains.

Under the influence of agricultural drains and also sewage waters of the enterprises, there is formed the degree of a chemical water composition of the Amu Darya river. The Amu Darya River concerns to category of fish and economic significance, and also is used for household water needs, including for needs of the objects of “Ystyurtgaz” USE.

The water supply problem is actual for considered region. The provision of the population of the Republic of Karakalpakstan with tap potable water is 39% (urban 68%, rural 13%). The main part of rural population uses water of open reservoirs.

There is used imported water for household needs in the nearest to Surgil field settlements.

Existing industrial projects (East Berdakh, Urga, etc.) does not influence on the surface and underground waters condition and in connection with remoteness of surface waterways and absence of dump in them.

1.3.3 SOILS AND GROUNDS

The region of Surgil GCF location represents uniform plain with a landscape of the dried up bed of Aral Sea. The field is in 131km to the north from Kungrad railway station (by highway). The surface is covered by offlaps of Quaternary age. Absolute marks of a surface fluctuate from 46 to 51m.

The large space of the sea drained part is lay between Aeolian sand zone at native coast and a zone of modern coast. This territory is weak partitioned by shallow hollows by 0.3-0.5m depth of drainless type. The dried part is combined of loam-sandy loam layer, interstratified in some areas very fine-grained sand. In process of removal from old coast the thickness of above specified deposits gradually decreases, and there are lay basically sea slimy deposits near to surface which are intensively salted as a result of sea drying up.

In the geological relation the region is dated to the western part of Syr Darya syneclise, to area of alluvial-deltoid plains and to Ustyurt system of structures, to area of structurally-peneplain formation plains.

The site of works and adjacent territories represent a zone of naturally low fertility. The insignificant humus compound does not allow developing to high forms of fauna. Close highly mineralized underground waters occurrence and the quiet lay of land promotes salinization of soils and to intensification of desertification process.

Set of small lakes located in the region of investigated site are sources of salt gathering.

Wind erosion, total amount of particles are one of the reasons of soil degradation.

Two following groups of grounds take part in a geological structure of Surgil site:

EGE-1 is extended in the top part of cross-section and is presented by sand from fine to middle with inclusion of cockleshells to 30% with design resistance under water saturation R = 80kPa, is possesses running properties.

Table 4 – Physical-mechanic properties of EGE -1

№	Name of characteristic	Unit	Standard value	Less of GWL
1	Mineral part density	g/sm^3	2.66	2.66
2	Volume weight:			
	a) sceletone	--	1.41	1.41

Table 4 continuous

№	Name of characteristic	Unit	Standard value	Less of GWL
	б) naturally humid	--	1.71	1.88
3	Porosity	%	47.0	47.0
4	Porosity coefficient	--	0.886	0.886
5	Natural humidity	%	21.6	33.3

6	Humidity	--	0.21	1.00
7	Specific coupling	kg/sm^2	0.02	0.00
8	Angle of internal friction	Degree	32	27
9	Modulus of deformation	kg/sm^2	180	100

Grounds of EGE-1 are non subsidence. Grounds group 29^B

In case of underground waters peak level to height mark 41.0m the grounds get running properties. Accordingly, the grounds design resistance is accepted 80kPa.

EGE-2 is presented by clay, loams, sand alternation. Grounds from humid to water saturated are non subsidence.

Preliminary physical-mechanical properties of the grounds of EGE-2 are resulted in the below-mentioned table.

Table 5 - Standard and design values of the grounds characteristics

Name of characteristics		**Unit**	**Standard values**	**Design values under**	
				0.85	**0.95**
Grounds particles specific weight		g/sm^3	2.72		
Ground specific weight		g/sm^3	1.84	1.80	1.76
Dry ground specific weight		g/sm^3	1.42		
Porosity			47.1		
Nature humidity		%	27.2		
Humidity of total water saturation		%	-		
Humidity			0.82		
Humidity at yield stress		%	42.3		
Humidity at rolling limit		%	25.1		
Number of plasticity		%	15.7		
Flow index			0.13		
Specific coupling		kg/sm^2	0.16	0.12	0.09
Angle of internal friction		Degree	26	25	24
Modulus of deformation	Under natural humidity	kg/sm^2	40		
	Under water saturation	kg/sm^2	30		
Initial subsidence pressure		kg/sm^2	0.-2.4		

Grounds group грунтов 8^B. Grounds are non subsidence. Grounds (according to archive data) are strongly aggressive to concrete on Portland cement, slag-Portland cement and sulfate-resistant cements.

Underground waters are opened on 1.4m depths and more. Water is strongly mineralized and suitable for technical needs only. Underground waters are middle aggressive to concrete on Portland cement.

Line of design communications are divided into two sites by passage: first site – Surgil CGTU– Urga CGTU– the territory of the former Aral Sea bed and the second site – Urga CGTU– Akchalak GCC – Ustyurt plateau.

First site: Surgil CGTU– Urga CGTU.

The first engineering-geological element (EGE-1) unites sandy grounds presented by aeoline sand, non-segmented, alluvial.

It is extended in the upper and middle part of the cross-section.

Layer thickness is to 1.8m. Layer upper boundary is bedded on 0.0–2.6m depth from ground surface.

Design resistance (R_0) EGE-1 to accept 150 kPa. (1.5kg/sm^3).

During water saturation the sand of EGE-1 accepts running condition. Design resistance (R_0) – 100kPa. (1.0kg/sm^3). Ground group according to development – 29^B. Angle of slide under natural humidity - 35^0; under water saturation - 27^0.

The second engineering-geological element (EGE-2) includes small clays with sand alternation, grounds are from dry to humid. Clays are in dry condition, dense, have tabular structure.

It is extended in the lower part of the cross-section. Layer thickness is to 3.0m. Layer upper boundary is bedded on 0.0-0.5m depth from ground surface. Grounds design resistance (R_0) to accept because of presence of the sand bands 200kPa. (2.0kg/sm^3). Ground group according to development – 8^F.

The third engineering-geological element (EGE-3) includes dense, small humid clays, of Paleogene age, non subsidence.

It is extended in the lower part of the cross-section. Layer thickness is more than 10.0m. Layer upper boundary is bedded on 0.5m depth from ground surface. Ground group according to development – 8^F.

The second site: Urga CGTU– Akchalak GCC.

The Ustyurt plateau area is presented by weak portioned relief with numerous ravines and takyrs.

Surface waters are absent on the site.

The nearest railway station Akchalak.

Three engineering-geological elements take part in geological process:

EGE-4. Cockleshell area sub-cemented, weak solid.

Ground group according to development – 31^B.

EGE-5. Crystalline limestone. The limestone is ventilated, crumbling in layer upper boundary, from tabular to massive. Physical-mechanical properties of limestone as follows:

Ground group according to development - 15^A.

EGE-6. Includes loamy sand, salted loams, macroporous, dry, with inclusion of gravel and detritus to 10-15%.

It is extended in the upper part of the cross-section. Layer thickness is 0.5-1.2m.

Layer upper boundary is bedded on 0.0m depth from ground surface.

Grounds (according to archive data) heavily aggressive in relation to concrete on Portland cement, slag-Portland cement and sulfate-resistant cement. Underground waters are deeply bedded - tens meters and will not be effect on the foundations of design construction.

Proceeding from the analysis of the soil cover condition in the object zone, it is possible to draw a conclusion:

- Object construction is carried out on the grounds not suitable for agriculture because of low fertility and heavy soils salinization;
- Soils of investigated area basically have already broken structure, therefore they will not bring additional physical influence of considerable changes;
- Chemical pollution collects, basically, in the top soils because of high capacitance properties of composed rocks.

The radioactivity of soils types fluctuates within 18-20mcr/h. According to sanitary norms of radiation safety of the Republic of Uzbekistan the exposure rate for the territories with constant presence of people should not exceed 30mcr/h. Thus, the natural radioactivity of soils does not exceed MPC.

1.3.4 GEOLOGICAL STRUCTURE

Rocks from upper Paleozoic up to anthropogene take part in a structure of a sedimentary cover and an intermediate structural storey.

Paleozoic group - Pz

Devonian system - D

There are heavy opened fissured, fine-grained sandstones and siltstones of quartz-feldspar composition with debrises of dacite-andesite effusive and petrosilexes. The fissures are executed by calcite and residual highly metamorphizated organic substance.

Carboniferous system - C

Rocks of carboniferous complex with cross and stratigraphic bedding overlie deposits of lower phamen layer of upper Devonian. The complex is composed by calcareous formation of upper Devonian (upper phamen) – lower carbon and magmatogene-sedimentary formation of upper carbon – lower Permian.

Middle carboniferous deposits - (C_2) are presented by alternation of siltstones, mudstones and biogenic-fragmental limestone.

Upper carboniferous – lower Permian deposits (C_3-P_1) are composed by a wide spectrum of formations - from magmatic to sedimentary. They are presented mainly by black, calcinated, horizontally layered mudstones, with sulfide mineralization, with spicules of sponges and radiolarians, quite often passing into tuffs.

The deposits of upper carbon – lower Permian are presented by biotite granite, weak cataclaziled, carbonized with hypidiomorphosisgrain structure.

Mesozoic group - Mz

Jurassic system - J

The Jurassic deposits are bedded on the deposits of upper Paleozoic with washout and cross bedding.

Lower Jurassic section - J_1

The lower Jurassic deposits have binominal structure. It is mainly sandy thickness of toar and lower the deposits are presented by thickness of alternating in the cross-section grey colored non-calcareous sandstones, siltstones and mudstones, with stratified structure (it is horizontal, thin in mudstones, unidirectional, slanting in sandstones), with a considerable admixture of the charred vegetative substance, siderite and quite often pyrite. The border between upper Triassic – lower Jurassic deposits and overlying thickness of toar is clear and corresponds to change of alternating mudstones and sandstones mainly sandy rocks.

The toar deposits are mainly composed by sandstones with interlauer of siltstones and mudstones. Lithologically the sandstones are grey, medium-fine-grained, with grains of coarse-grained sandy fraction and gravelites, silty micaceous with the mixed cement of porous-film type, with inclusion of charred vegetative detritus. Open porosity of these sandstones is 3.85-7.64 %.

Siltstones are grey, dark grey, black, anisomerous, silty micaceous with micaceous-clay cement and inclusion of the charred vegetative substance and siderite.

Mudstones are dark grey, sandy-silt, fine-scaled with inclusion of fragments of the carbonizated tissues of plants, with interlayers of grey siltstone and fine-grained sandstone. Mudstones are dense, impermeable, their open porosity is 1.75-2.42%.

Middle Jurassic section - J_2

Lithologically, these deposits are presented by terrigenous thickness of alternation of grey colored sandy-siltstone-clay rocks of the alluvial and lake-marsh continental genesis gradually passing into shallow water-sea.

Middle Jurassic deposits are composed by grey and dark grey silty micaceous sandstones, siltstones, mudstones and their transitive differences with inclusion of the charred vegetation, pyrite and siderite.

Sandstones are grey, greenish-grey in the top of cross-section, from small - to coarse-grained, micaceous, dense, silty micaceous, with the mixed carbonaceous-micaceous-clay cement. The sandy material is poorly sorted in aalen-bayos and is better sorted in batsk deposits.

Siltstones are dark grey, silty micaceous, strong, dense.

Mudstones are dark grey and greenish-grey, fine-washed, lensing-fine-horizontally layered, sandy and silt in tops of cross-section. Rocks contain the numerous rests of the charred vegetative organics and thin (0.5-1sm) rare interlayers of coal. There are widely developed from neogenic minerals the siderite and pyrite, occurring, basically, in a view of pseudomorphoses by the plant residues. Upwards on the cross-section the siderite compound is decreases. Mudstones practically are impermeable, their open porosity is equal to 2.49-4.4%, i.e. the purest, without terrigenous admixture, interlayers of mudstones can be local fluid supports in thickness of middle Jura.

Upper Jurassic section - J_3

The deposits of upper Jura are conformability on rocks of the middle Jurassic age.

Kellovey-Oxford deposits (J_3cl-oxf) are mainly presented by clay with interlayers of siltstones and sandstones collecting in shallow-sea conditions.

Clay are grey, greenish-grey, in upwards of cross-section - grayish-brown, aleureic, dense, fine-washed with the rare charred plant residues on which there are developed pseudomorphoses of pyrite. There are widely developed iron hydroxides in upwards of cross-section. A structure of rocks is horizontal-layered.

Siltstones are greenish-grey, clay and sandy, dense, strong.

Sandstones are greenish-grey, small-fine-grained, quite often are aleureic, dense, strong, massive, quartz-feldspar, with clays cement, with inclusion of rare grains of glauconite. Sandstones of upper Jura possess good filtration and capacitance properties. Their open porosity reaches 15-16%, and of some layers to 24%, permeability fluctuates in a wide range – 0.00-49m/darcy.

The deposits of titone (J_3tit) without visible cross bedding, but with washout, are bedded on deposits of kellovey-oxford.

The aggregate thickness of the Jura deposits is 811-4260m.

Cretaceous system - K

Lower Cretaceous section -K_1

Neocom uplayer (K_1 nc) includes the deposits of valangin and goteriv-barrem layers. The deposits of neocom uplayer are opened by all drilled wells within considered territory.

In the basis of neocom uplayer there is bedded the pack of bluish-grey with tints of green clays of valangin layer with pyritized charred plant residues.

Thickness of alternation of sandstones, siltstones and clays, greenish-grey is bedded above.

Barrem layer is the most thickness in neocom composition. The bottom part of barrem deposits is combined by red bed clays with the subordinated interlayers of siltstones and sandstones; top - mainly by sandstones. Clays are dense, strong, fine-washed, in some areas calcareous, massive, with nests of bluish-grey siltstones.

Sandstones are brown and red, small-medium-grained, quartz-feldspar, badly sorted, with gravel grains in some areas, dense (2.05-2.509 g/sm^3), massive, calcareous, passing into sand in some areas. Open porosity of sandstones is 16-22%, permeability – 0.01-163m/darcy.

The deposits of barrem were formed in continental conditions, passing into coastal in some areas. Thickness of the deposits of neocom uplayer is 275-585m.

Apt - K_2a.

On the red bed deposits of barrem there is bedded the layer of grey colored, and in the top part – speckled rocks. According to GIS they have binomial structure; the bottom part is presented basically by sandstones with the subordinated interlayers of siltstones and clays, and top - mainly clay.

Sandstones are light – and greenish-grey, anisomerous with interlayers of gravelites, dense (1.92-2.29g/sm^3), subcalcareous, quartz-feldspar with glauconite, with the charred plant residues. In the basis of cross-section in sandstones there are fixed concretions of phosphorite and pellets of clay rocks. Sandstones possess good permeability (to 335 m/darcy) and porosity (21-26%).

Clays are dark grey, aleuric, fine-washed, microlayered, dense with the charred plant residues.

Sediment accumulation of the apt deposits occurred in the conditions of shallow sea basin of normal salinity which was periodically freshened by water sources getting from a land.

Thickness of the apt deposits is 165-175m.

Alb - K_1al.

Lithologically, they are presented by terrigenous formations which accumulation occurred in shallow-sea conditions. The Alb layer is conditionally subdivided on two parts: bottom - sandy-argillaceous, responding to lower-middlealb sublayer and top - mainly sandy, responding to upperalb sublayer.

Sandstones are grey and greenish-grey, basically weak-cemented, quite often passing into loose sand. In bottoms of the cross-section the sandstones are more dense (1.90-2.16g/sm^3) with clay cement, quartz-feldspar, glauconitic with nodules of phosphorites. Open porosity of sandstones is 23-25%, permeability 9-88m/darcy.

Clays are dark grey with tints of green, thin-layer, silt, with the charred plant residues, pyrite and sea fauna. Thickness of the alb deposits is 310-317m.

Upper Cretaceous section -K_2

Upper Cretaceous section is present at volume of Cenomanian, turon, senon and the Danish layers. On the underlaying deposits of the lower cretaceous the rocks are bedded conformability. Lithologically they are subdivided into two complexes: terrigenous (Cenomanian, turon) and carbonate (senon, Danish).

Cenomanian-K_2 cm is presented by layer of alternation of sandstones, siltstones and clays, sediment accumulation which occurred in the conditions of shallow sea basin. There are rare interlayers of sand.

Sandstones are greenish-grey, rare dark grey, aleuric, mainly fine-grained, quartz-feldspar, glauconitic, micaceous, with concretions of phosphorite, with rare large fragments of the charred plant residues. Sandstones possess good filtration-capacitance properties - values of porosity reach 28%, and permeability 90-1950m/darcy.

Sands are glauconitic, quartz, micaceous. Siltstones are quartz-glauconitic, micaceous, with concretion of the iron and siderite.

Clays are dense, dark grey, horizontally-microlayered, with accumulation of phytodetritus, fauna and contractions of phosphorite.

Thickness of the deposits is 160m-179m.

Turon - K_2 t is presented by layers of terrigenous rocks of sea genesis. Silt-clay rocks are prevailing in the bottom part of the cross-section and are connected with transgressive cycle of sediment accumulation, in the top there is increases the content of sand and sandstones. Lithologically it is dark-greenish-grey sands and sandstones, weak slightly consolidated, micaceous with calcinated-clay cement. Siltstones and clays are greenish-grey, fat by touch, contain the charred plant residues, mica, quartz.

There is characteristic for the turon deposits the large content of glauconite, and in the basis of cross-section there are meet the concretion of phosphorite. Thickness of the turon deposits is 174-175m.

Senon - K_2 sn. The deposits of senon uplayer are widely developed in Aral-Ustyurt region. To bottom boundary of senon there are dated to intervals in sediment accumulation, expressed in absence of cognac layer. To upper boundary there are also dated to washouts and intervals and there is registered reduction of thickness or absence of the deposits of the Danish layer.

The deposits of campan and Maastricht layers are bedded conformability on the rocks of santon layer and are presented mainly by light grey, greenish-grey, dense, massive marls with interlayers of chalklike limestone and marls with pyrite and fragments of pelesypod, belemnites, foraminifer. Formation of the senon marls occurred in sea conditions under rather stable sedimentation process.

Thickness of the senon deposits is 365-368m.

Danish layer - K_2 d. The deposits of the Danish layer are bedded nonconformity on the Maastricht deposits. Their thickness is 12-15m. litholigically they are presented by greenish-grey, marly, sandy limestone with fragments of brachiopods, pearlweeds and foraminifers. There are plant residues on which the pseudomorphoses of pyrite are developed.

Kainozoic group - Kz

Palaeogene system - P

The palaeogene deposits with washout are bedded on the deposits of chalk and are presented by three sections.

Palaeocene section - P_1. The palaeocene deposits are presented in the bottom part by greenish-grey clay limestone, and in top by brownish marls with the numerous residues of inoserams, shells of urchins, fish scales and concretions of pyrite. Thickness of the palaeocene deposits is 10m.

Eocene section - P_2. The deposits are presented by greenish-grey, and in the top part of the cross-section – by brownish-grey marls, dense, strong with the fauna residues, phytodetritus and fine-air pyrite. There are interlayers of writing chalk among marls.

Oligocene section - P_3. The cross-section of Oligocene age is composed of clays of the sea genesis, bedded conformability on the Eocene deposits. The clays are greenish-grey, marly in the bottom part of the cross-section with the fauna residues and fish scales, with inclusions of fine-air pyrite; the clays are green in the top part with tints of blue with interlayers of siltstones, sands and mudstones, with concretions of pyrite. The clay of Oligocene are low- permeable (1.5-2.0m/darcy), values of porosity reach 25%.

The start of sediment accumulation was marked by extensive transgression of the sea. The same conditions, with short-term uplift of separate parts of territory, remained at accumulation of the Eocene deposits. The high sea regime was stabilized in Oligocene time.

Thickness of the Palaeogene deposits is 548-632m.

Quarternary system-Q.

The Neogene deposits are absent and rocks of quarternary age with washout are bedded on the chalk and Palaeogene deposits of different ages.

The quarternary deposits are presented by brownish-yellow, quartz-feldspar sands and loose sandstones, siltstones and grey loams. The sediment accumulation of the quarternary deposits occurred in alluvial-lake facial conditions with short-term transgressions of the sea. Thickness of the quarternary deposits fluctuates within 60-186m.

1.3.5 FLORA AND FAUNA

Modern condition of Aral area in deserted zone defines character of the vegetative cover of investigated region. In connection with modern natural processes in the territory of Aral Sea there is observed degradation of the vegetative cover in the region of works. One of the heaviest factors defining a modern condition of biocenose of Aral area is desertification process.

The greatest distribution in the territory was obtained by such types of anthropogenous desertification as degradation of vegetation and salinization of the soils, caused by drawdown of Aral Sea and overregulation of the deserted Amu Darya and Syr Darya rivers drainage.

All dried up area is located in a zone of deep ecological crisis with strong degree of desertification. Prevailing type of desertification – salinization of the soils, but along with it thre is noted degradation of unstable vegetation. Display of desertification process are huge spaces of s alkaline lands, inequality in overgrowing, prevalence of annual species of plants, their weak associativity, insignificant participation of perennial plants, incomplete development of biohorizons, intensification of mineralization degree of the underground waters and their decrease.

Ecological situation on the drained sea bed is critical and strained. The same conditions are in the regions of modern Syr Darya delta and throughout Amu Darya delta.

According to literary data, there are 244 species of flora representatives in Aral area in the territory of Uzbekistan. Among the most widespread families there are presented the following: buzgun, compositae, cereal, tamarisk, sedge, chenopodiacious, crucials and legumes.

A high specific variety of vegetation is concentrated in the deltas of Syr Darya and Amu Darya rivers. However, this variety is reduced now in connection with overregulation of the rivers drainage and desertification of meadow-tugai vegetation. So, thickets of endemic Kazakhstan cane were widespread through Aral shallow gulfs and lakes in Syr Darya delta. Now this species meets very seldom. Hydrophytic vegetation of Aral Sea shoal (reed, zinnikelnya, rupee, naiad) has disappeared completely. Fragments of hydrophytic communities have remained in small lakes of Syr Darya and Amu Darya deltas, on the sites of pinching-out of underground waters in northern drying of Aral (Karabulak).

The flora of reservoirs (Aral Sea and lakes) is very poor and makes 13 species of the higher plants. They are representatives of reed mace, pondweed, eelgrass, zannikelch, naiad and sedge families, during sea contraction they be found as the most vulnerable, than other groups of plants.

Changes of environmental conditions have caused impoverishment of flora specific composition (as in qualitative and quantitative relations). Most widespread species of plants in the region of works are the following: tezgun, wormwood, white-ground wormwood, turan wormwood, sand wormwood, glasswort, saltwort, keyruk, locoweed, camel's-thorn, aperec, tamarica, tamarisk, karaborak, yerkek, biyurgun, tastibiyurgun, licorice, black saxaul, ferula, ebelek, sumbul, ephedra, saline seepweed, adraspan, itsichek, climacopetra, sakrsazan, selin, karrak, kazy-kulak, white saxaul.

30 species are valuable fodder plants among flora species of Aral coasts. It is white-zemeot wormwood, cherekez Richter, keyruk, yerkek, feather grass, agrek, ebelek, etc.

In connection with observed degradation of the vegetative cover it is necessary to notice that loss of biodiversity conducts to ecosystems integrity disturbance and any economic activities can intensify these negative processes.

Fauna representatives in the investigated region and adjacent territories are not numerous, it could explain with poor forage reserve and the developed adverse conditions in this region.

Birds of pray	-	Long-legged buzzard, steppe eagle, imperial eagle, marsh harrier;
Fowl-like birds	-	Pheasant;
Crane	-	Coot, gallinule;
Shore birds	-	Stone curlew;
Pigeon	-	Blue rock pigeon, laughing dove, turtle dove;
Cuculiformes	-	Cuckoo;
Owl order	-	Little owl, strawberry owlet;
Swift order	-	Black swift, blue-cheeked bee eater, hoopoe, common swallow, house martin, common lark, black-headed wagtail, great gray, starling, pastor, jackdaw, carrion crow, widetail, desert chat, dancer, bearded tit, Bokhara tomtit, smoke sparrow, tree sparrow, red-headed bunting.

In connection with falling of Aral Sea level and drawdown of underground waters, there is vegetation degradation and in this connection the number of birds nesting on it decreases. There was a decrease in number of flying and wintering birds as the forage reserve in the given region was reduced.

Since 1960 Aral level has drawdown more than 14m that has caused variety of changes of the natural conditions on its coasts. There was a full reorganization of landscapes. Now Aral has completely lost its meaning as fish reservoir. The quantity of the swimming birds was sharply reduced. Many mammals and birds migrated in the Sarykamysh hollow in search of new places.

There are lives more than 60 species of mammals in southern area of Aral. More than 40 species meet in the region of researches. We will notice that half of them are made by the rodents, managed to master the drained bed. The specific structure of animals meeting in this region as follows:

Rodent order	-	greater sand eel, Libyan jird, tamarisk gerbil, long-clawed ground squirrel, Severtsev jerboa, fat-tailed jerboa, comb-toed jerboa, lesser five-toed jerboa, dwarf hamster, mole lemming, mouse, muskrat;
Insect-eaters	-	eared hedgehog;
Duplicidentates	-	tolai hare;
Chiroptera	-	great bat, bearded common bat;
Vermin	-	sand cat, Pallas' cat, steppe polecat, badger, corsac fox, wolf, jackal, fox, African wild cat, saiga;
Reptile	-	steppe tortoise, comb-toed gecko, gray gecko, Turkestan gecko, agama, desert monitor, lined desert lacerta, brindled desert lacerta, eared toad agama, grass lizard, Pallas' coluber, phoorsa, cobra, mocassin, arrow snake, Orsini's viper.

As a result of change of the rivers water balance and the growth of water mineralization caused by it (Aral salinity has risen from 11 to 22g/l), there is lost a number of endemic species of animals.

The rare animals and threatened species, recorded in the Red Book: caracal, Pallas' cat, khangul, jerboa, giant noctule, Asiatic wild ass, Persian gazelle, moufflon, desert monitor, Central Asia cobra, steppe eagle, golden eagle, imperial eagle, balaban, peregrin, white crane, desert falcon, desert sparrow.

Thus, the flora and fauna condition in the Aral area are characterized by structural failures of biocenoses (it is expressed in change of a quantitative proportion of various species of animal organisms) which lead to changes of functions of the various organisms (first of all to fall of reproduction level and quality of posterity).

1.3.6 LANDSCAPE

Landscape is weakly-changed. The area of Surgil field location concerns to weakly-gentle plains with thinned annual halophytic tamarisks on the typical saline soils in aggregate with residual takyr saline soils. The area planned under CGTU construction is slightly hilly and covered by annual halophytic vegetation. A landscape deserted, not subject to anthropogenic loads as the industrial enterprises in the CGTU construction region are absent.

1.4 SOCIO-ECONOMIC ASPECTS

Natural gas has primary value in economy as chemical raw materials and as one of effective kinds of fuel, most ecologically pure, high-quality and economic in comparison with coal and black oil.

Use of natural gas in the national economy gives the large economic effect. Conversion to gas fuel considerably reduces pollutant emissions in environment, improving a sanitary condition of settlements. The main increase of gas consumption in the republic is necessary to the population.

Objects of planned construction cover territory of Muynak and Kungrad regions, which as all other regions of Kara-Kalpak are related to ecologically unsuccessful. Salinity and dustiness leads to development of some heavy diseases. Also, one of the main reasons of it is unsatisfactory provision of the population with good-quality potable water, insufficient sewerage and low level of sanitary purification of the occupied places.

The spent medical inspections show growth of disease of alimentary organs, blood and blood-forming organs, cardiovascular and organs of respiratory tracts.

There is observed high level of diseased in Kungrad region.

Morbidity rate

	Kungrad	**Muynak**
Morbidity for 100 thousand persons	34912.3	30419.6
Disability for 100 thousand persons	2.2	1.9

Kungrad and Muynak regions bordered on Aral Sea are characterized by the lowest population density, weak level of industry and agriculture development.

According to actual data of 2004 year the resident population size of the Republic of Karakalpakstan has made 1564.8 thousand persons, including 113 thousand persons in Kungrad region, 28.6 thousand persons in Muynak. The percent of rural population through the regions makes 36.5% and 53.7% respectively. Native population has leading position in ethnic structure.

There is observed high degree of natality in both considered regions, basically, thanks to high level of birth rate.

Kungrad region is the happiest region according to rates of population increase. Though, higher rates of mortality among the population in comparison with average data through the republic are attract attention.

Table 6 - Natality demographics

Name of parameter	Kungrad	Muynak
Mortality for 1000 persons	5.7	6.0
Birth rate for 1000 persons	24.5	21.8
Natural increase for 1000 persons	18.8	15.8

High rates of population increase and also considerable share of able-bodied population make the problem of employment sharp, which decisions enters into number of priority political and socio-economic problems of the republic.

Now, the government of Uzbekistan takes measures on elimination of the negative tendencies which are taking place in economic and social spheres.

Carrying out of an active policy on the labour market, directed on creation of workplaces, employments and occupational training of the unemployed, in certain degree promote job growth of the population and unemployment decrease.

The decision of the question of effective economy development at the expense of domestic resources and mobilization of foreign investment is created conditions for self-development, self-affirmation and material welfare of the population.

Construction of the new industrial projects and development of hydrocarbons fields of Ustyurt region will favorably be reflected in employment of the population and as a whole in improvement of social level of inhabitants of considered regions.

The majority of families of the given regions lives in a countryside and is mainly focused on agricultural work from which receive the basic incomes. Data about population employment through these regions are listed in the table

Table 7 – Population employment

Human resources	Kungrad	Muynak
Able-bodied population size in able-bodied age at the average for 01.10.2005., thousand persons	60.3	15.4
Employed population size for 01.10.2005., thousand persons	37.9	9.6

Average monthly wage of workers and employees are low and makes 72.2 thousand soums through the Kungrad region and 27.8 thousand soums through the Muynak region.

Realisation of planned construction of Surgil GCF will provide increase in extraction of natural gas to 3 billion cubic m per year.

Commissioning of additional capacities of gas extraction will also bring into its contribution to maintenance of the reached production level in "Ustyurtgaz" USE and, hence, will lower acuteness of hydrocarbons deficit in the republic.

As is known, gas fuel is most ecologically pure. If to consider, that 85% of the electric power in Uzbekistan are made on the thermal power stations using natural gas as fuel it is possible to draw a conclusion that wide use of gas fuel has appreciably reduced atmospheric air pollution as a whole through the country.

Gas supply for export to neighboring countries gives the currency earnings necessary for further development of oil and gas branch and also for the decision of other state tasks.

Thus, planned construction will bring into its certain contribution to improvement of social and economic conditions in the country.

The nearest settlement is the Uchsay settlement located in 30km to the southeast from the field. In connection with insignificant emissions and good conditions of dispersion, there is not predicted additional impact on health of the working personnel. The personnel will be placed in camp with high level of comfort.

Directly detrimental effect on the population is practically ruled out, in view of absence of residential areas in the considered territory.

Construction of the new industrial projects, even small, gives new workplaces, improving social and economic condition of workers. The local population also is usually involved in work in sphere of service of the enterprise.

It is necessary to add, that the realization of construction and additional gas and gas condensate extraction in the republican scale is one of the actions for creation of a stable raw-materials base for population and industry providing with gas fuel and oil products in the planned volumes.

Realization of construction and the subsequent operation of designed constructions will cause some negative consequences: transfer of certain areas in temporary and constant use, risk of emergencies and the environmental contaminations connected with them.

Planned design decisions inseparably linked with performance of a complex of actions for environmental protection on the essentially new scientific and technical bases of designing, construction and operation.

Thus, the social and economic effect from project realization is obvious.

2 DESCRIPTION OF THE BASIC PROJECT DECISIONS

2.1 ENVIRONMENTAL LEGISLATION

The end of XX and the beginning of the XXI centuries is characterized by not only political integration of the various countries, but also formation of large transnational corporations. The purpose of this process was, in particular, deriving of the greatest economic benefits. The economic benefit of this process for the CIS countries is defined, first of all, by mobilization of large foreign investments into a national economy, equipment of manufacture by high technologies and creation of new workplaces. At the same time, the world community shows more and more anxiety in relation of environment fortune, and the firms using natural resources realize the responsibility for steady use and protection of natural resources.

Uzbekistan, developing communications with UNDP, UNEP, OSCE, World Bank, GEF and others, has practically joined to all Conventions in the sphere of environmental protection and carries out necessary actions for their realization.

With the assistance of experts from the interested ministries, departments, SRI, there has been developed National strategy for biodiversity preservation (approved by the country government in April, 1998). This document reflects a condition of bioresources of Uzbekistan, and Action Plan which is a part of National strategy, defines steps on performance of the accepted obligations.

Uzbekistan has signed the United Nations Convention on struggle against desertification in 1995. The national executive agency (Uzgidromet) in 1999 with the assistance of experts from the profile organizations under support of UNDP has organized design of the National program of actions on struggle against desertification. This program provides creation of the mechanism of working out of effective target programs and projects for convention performance.

There has been accepted the Kioto protocol in 1998 (ratified by Uzbekistan in 1999), defined ways of performance of the Framework convention of the United Nations on climate change by the international community. Uzgidromet is appointed as national executive agency. Necessity of observance of requirements of this Convention is explained by requirements of present Convention on struggle against global warming of Earth climate.

The government of the Republic of Uzbekistan since first days of formation has started to undertake considerable efforts in a direction of development of own nature conservation policy. In particular, there has been spent reorganization in the structure of the majority of the Ministries, especially great changes occurred in structure of the Ministries using and supervising use of natural resources. Among the fundamental laws regulating nature management in the Republic, the "Law of the Republic of Uzbekistan on nature conservation", passed on 9. December, 1992, establishing legal, economic and organizational bases of preservation of natural environment condition, rational use of natural resources.

Nature conservation in Uzbekistan is also regulated by the land, water, forest laws, Interior legislation (2002), on protection and use of atmospheric air (1996), of fauna (1997), and of flora (1998), on forest (1999), on the waste (2002), on protected natural territories (2005), etc. According to these laws, earth, interior, waters, fauna and flora, atmospheric air are subject to protection from pollution, contamination, damage, exhaustion, destruction, killing, irrational use. All nature users should consider necessity of natural resources reproduction, non-admission of harmful irreversible consequences for the natural environment and population health, provide publicity in the decision of nature conservation tasks and bear a liability of breach of the nature conservation legislation requirements. The state management of nature conservation is carried out by the Cabinet of Ministers of the Republic of Uzbekistan and State Committee of the Republic of Uzbekistan on natural conservation, by local organs of government.

In an aforesaid context there is integrally arising a necessity of carrying out of ecological monitoring of the natural environment for region of planned anthropogenic impact.

The estimation of ecological danger level of planned or carried out economic and other activity which can render or has negative impact on condition of natural environment, including flora and fauna, is spent according to the Law of the Republic of Uzbekistan “On ecological examination” (2000).

Thus, there is created in the republic the wide legislative base limiting the rights of nature users in the course of industrial activity and making the demands to them on environmental protection at modern level.

The primary goals facing to possible investors in the sphere of environmental protection are:

- provision with necessary permissible documentation in the sphere of environmental protection for realization of industrial-economic activities;
- control of observance of requirements of the nature conservation legislation of the Republic of Uzbekistan during designing, construction and operation of industrial objects;
- organization and realization of continuous ecological monitoring of environmental components condition;
- interaction with bodies of Goskompriroda of the Republic of Uzbekistan concerning environmental protection and rational use of natural resources;
- ensuring of radiation safety of the personnel and the population;
- planning and realization of technical-organizationalactions in the sphere of environmental protection and rational use of natural resources;
- supply of introduction and functioning of the environment Control System.

For the decision of these tasks it is necessary to provide working out and registration of permissions to emission (dump) of pollutants, placing of a waste, licences (for water use, waste handling, ensuring of radiation safety); realization of compensatory payments for environmental contamination; working out and the coordination with bodies of Goskompriroda of the Republic of Uzbekistan of standards and the regulations of the enterprise regulating conducting of industrial operations in the sphere of environmental protection, and also instructions and analytical techniques for the control of emissions, dumps, waste; examination of the construction documents on conformity to requirements of the legislation of the Republic of Uzbekistan in the sphere of environmental protection; organization of continuous ecological monitoring by forces of the specialized laboratories licensed and accredited according to requirements of the legislation of the Republic of Uzbekistan; training of the personnel to bases of ecological knowledge.

Thus, activity in the sphere of environmental protection should put as the primary goals the actualization of the necessary permissible documentation in the sphere of environmental protection, organization and realization of continuous ecological monitoring of environment components condition in the area of realization of industrial activity, to consider the most strict requirements of the international organizations, such as the World Bank, International financial corporation, European community, and also EP laws of the Republic of Uzbekistan.

2.2 PURPOSE, CHARACTER, CAPACITY AND STRUCTURE OF THE PRODUCTION

The project purpose is the concretization of the basic technical decisions on construction of Surgil GCF, main transport of field production to objects of gas and chemical processing.

The basis for working out are the decision of the President of the Republic of Uzbekistan №PP321 from April, 11. 2006 and the Memorandum of mutual understanding between "Uzbekneftegaz" NHC and Korean gas corporation from March, 29. 2006.

There are revealed in the Republic of Uzbekistan considerable reserves of the hydrocarbons which development is interfaced to certain difficulties (remoteness and the inaccessibility, raised content of hydrogen sulfide, etc.), that dictates necessity of cooperation with foreign investors for mobilization of high technologies and additional financial assets.

For the last years there is stored in the country the experience of construction of ecologically proved objects of oil and gas branch with participation of the foreign capital. There is created the favorable investment climate for mobilization of all forms of foreign investments.

Analyzed project of complex construction of Surgil field with valuable components retrieval is the confirmation of aforesaid.

Field capacity makes 3 billion m^3/year.

It is planned to equip 54 operational wells, 3 GGS, CGTU and also gas pipeline and condensate pipeline to constructions of gas and chemical complex with commercial account assembly. Personnel of Surgil CGTU will live in well-organized camp.

2.3 RATES OF THE SURGIL GCF DEVELOPMENT

Surgil gas condensate field is opened in 2002. industrial gas content is established by testing of the prospecting borehole 1-p.

The field represents two-dome brachyanticlinal of northwest strike. Fold dimension according to structure contour "-2875m": length – 21.0km, width – 7.0km at 150m height.

The terrigenous deposits of middle and upper Jura are the fluid-adjoining rocks in the natural tank on the field. There are allocated 16 productive geological units (5 layers of upper Jura and 11 layers of middle Jura, representing independent gas condensate deposits) on the field.

Operative industrial reserves of gas and condensate, accepted on balance as of 01.01.06 make (together with the North Aral area) more than 100 billion m^3 of dry gas.

Initial formation pressure in productive cross-section is varying (upwards) from 295kg/sm^2 to 195kg/sm^2. Formation temperature is varying from +95^{0}C to +78^{0}C.

On the average, potential content (g/m^3) of methane homologs in native gas through the field makes: ethane (C_2) – 54.0; propane (C_3) – 36.3; i butane (C_4) – 8.33; n butane (C_4) – 9.67; fractions C_3+C_4 – 54.33; $C_{5+higher}$ – 44.24.

Natural gases of Surgil field are carbonic-acid-hydrocarbonic, according to hydrocarbonic content light with the lowered content (moln) of carbonic gas – 0.79 % and nitrogen – 1.12 %, hydrogen sulfide is not found out. Content of methane – 90.2 %.

The fund of the drilled wells for 01.10.2006 includes:

- 4 operating (well 3, 4, 6. 10);
- 2 in capital repair (degreasing) (well 5. 8);
- 6 in conservation (well 1-p, 2-p, 9. 12. 13, 29);
- 3 in expectation of liquidation (7. 11. 14);
- 2 in test (well 16. 15);

besides, 4 wells are in drilling (well 17. 18. 19. 32);

Total: 21 wells.

Exploratory wells have the single-type light-weight design:

- 299mm surface casing, landing depth is 57-1650m;
- 219mm intermediate casing, landing depth is 1354-2802m;
- 140mm flow string, landing depth is 2323-3158m;

Proceeding from experience of fields development of Ustyurt region (Shakhpakhty, Urga, East Berdakh-Uchsay) in conditions of compound-formed sandy-argillaceous deposits of upper and middle Jura, the value of maximum permissible pressure for wells of Surgil field for period

OPO has been accepted equal to 30.0 kg/sm^2. In this connection, there are necessary the special researches on commissioning wells for establishment of actual permissible pressure on a layer. Necessity of the given recommendation is proved by results of spent special gas-hydrodynamic researches on East Berdakh field (well 6 and 7) – under pressure 7 kg/sm^2 there have been received water and rocks particles in the taken out production.

The forecast of the basic technological rates of Surgil field development is developed with observance of rules of interiors protection on annual extraction 3.0 billion m^3 (they are presented in the table).

Table 8 - Estimation of the basic technological rates of the development with annual gas extraction 3 billion m^3

2.4 WELLS AND TRAILS CONSTRUCTION

Composition and parameters of the native gas of Surgil field for choice of the gathering and treatment system are presented in the table.

Table 9 – Surgil field native gas composition

Name of rate	Value
Components volume fraction, %:	
CH_4	89.51
C_2H_6	4.563
C_3H_8	2.23
iC_4H_{10}	0.313
nC_4H_{10}	0.39
$C_5H_{12+higher.}$	0.99
H_2S	-
N_2	1.113
CO_2	0.89
Total	100
Density at 20°C and 760mm Hg, kg/m^3	0.791
Relative gas density by air	0.656
Content of $C_{5+higher.}$ molar fraction, % mass concentration, g/m^3	 0.99 46.77
Molecular weight $C_{5+higher.}$,	123.84
Content of C_3 molar fraction, % mass concentration, g/m^3	 2.23 40.3
Content of C_4 molar fraction, % mass concentration, g/m^3	 0.703 18.55

Proceeding from mining and geological conditions of Ustyurt region fields, from character of possible complications and experience of wells drilling, the following design of new wells is recommended:

- cellar pit by 426mm diameter lower on 7m depth.
- surface casing by 299mm diameter lower on 150m depth for the purpose of overlapping of sloughing and collapsed rocks in the top part of the wells cross-section.
- intermediate column by 219mm diameter lower on 1900m depth proceeding from a condition of prevention of hydro break of rocks during emergency gas flowing from productive horizon.

- flow string by 140mm diameter lower on design depth for the purpose of full opening of productive horizons with deepening on 20m lower and their development in stand of pipes.

There are made special demands for design of gas wells. Wells should be airtight, durable, reliable in operation, inexpensive.

Gas condensate wells are equipped by the special underground and ground equipment.

Purpose of the underground equipment:

- not to allow destruction of critical area of formation;
- to protect flow strings and pump-compressor pipes and other equipment from corrosion and erosion;
- to prevent formation of hydrate blocks in a borehole;
- not to allow open well flowing by overlapping of gas stream on a bottomhole;
- to provide supplying on a bottomhole and borehole of the corrosion inhibitors and hydrate inhibitors, and also a liquid mud during killing of well;
- to provide work on increase of wells productivity;
- to lower inundation rate and to isolate watering interlayers;
- to provide liquid and firm particles removal from the bottomhole;
- to provide possibility of carrying out research and repair works.

The land equipment is intended for:

- hermetic sealing of hole annulus of well;
- regulations and control of gas streams;
- regulations of well rate of yield and maintenance of the operation set mode;
- start-up, shutdown and killing of well;
- supply of the corrosion inhibitors and hydrate inhibitors on bottomhole and in borehole;
- control of wellhead pressure and temperature;
- carrying out research and repair works, including works on increase of wells productivity.

There is install the casing head OKK-2-350-299-214-140 type on the wellhead which binding and sealing all well strings. Wellhead is equipped with control equipment (casing head and Christmas tree) of cross-shaped type AFK 3-65x350 for 350 atmospheres which binding and sealing tube and tubing space of the well flow string.

Connections of assembly of control equipment are flange. The control equipment is completed by straight-through type slide valves with consolidation “metal to metal” with positive or automatic greasing feed.

The site of 0.36 hectares, on which there is arranged dike by 0.8m height with two entrances from opposite sides is set aside for well. There are equipped working station, station for the unit-lift and platform under legs of the lift rig, and also 4 concrete anchors for rig guy on the wellhead. The well is equipped with a torch for a periodic well blowing-out. Thus, if necessary it is possible to make repair works on wells, works on increase of wells productivity.

Technological decisions for natural gas gathering and field processing systems are the basis of the field construction project.

Gathering of wells production of Surgil field in volume $3.0 \cdot 10^9$ m^3 per year is offered to carry out on three gathering stations (GGS) located in the field area. Then, gas from GGS and from 7 wells to GS, transfers through three collectors to Surgil CGTU for treatment (Figure 2).

Preliminary hydraulic calculation of loops is executed on wells average rate of yield $280.1 \cdot 10^3$ m3/days. Gas pressure and temperature in the beginning of wells loops make 8.45MPa and 50°C relatively. Maximum length of loop of one well is 2km. Quantity of production wells - 54.

According to results of hydraulic calculation pressure loss make 0.65MPa if the pipe diameter is 108x6mm and maximum length of loop is 2km.

The control of wells operation is made by means of periodic measurement of the rate of yield of oil-gas condensate mix, amount of taken out liquid hydrocarbons (oil plus gas condensate) and formation water, with application of mobile measurement installation.

There are equipped 54 wells for extraction of 3 billion cubic m per year (there is also considered the variant of 36 wells for 2 milliard extraction).

<u>Loops </u>– 54 wells

Pressure – 10.78MPa

Diameter – 108mm.

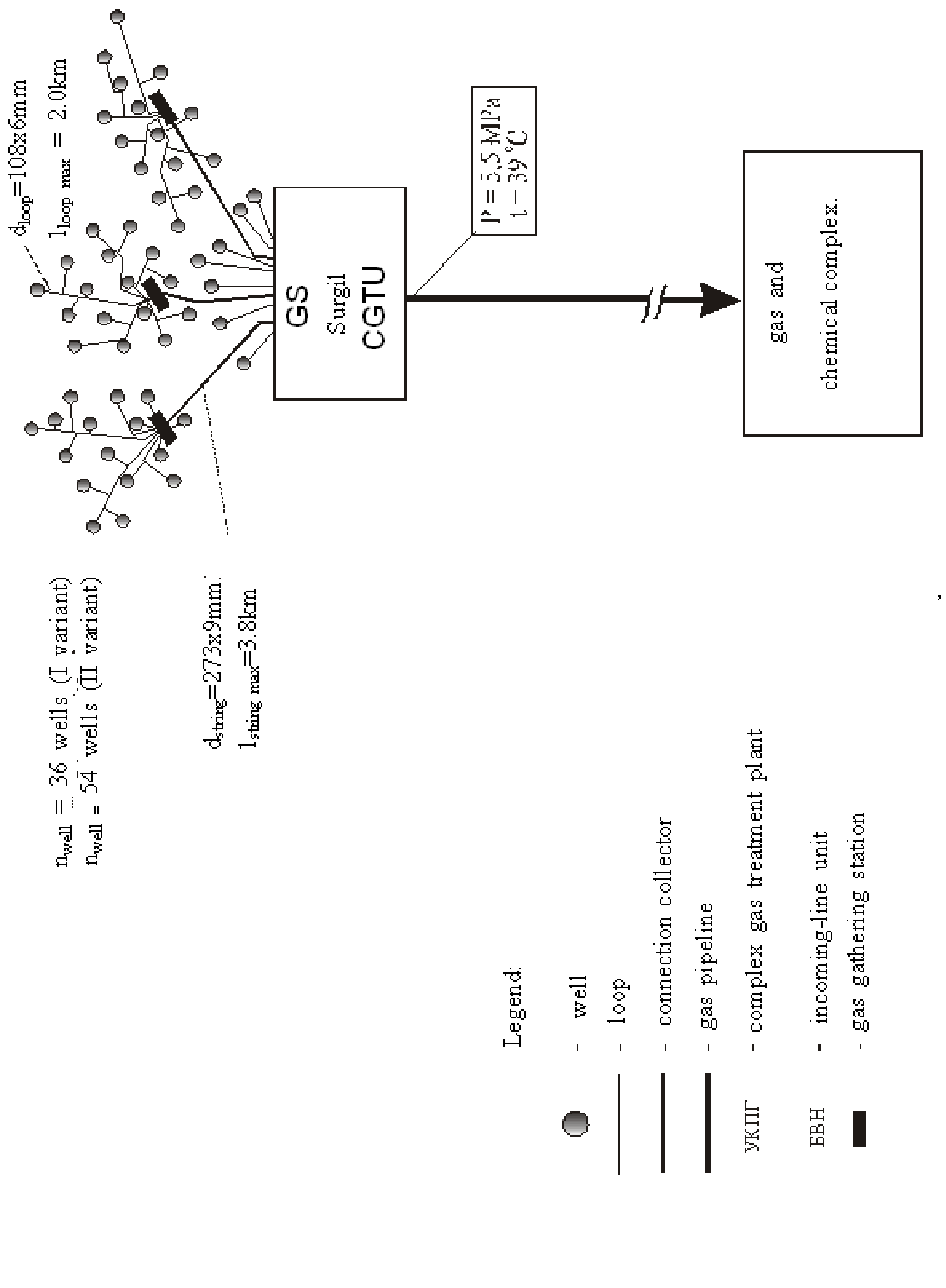

Figure 2 - Schematic diagram of the gas gathering, treatment and transport of the Surgil field

Length is 108km.

On all loops at the distance of 14-15m from wellhead there are arranged "П" shaped compensators for thermal-changes compensation of laid length. Loops are laid into ground with deepening 1m to the top of forming pipe and covered by anticorrosive isolation.

At this stage, the land resources (temporary and constant allotment of lands under construction), atmospheric air - from burning of technologically necessary emissions on wells flares are the objects of impact. Underground waters will not undergo specific changes.

2.5 GAS GATHERING STATIONS (GGS) AND COLLECTORS PROJECT

By all variants of PFS there are provided gas gathering stations in number of three pieces. Difference by variants is the quantity of input loops to gas gathering stations. There is also provided incoming-line unit for seven wells and three collectors from gas gathering stations in the CGTU area by all variants.

GGS-1. 2 and 3 (figure 3 and 4) are consists of following constructions:

- incoming-line unit (GS);
- platform for torch farm;
- drainage tank for torch farm.

There is provided on GGS:

- purging of loops on torch;
- protection of loops from pressure excess.

The incoming on GS of GGS loops from wells are equipped by safety valves for protection of loops from pressure excess (safety valves of Drain Safety Spring Valve type through T-valve are binding on a torch). By means of tap valves each loop is binding on a torch for purge execution during liquid gathering. Besides, there are installed disconnecting tap valves, adjustable choke, and float valve on a loop.

GGS territory is fenced; the torch platform also has the fence and is taken out on 100m.

Preliminary hydraulic calculation of connecting collectors of GGS – Surgil CGTU is executed for productivity $2.518 \cdot 10^6$ m3/days. Maximum collector length is 3.8km. Gas pressure and temperature in the beginning of collector make 7.8MPa and 45^0C relatively.

Figure 3 – GGS 1 and GGS 2 area

Figure 4 – GGS 3 area

According to results of hydraulic calculation, if the pipe diameter is 273x9mm and the collector maximum length is 3.8km, so the pressure loss makes 0.56MPa. Gas pressure and temperature at input in GS will make 7.24MPa and 39^0C relatively.

Gas collector

Pressure – 10.78MPa

Diameter – 273mm

Length – 3.8km (each)

At the given stage the anthropogenic impact will be expressed in use of the lands under construction of GGS and gas-field gathering mains, and also in emissions of gas combustion products in atmosphere on torches during purging of collectors sites (periodic and short-term).

2.6 Complex Gas Treatment Unit (CGTU)

For gas transportation through the main gas pipelines there are necessary careful clearing and dewatering of gas from solid impurities, aggressive components and moisture as they promote quick deterioration of the expensive equipment and cause disturbances in the conditions of normal operation.

It is offered to carry out gas treatment on CGTU located on the field area, by method of low-temperature separations (LTS) with gas cooling at the expense of its expansion in turbo-expander.

Treatment of the hydrocarbonic condensate allocated during gas separation on the LTS plant, is offered to make by open system of condensate gathering. Condensate is exposed to step aeration (separation, degassing) on the condensate separation and aeration plant. Gas condensate completely disappears under atmospheric pressure, and represents a stable condensate by saturated vapors pressure.

Prevention of hydrate formation in the LTS plants is carried out by input of hydrate inhibitor into gas stream through sprayer directed towards gas flow for the best inhibitor dispersion in the gas stream and maintenance of its contact with water. It is offered to use diethyleneglycol (DEG) as anti-hydrate inhibitor on the CGTU.

Production which is produced on the CGTU will be nonsulfurous dry combustible natural gas meeting on quality requirements of state standard Oz'DSt 948:1999 and stable gas condensate, meeting requirements of standard TSt 39.0-02:2004.

CGTU productivity is defined proceeding from conditions of gas extraction from the field by years (including the term of attainment of constant extraction and the period of constant extraction) taking into account necessary requirements for reservation of equipment capacity.

Design productivity of CGTU makes $3.0{\cdot}10^9$ m^3 per year. Productivity of one technological line of LTS for gas is $3.0{\cdot}10^6$ m^3/day. Plant inlet pressure is 7.24MPa, temperature is 39°C. Gas moisture content gas is 5.36 g/m^3, the initial potential content of condensate in the formation gas is 46.77g/m^3.

Carried out calculations of low-temperature gas separation process shows, that for the gas treatment of Surgil field in volume $3.0 \cdot 10^9$ m^3 per year with the regulated quality there is required construction of three identical technological lines of LTS by productivity of each $3.0 \cdot 10^6$ m^3/day.

During supply of unstrapped gas from the field to one technological line of LTS in volume 125901 m3/hour, there will be extracting 123384 m3/hour of the stripped and dry gas and 4322 kg/hour of the stable condensate.

For stable condensate storing it is necessary to provide condensate park on the CGTU proceeding from volumes of its extraction 311.2 t per day.

It is also necessary to provide a reserve technological line.

CGTU consist of the following constructions (figure 5):

- incoming-line unit;
- low-temperature gas separation plant (with turbo-expander);
- DEG fire regeneration;
- condensate separation and aeration plant;
- assembly of self-supporting gas measuring (with reduction assembly);
- technological pumphouse of condensate;
- DEG warehouse;
- torch separator platform;
- drainage tank for DEG V=25m^3;
- drainage tank for condensate V=63m^3;
- area for torch farm;
- condensate warehouse;
- compressor house of compressed air;
- condensate loading platform;
- drainage tank of torch farm V=16m^3

Figure 5 – CGTU area

There are passes 7 loops to the incoming-line unit of Surgil CGTU from wells and three collectors from gas gathering stations. There is provided protection of loops from pressure excess (Drain Safety Spring Valve plant) and purging of loops and collectors on a torch.

Humid natural gas from GS is distributed through technological lines of LTS plant and come into separator of first step S-101 where at the expense of centrifugal forces the great bulk of liquid and mechanical impurities are separated from gas (figure 6).

After separator S-101 unstripped gas turned to tube space of recuperative heat exchanger T-101 where it is cooled by upstream of the treated gas.

From heat exchanger T-101 unstripped gas come into separator of second step S-102 for separation of the liquid phase allocated during gas cooling in heat exchanger T-101/1. 2.

After separator S-102 unstripped gas turned to tube space of the second recuperative heat exchanger T-102 where it is cooled by cold upstream of the treated gas.

There feeding RDEG by 80% of mass concentration in each section of heat exchanger T-102 for prevention of hydrate formation in humid natural gas stream.

From heat exchanger T-102 gas come into separator S-0 for separation of the liquid phase allocated during gas cooling in heat exchanger T-102. and prevention of dropping liquid ingress in turbo-expander.

After separator S-0 unstripped gas turned to turbo-expander where gas is expand up to pressure 5.0MPa. Thus, the temperature of treated gas drops to minus 10^0C.

There feeding RDEG by 80% of mass concentration on input of turbo-expander for prevention of hydrate formation in humid natural gas stream.

Cooled gas-liquid stream come into low-temperature separator of third step S-103 where gas is separated from waterlogged DEG and from hydrocarbonic condensate.

Stripped and dry gas from separator C-103 consistently passes hole annulus of recuperative heat exchangers T-102 and T-101. heats up in them by direct gas stream. Then, gas come into turbo compressor, located on one shaft with turbo-expander where compressed up to pressure 5.5MPa and through measuring assemble is transported to gas pipeline.

The assembly of self-supporting gas measuring is intended for the commercial account of the dry gas supplied to the main gas pipeline. There is also provided gas fuel reduction in the given area for maintenance of the fire regenerator, torch, boiler house (auxiliary).

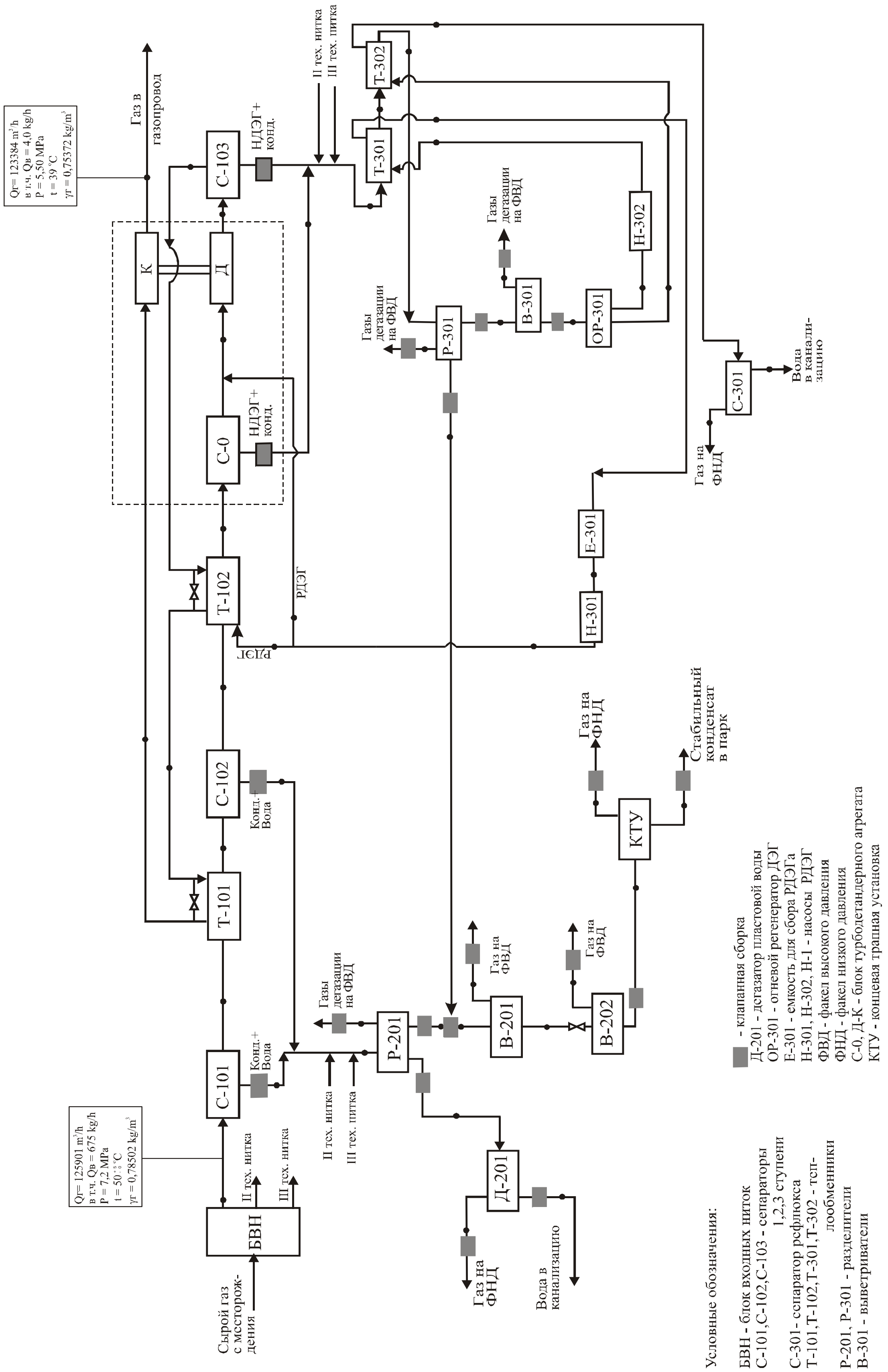

Figure 6 – Schematic flow diagram of Surgil field gas treatment on Surgil CGTU

There are installed three tanks of $25m^3$ in the DEG warehouse for storage fresh DEG. There is installed on the given area the device for fresh DEG drain, the pump which provides loading in tanks, inter-tank swapping and fresh DEG supply for feed in the fire regenerator on the platform of DEG fire regeneration.

Condensate farm. Condensate tank farm is intended for storage of three-day reserve of the ventilated condensate. It consists from 100m3 tanks which quantity depends on variants of the field development. From the separation area the condensate come into condensate tank farm, then the condensate come on the loading platform where by means of measuring complexes KM 100-80-170 there is carried out the condensate account and loading in tank lorries for the further transportation. This cycle is carried out in the case of condensate line of unstable condensate is failure or in the case of impossibility of reception of unstable condensate at the gas and chemical complex. For swapping of unstable condensate through condensate line there are provided three multiphase pumps according to the second variant. Also, according to all variants, there is provided one three-piston crank-type electric motor hydraulic pump package for inter-tank swapping.

Compressor house of compressed air provides the devices of CEA and also multipurpose valves of whole complex CGTU with compressed air.

Torch system. The torch is provided with gas fuel from the measuring and reduction platform. The structure of torch farm includes drainage tank for condensed liquid gathering. There are dumped for popping the gases of purging from loops, devices, and also emergency dumping from safety valves and gases of constant aeration from devices. There is provided the torch separators for steady work of torch system, in which the liquid is separated from dumped gases on the torch.

The territory of CGTU area is protected throughout perimeter by metal mesh fencing. Total height of the fence makes 2.5m (height of the panel is 2.0 m. plus head from barbed wire 0.5m).

At the given stage impact on environment consists in withdrawal of the land resources for long-term using, in certain atmospheric air pollution from operating torches, decontaminators, heaters, boiler house, pump houses and tanks for condensate, and also consumption of water resources for industrial and household purposes. In the course of construction impact from the working equipment will be short-term.

2.7 GAS AND CONDENSATE TRANSPORT

In the performance specification for development PFS "Surgil field complex construction with valuable components retrieval", in Section II "Gas and chemical complex construction" there is provided GCC location by one of the variants, in the Akchalak settlement area of Kungrad region. This variant is optimum (figure 7).

Treated and dry gas in volume $3.0 \cdot 10^9$ m^3 per year and a stable condensate in volume $140 \cdot 10^3$ t per year from Surgil CGTU turned for processing to GCC, located in the area of Akchalak settlement.

Preliminary hydraulic calculation of gas pipeline Surgil CGTU -Akchalak GCC is executed for productivity $9.09 \cdot 10^6$ m3/day. Gas pressure and temperature in the beginning of gas pipeline make 5.5MPa and 39^0C relatively. Gas pipeline length is 115.0km.

According to results of hydraulic calculation, if the diameter of gas pipeline is 820x19mm, so gas pressure and temperature on input Akchalak GCC will make 4.7MPa and 25.9^0C.

Condensate line length is 115.0km. Condensate pressure and temperature in the beginning of condensate line make 1.6MPa and 25^0C relatively. According to results of preliminary hydraulic calculation, if the diameter of condensate line is 219x11mm, so the condensate pressure and temperature on input Akchalak GCC will make 1.2MPa and 25^0C.

Gas pipeline

Pressure – 5.4MPa

Diameter - 820mm

Length - 115km

Condensate line

Pressure – 4.5MPa

Diameter - 219mm

Length - 115km

Surgil field is in the territory of Muynak area of the Republic of Karakalpakstan.

The district of pipeline routes passage represents the fixed sands.

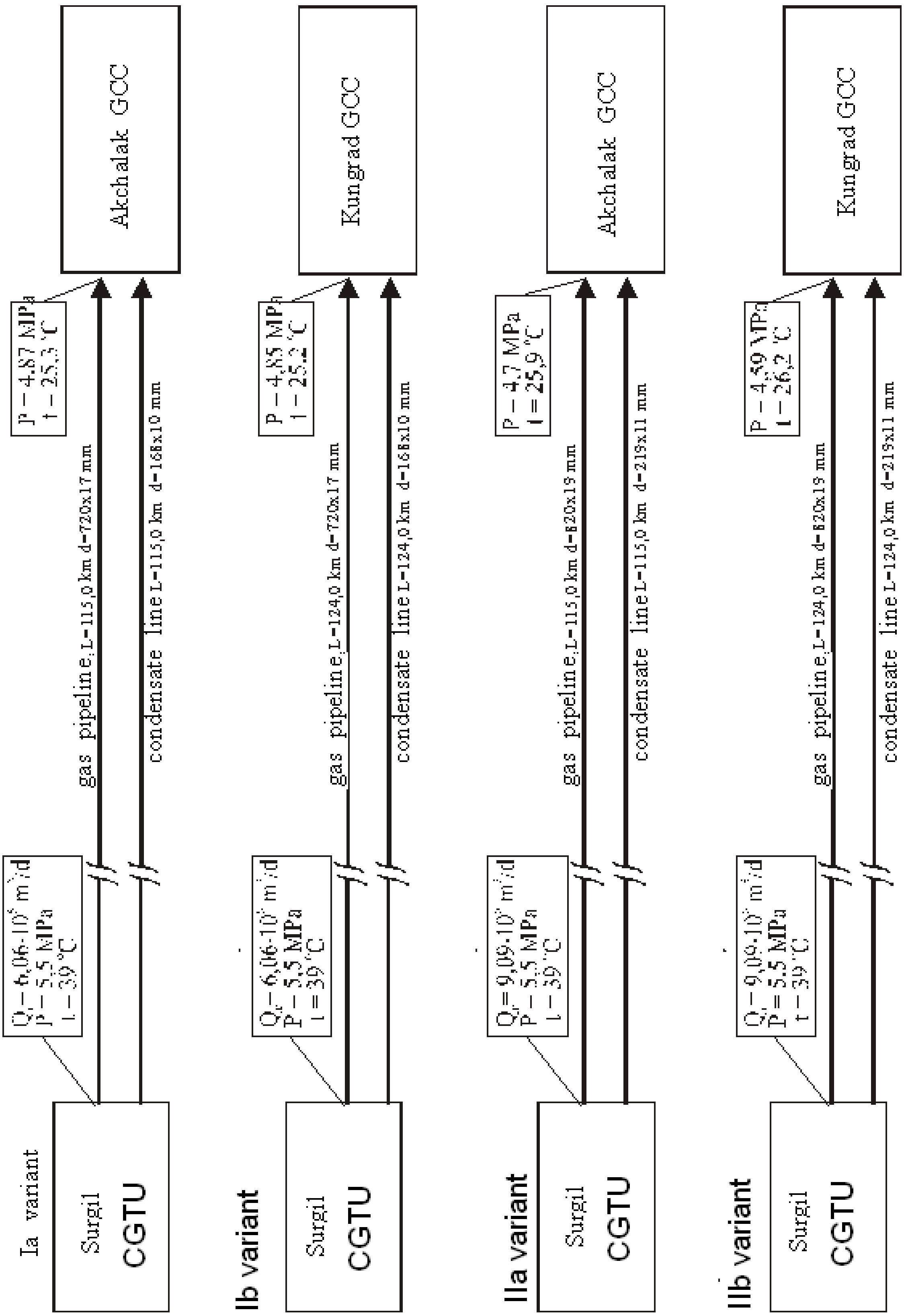

Figure 7 –Schematic flow diagram of Surgil CGTU finished products transport

Area of CGTU of Surgil field is the beginning of gas pipeline and condensate line route with the route general direction to the southwest. Gas and chemical complex (GCC) is the pipeline route end.

The pipeline route goes from CGTU area to 21km in southern direction to existing gas pipeline East Berdakh-Bukhara-Ural (26km) and then goes across at the distance not less than 23m, then on 58km crosses one line of Bukhara-Ural gas pipeline, turns to the south and then goes across to the existing Bukhara-Ural gas pipeline by diameter 1020 at the distance not less than 28m. On 86km the pipeline route crosses Bukhara-Ural gas pipeline by diameter 1020. on 98km crosspiece by diameter 1020 between Bukhara-Ural gas pipeline and CAC and goes to GCC to Akchalak region.

Pipeline routes cross dirt roads only. The barchan, eolian sands take part in the lithologically structure of the pipeline routes.

The project provides subsurface pipelining, whenever possible across to the lay of land. Minimum depth of pipelines is 1.0m.

Turns of pipelines in horizontal and vertical plane are carried out by radius of free bending (ρ - according to diameters), branch pipes of cold flexure R-15-35m in accordance with GOST 24950-81.

There are recommended pipes for construction of pipelines:

- diameter 820. 720 TR 14-3-1573-99 Art. 17G1S-U - longitudinal pipes, produced by “Vyksun metallurgical works”;
- pipes should be delivered with factory isolation of the strengthened type except for pipes of connection of tap valve assembly and for making of bent branch;
- diameter 108. 273 TR 14-3-1128-2000 Art. 20 – steel pipes, seamless from rolled and forged blank;
- diameter 168. 219 for condensate line in accordance with GOST 8732-78 with hydro-test B 20 GOST 8731-74. Thickness of pipes wall is listed in table 1 by diameter

There is provided installation of following mounting assembly in the project:

On the gas pipeline:

- guard tap valve of CGTU and GCC with two-way purging at the distance of 500m from areas;
- linear tap valves installed after 25-30km;
- treatment piston launching assembly in the pipeline route beginning;
- treatment piston receiver assembly in the pipeline route end.

On the condensate line:

- guard gate valves of CGTU and CGG at the distance of 100-300m from areas;

- gate valves installed after 10km.

There are accepted by the project pipes with factory three-layer isolation of the strengthened type for protection of the gas pipeline from soil corrosion.

At non-delivery of pipes with factory isolation and for isolation of gas pipelines - loops, gas collectors it is possible to apply a polymeric tape made in USA "Polycen 980-25" with wrapper "Polycen 955-25" by primer "Polycen 919 S".

It is possible to apply other tapes which provide gas transport with temperature 55-40°C.

Isolation and wrapper by thickness of 0.63mm applied in 1 layer provide the strengthened type.

There is provided protection of isolation from damages by soft ground during pipeline route passage in grounds of V group.

Electrochemical protection should be constructed simultaneously with pipelines construction.

The cavity of pipelines before test should be cleared of cinder, dirt and casually got in a pipe during construction of ground, water and other subjects. After carrying out of pipelines clearing there is conducted its test by hydraulic method.

Durability check is made for pressure 1.1Pwork but no more the test pressure guaranteed by factory.

Air-tightness test is made for pressure equal to working pressure in pipelines.

Besides, the sites of I category should be tested in 2 stages:

I stage – value of test pressure is accepted according to BCH 011-88

II stage - simultaneously with all pipeline.

The basic anthropogenic impact during construction will be experienced by soils and grounds in zone of temporary allotment of lands, upon completion of construction the soils along pipeline route completely reclamates and become suitable for further use.

Atmospheric air will experienced some impact from working special equipment and motor transport, however, this impact is short-term and small. There are not present surface water sources in the considered region and there are not found out underground waters up to 3m depth.

There are designed assembly of reception and launching of treatment facilities for clearing of internal cavity of the gas pipeline during operation.

2.8 BRIEF CHARACTERISTIC OF THE PR AND PL

During gas pipeline operation there is possible pollution of its internal surface by condensate, water and mechanical impurities that leads to increase of hydraulic resistance coefficient and accordingly to gas pipeline capacity reduction.

Designed gas pipeline has the sizes 820x19mm. According to BCH 2. on the pipelines with passage diameter more than 200mm, demanding periodic clearing by means of pistons or balls, there should be provided assembly of launching and reception of treatment and separation facilities which construction and arrangement is defined by the project. Also, there can be made gas pipeline inhibition through these assemblies.

Gas pipeline piston reception and launching assemblies are intended for removal of purging of cavity of gas pipeline site, as a rule, without termination of gas transportation.

There is used swabbing method in the considered project for clearing of gas pipeline internal surface. Clearing of internal cavity is made as a result of movement of the treatment piston which collects various pollutions before itself.

Slime and condensate are loaded into tankers and are taken out: condensate to GCC, slime to specially allotted places.

Assemblies of reception and launching of natural gas pipelines treatment facilities should be equipped by the devices registering passage of treatment facilities.

Piston reception assembly is located on the area by size of 0.32 hectares; piston launching assembly has area of 0.09 hectares within fence. Torch by Ø200mm and height 35m is took from PL basic area at 100m and has own fence by radius of 50m (0.79 hectares). It will be occupied in total about 1.3 hectares of lands under long-term using.

Assemblies of launching and reception of treatment facilities are sources of atmospheric pollution, though they are short-term. PR is also a source of waste formation.

Thus, realization of the design plan will be inevitable accompanied by waste formation of different aggregative state; however, their environmental impact will be rather insignificant.

It will be withdrawn a plot of land for long-term using under piston reception and launching assemblies and torch farm. Underground waters are deeply bedded and will not experienced impact from construction and operation.

2.9 INFRASTRUCTURE OBJECTS

Power supply and electrochemical protection

Technological process on Surgil CGTU is continuous. According to RD 51-122-87 and PUE-86g, collectors of CGTU by degree of power supply reliability concern to I category consumers.

Total loads according to the executed calculations make:

Table 10 - Design loads

Name	Installed capacity, kV	Design capacity, kV	Annual electric power consumption thous.kV.h.
CGTU primary function zone	256.66	188.56	859.376
CGTU secondary function zone	165.75	116.37	367.17
ECCP GGS -1. 2. 3	45	45	394.2
ECCP of wells loops	144	144	1261.44
Pump station over artesian well	22	13.64	143.00
Total	**633.41**	**507.57**	**3025.186**

Because of absence in the region of CGTU area construction of reliable source for power supply of CGTU, ECCP consumers, there is provided installation of own source of power supply on the area - gas-piston power stations of PG475B mark, made by FG Wilson company, by capacity of 380kW in number of 3 sets.

For power supply of pump station over artesian wells there is provided by the project the installation of packaged switchyard MKTP-63/10/0.4U1 with transformer by capacity 63kVA on each well. External power supply is feed from OTL 10kV of ECCP gas pipeline and condensate line of Surgil CGTU– Akchalak GCC.

The main consumers of the electric power of CGTU area are: motors of technological installations (pumps, fans, electric gate valves of pipelines); CEA devices; electric lighting installations. Motors are, basically, asynchronous, with a short-circuited rotor for voltage 380V AC. They are completed on the basis of required power of mechanisms. Motors version is accepted depending on environment of premises and external installations (in the normal, protected and explosion-proof versions).

Voltage of the power electric equipment network is 380/220V. Voltage of lighting network is 220V.

It is provided by the project following types of lightning: exterior lighting of territory, interior - working, emergency and repair lightning. Lamps voltage ~220V, repair ~36V.

Exterior lighting is provided to execute by lamps RKU-01-250 with mercury lamps DRL-250 installed on ferroconcrete support at height of 8m.

Lighting of technological areas is executed by searchlights PZS-45 with glow lamps, installed on searchlight towers at height of 22m. Local lighting of technological areas is executed by explosion-proof lamps with glow lamps, installed on the fence railings and on the floorstanders.

It is provided control box in the control post for remote control of exterior lighting. The control of lamps in premises is carried out by switches in a place.

It is provided by the project following actions of electrical safety:

- electrical equipment earthing at all steps of voltage according to PUE requirements;
- lightning protection, earthing, explosive zones protection protection according to RD 34.21.122-87;
- choice of electrical equipment and electric wirings according to the environment.

This project of Surgil GCF construction for gas production of 3 billion cubic m per year provides electrochemical protection of the following constructions:

- 54 wells, loops by diameter of 108x6mm, by length of 108km;
- equipment of GGS -1. GGS -2. GGS -3 areas;
- gas reservoir of GGS -1 - CGTU, GGS -2 - CGTU, GGS -3 - CGTU, by diameter of 273x9mm, by total length of 11.4km;
- equipment of CGTUarea;
- Surgil CGTU– Akchalak GCC gas pipeline by diameter of 820x9mm, by length of 115km;
- Surgil CGTU– Akchalak GCC condensate line by diameter of 168x6mm, by length of 115km.

The connection scheme of electrochemical protection provides joint and separate protection. Electrochemical protection is carried out by installation of the switchgears of cathodic protection UKZV, UKZN type and subsurface anode earthing devices from steel pipes by diameter of 219x8mm, by length of 75 and 100 meters.

Power supply of buildings and constructions of the camp is provided from the en-block diesel generator on gas fuel.

Design capacity makes 290kV.

Lighting of camp territory to execute by the lamps of RKU-01-250 type, installed on f/c supports of exterior lighting.

Installed, design capacities and annual electric power consumption of the ECCP means are listed in the table 11:

Table 11 - Annual electric power consumption of the ECCP means

Name	Installed capacity, kV	Design capacity, kV	Annual electric power consumption thous.kV.h.
ECCP GGS -1. 2. 3	45	45	394.2
ECCP of wells loops	144	144	1261.44
ECCP of Surgil CGTU–Akchalak GCC gas pipeline and condensate line	80	80	700.80

Total length of TL 10kV makes:

- for power supply of ECCP means, loops of wells, GGS -1. 2. 3 – 108km;
- for power supply of ECCP means of Surgil CGTU– Akchalak GCC gas pipeline, condensate line – 115km;

It is necessary to note, that device of electrochemical protection from gas pipeline corrosion is one of effective nature-conservative measures at minimum impact on soils and grounds.

ECCP allows to considerably reducing the danger of corrosion destruction of gas pipelines and, therefore, emissions of hydrocarbons in atmospheric air.

Water supply and sewerage, firefighting

Water supply and sewerage technical decisions are directed to providing of projectable manufacture with water taking into account its specificity.

Area water supply for industrial and fire-prevention needs is carried out by pump stations with pumps ESV 8-40-90M, installed over artesian wells of process water - 2pcs. (1 development and 1 reserved) through water conduit L = km (2 lines).

External firefighting is carried out from fire hydrants and wedge tubes with protective screen, installed on the loop network of fireproof water-supply line. Special requirements to water quality for firefighting are not demand.

For clearing and disinfecting of incoming water from wells, for needs of household water supply it is provided water treatment installation EDU-2.5 TR-001-53805413-08 – factory-made packaged installation. Water treatment is carried out to quality – potable water O'zDSt 950:2000.

There are designed following systems of water supply on the CGTUarea:

- household;
- fireproof;
- industrial;
- feeding water-supply line.

There are designed following constructions for needs of firefighting:

- pump station of industrial-fire-prevention purpose;
- tanks of industrial-fire-prevention water-supply W = 300m^3 (2pcs.);
- a premise for monoblock pump with the frothing agent tanks placed in it, monoblock pump MM-27/100 and the dry powder fire extinguisher.

Water-supply for firefighting makes 566m^3. Taking into account a water-supply for industrial needs and area seismicity there are accepted two tanks W = 300m^3 for installation by t.r.901-4-78p.84.

Firefighting pump station is intended for water delivery from water-supply tanks in the network of fireproof water-supply line.

Feeding water-supply line is intended for water delivery in tanks of industrial-fire-prevention purpose. Feeding water-supply line is designed from pipes PE63 SDR17.6-110x6.3 in accordance with GOST 18599-01 (two lines) and is installed on 1.2m depth from planned earth marks (2 lines).

There is provided flow record device in each pump house over artesian well.

The system of industrial water-supply line is intended for washing of processing facilities. The network is made from steel electric-welded pipes in accordance with GOST 10704-91 by diameter 57x3.5mm with the reinforced anticorrosive isolation and installed on 1.2m depth from planned earth marks. There are provided watering taps on the network by diameter of 50mm.

System of fireproof water-supply line is designed in form of ring. There are installed fire hydrants and wedge tubes on the network. Arrangement of the fire hydrants should provide extinguishing of any buildings and constructions point by two streams.

There is installed manually operated gate valve in the well of the branch from water supply system to wedge tube, which hand wheel is taken out manhole cover. It is installed outlet valve in front of gate valve for bleeding of dry piped site after a fire.

Cooling of tanks during fire is made by the fire-hose barrels attached by fire hoses to fire hydrants on the network of fireproof water-supply line.

The network is made from steel electrical-welded pipes in accordance with GOST 10704-91 by diameter 159x4.5 and 108x4mm with the reinforced anticorrosive isolation and installed on 1.2m depth from planned earth marks.

There are installed wet wells for the direct withdrawal of mobile technics near to industrial-fire-prevention tanks.

Sewerage. Industrial flows from equipment washing (1-2 times a year) by gravity flow are going into treatment facilities of industrial sewage waters and after corresponding clearing in tank of industrial-rainfall run-offs. (EP 12.5-200-1-1 with pump HB 50/50) and then are pumped over on ponds-evaporators.

There are provided wells with hydraulic lock in a view of fire safety on outlets from technological areas.

The industrial-rain sewerage is made from steel electrical-welded pipes in accordance with GOST 10704-91 by diameter 219x4.5mm with the reinforced anticorrosive isolation.

Discharge of household flows is carried out in cesspool with the subsequent transportation in places coordinated with SES. Network of the household sewerage is designed from ceramic sewer pipes by diameter of 150mm in accordance with GOST 286-82.

In camp the water is supplied for household and fire-prevention needs.

For household needs the water is supplied through pipeline by diameter of 57x3.5mm, L=500m, from water treatment installation of CGTU area.

Intra-areas networks of household water-supply line are designed from steel electrical-welded pipes GOST 10704-91 D57x3.5; D25mm with the reinforced anticorrosive isolation.

For fire-prevention needs the water is supplied through pipeline D108x4mm, L = 500m (two lines), from fire-control system of CGTU area.

Firefighting is carried out from fire hydrants installed on the loop network of fireproof water-supply line.

Intra-areas networks of fireproof water-supply line are designed from steel electrical-welded pipes GOST 10704-91 D108x4mm with the reinforced anticorrosive isolation.

Household flows are going into sewage pump station through gravity sewerage and then into treatment facilities of household flows. Treated household flows are pumped over by pump station on ponds-evaporators of CGTU area through pipeline D89x4.5 GOST-91 L=700m with the reinforced anticorrosive isolation.

Gravity network is designed from ceramic pipes D150 in accordance with GOST 286-82.

Internal networks of household water-supply line are designed from steel galvanized water-gas pipes D15-32mm GOST 3262-75 with painting by oil paint for 2 times in accordance with GOST 8292-85.

There are provided electrical water heaters for hot water preparation.

Table 12

Heating and ventilation

Heat supply of buildings and constructions of Surgil CGTU is provides from designed own boiler house.

Table 13 - Heat consumption

Rated conditions	Heat productivity of boiler house mw (gcal/h)				Installed capacity E/m.kW
	Heat consumption for heating and ventilation	Heat consumption for hot water supply	Heat consumption for technological needs	Total heat consumption	
Maximum-winter condition	0.0883 (0.076)	-	0.349 (0.301)	0.4373 (0.377)	
Condition of coldest month	0.0574 (0.0494)	-	0.349 (0.301)	0.4064 (0.3504)	11.2
Summer condition	-	-	-	-	

Taking into account losses (K=1.1) total heat requirement will make QTOTAL=0.3770 gcal/hx1.1 = 0.41gcal/h.

Proceeding from the above-stated heat loads, there is accepted for installation the modular transportable automated boiler house KBTA – 0.5 GH with two hot-water boilers by capacity 0.25 MW each. Total installed capacity of the boiler house will make 0.43gcal/h.

Hot water with parameters T=95-70°C serves as heat carrier for heating and ventilation systems.

There is accepted tank V=5m3 for water reserve. There is provided raw water softening in water preparation installations on constant magnets UVPM-1.

As fuel for boilers is accepted natural gas of low pressure. Gas supplied from fuel gas reduction assembly of Surgil **CGTU**. Gas hourly consumption for boiler house BH=56m3/h. Annual consumption is equal BH=234534m^3.

As source of heat supply of camp buildings and constructions serve individual gas heating water-heating modules of “VITOPEND-100” type, provided with the built-in circulating pumps and heating gas devices of AOGV type. The heat-carrier - water with parameters T=95-70°C.

Heating systems of CGTU buildings and constructions are accepted horizontal flow with passing movement of the heat carrier. There are accepted cast-iron radiators of MC-140-108 type and registers from smooth pipes as heaters.

Heating systems of camp office building and dining room are double-piped dead-ended with overhead distribution of supply mains. Heating system of hostel is single-pipe dead-end with overhead distribution of supply mains. There are accepted cast-iron radiators of MC-140-108 type as heaters.

It is accepted electrical heating in premise for monoblock pump and pump house of household purpose. There are accepted electrical oil-filled radiators with manual temperature regulation of ERMPB-1.0/220 N=1.0kV type as heaters.

There is provided supply-and-exhaust ventilation with mechanical and natural movement in the main premises of the designed buildings and constructions. Incoming air volume in premises is defined from provision of assimilation of heat-excesses, dissolution of harmful substances to permissible concentrations and observance of sanitary norms for fresh air.

It is provided supply-and-exhaust ventilation with natural movement in the camp office building, premise for monoblock pump and pump house of household purpose. Free air intake is unorganized, through leakage of windows and doors. There is provided supply-and-exhaust ventilation both natural and mechanical movement in the dining room. Air exchange is calculated from condition of heat excesses assimilation from the process equipment in hot shop and by multiplication factors.

There are installed window packaged air conditioners with air cooling of condenser in administrative premises, operator room, rest rooms for creation of comfortable conditions during the hot period of year.

Thermal-transmission distance ≈ 941m.

Automation

Objects of the control and management for a zone of main purpose of Surgil CGTU are:

- ILU;
- LTS installation with turbo-expander;
- DEG fire regeneration installation;
- condensate separation and aeration installation;
- pump house of condensate swapping;
- condensate loading platform;
- drainage tank for condensate;
- technological pump house of condensate;
- DEG warehouse;
- condensate warehouse;
- drainage tank for DEG;
- drainage tank for condensate;
- torch separator;
- torch farm;

- drainage tank for torch farm;
- self-supporting gas measuring assembly;
- compressor house of compressed air.

and for a zone of auxiliary purpose of Surgil **CGTU**:

- pump station of industrial-fire-prevention purpose;
- tanks of industrial-fireproof water-supply;
- treatment facilities of household flows;
- sewerage pump station.

for GGS 1. 2. 3 consists of:

- GS;
- torch farm;
- drainage tank for torch farm.

Hardware is provide performance of the following primary goals:

- temperature and pressure control on LTS input;
- automatic control of processes in separators S-101. S-102. S-103;
- control of the parameters of technological processes in heat exchangers T-101 and T-102;
- control of the consumption, pressure and temperature on LTS output.

ACS provides:

- automatic and remote starting and stopping of unit;
- unit protection (stop) during increase of rotation speed of the rotor, temperature of bearings, gas pressure on input of turbo-expander over permissible values;
- warning and hazard light;
- visual control of technological parameters;
- signals forming by technological parameters;
- information transfer to control upper level.

It is provided gas measuring assembly on input of tank gas from LTS area, intended for measuring of gas consumption and commercial account.

Amount of automation provided in the project allows providing normal operation of field objects with minimum amount of maintenance staff.

Hardware offered by the project of automation provides performance of the following tasks:

- anti-damage protection and blocking;

- control of parameters of technological processes;
- data acquisition and transfer to control upper level.

Offered functions of ACS TP:

- conducting technological process in the automated mode;
- account of products and reagents and automated calculation of their balance by installations;
- automated control for quality of technological process passing;
- remote control and submitting to the operator of the full information on a process course (technological parameters in measured points, conditions of stop, control valve, pumps and fans);
- anti-damage protection of the control objects;
- gassed condition control by the control objects;
- archive (database) maintenance.

Power supply ACS TP means is offered with use of sources of uninterruptable power supply (UPS).

Camp

Camp is located in northeast side at the distance of 500m from CGTU area.

The general plan is decided with observance of sanitary and fire-prevention norms (figure 8).

Camp includes the following objects:

- living block-box for 4 persons, 11pcs;
- living block-box for 4 persons, for travelling experts;
- living block-box for 2 persons, 10pcs;
- block-box for 2 persons, for travelling experts;
- sauna (block-box);
- first-aid post;
- kitchen dining room for 24 person (block-box);
- products warehouse (block-box);
- leisure room (block-box);
- toilet - shower cubicle of container type;
- shadow summerhouse;
- electrical switchboard room (block-box);
- control post (block-box);

- diesel power station, 2pcs.

All buildings are placed in a zone of pedestrian availability and have convenient communication among themselves.

There are considered conditions of insolation and airing at placing.

It is provided ring fire passage.

All passages are made from precast ferroconcrete pavement plates.

Free from building territory is planted trees and shrubs, lawns and trees saplings.

The territory is protected by metal mesh panels by height of 1.65m.

There are provided two fire-prevention exits, one main and reserve.

Main exit is equipped by control post.

The site area makes 1.21 hectares.

Figure 8 – Scheme of the camp general plan

Construction decisions

Placing of GGS constructions is made according to the technological scheme.

There are provided protections from metal grid on ferroconcrete posts for the area of incoming-line unit and torch farm.

Constructions of GGS area include: incoming-line unit, areas of torch farm and drainage tank, lightning arresters.

There is provided access road for the motor vehicles with area for turning to the incoming-line unit area.

Rates according to the GGS general plan

1. Site area	0.18-0.19hectares
2. Building area	0.03-0.04hectares
3. Building density	25%
4. Area of torch farm	0.79hectares

Designed network of intra-area roads with hard surface on CGTU provides possibility of approach to all constructions and areas, the passages are provided by width of 4.5m.

There is provided landscape gardening by saplings of drought-resistant, decorative trees and bushes for creation of favorable working conditions in the territory free from building.

Within a fence all constructions of area are divided into two zones: main purpose zone and auxiliary constructions zone.

Table 14 - Rates according to the CGTU general plan

№	Name	Unit	Volume
1	Site total area	hectare	6.02
2	Building area	hectare	1.22
3	Engineering services area	hectare	0.77
4	Road carpets area	hectare	0.94
5	Landscape gardening area	hectare	3.09
6	Building density	%	33

Table 14 continuous

№	Name	Unit	Volume
7	Used territory coefficient	un.	0.51
8	Landscape gardening coefficient	un.	0.49
9	Torch farm area	hectare	0.81
10	Ponds-evaporators area	hectare	1.1

Shift workers accommodation, their food and medical care are provided in the warmed block-boxes, which sizes in the plan are 6.0x3.23m and 12.0x3.23m. Each living block-box is designed for accommodation of 2 or 4 persons. There are provided following block-boxes for household needs of shift personnel: sauna, toilet with shower, leisure room, kitchen dining room, products warehouse. There is provided installation of the block-boxes for travelling experts.

Block-box control post by 6.0x3.23m size.

Precast concrete pavement plates are foundation under each block-box.

There is provided heating by electric radiators. Hot water is supplied from electrical heaters. Gas supply is natural gas.

There are takes into account antiseismic and anticorrosive measures during construction, wherewith it is achieved increase of environmental safety.

There take place the certain increase electric power, heat power, fresh water, consumption during object of infrastructure construction and at their operation, and also fuel gas consumption, sewage disposal, that will cause some increase of anthropogenic loads on the environment.

3 ALTERNATIVE DECISIONS ANALYSIS

There is provided in the performance specification for development of "Surgil field complex construction with valuable components retrieval" PFS, in section I "Surgil field construction":

I variant - gas production, treatment and transport in volume of $2.0x10^9m^3$ per year, gas condensate recovery, treatment and transport in volume of 100 thousand tons per year.

II variant - gas production, treatment and transport in volume of $3.0x10^9m^3$ per year, gas condensate recovery, treatment and transport in volume of 140 thousand tons per year.

Both variants assume to carry out wells production gathering and gas preparation on the gas complex treatment plant (CGTU) located on the field area. Dry gas and allocated condensate during gas treatment to supply to the gas and chemical complex (GCC) located in Akchalak settlement or the Kungrad town.

There are considered two variants of the location GCC in section II of "Gas and chemical complex construction" project: in the region of Akchalak settlement and in the region of Kungrad town (Ravshan). Therefore, there are allocated sub-variants of the finished goods transport:

Ia variant - GCC capacity for raw gas processing in volume of $2.0x10^9m^3$ per year with location in the region of Akchalak settlement;

Ib variant - GCC capacity for raw gas processing in volume of $2.0x10^9m^3$ per year with location in the region of Kungrad city;

IIa variant - GCC capacity for raw gas processing in volume of $3.0x10^9m^3$ per year with location in the region of Akchalak settlement;

IIb variant - GCC capacity for raw gas processing in volume of $3.0x10^9m^3$ per year with location in the region of Kungrad city.

There is presented the schematic diagram of Surgil CGTU finished goods transport by variants in the figure 7.

Variants analysis shows that the variant IIa have maximum advantages with extraction of 3 billion and GCC location in Akchalak settlement (nearness of the railway and oil loading rack, highways, TL, main gas pipeline, water conduit and others).

Main purpose of planned activity is fuller use of valuable components containing in natural gas of Surgil field: ethane, propane-butane fraction, gas condensate, and deeper tank gas dewatering.

Rational and full retrieval of ethane, propane-butane fraction and gas condensate from natural gas provides output expansion of polyethylene and liquid hydrocarbons on GCC.

Thus, necessity for urgent designing and building of constructions for fuller valuable components retrieval does not require proofs.

Designed object could be safely referred to nature-conservation and resource-saving (rational use of mineral resources).

Thus, it is difficult to choose more optimum variants for designed technology and for constructions arrangement.

4 ANALYSIS OF ENVIRONMENTAL IMPACT OF THE DESIGN OBJECTS

This chapter includes characteristics of sources of environmental impact proceeding from the analysis of possible technological and technical decisions on designing of Surgil GCF construction and gas transport to Akchalak GCC, and also the characteristic of impact types connected with adding of pollutants to environment and withdrawal of natural resources, parameters of anthropogenic impact and the main objects of impact in the course of construction and operation of designed objects. There will be impact on the following components of environment during project realization:

- atmospheric air.
- soils and vegetation.
- underground waters.

From the general project it is possible to allocate pollution sources by the following production string:

- wells construction;
- construction and operation of loops, GGS, collectors;
- construction and operation of CGTU;
- construction and operation of pipelines on GCC.

There is carried out analysis of impact of the emissions, dumps, waste, and withdrawal of land resources during construction and operation on the basis of design decisions.

4.1 IMPACT ON ATMOSPGERE AIR, AQUATIC ENVIRONMENT, LAND RESOURCES AND FLORA DURING CONSTRUCTION

During construction of designed buildings, constructions and pipelines the atmospheric air will be exposed to impact by emissions of pollutants from internal combustion engines (ICE), from road building technique and motor transport, and also from welding machines and painting units.

There will concern to the road building technique and motor transport used in the construction of designed objects: excavators, bulldozers, motor graders, pneumatic-tyred road roller, pneumowheel, rubber-tire, caterpillar and automobile cranes, cranes and pipe-stringing machines, moving welding machines and compressors, inclined-axis mixers and auto cement mixers, dump trucks, pipe trucks, tractors, onboard cars, tank truck.

Table 15 - Estimated volumes and characteristics of the lands allotment under Surgil GCF construction

Object name	Lands quality	Sizes	All	Allotment lands, hectare

				on construction period	from their permanently
Production wells (wells operating areas, jacking machine areas, torches areas)	Saline and fixed sands	0.36x54=19.44 0.28x54=15.12		19.44+15.12=34.56	34.56
Wells loops	- " -	ℓ=92700m	28	259.56	-
GGS with torches		0.19x3=0.57 0.79x3=2.37			
Collectors		ℓ=11400m	28	31.92	-
CGTU with torches and ponds-evaporators		6.02+0.79=0.75		7.56	7.56
Condensate line		ℓ=11500m	28	322.0	-
Gas pipeline		ℓ=11500 м	398	448.5	-
Taps and gate valves on the junction lines		100x19=1900m^2		0.19	0.19
Total				**117.23**	**45.25**

Sources of pollutants emissions during construction of designed objects will be:

- exhaust pipes of road building technique and motor transport;
- moving welding machines and painting units located on open building areas.

List of pollutants, which ingress in atmospheric air during construction of designed objects is presented in table 14.

Table 16 - List of pollutants which ingress in atmospheric air during construction

Pollutant name	Used criterion	Volume of criterion, mg/m^3	Danger class
Ferric oxide	MPC m.c.	0.04	3
Manganese and its compounds	MPC m.r.	0.01	2
Nitrogen dioxide	MPC m.r.	0.085	2
Carbon black	MPC m.r.	0.15	3
Sulfur dioxide	MPC m.r.	0.5	3
Carbon oxide	MPC m.r.	5.0	4
Gaseous fluorides	MPC m.r.	0.02	2

Poorly soluble fluorides	MPC m.r.	0.2	2
Xylene	MPC m.r.	0.2	3
Benzapyrine	MPC m.c.	0.000001	1
Hydrocarbons (of gasoline)	MPC m.r.	5.0	4
Hydrocarbons (of kerosene)	suggested no-adverse-response level	1.2	-
White spirit	suggested no-adverse-response level	1.0	-
Inorganic dust: 70-20% silicon dioxide	MPC m.r.	0.3	3

Some tens tons of pollutants will ingress in atmospheric air during construction of the designed objects.

Thus, there would be air pollution from automotive and construction engineering operation (dust emission, exhaust gases) during building of surface constructions, which is insignificant by volume and is short-term by impact.

Impact on aquatic environment during construction will be rendered through withdrawal of water resources. Water supply of designed objects construction will be carried out from artesian wells, and also by imported water in tank trucks.

Volume of household sewage waters on the construction period is formed in the amount equal to water consumption. Discharge of these waters is carried out in cesspool system. Discharge is constant, but is limited by the period of construction work execution.

Execution of works on construction of industrial areas and out of the area communications is connected with use of the ground areas for construction period (short-term rent) and for the process equipment operation (long-term rent).

Sources of impact are construction objects and the construction technique, mechanisms, motor transport.

It is necessary to allocate some types of impact on the soil-vegetable cover, carried out in the period of construction-and-assembling works execution, and in the period of constructions operation:

Direct impact connected with ground areas withdrawal under arrangement of the construction objects

Ground areas withdrawal under construction objects will be made in long-term and short-term rent.

There is withdrawal in long-term rent the ground areas under wells, GGS, CGTU areas, access motorway bed. For arrangement of intra-field and external communications by underground way the ground areas are allotted in short-term rent.

The sizes of the ground areas withdrawn in short-term and long-term rent correspond to working regulations. The areas of the lands necessary for building of designed constructions will be corrected on the further design stages.

Mechanical impact connected with damage of the soil-vegetable cover during earth and construction-and-assembling works execution and relief leveling reoperation

The leveling operation of designed industrial areas and access roads bed is executed taking into account existing lay of land, geological and hydrological features of the construction territory.

Impact on soil-vegetable cover during laying of out of area communications will have short-term character – during construction only. There is damage of the soil surface layer on depth up to 2m during preparation of zone of temporary allotment under pipeline laying.

After carrying out construction-and-assembling and earth works there are taken out construction waste (the rests of pipes, insulating material, etc.) from construction zone (territory of short-term rent), all temporary installations, and there is spent technical and biological restoration. Then, these ground areas will return to former owners in condition suitable for their economic use.

One of the main measures directed on protection of the soil-vegetable cover is technical and biological restoration of the ground areas dislocated during construction-and-assembling works execution.

The technical stage of restoration includes work package for removal and restoration of the soil fertile layer and preparation of the construction zone territory (the ground areas of short-term rent) for carrying out biological stage of restoration.

Proceeding from soil conditions of work production area, there is subject to stripping the fertile, most active in the biological relation and used in agricultural production layer of soil by thickness of 30.0sm.

Biological restoration is carried out after technical stage and directed to restoration of soil physical and biological characteristics, improvement of structure and water-air regime of plough-layer.

Unsystematic travel of motor transport and the construction technique, and also planning works execution during leveling operation under arrangement of areal objects can cause serious damages of the soil-vegetable cover. It is possible considerable activization of deflation processes in the territory of the broken sandy massifs.

Analysis of the damages occurring during construction on objects-analogues shows, that during construction work execution without nature conservative measures (absence of access roads, work out of allotment zone) the area of damages in 3-5 times exceeds the permissible allotment areas.

Soil-vegetable cover chemical pollution during objects construction and operation

It is possible soil cover chemical pollution:

- in the absence of the organized gathering system and placing of the building refuse;
- during operation of designed constructions - at violation of the technological process of the process equipment operation, absence of the organized waste storage and placing system, organized removal of sewage waters and surface flow.

Soil-vegetable cover pollution can occur as a result of worst-case situations - emergency or unregulated FAL, technological products, sewage waters flows. Ways of migration and accumulation of pollution will be defined by landscape-geochemical conditions.

4.2 WASTAGE AND CONSUMPTION RESIDUE DURING CONSTRUCTION

Environmental pollution during waste handling depends on:

- their quantities;
- danger class;
- way of placing and sterilization.

There is formed household and industrial waste during construction of designed objects.

Rubbish from doghouses concern to the domestic waste formed as a result of people live activity, engaged in the construction of objects.

The industrial waste formed during preparatory and construction-and-assembling work is shown in table 15.

Table 17 - Characteristic of waste formed during construction

Waste name	Place of waste formation	Waste danger class
Domestic waste		
Unsorted rubbish from doghouses (except of large-sized)	Construction areas	4
Industrial waste		
Waste motor oils	Area of construction base of contracting organization	2
Waste transmission oils	Same	2
Waste of paint-and-lacquer means (lumpy)	Construction areas	3
Scrap and waste contains nonferrous alloy	Area of construction base of contracting organization	3
Oil-polluted cleaning cloth (oils content less than 15%)	Same	4

Waste tire casings	Same	4
Residues and stubs of steel welding electrodes	Same	4
Unsorted iron-and-steel scrap	Same	4
including: *formed during construction work*	Construction areas	
formed during technique maintenance	Area of construction base of contracting organization	
Waste of insulated wires and cables	Same	4
Brickbats	Same	4
Cement waste in the lumpy form	Same	4
Concrete mix waste with dust content less than 30%	Same	4

For the purpose of waste impact reduction on soils and head water-bearing horizons there are offered measures for their organized gathering, holding and further placing.

It is offered to collect and accumulate all waste, in process of their formation, on specially taken away and equipped, according to requirements of their storage, areas with hard surface, as follows:

- unsorted rubbish from doghouses of the organizations (except of large-sized) - in the metal containers installed on areas with hard surface;
- waste motor and transmission oils - in the closed metal tanks;
- oil-polluted cleaning cloth; waste of paint- and- lacquer means (lumpy) - in the closed containers;
- scrap and waste contains nonferrous alloy - in the containers located indoor;
- residues and stubs of steel welding electrodes; cement waste in the lumpy form; concrete mix waste with dust content less than 30%; waste of insulated wires and cables - in containers, by waste sort;
- scrap and iron-and-steel waste with impurities; unsorted iron-and-steel scrap; waste tire casings; bitumen, asphalt waste in the hard form; brickbats; asbestos-cement waste in the lumpy form - on the areas, by waste sort.

4.3 EXPECTED ATMOSPHERIC EMISSIONS DURING OPERATION

Atmospheric air pollution is possible under normal operating regime, during carrying out of periodic (scheduled) works and in emergency conditions.

On the linear part the source of impact on atmospheric air can arise in the emergency conditions only in the time of disturbance of pipeline integrity. Pipeline breaking probability is very small; however, it is impossible to completely exclude such cases.

During operation of the new constructions intended for Surgil GCF construction and the main gas transport, there will be additional sources of impact on atmospheric air which are divided into two kinds:

1. Constants
- condensate aeration installation;
- torches in the CGTU, GGS areas;
- pump station of condensate on CGTU;
- fire regenerators;
- condensate warehouse:
- DEG and FAL warehouse;
- boiler house;
- gas-piston power station;
- ponds-evaporators.

2. Periodic
- torches of production wells;
- degasser, drainage tanks;
- condensate loading post.

Thus, there will be accordingly increase in volume of receipt of pollutants in atmospheric air. Calculation of prospective volumes of emissions from the above-stated sources was made according to RD 39.2-170-95 [2], proceeding from available design data on volumes of processing and formation of the gaseous waste, and also by analogy with existing technological installations.

Calculation of emissions in atmosphere is carried out for maximal gas extraction by productivity of 3 billion m3/year, i.e. by the second variant of Surgil field construction.

CGTU area

Low pressure torch

Source of emissions will be LPF by height - 35m, diameter - 0.264m. Temperature of mix discharge is 700°C. Torch action period is all-the-year-round, 8760 h/year.

There will ingress gases in a torch:

- condensate degasses 1.2m^3/hour by density of 1.2kg/m^3;
- from end trap installation 491.55m^3/hour by density of 2.02kg/m^3
- from reflux separator - 1.29m^3/hour by density of 1.163kg/m^3;
- gas for maintenance of fire on duty 12m^3/hour with average density 0.8kg/m^3.

Gases weight flow on a torch will make:

B = (1.2 x 1.2 + 491.55 x 2.02 + 1.29 x 1.163 + 12 x 0.8) x 1000 : 3600 = 279.298 g/sec.

Emissions of harmful substances in atmosphere are calculated according to method [4] and will make:

M_{co} = 279.298 x 0.057 = 15.91999g/sec = 502.0527t/year

M_{NO2} = 279.298 x 0.002 x 0.8 = 0.446877g/sec = 14,09271t/year

M_{NO} = 279.298 x 0.002 x 0.2 = 0.111719 g/sec = 3,523177 t/year

M_{CH} = 279.298 x 0.03 = 8.37894 g/sec = 264,2383 t/year

There is absent hydrogen sulfide content in gas.

Fraction content $C_{5+higher}$ is equal to 0.99%. Volumetric gas discharge is equal to 0.141m^3/sec.

$M_{carbon\ black}$ = 0.003 x 0.141 x 0.99 x 3457 x 10^{-2} = 0.01448g/s = 0.0.45664t/year,

Total emission from LPF will make 784.363527t/year.

High pressure torch

Source of emissions will be HPF by height – 35m, diameter – 0.7m. Temperature of mix discharge is 700°C. Torch action period is all-the-year-round, 8760h/year.

There will ingress gases in a torch:

- from separator 429m^3/hour by density 0.8042kg/m^3;
- aeration 250.5m^3/hour by density 0.898kg/m^3;
- aeration 429m^3/hour by density 1.21kg/m^3;
- from separator 264m^3/hour by density 0.85165kg/m^3;
- aeration 1.41m^3/hour by density 1.06383kg/m^3;
- gas for maintenance of fire on duty 12m^3/hour with average density 0.8kg/m^3.

Gases weight flow on a torch will make:

B = (429 x 0.8042 + 250.5 x 0.898 + 429 x 1.21 + 264 x 0.85165 + 1.41 x 1.06383 + 12 x 0.8) x 1000 / 3600 = 368.049g/sec.

Emissions of harmful substances in atmosphere are calculated according to method [4] and will make:

M_{co} = 368.049 x 0.057 = 20.97879g/sec = 661.5872t/year

M_{NO2} = 368.049 x 0.002 x 0.8 = 0.588878g/sec = 18.57087t/year

M_{NO} = 368.049 x 0.002 x 0.2 = 0.14722g/sec =4,642717 t/year

M_{CH} = 368.049 x 0.03 = 11.04147g/sec = 348.2038t/year

There is absent hydrogen sulfide content in gas.

Fraction content $C_{5+higher}$ is equal to 0.99%. Volumetric gas discharge is equal to 0.385m^3/sec.

$M_{carbon\ black}$ = 0.003 x 0.385 x 0.99 x 3457 x 10^{-2} = 0.039529 г/c = 1.24659 t/year,

Total emission from HPF will make 1034,25 t/year.

Condensate pump house

Source of emissions will be the pump for condensate swapping. Conditional characteristic of the source: height - 2m, diameter - 0.5m. Sources action period is all-the-year-round, 8000h/year.

Specific emissions of hydrocarbons during condensate swapping make 0.039g/s, according to table 3.5 [4], hence, total emissions of hydrocarbons during condensate swapping will make:

M_{CH} = 0.039 x 3600 x 8000 x 10^{-6} = 1.123 t/year

Fire regenerator

Source of emissions will be chimney of the fire regenerator by height of 6m, by diameter - 0.1m. Fuel gas flow for regeneration will make 0.018m3/sec. Temperature of combustion gases discharge makes 225°C. Action period is 8000h/year.

If the fuel gas density is $0.81kg/m^3$ its weight flow will make 14.58g/sec. Combustion gases volume will make:

$$V = 7.84 \times 0.018m^3/sec \times 1.1 \times 1.62 = 0.2515m^3/sec$$

Concentration of oxides of nitrogen in combustion gases will make:

$$C_{NOx} = 1.078 \times 180 \times 1 \times 1.1^{0.5} \times 0.81 \times 10^{-3} = 0.1648g/m^3$$

Emissions of harmful substances from fire regenerator are calculated according to method [4] and will make:

$$M_{NO} = 0.2515 \times 0.1648 \times 0.2 = 0.0083g/s \text{ or } 0.23874t/y$$
$$M_{NO2} = 0.2515 \times 0.1648 \times 0.8 = 0.0332g/s \text{ or } 0.95494t/g$$
$$M_{CO} = 1.5 \times 14,58 \times 10^{-3} = 0.0219g/s \text{ or } 0.63072t/g$$
$$M_{CH} = 1.5 \times 14,58 \times 10^{-4} = 0.0022g/s \text{ or } 0.06307t/y$$

Total emission from fire regenerator will make 1.88747t/year.

Condensate warehouse

There are provided tanks for condensate gathering and storage on CGTU. Height of sources – 4m, diameter – 0.15m. Temperature of mix discharge – 20°C. Sources action period – all-the-year-round, 8760h/year.

Rated volume of condensate production makes 311.2t/day or 113588t/year. Specific condensate losses in the form of hydrocarbons make 0.0009t/t, hence, emissions of hydrocarbons will make:

$$M_{CH} = 0.0009 \times 113588 = 102.2292t/year \text{ or } 3.241667g/s$$

Total emission from warehouse makes 102.2292t/year.

Tank for diesel fuel

Source of emissions will be the relief valve of tank for diesel fuel used for ICE operation. Industrial operations are diesel fuel reception, storage. Source height is 2.5m, diameter - 0.1m. Source action period is 24 hours a day, 8760 hours per year. Temperature of air-gas mix emission is 25°C.

Ingress of diesel fuel in tank within a year has made 106.945tons. Diesel fuel density is $0.81t/m^3$.

Mineral oil volume which has ingress in tank is equal:

$$V = 106.945 : 0.81t/m^3 = 132.031m^3$$

Amount of the hydrocarbons departing from a source is defined by method [5], taking into account specific losses.

For diesel fuel the specific losses are equal $20t/m^3 \times 10^{-6}$, according to table 1 [5].

Emissions of hydrocarbons are equal:

$$M_{CH} = 132.031m^3 \times 20t/m^3 \times 10^{-6} = 0.003t/g = 0.00008g/s$$

Tank for oil

Source of emissions will be relief valves of tank for oil. Source height is 2m, diameter - 0.1m. Source action period is 24 hours a day, 8760 hours per year. Temperature of air-gas mix emission is 25°C.

Annual receipt of oil in tank has made 292 tons. Oil density is $0.9t/m^3$.

Oil volume which has ingress in tank is equal:

$V = 292 : 0.9t/m^3 = 3.24m^3$

Amount of the hydrocarbons departing from a source is defined by method [5], taking into account specific losses.

For oil the specific losses are equal $4 \times 10^{-6} t/m^3$, according to method 1 [5].

Emissions of hydrocarbons are equal:

$M_{сн} = 3,24\ м^3 \times 4t/m^3 \times 10^{-6} = 0.000013t/y = 0.0000004g/s$

Boiler house chimney

The source of heat supply of Surgil CGTU objects accepts a boiler-house. A source of emissions will be chimney of boiler house by height of 15m, by diameter of 0.264m. Fuel gas flow for boiler house will make 10.3m3/hour or 0.003m3/sec. Temperature of combustion gases discharge makes 225°C. Action period is 3520h/year.

Gas combustion heat ≈ 45 MJ/kg. If the gas density is $0.81kg/m^3$, so gas weight flow make 2.43g/sec. Emissions of harmful substances in atmosphere during gas popping are calculated according to method [4] and will make:

$M_{CO} = 0.001 \times 2.43 \times 0.5 \times 0.5 \times 45 \times 0.995 = 0.0272g/sec = 0.3447t/year$

$M_{NO2} = 0.001 \times 2.43 \times 45 \times 0.09 \times 0.8 = 0.0079g/sec = 0.1001t/year$

$M_{NO} = 0.001 \times 2.43 \times 45 \times 0.09 \times 0.2 = 0.002g/sec = 0.0253t/year$

Total emission from boiler house makes 0.4701t/year.

Internal combustion engine (ICE)

Source of emissions will be the diesel generator used for the electric power generation. Source height is 3m, diameter is 0.2m. Temperature of exhaust gases discharge is 120°C. Action period is 24hour/day, 8760hour/year.

Diesel fuel rate for ICE operation will make 0.293t/day or 106.945 tons in time of action period 365 days.

Total and maximum-one-time emissions during ICE operation will make:

$M_{NO2} = 106945kg \times 30g/kg \times 10^{-6} = 3,20835t/year = 0.101736g/sec$

$M_{CO} = 106945kg \times 25g/kg \times 10^{-6} = 2.67363t/year = 0.08478g/sec$

$M_{SO2} = 106945kg \times 10g/kg \times 10^{-6} = 1.06945t/year = 0.033912g/sec$

$M_{CH} = 106945kg \times 12g/kg \times 10^{-6} = 1.28334t/year = 0.040694g/sec$

$M_{акр} = 106945kg \times 1.2g/kg \times 10^{-6} = 0.12833t/year = 0.004069g/sec$

$M_{carbon\ black} = 106945kg \times 5g/kg \times 10^{-6} = 0.53473t/year = 0.016956g/sec$

Total emission from ICE will make 8.89782t/year.

GGS area
Torch

Torch designed characteristics are make: height is 35m, diameter is 0.4m. Torch is organized source if emissions. Temperature of mix discharge is 700°C. Torch action period is the-all-year-round, 8760h/year.

It will be constantly ingress in a torch the gas for maintenance of fire on duty only, in volume 10m3/hours, and also periodically gas from tank of condensate gathering of the mobile gaging separation installation in volume 3.78m^3/hour. Total gas flow will make either 0.004m3/sec or 3.1g/sec.

Emissions of harmful substances in atmosphere will make:

M_{CO} = 3,1 * 0.057 = 0.1767g/s = 5.5724t/year

M_{NO2} = 3,1 * 0.002 * 0.8 = 0.005g/s = 0.1577t/year

M_{NO} = 3,1 * 0.002 * 0.2 = 0.0012g/s = 0.0378t/year

M_{CH} = 3,1 * 0.03 = 0.093g/s = 2.9328t/year

Fraction content $C_{5+higher}$ in burning gas is 0.99%t., hence, carbon black emissions are equal:

$M_{carbon\ black}$ = 0.003 * 0.004 * 0.99 * 3457 * 10^{-2} = 0.000411g/s = 0.01295t/year

Speed of air-gas mix discharge is 0.2km/s

Total emissions from a torch of one GSS will make 8.71365t/year, and from three 26.14095t/year.

Characteristics of the main designed sources of emissions of pollutants of Surgil field are listed in table 18.

Table 18 – Design characteristics of the emissions sources

Source of pollution	*H, m*	∅, m	Component	Emissions in atmosphere	
				g/sec	t/year
LPT	35	0.264	Carbonic oxide	15.91999	502.0527
			Nitrogen dioxide	0.446877	14,09271
			Nitrogen oxide	0.111719	3,523177
			Hydrocarbons (of methane)	8.378940	264,2383
			Carbon black	0.01448	0.45664
HPT	35	0.7	Carbonic oxide	20.97879	661.5872
			Nitrogen dioxide	0.588878	18.57087
			Nitrogen oxide	0.147220	4,642717
			Hydrocarbons (of methane)	11.04147	348.2038
			Carbon black	0.039529	1.24659
Pump	2	0.5	Hydrocarbons (of methane)	0.039000	1.123000

Table 18 continuous

Fire regenerator	6	0.1	Nitrogen oxide	0.008300	0.238740
			Nitrogen dioxide	0.033200	0.954940

			Carbon black	0.021900	0.630720
			Hydrocarbons (of methane)	0.002200	0.063070
Condensate warehouse	2	0.5	Hydrocarbons (of methane)	3,241667	102.2292
Tank for diesel fuel	2.5	0.1	Hydrocarbons (of methane)	0.003000	0.000080
Tank for oil	2	0.1	Hydrocarbons (of methane)	0.0000004	0.000013
Boiler house	15	0.264	Carbonic oxide	0.027200	0.344700
			Nitrogen dioxide	0.007900	0.100100
			Nitrogen oxide	0.002000	0.025300
DPS	3	0.2	Nitrogen oxide	0.101736	3,208350
			Carbonic oxide	0.084780	2.673630
			Sulfur dioxide	0.033912	1.069450
			Hydrocarbons (of methane)	0.040694	1.283340
			Acrolein	0.004069	0.128330
			Carbon black	0.016956	0.534730
Torch on GGS	35	0.4	Carbonic oxide	0.176700	5.572400
			Nitrogen dioxide	0.005000	0.157700
			Nitrogen oxide	0.001200	0.037800
			Hydrocarbons (of methane)	0.093000	2.932800
			Carbon black	0.000411	0.012950
TOTAL:				**61.61272**	**1941.936**

Thus, during operation of objects on Surgil field there will additionally ingress in atmosphere the fuel gas combustion materials on torches, technological installations, and also hydrocarbons (of methane).

List of the pollutants departing from designed sources is presented in table 19.

Table 19 – List of pollutants

Components	MPC, mg/m^3	Emissions in atmosphere		%%
		g/sec	t/year	
Carbonic oxide	5.000	37.20936	1172.861	60.3965
Nitrogen dioxide	0.085	1.183591	37.08467	1.909675
Nitrogen oxide	0.600	0.270439	8.467734	0.436046

Hydrocarbons (for methane)	50	22.83997	720.0736	37.08019
Carbon black	0.15	0.071376	2.25091	0.115911
Sulfur dioxide	0.5	0.033912	1.06945	0.055071
Acrolein	0.3	0.004069	0.12833	0.006608
TOTAL:		**61.61272**	**1941.936**	**100**

As it is obvious, additional introduce during operation of Surgil field will make about 1941.936t/year of pollutants of 7 names. Thus, capital contribution brought by nitrogen oxides (60.3965 %) extracted during torch operation.

Emissions during operation of pond-evaporator, drainage tank, condensate loading post have insignificant character (no more than 1t/year in total). More detailed characteristic of these emissions will be given on the following design stage after specification of initial data.

Except constant ingress of pollutants in atmosphere during object functioning, it is possible periodic and short-term ingress of gas combustion materials during repair and purging works on CGTU. Also, there will periodically ingress in atmosphere the gas combustion materials during purging, repair and research of production wells. More detailed description of emissions during above-listed operations will be given on the following design stage.

Atmosphere pollution by the above-stated sources will have constant character.

4.4 WATER CONSUMPTION AND WATER DRAINAGE DURING OPERATION

On designed objects water is used for household and industrial needs (figures 9-12).

Water supply is provided from artesian well according to it there are designed separate systems of economic-fire-prevention and industrial water supply lines.

It is provided installation of fire tanks in the designed areas: two ferroconcrete tanks by 300 cubic meters. Water consumption for firefighting - 566m3/days

Estimated flows for water consumption of designed objects are resulted by articles in the table. As it is obvious from the table, the total of constantly consumed water on designed objects makes 28.61m3/day (10242.65).

The control over the water flow arriving on designed objects is carried out by means of the measuring devices installed in building of IES.

The project is provides to drain the formed household and industrial sewage waters in various systems of the sewerage - household and industrial.

The control over amount of the industrial sewage waters formed on designed objects is carried out in gage tray installed in front of drain in the pond-evaporator.

Water draining of industrial-rainfall run-offs at a rate of 85.87m3/day is directed to ponds-evaporators.

Unbalance is explained by condensate water ingress with gas in amount of 48.48m3/day (17694.).

4.5 EXPECTED WASTE DURING OPERATION

List and danger classes of waste, formed during construction and operation of designed objects, are classified in accordance with Instruction about order of accounting of formation, using and warehousing of the toxic waste under the form № 3 - the toxic waste (semi-annual, annual), State Department of Statistics of the Republic of Uzbekistan. 1997.

Formed during operation of objects industrial wastes and consumption waste are subject to transportation for processing by the specialized enterprises or warehousing on specially assigned places, namely:

- hard household waste will gather in specially assigned place;
- mercury contained lamps are provided to be placed in warehouse for the purpose of accumulation and transportation by the specialized enterprise for demercurization;
- waste turbine oils are subject to delivery to tank farm for the further shipping on petroleum refinery.

Table 20 - Waste characteristic formed during operation on the designed objects

Waste name	Place of waste formation	Waste danger class	Waste physical-chemical characteristic	Waste formation periodicity	Waste storage method
Rubbish from doghouses of organizations unsorted (except of large-sized)	Doghouses on the designed areas	4	hard	constantly	In metal containers in the area with hard surface
	Industrial waste:				
Mercury lamps, luminous mercury contained waste and defective	Exterior and interior lighting on designed areas	1	hard; glass – 92.00%; mercury – 0.15%; others metals– 2.00% other – 5.98%	Periodically, as far as replaced	In special container of close premise

Table 20 continuous

Waste name	Place of waste formation	Danger class	Waste physical-chemical characteristic	Waste formation periodicity	Waste storage method
Oil-polluted cleaning cloth (oil content less than 15%)		4	hard	Periodically	In container of close premise

5 POSSIBLE EMERGENCY SITUATIONS ANALYSIS

Emergency is understood as a situation on the industrial enterprise at which raw materials, intermediate products, production of the enterprise and the production wastes, installed process equipment on industrial area, being involved in emergency process create strike factors for the personnel, population, environment and industrial enterprise.

There are possible during emergencies and damages of the process equipment and pipelines:

- fire hazard;
- explosion;
- electrical shock.

Sources of fire hazard and explosion are formed explosive air-gas mixes.

One of the basic substances participating in technological process (extraction, main transport and processing) is natural gas. Natural gas is explosive and fire-hazardous substance and can have toxic impact on a human organism at the raised concentrations (more than 10 %), have no color and a smell.

There can escape gas condensate from gas in process of drying and processing. Gas condensate concerns to inflammable liquids with wide fluctuations of the hydrocarbonic components content.

Except of the specified substances, there is used turbine oil in technological process, which is combustible, fire-hazardous liquid of oil origin.

Table 21 – Substances explosive and toxic features

Substance	Characteristic *)	Inflammability limit in mix with air, t.%		Temperature, ^{o}C	
		lower	upper	flashes	inflammation
Natural gas	EX	3.8-5.0	15÷5.0	-	535
Hydrocarbon condensate	EX	Are defined by actual composition			
Turbine oil	FH	-	-	193	390

*) EX - explosive fire-hazardous substance, FH – fire-hazardous

Origin of the emergencies is possible because of various failure modes:

- technological failure caused by breakdown of manufacture technological mode or separate technological process;
- mechanical failures caused by partial or full destruction, or deterioration of the process equipment or separate details;
- technical-organizationalfailures caused by stopping delivery of raw materials, electric power, personnel errors, etc.;

- spontaneous caused by acts of nature, fires, explosions, etc.

Level of automation provided by the project allows to operate equipment of installations without constant presence of personnel there and to monitor performance work from the control room.

It is provided automatic control, alarm system and emergency protection from pressure excess in the main technological lines.

There is provided protection acting for the prevention of emergencies origin or malfunctions. During violation of operating mode of units or auxiliary mechanisms there can be automatic shutdown of the unit separate systems its full stop.

According to the aforesaid, the technological failures under installed technological mode have low degree of probability.

Designed process equipment meets the requirements of service instructions, so possibility of emergencies origin connected with mechanical failure is almost completely excluded.

Technical-organizational failures causing emergencies are practically impossible, as decrease or excess of processed gas volume is in limits of the installed capacity. Otherwise, emergency stops of units occur automatically at protection acting or manually by pressing of the emergency stop-button.

As to emergencies caused by acts of nature, particularly by earthquake they are improbable as far as constructions are located in low-seismicity area, and buildings and equipment are estimated taking into account possible earthquakes.

Quantitative characteristics of detrimental effect of possible emergency process are:

- volume of possible irretrievable losses (i.e. quantity of causa mortis as a result of failure);
- volume of possible sanitary casualties (i.e. quantity of victims which require hospitalization);
- expected frequency of failures.

The considered object concerns to category potential dangerous. Danger degree of of sources of fire-hazardous substances is defined by their volatility. In this case, gases concern to 4 class of danger with boiling temperature 253^{o}K.

The open flame, spark from blow by iron object, spark in electric devices (knife switches, furnaces) etc, can be the reasons of ignition of explosive mixture. During equipping of lighting it is necessary to consider possibility of gas accumulation, so, all wiring should be in explosion-proof version or bulb-reflectors should be installed in window or special apertures. Fire safety and explosion safety of production processes are provided by development and realization of the fire prevention systems and explosion protection systems.

However, there can origin emergencies during operation of the equipment of designed constructions owing to pressure excess in pipelines, owing to formation of air-gas mixture with concentrations capable to provoke explosion, with the subsequent gas ignition.

It is impossible to predict emergencies neither in the place of their origin, nor by time. Therefore, there are supposed some assumptions during an estimation of parameters of emergencies origin and their detrimental effect on people health and safety.

Scenario or type of failures is understood as a characteristic variant of emergency process development.

Maintenance stuff of the enterprise can be object of effect. Quantitative estimation of detrimental effect can serve as the estimation of possible irretrievable losses and sanitary casualties.

Dangerous substances of oil and gas sector are characterized as fire - and explosive (FE), and according to class can be concerned to class (D) - combustible gases under pressure and to class (A) - combustible liquids.

Beaten zones are set by the form and the size concerning source of impact. Zone edge can be approximated by circumference (C) or rectangle (R). For beaten zone in form of circle the size is set by circle radius (R).

In the considered case we can assume that there was leakage of the connecting gas pipeline.

This case belongs to the class (D), the failure scenario is (D1) - a fire. Beaten zones have the form of concentric circles with the centre in a place of gas leak. Radiuses of beaten zones depend on diameter of gas pipeline (parameter «X») and are defined under the formula:

$$R = a * x + v,$$

где: $a = 38.9$. $v = -1.7$ – for irretrievable losses;

$a = 105$. $v = 3$ – for sanitary casualties.

$$R_B = 38.9 * 0.820 + (-1.7) = 30m$$

$$R_C = 105 * 0.820 + 3 = 89m$$

Thus, in a case of leakage of the gas pipeline by diameter of 0.820m and gas ignition the radius of irretrievable losses will make 30m, and radius of sanitary casualties - 89m.

At these distances there can be only maintenance stuff of the enterprise as residential zone is at rather remote distance.

Thus, at observance of all service instructions and safety engineering probability of emergencies origin is low and in accordance with RD РД 118, priori frequency of failures for pipelines makes 10^{-5}.

Reliable trouble-free operation of designed objects is provided by strict observance of the technological mode, all job descriptions as industrial, and on safety engineering, by good technical training of the maintenance stuff.

The basic obligatory conditions of safe conducting processes are:

- constant control of all apparatus and equipment operation;
- immediate elimination of all defects, malfunctions, deviations from norms during equipment operation;
- systematic control of the air environment of industrial premises and territory of installations.

All devices and installations are equipped by the light and sound alarm system. Besides, at a deviation of parameters of the technological mode there is activated automatic gas shutdown on input.

Thus, in case of emergencies origin (pressure excess, power shutdown, system depressurization and etc.) there will be activated safety valves on designed installations and gases will be discharged on torches.

Besides, there is constant control from gas rescue service on the enterprises of gas industry.

Thus, having considered planned construction it is possible to draw a conclusion, that the constant control of technological process, workplaces and territory of production units will provide low degree of probability of failures.

6 NATURE-CONSERVATIVE MEASURES

Monitoring

There is carried out industrial ecological monitoring for environmental safety in zone of possible impact of industrial projects.

The industrial ecological monitoring defines ecological fixing of man's impacts on environment, allows predicting not only direct, but also long-term cumulative effects of current loads.

The industrial ecological monitoring is a part of structure of production environmental monitoring (PEM).

There is allocated a number of specialized subsystems during division of PEM system on the basis of controlled component of environment. Recommendations about the organization of PEM subsystems in the region of designed constructions are given below.

Offered industrial ecological monitoring includes:

- control of atmospheric air condition;
- control of sewage waters;
- control of soil cover;
- control of the waste treatment;

The general requirements to PEM system are:

- compliance of supervision methods with requirements of regulation and methodical documents;
- choice of sites and monitoring points subject to conditions of environment and features of designed engineering object;
- actual data acquisition on the condition of environment by performance of engineering-ecological supervisions with use of route researches, complex and local stationary supervisions;
- received information processing by execution of cameral works, laboratory chemical-analytical researches with computer processing and modeling of the processes of interrelation of engineering constructions and natural environment components.

Thus, the scheme of points placing of observational network is defined by location of considered new entered industrial projects and coordinated with local committee of environmental protection.

Data acquisition is carried out by conducting:

- regime observations;
- laboratory analyses and experiments;

- route inspections and surveys;
- experiments for approbation of nature-conservative measures and means of engineering protection.

Gathering, storage and processing of results of all data types is carried out in a uniform universal databank, organized by PEM service.

For regular air sampling in the territory and at the border of the nearest settlements there can be organized route posts of the air monitoring. Monitoring is possible by means of two mobile moving laboratories on the Gas-66 PLM-F base.

The main components are included necessarily controlled substances: sulfur dioxide, mercaptans, nitrogen oxides, carbon oxide, and methane.

Monitoring periodicity is established subject to danger class of harmful substance and as follows:

- for I class - not rare than 1 time in 10 days;
- for II class - not rare than 1 time a month;
- for III, IV classes - not rare than 1 time a quarter.

Monitoring of sources of pollutants emissions on the new industrial areas should be made by forces of laboratory of environmental protection.

Atmospheric air

With a view of protection of air basin it is necessary to provide following actions:

- all production equipment, accessories, gas- and condensate lines, liquefied gas pipelines should be reliably encapsulated.
- gas discharging through safety valves and aeration gases should be obligatory burnt on the torches;
- torch height should provide permissible concentrations in air of the working area of products of gas combustion products.

There is basically provided application of valves with joining "under welding" for maintenance of the maximum air-tightness and minimization of leaks in environment.

Valves included into ADP (anti-damage protection) system has operation time no more than 12 seconds

All control valves should be flanged for possibility of carrying out of valves check.

There is provided protection of the equipment by system of the safety valves consisting of service and reserve valves, irrespective of terms of safety valves check.

For maintenance of trouble-free operation of technological installations the project provides:

– hermetic sealing of the equipment and pipelines;

– application of nonflammable materials for heat- and sound insulation of pipelines and the equipment;

– equipping of the technological equipment by all necessary control devices, automatics, safety valves (drain, back valves, etc.), providing reliability and trouble-free operation;

– remote control of tap valves on the main gas pipeline, tap valves on the candles of pressure dumping in head gas pipelines;

– emergency lighting with supply by batteries;

– application of explosion-proof equipment for explosive zones;

– gas pipeline protection from electromagnetic induction, static electricity, and measures for prevention of high potentials bringing in buildings;

– usage of steel seamless pipes for gas pipelines and other technological pipelines with obligatory hydraulic test of each pipe at the factory of origin;

– usage of welded connections on gas pipelines and pipelines with explosive-fire-hazardous and toxic substances;

– usage of shaped connections of pipelines (taps, tees, adapters) of the factory manufacturing, checked up and tested at factory;

– identification coloring of gas pipelines and other technological pipelines.

With a view of protection of the personnel from thermal effect, the hot surfaces of the equipment and pipelines in the service area have a heat insulation providing temperature of hot surfaces in permissible by norms sanitary limits.

Sewage waters

Industrial sewage waters discharge is made in designed on CGTU sewerage network and further in ponds-evaporators. Household flows are discharged in rakings.

Protection of land resources

The construction organizations should reduce as much as possible use time of the lands, occupied under temporary using, strictly observe norms of duration and terms of lands restoration carrying out (under construction of the connecting gas pipeline and condensate line).

Lands restoration is included in the general complex of works on construction of pipelines and is carried out in following sequence:

- stripping of the soil fertile layer and its removal to temporary spoil.
- construction of pipelines (earth, insulation-packing works, etc.)
- distribution of surplus of the mineral ground which has remained after tranches filling, throughout restoration zone.
- clearing of rubble and debris.
- backspacing from the temporary spoil of the sfl and its uniform distribution within restoration zone.

- sowing of grass.

During stripping, transportation, warehousing and storage of the fertile layer it is necessary to take measures excluding deterioration of its quality (its mixing with substratum, pollution by industrial, household and other waste), and also freezing, washout and blowing prevention. During storage of the fertile layer more than 3 months in the temporary spoil, the spoil surface should be sowed by fast-growing grasses.

During execution of works near to operating pipelines, CL or on crossing with them it is necessary presence of representatives of the maintaining organizations.

After passage of insulating-packing columns, the pipeline laid in the trench is filled by removal of all mineral ground from the spoil on a zone with the stripped soil fertile layer by bulldozers.

After termination of complex of works on pipeline construction there are executing following works throughout construction zone:

- filling and level-by-level ramming or alignment of ruts and pits which occurred as a result of construction work execution;
- clearing of rubble and debris;
- stripping of soil layer in places of pollution by FAL, etc. by substances worsening soils.

Flora, along pipeline route, is easily restored after restoration, and the animals, feeling the factor of anxiety during building, come back in former inhabitation after construction finishing. As far as all gas pipelines route practically is laid underground, there will be no obstacles on the way of animal migration.

Undeveloped sites are restored upon construction finishing, and subject to improvement and gardening.

Waste utilization

There will be formed hard waste during CGTUoperation: industrial waste, hard household waste and swept from hard surfaces of roads and areas. There are formed the certain amount (from 1 to 10 %) of building refuse during construction.

It is necessary organization of landfills of hard waste that will allow to reduce to a minimum the negative impact on environment.

Automation and ACS

Management-information system of technological processes is subdivided into three levels: level of complex supervisory control as a whole, level of operations management on gas processing and transport, level of automatic and remote control by technological installations.

Fire-prevention measure

Fire-prevention measures are developed with observance of norms and rules. All designed buildings and constructions have the II degree of fire resistance with categories of by explosive-fire-hazard. During design there have been taken into account requirements for necessary quantity of evacuation exits, and have been avoided crossings cargo and people streams. In case of explosion there are provided in explosive premises the easily dropped constructions. It can be window apertures and coverings. There are provided spark-proof floors in premises or constructions of categories: A, B, C.

For fast response during emergencies origin on the industrial areas there is a complex of buildings and constructions of fire-prevention purpose:

- pump stations of household and fire-prevention purpose;
- fire-prevention water-supply tanks;
- automatic firefighting pump stations;
- automatic firefighting water tanks.

There are provided following action for the purpose of decrease of production fire hazard:

- all stop and safety valves is accepted by 1 class of flap tightness;
- there are installed gassed condition signalling devices in explosive premises;
- electric equipment in fire-explosive premises and on external areas is designed in explosion-proof version;
- technological pipelines are laid underground or on fireproof support;
- explosive- and fire-hazardous substances are removed from premise by exhaust ventilation system;
- valves and pipeline are estimated on the pressure exceeding the maximum possible working pressure for reduction of emergency;
- if the devices are stopped for repair the liquid rests are drained in the drainage tank, and gases are freeing on a torch.

Antiseismic measures

All buildings and constructions were designed taking into account seismicity: selection of all precast ferroconcrete and steel elements of the structures is executed by typical materials developed taking into account seismicity, the buildings foundations were are estimated on the special combination of loads, i.e. during action of seismic force.

Thus, the provided antiseismic measures are directed on maintenance of reliable and safe use of buildings, constructions, and, accordingly process equipment operation.

Technological communication

The communication system is intended for operative and continuous control of technological processes, maintenance of effective interaction of the factory divisions, and also maintenance with communication of emergency, rescue and other services during liquidation of consequences of failures, acts of nature and other emergency situations.

Maintenance stuff

There are made demands to the personnel allowable to execute of works, according to the branch standard.

Considering the present demands, workers are allowed to work after passage of special instructing only, both introductory, and on a workplace.

Thus, technical-organizational failures during operation of installations are minimized.

As a whole the process equipment accepted in the project of construction meets the modern requirements made to installations of gas extraction, processing and transport.

There are provided by design decisions for trouble-free operation maintenance:

- technical decisions on corrosion protection and control;
- preparation of the qualified operating personnel.

Thus, the measures of technical and nature-conservation character offered by the project will allow to operate enterprise in a safe mode.

7 FORECAST OF ENVIRONMENTAL CHANGES AND ECOLOGICAL CONSEQUENCES AS A RESULT OF OBJECT REALIZATION

As a result of designed objects functioning there will be additional impact on atmospheric air from emissions of pollutants, such as carbon oxide, nitrogen oxide and dioxide, various hydrocarbons, i.e. environment will be subject to chemical impact.

Physical impact can be expressed in soil load during construction and installation of industrial areas equipment, during laying of pipelines, TL, communication lines, highways, and also in bringing of noise, vibration, electromagnetic radiations.

As it has been shown in subsection 4.5, bringing of the chemical substances during operation of objects will be defined, basically, by emissions in atmospheric air of saturated hydrocarbons, and also fuel gas combustion products and will make about 1941.936t/year.

For the purpose of definition of pollution level of atmospheric air by predicted emissions there has been carried out dispersion calculation on the area 5x5km with use of the bundled software "Ecologist". Concentrations calculation was spent only from emissions of designed objects. Analysis of calculations has shown, that:

Nitrogen dioxide - largest prospective level of atmospheric pollution is supposed on the given component (figure 13). Peak concentration will make 0.51 MPC (directly close to CGTU), at the distance of 700m from area the concentrations are decrease up to level 0.23 MPC, at the distance of 2000m from area the concentrations do not exceed level 0.1 MPC.

Nitrogen oxide – bringing level of the given component is predicted by small amounts (figure 14) – peak concentration will make 0.01 MPC (directly close to Surgil CGTU)

Carbon oxide – bringing level of the given component is predicted by small amounts (figure 15) – peak concentration will make 0.04 MPC (directly close to Surgil CGTU), least - 0.01 MPC (at the distance of 2500m from CGTU).

Hydrocarbons (of methane) – bringing level of the given component is predicted by small amounts (figure 16) – peak concentration will make 0.06 (directly close to Surgil CGTU), least - 0.01 MPC (at the distance of 1000m from CGTU).

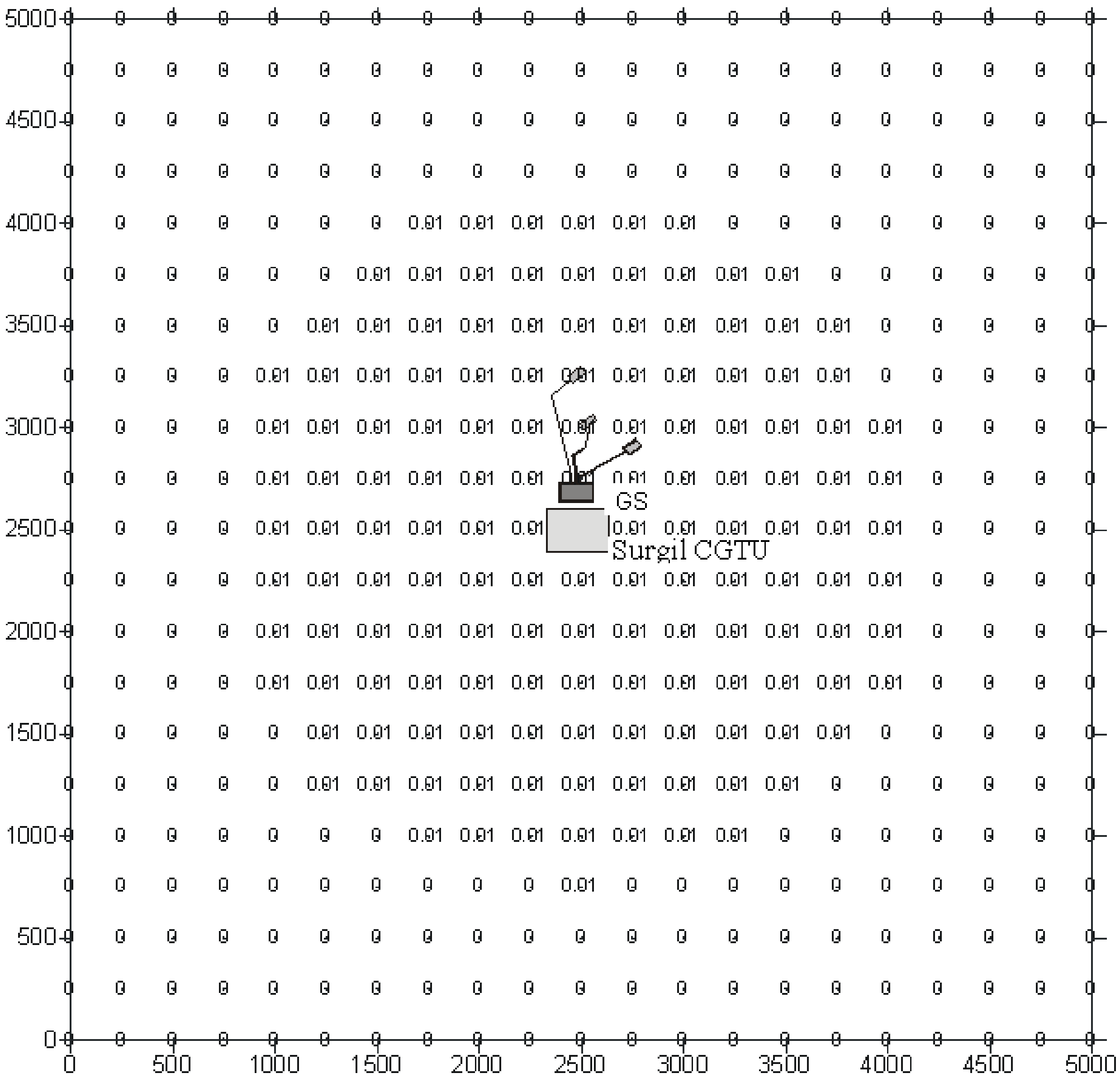

Figure 14 - Predicted atmospheric air pollution level by nitrogen oxide in the CGTU region of Surgil field (MPC quota)

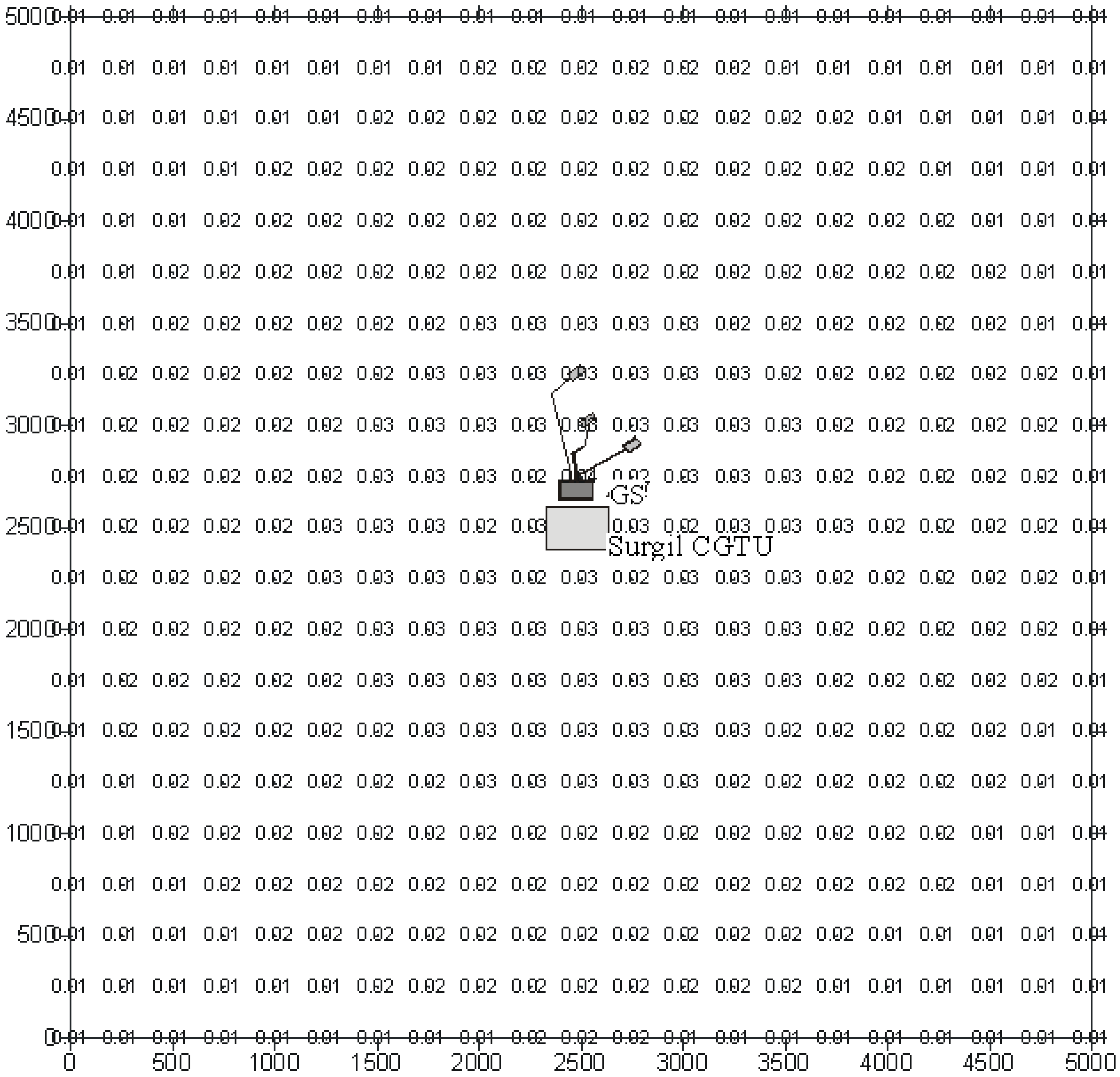

Figure 15 - Predicted atmospheric air pollution level by carbon oxide in the CGTU region of Surgil field (MPC quota)

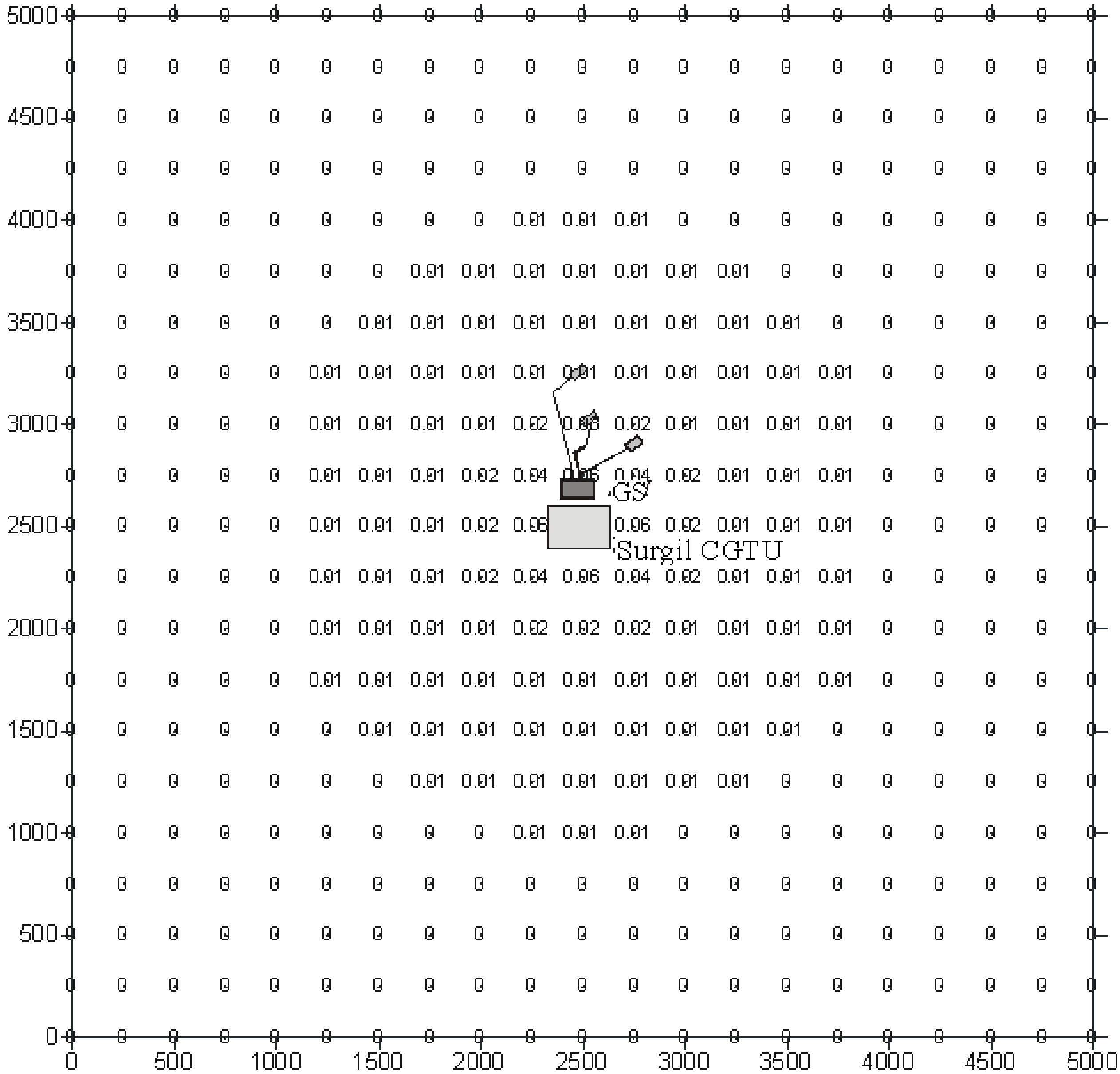

Figure 16 - Predicted atmospheric air pollution level by hydrocarbon in the CGTU region of Surgil field (MPC quota)

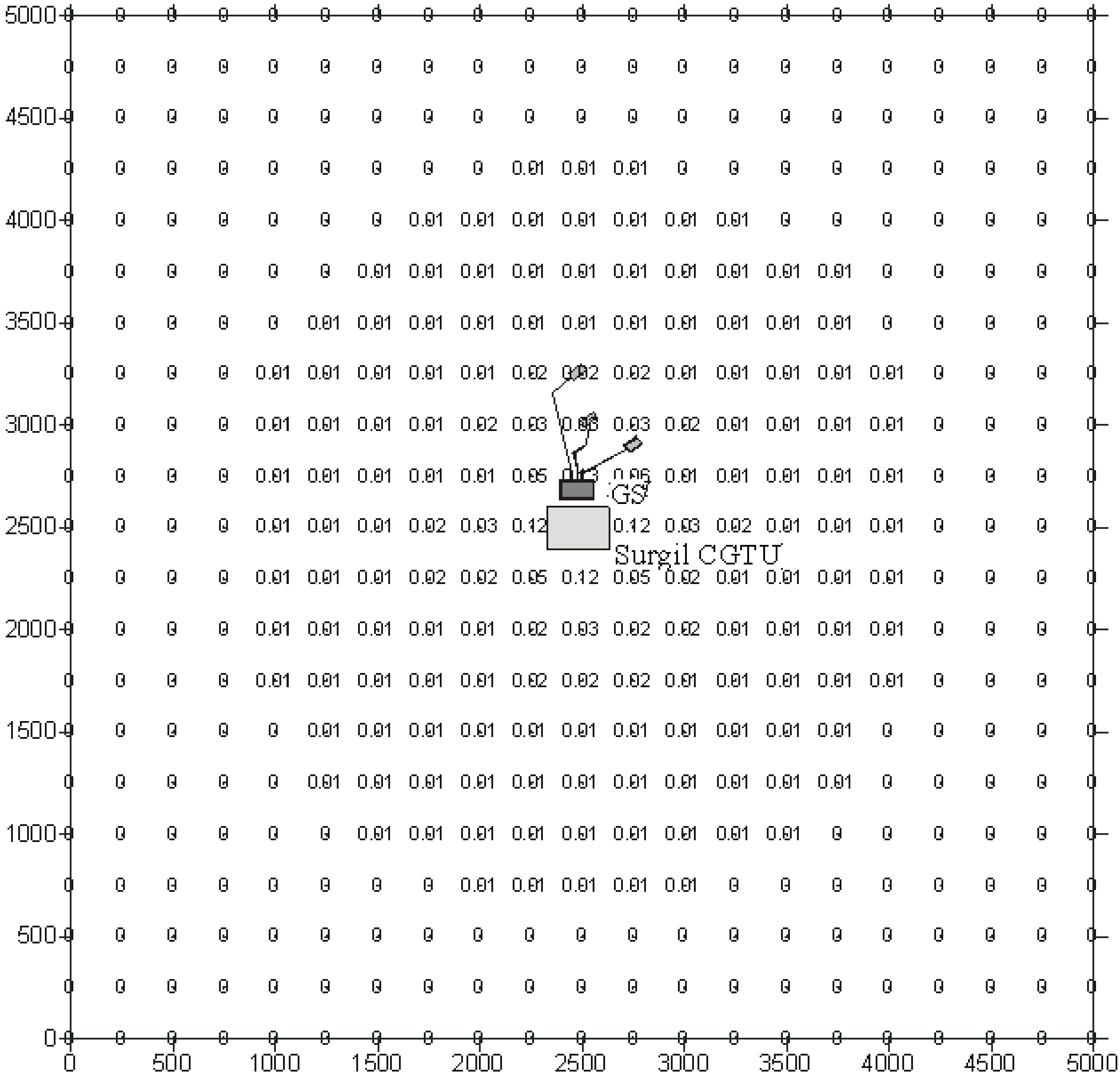

Figure 17 - Predicted atmospheric air pollution level by carbon black in the CGTU region of Surgil field (MPC quota)

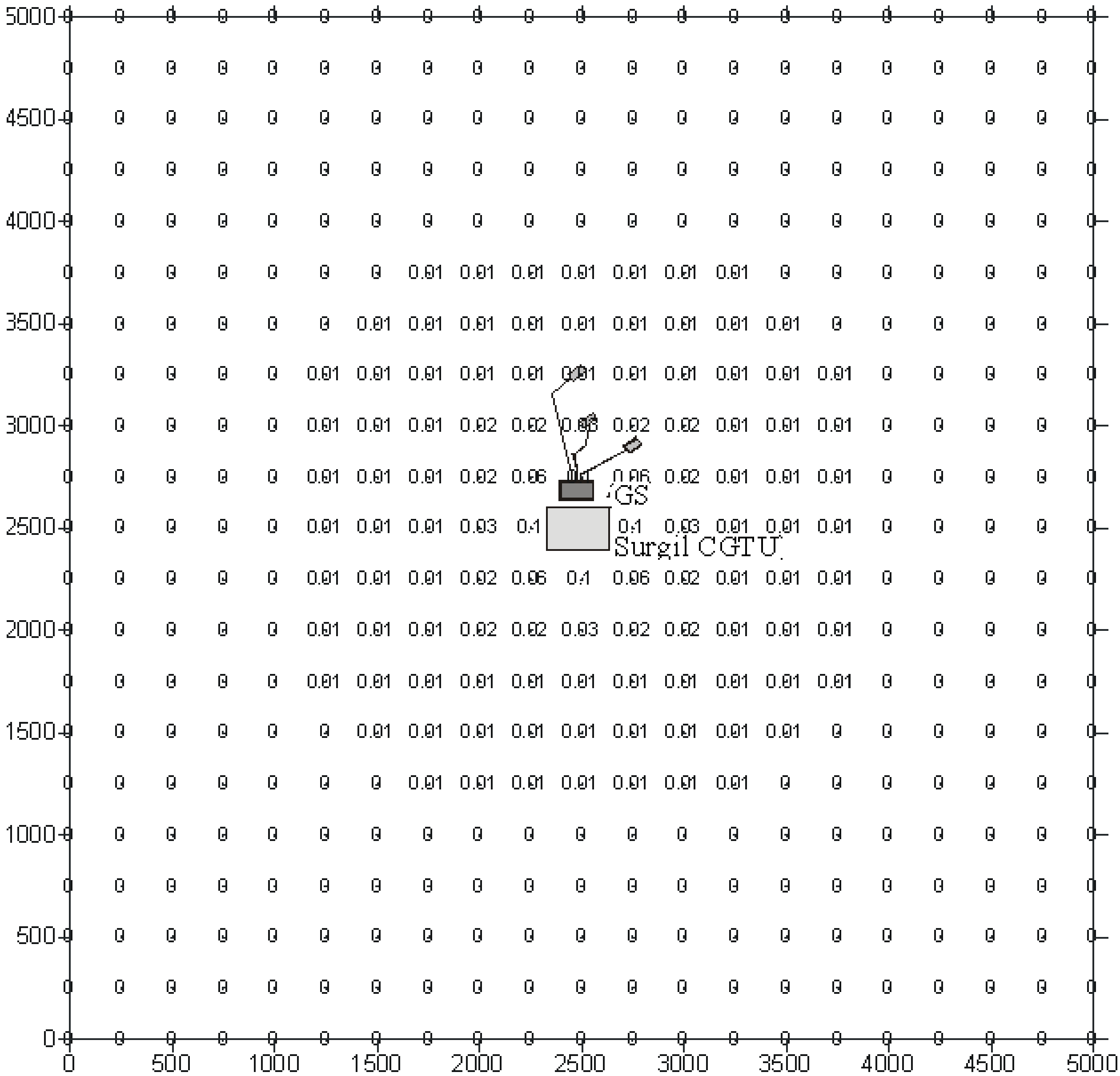

Figure 18 - Predicted atmospheric air pollution level by sulfur dioxide in the CGTU region of Surgil field (MPC quota)

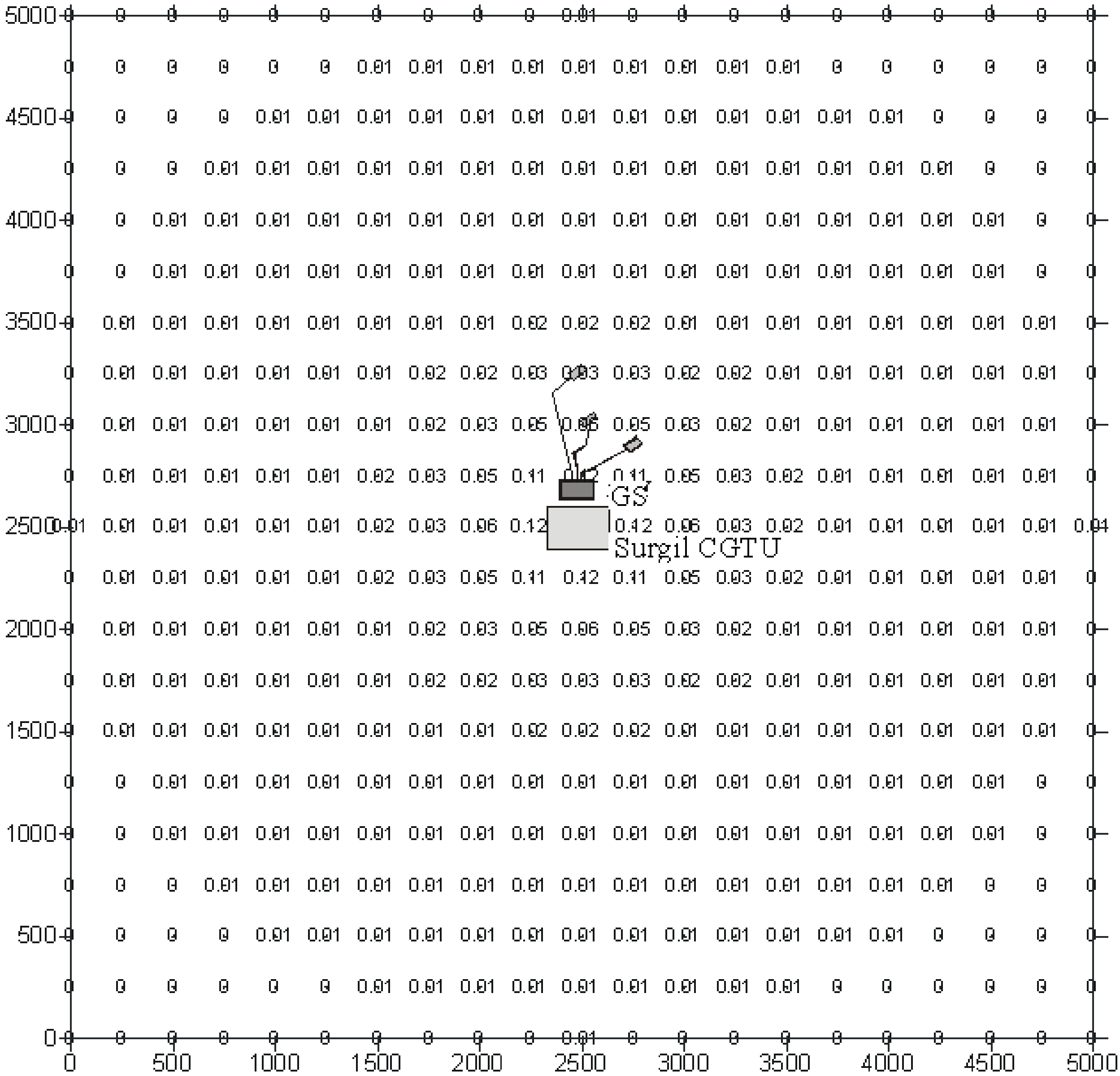

Figure 19 - Predicted atmospheric air pollution level by acrolein in the CGTU region of Surgil field (MPC quota)

Carbon black – bringing level of the given component is predicted by small amounts (figure 17) – peak concentration will make 0.13 MPC (close to CGTU), least - 0.01 MPC (at the distance of 1500m from CGTU).

Sulfur dioxide – bringing level of the given component is predicted by small amounts (figure 18) – peak concentration will make 0.10 MPC (close to CGTU), least - 0.01 MPC (at the distance of 1000m from CGTU).

Acrolein – bringing level of the given component is predicted by small amounts (figure 19) – peak concentration will make 0.12 MPC (close to CGTU), least - 0.01 MPC (at the distance of 1000m from CGTU).

Thus, pollution of atmospheric air by sources of designed area has moderate character; there is not predicted excess of permissible norms by no one of dispersed components. There is not expected considerable impact on atmospheric air of the nearest settlements by pollutants emissions.

The forecast of air condition during functioning of designed objects is favorable, additional bringing is rather insignificant, it is not supposed concentrations exceeding permissible norms out of the industrial areas of objects.

According to character of planned construction it is supposed withdrawal from natural environment of water and land resources.

During preparatory and construction-and-assembling works the grounds and soils throughout gas pipelines route and in the industrial areas are exposed to the strengthened impact. It can be expressed in some deterioration of the soil-vegetable cover, change of soil structural properties. Negative impact on soils can render the vehicles destroying them mechanically and worsening physical and agrochemical properties, construction works, emissions of harmful substances in atmosphere, possible failures.

The volume of the disturbed lands will carry temporality throughout pipelines route and constant character in the wells, GGS and CGTU areas.

The volume of the disturbed lands will carry temporality throughout pipelines route (loops, collectors, connecting gas pipeline and condensate line).

According to the project, water supply of CGTU area will be carried out from artesian well. Thus, there are saved material resources and is minimized impact on the environment, connected with water-supply lines laying.

The system of household and industrial water supply is intended for water delivery for household and industrial needs. The requirement for household needs is defined by quantity of working people.

Visual dominants in the region of construction remain practically the same - a torch, technological installations, office buildings.

As a whole, bringing of chemical substances in environment will not undergo qualitative changes.

Anthropogenic noises are one of kind of the anthropogenic impact on environment. Harmful effect of noise is defined by some factors:

- intensity (in dB);
- frequency (most dangerous - high-frequency);
- duration;
- noise character (impulsive noise is especially dangerous).

Pipes through which gas is transported, torches of technological installations and etc., can be the noise source on designed constructions. Noise from the given production processes, as a rule, is rather low.

The most essential source of noise is separating devices at the moment of their purges. In this case noise results from considerable gas pressure losses, as a result of the high speed of the blowing-off products discharge. Gas bleeding-off from the equipment occurred before the execution of repair-preventive works once a year within 20-30 minutes. Purging of separators is spent seasonally: 1-2 times a day during the summer period and 3-4 times a day during the autumn-winter period. Purging time rather small and makes 1-2 minutes.

Noises during gas bleeding-off have short-term incidental character. During gas bleeding-off from the equipment and also during carrying out of purging of separating devices the maintenance stuff should use personal protection equipment (ear-phones, hum-eliminating plugs, etc.).

In the territory of designed constructions the permissible noise levels on workplaces, in working zones, in industrial premises and in the territory of the enterprises, constant workplaces of stationary machines will make no more than 80dB, which shows equipment operating experience at the similar enterprises.

One of the main characteristics of prospective industrial activity is the impact characteristic on environment.

The technology of objects is characterized by work continuous process, connected with low emissions in atmosphere of chemical substances. Nitrogen and sulfur dioxide, carbon oxide, hydrocarbons and carbon black are the main from them.

Proceeding from design values of atmospheric pollution levels, shown on dispersion maps (figures 13-19) by considered components, it is visible, that character of impact during normal constant operating mode has moderate character. Peak values of ground concentration outside of designed objects make: nitrogen dioxide - 0.51 MPC, and per other polluting impurities (nitrogen oxide, carbon oxide, sulfur dioxide, carbon black, acrolein, hydrocarbons) concentrations will not exceed 0.1 MPC level.

Enterprise impact can be raised in case of the emergency emissions which origin will have short-term character.

Besides, direct impact on atmospheric air will occur during construction. Emissions in atmospheric air during this period are formed as a result of special equipment and motor transport operation. The main components will be fuel combustion products in engines, and also inorganic dust during pipelines laying, trenching and excavation and etc. it is necessary to note, that impact on atmospheric air during construction will have short-term character, that practically will not affect background level of atmospheric pollution.

According to intensity and impact level per time unit and unit of area the impact will be moderated and subject to inversion phenomenon the level of APP will low increase.

As construction will be in the limited areas, dimensional coverage of impact will be limited by the necessary area and will have local character.

Construction of pipelines will have temporary impact on soil and vegetation, upon termination of construction there will be executed restoration of the disturbed lands.

Impact on surface waters has indirect character and is connected with withdrawal of water resources for industrial and drinking needs. Impact duration is the period of the designed constructions operation. Temporary dynamics of water withdrawal will be constant for fresh water.

Distribution area, in case of sewage disposal to ponds-evaporators, is limited by the area of ponds-evaporators.

Soils of investigated region concern to the main objects of impact. During this time intensity of impact is low, has the periodic character increasing during emergency emissions.

Impact duration will not change, as this volume depends on time of the constructions operation. Impact will be continuous. Distribution areas will not extent. Impact character remains direct, as before.

According to calculations of atmospheric pollution and operational experience of similar manufactures, it is possible to state, that the enterprise personnel will breathe air which quality corresponds to sanitary norms in the working areas, confirmed by Ministry of Health of the Republic of Uzbekistan.

The soils of the investigated site of works and adjacent territories represent a zone of natural not high fertility (it is necessary irrigation). Small humus content does not allow developing to high vegetation types. Wind erosion and total amount of dusty particles are one of the reasons of soil degradation. Proceeding from the analysis of soil cover condition in the zone of object impact, it is possible to draw a conclusion:

- object construction is carried out on the lands not convenient for agricultural crops.
- main object impact is connected with additional disturbance of soils structure throughout gas pipeline route.

In view of remoteness, surface waters are not objects of impact (only withdrawal for water supply).

There is not supposed considerable impact during object functioning on other components of environment (water, flora, fauna) during performance of the measures offered by the project for prevention or softening of the revealed possible adverse effects.

Construction and operation process of planned object can also change of social and economic conditions of the vital activity of the population of nearby settlements.

Offered design decisions are confirmation of ecological efficiency of project realization connected with improvement of the environmental conditions or its separate components, and also are directed to the prevention of ecological risks occurrence.

The population living at distance from industrial objects will not feel special change because of local character of the given project operation.

Sewage waters do not render direct impact on water objects. There is possible underground waters pollution as a result of a water filtration in the ponds-evaporators, however, during long operation of ponds their bottom has become covered by deposit layer interfering with filtration processes. Also, filtration process is interfered with structure of the underground waters having high density at the expense of high mineralization. Absence of organic pollution in the analysis of existing observation wells waters confirms the assumption of absence of underground waters pollution.

Proceeding from the aforesaid, integrated assessment of the environmental condition in the region of planned construction has shown following results.

Impact on atmosphere will rather increase, especially by nitrogen oxides, however, in whole, functioning of designed object practically will not change the established level of atmospheric air pollution.

Impact on soil and vegetation will be expressed in violation of integrity of the soil-vegetable cover during construction works execution and gas pipeline laying. Possibility of emergency condensate spills is not excluded during pipeline leakage. After execution of construction works on pipelines laying, all lands which have been allotted for temporary use, will be restored. There are build into estimate corresponding means for restoration. The emergency spills, which probability is extremely small in view of pipelines embodiment, do not represent considerable danger to environment (soils, water streams, atmospheric air). Failures are subject to the immediate liquidation, the polluted ground is subject to transportation, the failure site is exposed full restoration. Thus, it is possible to state, that design decisions provide the careful treatment of grounds and soils, provide conservation of their agricultural qualities.

After restoration processes the vegetation during short time is completely restored. Accordingly, animals after construction termination have possibility to return to former inhabitation. Planned construction does not establish obstacles to migration of animals.

The landscape will keep its modern appearance (will change not considerably).

Considering the above-stated, health impact of the maintenance stuff and population through the way of pipelines routes will practically not be felt.

Thus, as a whole, the forecast for impact on NE is favorable; the planned construction will bring its nature conservational contribution (conservation of resources and rational use of natural resources).

CONCLUSION

Ecological estimation of impact of designed production was spent on the basis of the analysis of existing condition and characteristics of environment in the region of planned activity.

There are analyzed variants of realization of principal design decisions in work, and are revealed and characterized possible sources of impact, type and character of impact, and also objects of impact from the ecological point of view.

There is made the forecast of possible impact of construction objects on the condition of mineral resources, atmosphere, soils, surface reservoirs, flora and fauna, and also on the maintenance stuff.

There are considered the social and economic aspects connected with construction and operation of designed constructions.

There are described objectively existing dangers for maintenance stuff, and for environment in section of possible emergencies origin, and is drawn a parallel of designed production with the similar enterprises operating over a long period of time, and also are planned measures for prevention emergency situations and possible adverse impacts on environment.

As a result of the done work it is possible to draw following conclusions:

- project realization is directed to support stability in supply of the country by gas and polyethylene combinations;
- the project purpose is the increase of hydrocarbons extraction and deeper tank gas drying without considerable anthropogenic load increment on the environment;
- in the social plan project realization will allow to create additional workplaces, to create comfortable conditions for maintenance stuff;
- risk of emergencies origin with considerable consequences is low, as well as at nearby similar manufactures.

Realization of planned activity at observance of technological discipline, safety engineering, and realization of nature conservation measures cannot affect environment with long-term harmful consequences, therefore, it is recommended to continue designing of object taking into account results of this work.

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СПИСОК РИСУНКОВ К ТЕКСТУ

INTRODUCTION

THIS DRAFT STATEMENT ON THE IMPACT ON THE ENVIRONMENT (DRAFT EIS) WAS DEVELOPED AS AN ENVIRONMENTAL SUPPORT (I STAGE OF EIA PROCEDURE) PRE-FEASIBILITY STUDY (OTEC) INVESTMENT FACILITY "INTEGRATED FIELD DEVELOPMENT SURGIL THE EXTRACTION OF VALUABLE COMPONENTS.

FOUNDATION FOR THE DEVELOPMENT OF OTEC - RESOLUTION OF THE PRESIDENT OF THE REPUBLIC OF UZBEKISTAN DATED 11 APRIL 2006 AND THE MEMORANDUM OF UNDERSTANDING BETWEEN UZBEKNEFTEGAZ AND THE KOREA GAS CORPORATION «KOGAS» ON MARCH 29, 2006.

OTEC IS MADE IN ACCORDANCE WITH THE TASK OF UZBEKNEFTEGAZ AND AK UZGEOBURNEFTEGAZDOBYCHA (UAE USTYURTGAZ ") APPROVED BY THE CABINET OF MINISTERS OF UZBEKISTAN JUNE 12, 2006.

THIS PROJECT ADDRESSES ISSUES OF DESIGN ARRANGEMENT GCM SURGIL AND GAS TRUNKLINE IN GAS-CHEMICAL PROCESSING (BOOK 2. PART 1 "DRAFT EIS TO DEVELOP FIELDS SURGIL). IN PART 2, "DRAFT EIS FOR THE CONSTRUCTION OF MCC," FOCUSES ON THE CONSTRUCTION AND OPERATION OF DIRECT GAS-CHEMICAL COMPLEX AND A RESIDENTIAL VILLAGE FOR STAFF.

THE PURPOSE OF OTEC IS THE DEFINITION OF TECHNOLOGICAL AND ECONOMIC PERFORMANCE OF GAS PROCESSING GCM SURGIL ON AKCHALAK MCC, THE DEFINITION OF THE VOLUME OF CAPITAL INVESTMENTS AND THE ECONOMIC JUSTIFICATION OF INVESTMENTS IN CONSTRUCTION WORKS AND TO DETERMINE THEIR EFFECTIVENESS.

IN IMPLEMENTING THIS PROJECT ACHIEVED A BETTER USE OF INFORMATION CONTAINED IN NATURAL GAS DEPOSITS SURGIL VALUABLE COMPONENTS: ETHANE, PROPANE-BUTANE FRACTION, AND GAS CONDENSATE. ALSO ACHIEVED A MORE PROFOUND DEHYDRATION OF MARKETABLE GAS. PROJECTED FACILITY HAS THE CHARACTER OF RESOURCE CONSERVATION.

THE TECHNIQUE OF WORKS BASED ON TRADITIONAL METHODS SUCH AS EIA PROCEDURE AND TAKES INTO ACCOUNT THE PECULIARITIES OF THE OBJECT.

BASED ON THE INFORMATION ON THE SOURCES OF THE NEGATIVE IMPACT THE CALCULATIONS OF EMISSIONS AND IDENTIFIED AREAS OF THEIR DISTRIBUTION AND DEGREE OF INFLUENCE ON THE OPS.

IN THE PRESENT STUDY, WE USED THE DESIGN DOCUMENTS, STOCK MATERIALS, LITERATURE, AND "REGULATION ON STATE ENVIRONMENTAL REVIEW IN THE

REPUBLIC OF UZBEKISTAN", APPROVED BY THE CABINET OF MINISTERS DATED 31 DECEMBER 2001 № 491, WHICH REGULATES THE COMPOSITION AND VOLUME OF THE "DRAFT EIS" AND OTHER EXISTING REGULATORY INSTRUMENTS IN ENVIRONMENTAL PROTECTION.

1 STATE OF THE ENVIRONMENT BEFORE PLANNED ACTIVITIES

ADMINISTRATIVELY, THE MCC IS LOCATED IN THE AKCHALAK KUNGRAD REGION OF KARAKALPAKSTAN.

THE SITE OF THE FUTURE OF MCC AKCHALAK LOCATED ON THE EAST CINQUE USTYURT IN 5,0 KM TO THE NORTHEAST OF THE RAILWAY STATION KYRKKYZ. FROM THE NORTH-WEST OF 1,0 KM AND NORTH-EAST TO 2.0 KM LIMITED VL - 110 KV, AND FROM THE SOUTH TO 2.0 KM OF OVERHEAD LINES - 35 KV. THE SITE IS LOCATED ON LEVEL GROUND WITH A HEIGHT DIFFERENCE OF UP TO 2 M. IN THE SOUTHWEST ARE THE RAILROAD AND HIGHWAY KUNGRAD - BEINEU, MAIN GAS PIPELINE CENTRAL ASIA - A COMPRESSOR STATION AKCHALAK (FIGURE 1).

THE CLIMATE OF THE REGION IS WELL UNDERSTOOD BY MANY YEARS OF OBSERVATIONS AT METEOROLOGICAL STATIONS (PERMANENT SURVEILLANCE 1936.) LOCATED CLOSE TO THE PLACEMENT OF OBJECTS.

CHARACTERIZED AS A CONTINENTAL CLIMATE. THIS IS INDICATED BY THE FOLLOWING FACTORS: FIRSTLY, A LARGE AMPLITUDE OF AIR TEMPERATURE - THE MAXIMUM DAILY AMPLITUDE IS: IN THE MONTH OF JANUARY 1922 0C, IN JULY 1924 0C, AND SECONDLY, SMALL ENOUGH RAINFALL THROUGHOUT THE YEAR, AND THIRDLY, A SIGNIFICANT DECREASE HUMIDITY IN THE WARM SEASON AND AN INCREASE IN THE COLDEST PERIOD.

THE AVERAGE ANNUAL TEMPERATURE OF AIR IS 10.2 0C. AVERAGE MONTHLY VALUES OF AIR TEMPERATURE IN THE COLDEST MONTH (JANUARY) IS -5.9 C 0, THE MEAN MONTHLY VALUES OF AIR TEMPERATURE FOR THE WARMEST MONTH (JULY) IS 26.6 C0. ABSOLUTE MINIMUM AIR TEMPERATURE IS -31 0 C, ABSOLUTE MAXIMUM TEMPERATURE - 44 0C. THE DURATION OF THE HEATING PERIOD 167 DAYS. DURATION OF THE PERIOD WITH DAILY AVERAGE TEMPERATURE LOWER THAN 0 0 C - 104 DAYS. THE GREATEST DEPTH OF SOIL FREEZING IS 72 CM MAXIMUM DEPTH OF SOIL FREEZING MAYBE ONCE IN 10 YEARS - 117SM, ONCE IN 50 YEARS - 138 CM.

THE ANNUAL DISTRIBUTION IS DOMINATED BY THE WINDS OF THE NORTHERN, NORTHEASTERN AND EASTERN DIRECTIONS. IN JANUARY, THE PREVAILING WINDS ARE EAST, NORTH-EAST AND WEST DIRECTIONS. IN JULY THE PREVAILING WINDS OF THE NORTHERN AND NORTHEASTERN AREAS. AVERAGE MONTHLY WIND SPEED IN JANUARY AND JULY IS 4,1 M / SEC. ANNUAL MAXIMUM WIND SPEED OF 25 M / S (M.ST. MUINAK) AND 35 M / S (M.ST. KUNGRAD).

AVERAGE ANNUAL RELATIVE HUMIDITY IS 70%, THE AVERAGE MONTHLY RELATIVE HUMIDITY IN JANUARY IS 83% FOR JULY - 58%. ANNUAL PRECIPITATION IS 121 MM. IN THE ANNUAL RAINFALL THIS AREA RELATES TO THE TRANSITION ZONE BETWEEN THE NORTHERN LATITUDES, WHICH ARE CHARACTERIZED BY THE PREDOMINANCE OF THE YEAR PRECIPITATION DURING THE WARMER PERIOD, AND THE MORE SOUTHERN, WHERE THE PRECIPITATION FALLS MAINLY IN THE COLD SEASON.

Figure 1 - Arrangement Ustyurt Gas Chemical Complex

Most rain falls in April - 18 mm, representing 16% of the annual amount, the least rainfall in July, August and September. Maximum daily rainfall of 66 mm.

Snow cover does not exceed 17 cm, number of days with snow cover is 27. Number of days with dust storms and dust ground winds for the year equal to 57. Number of hours of thunderstorms per year - 9.

According to the zoning of the territory of Uzbekistan on the climatic characteristics, this area belongs to a region of wind pressure with the normative values of 0.38 kPa and an area for snow loads with a normative value of 0.5 kPa.

Regulatory wall thickness of ice with repeatability once every 5 years is 15 mm, once in 10 years - 20 mm.

Thus, the location of the major sources of harmful air emissions may contribute to the formation of elevated levels of air pollution in all wind directions. Nevertheless, in every season meteorological factors may also influence the activation of the scattering power of the atmosphere, excluding the formation of intense sources of pollution.

The main sources of environmental impact in the area of construction of MCC Akchalak and pipelines for transporting products of the complex are: objects Akchalak COP and the main gas pipeline Central Asia - Center, CPF Akchalak, Kungradskiy Soda Plant, as well as railways and roads Kungrad - Beyneu and residential village.

However, these objects are not large and are located far away from the construction site, almost industrial impact on the components of the environment in the GCC do not have.

In terms of air pollution largest and closest sources are the sources of the compressor station Akchalak at the site to which there are four compressor plant, each equipped with a fleet of SBS. The main sources of air emissions is gas-compressor units such as the GT-25I, SCC-10-4, I-6, 3 in quantities of 10 pieces, by which the atmospheric air enters the combustion products of fuel gas in gas-turbine drives.

On-site cleaning of the gas compressor in all the shops are set cyclones (22 pcs.) That are sources of emissions of hydrocarbons (as methane).

Methane into the atmosphere also occurs at start-up operations, cold cranking, stop and unloading units, purging pulse and fuel reservoirs. Emissions into the

atmosphere during this depends on the amount of bleed or purge gas. These emissions are intermittent and periodic in nature and can not influence the formation of background concentrations in the areas where a compressor station.

According to the statistical reporting total emissions into the atmosphere from actually working 3 aggregate amounted to 1,392.783 tons a year, including: carbon monoxide - 298.454 tons / year, nitrogen dioxide -218.866 tonnes / year, nitrogen oxide - 875.464 tons / year. The total methane emissions from dust collectors totaled 824.736 tons / year.

As can be seen from the emission dominant ingredients, emitted by the COP Akchalak are methane and nitrous oxide.

In order to determine the level of air pollution emissions of existing COP Akchalak calculated the dispersion of the area 20x20 km with a design in increments of 1 km. The calculation was performed using UPRZA Environmentalist 1, 10. Analysis of the calculations showed that:

Nitrogen dioxide - maximum concentration was 0.88 MAC near the CS (Figure 2). On the territory of the planned GCC Akchalak impurity concentration are 0,27-0,39 MAC, ie impact of the emissions of the COP will not affect significantly the level of atmospheric pollution in the area of design.

Nitric oxide - maximum concentration was 0.48 MAC near the CS (Figure 3). On the territory of the location of MCC Akchalak impurity concentration are 0,22-0,15 MAC, ie impact of the emissions of the COP will have virtually no impact on the level of atmospheric pollution in the area of design.

Carbon monoxide - maximum concentration was 0.02 MAC near COP (Figure 4). Emissions from the COP on air pollution in the area of design is not affected.

Hydrocarbons (Methane) - maximum concentration was 0.48 MAC near COP (Figure 5). Emissions from the COP on air pollution in the area of projection does not affect (0,03-0,05),.

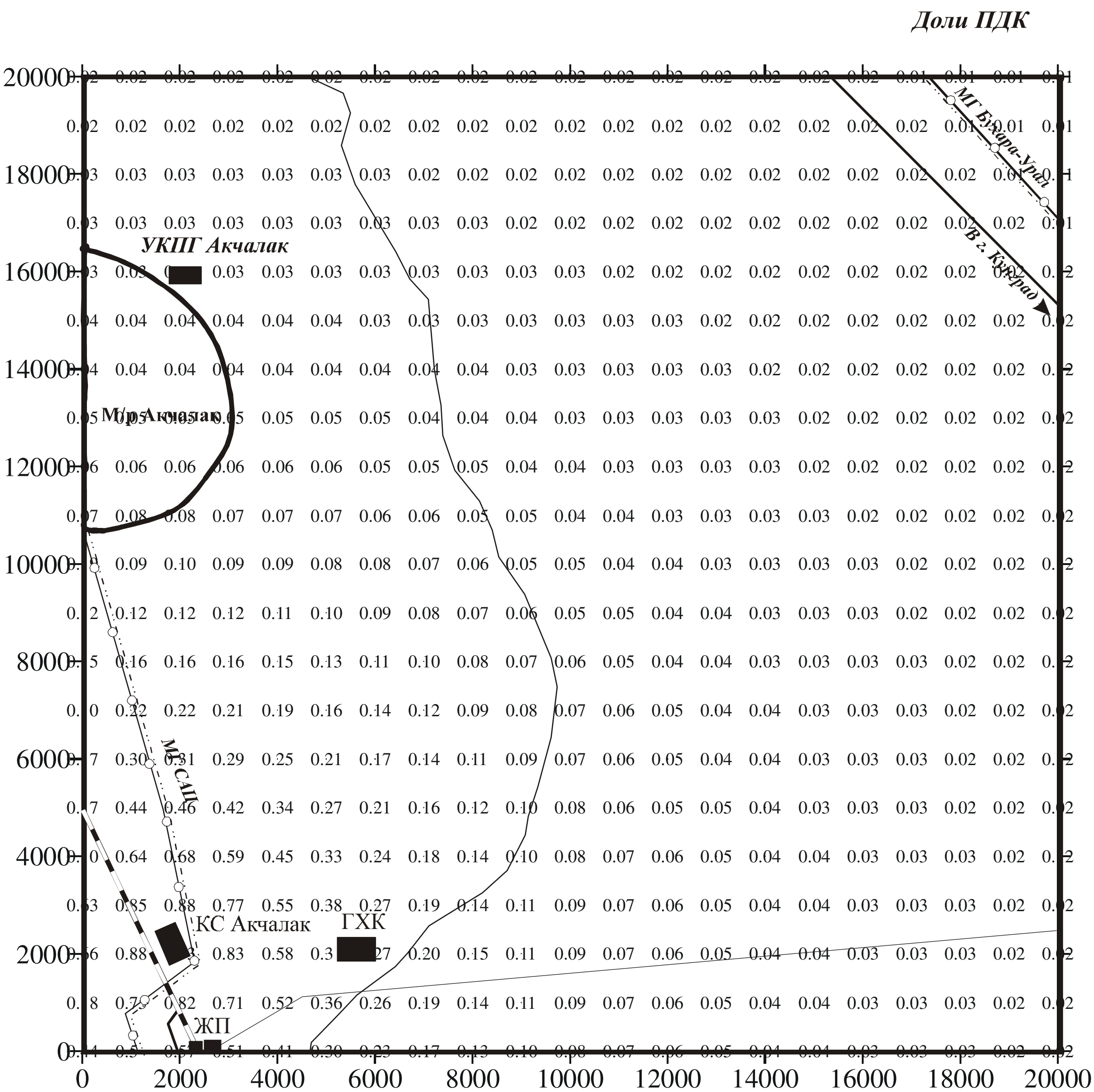
Thus, based on the layout of the most significant industrial sites, that at present, except for CS Akchalak, industrial activities in adjacent to the MCC area is not fixed. Therefore we can conclude that the air near the proposed construction does not feel large anthropogenic loads.

However, it should be noted that the feature of air pollution in the Ustyurt region is the high content of dust and salts of natural origin (10 or more Macs during dust storms).

Major surface water streams within the area of MCC absent, the district is classified as arid. The hydrographic network is absent.

Ustiurt surface sediments of low power (up to several meters) overlap more ancient and are anhydrous. The depth of the groundwater level is 5 - 8 or more. Salinity is very high, sometimes reaching up to 75 - 80 g / l of sodium chloride.

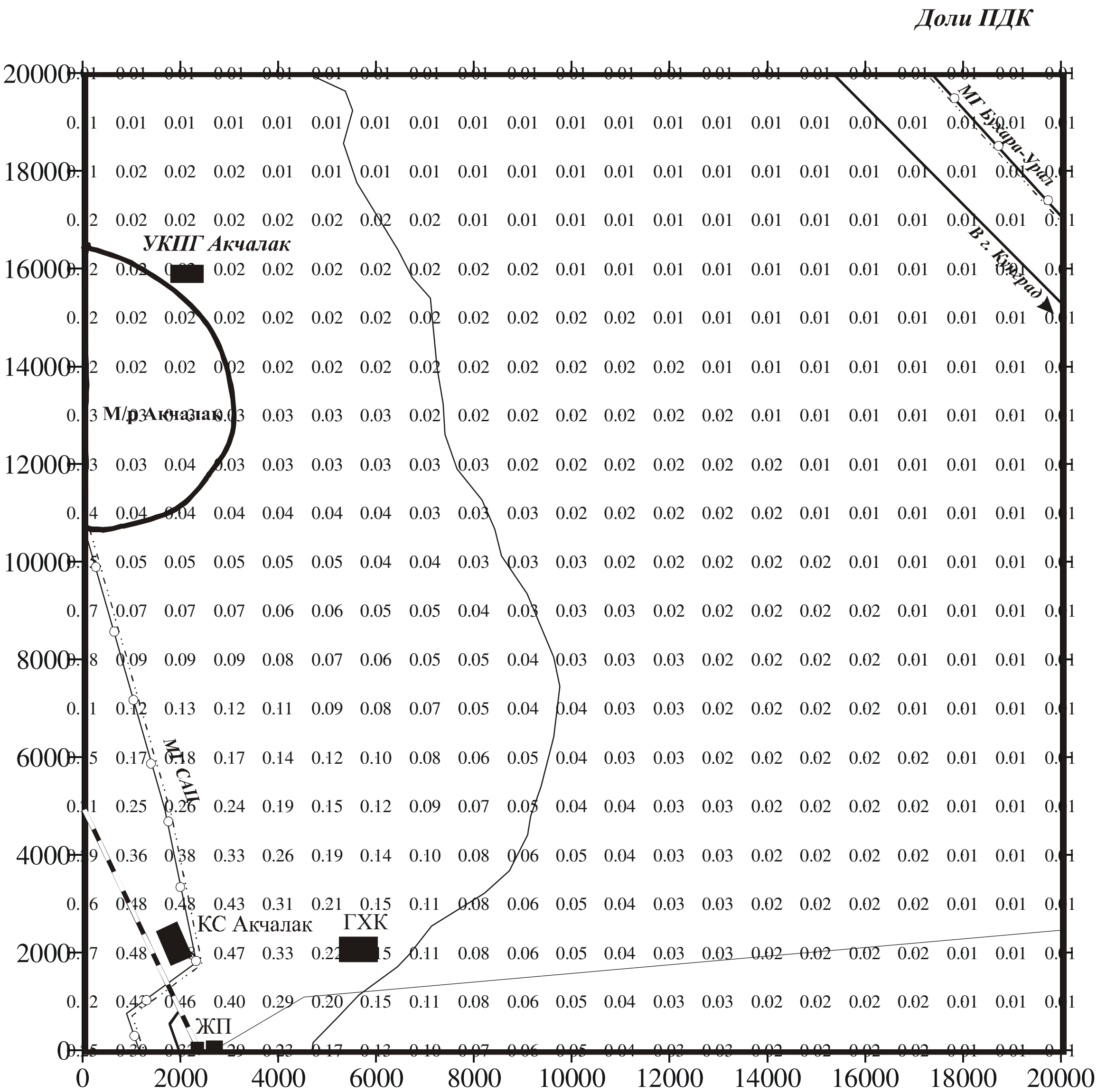
Underground (ground) water opened shallow wells, rarely - in the form of top-down sources come to the surface. By late summer, almost all the springs and wells dry up. In this period mineralization exceeds the maximum permissible concentration for drinking water and up to 3 or even 7 grams per liter.



Условные обозначения:

- газопроводы
- автодороги
- железная дорога
- ЛЭП

Рисунок 2 - Существующий уровень загрязнения атмосферного воздуха диоксидом азота в районе проектируемого Акчалакского ГХК



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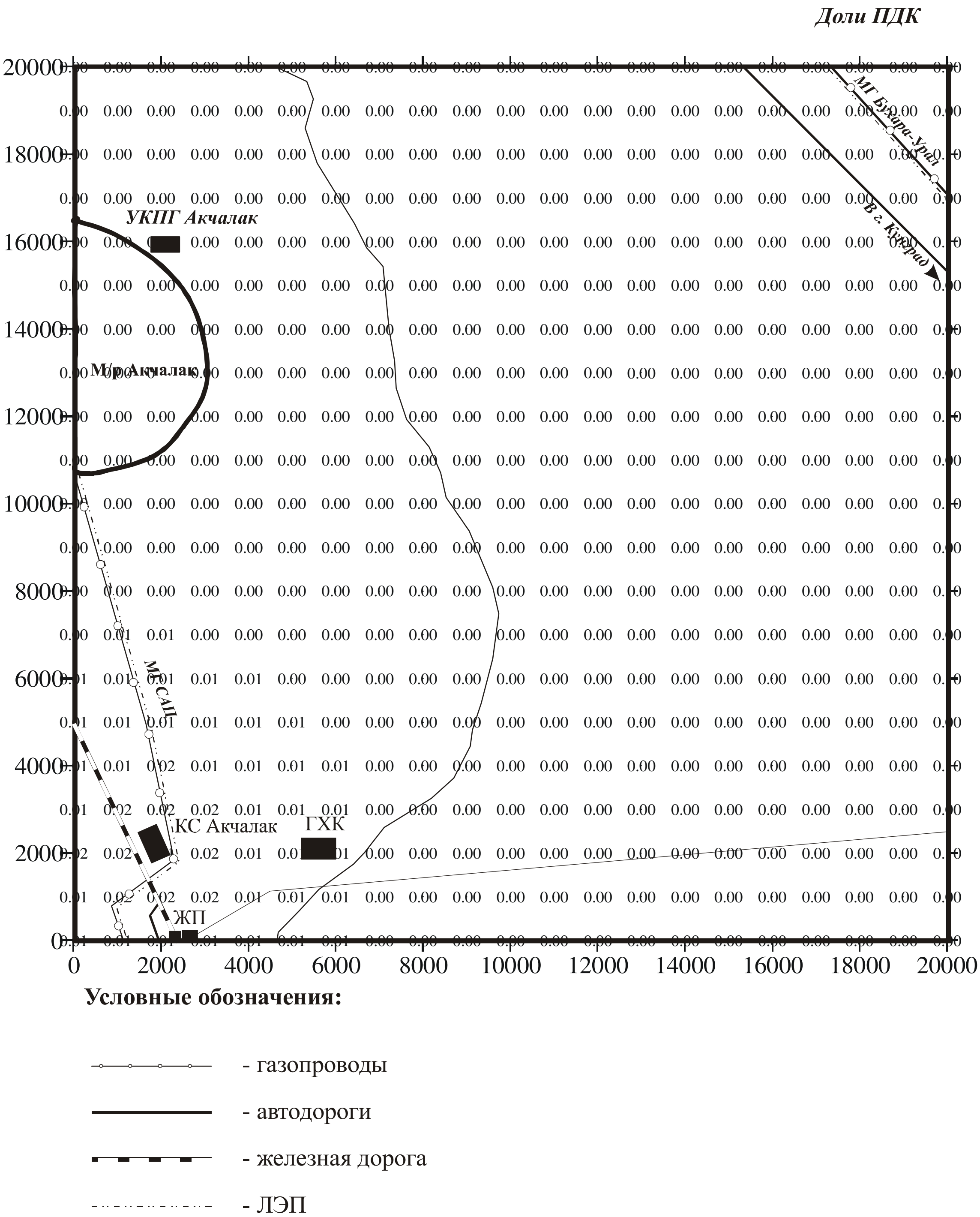

Рисунок 4 - Существующий уровень загрязнения атмосферного воздуха оксидом углерода в районе проектируемого Акчалакского ГХК

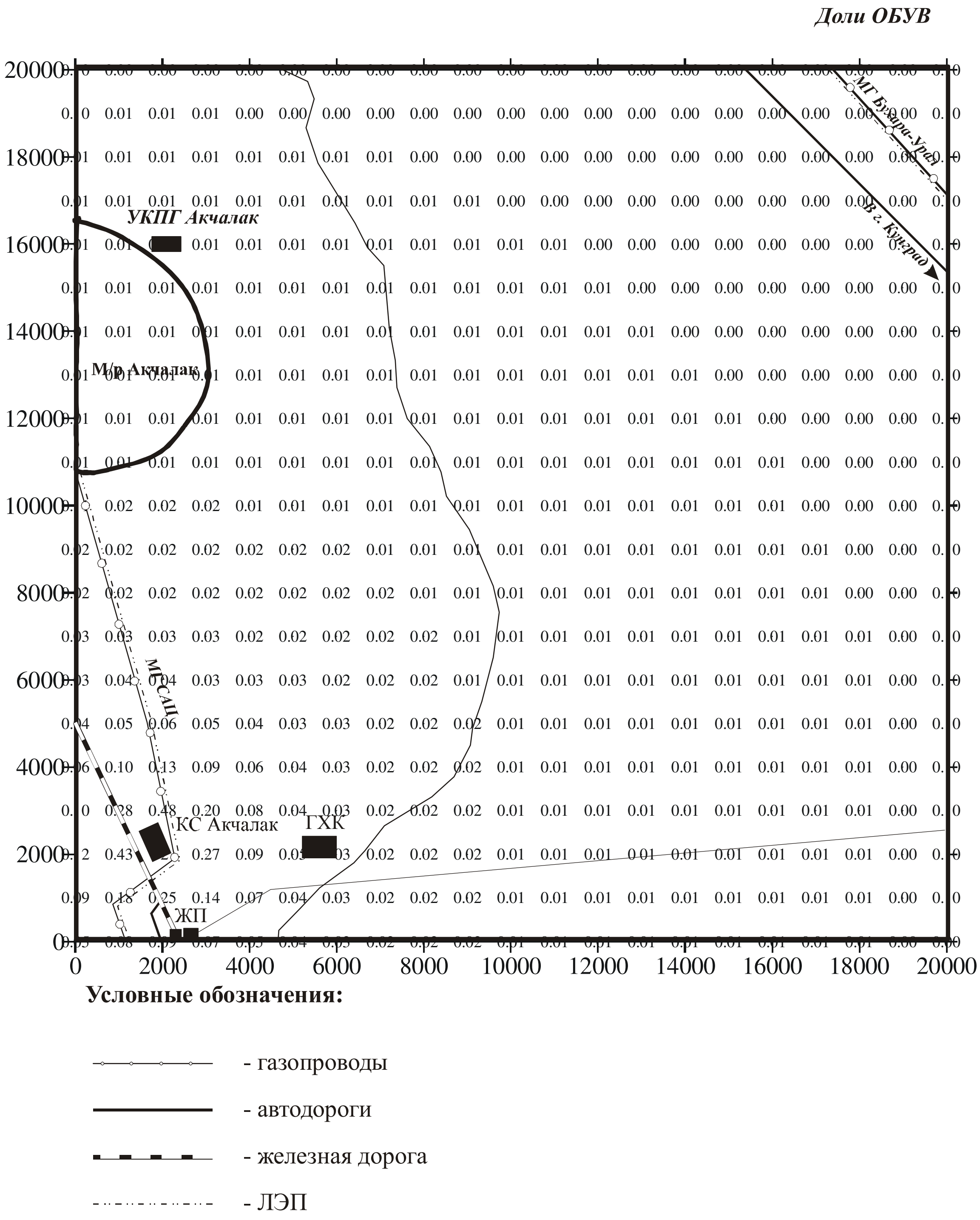

Рисунок 5 - Существующий уровень загрязнения атмосферного воздуха углеводородами (по метану) в районе проектируемого Акчалакского ГХК

The water is relevant for the region. Provision of the population of the Republic of Karakalpakstan of piped drinking water is 39% (68% urban, rural 13%). The main part of the rural population uses water dug ponds.

The only source of water for industrial and drinking purposes in the areas of planned facilities and gas pipelines SATs are surface water from the Amu Darya basin.

Source of drinking water on the main road of Central Asia-Center is a conduit Kungrad - COP Karakalpakstan, which is run by DP "Urgenchtransgaz. This aqueduct was designed to provide water not only objects located in Uzbekistan, but also in Kazakhstan and was formerly known as Kungrad-Kulsary. Water main is laid along the route of gas pipeline SATs.

Water intake is located on the left bank of the Amu Darya River. Place water intake - a village Kyzyldzhar. The purpose of the organization is supplying water intake facilities CAC. Thanks conduit Kungrad - COP Karakalpakstan, almost completely covered by water supply network, the Kungrad, villages and farmhouses along the railway, as well as objects "Ustyurtgaz" and "Urgenchtransgaz, including UPPG Urga, KS Akchalak and zhilposelkov at railway stations.

Performance intake - 120 m3/day. Underground conduit pipe diameter 1020 mm, a length of 300 km is made in a thread. According to the DP "Urgenchtransgaz" technical condition of culvert is satisfactory.

The composition of water in the culvert is not constant and depends on the chemical composition of water in a river.

Table 1privedeny data on the composition of water on water intake.

Table 1 - Averaged chemical analysis of water supplied to the conduit Kungrad - COP Karakalpakiya

№ пп	Index	III vodopodem	The ratio of O'zDSt 950:2000
1	Temperature oC	14	
2	Taste Rating	1	2
3	Smell score	2	2
4	Transparency, cm	30	no limit
5	PH	7	6-9
6	Chlorides, mg / dm 3	216	250
7	Oxidizability, mg / dm 3 KMnO	1,9	no limit.
8	Total hardness, mg-ekv/dm3	9,1	7
9	Stiffness constant mg-ekv/dm3	6,7	no limit
10	Stiffness carbonate, mg-ekv/dm3	2,4	no limit
11	Calcium, meq / dm 3	5,2	no limit

12	Magnesium, meq / dm	3,9	no limit

Continued Table 1

№ пп	Index	III vodopodem	The ratio of O'zDSt 950:2000
13	Alkalinity meq / dm 3	2,4	no limit
14	Solubility of oxygen, mg / dm 3	10,6	no limit
15	BOD5, mg / dm 3	0,3	no limit
16	Dry residue, mg / dm 3	1042	1000
17	Suspended solids, mg / dm 3	Отс	no limit
18	Nitrate nitrogen, mg / dm 3	0,34	9,9
19	Nitrites-nitrogen, mg / dm 3	0,006	0,9
20	Iron, mg / dm 3	0,13	0,3
21	Sulfates, mg / dm 3	474	400
22	Hydrogen sulfide, mg / dm 3	Отс	Oats.
23	Aluminum	Отс	no limit
24	TDS	1112	The dry residue
25	If index	1183	No more than 3
26	Coli titer	333	Lack of
27	The total number of microbiological	14	No more than 100 in 1 ml of water

Indicators of the quality of drinking water must meet O'zDSt 950:2000, both in toxicological and microbiological, parasitological and organoleptic characteristics. As is evident from the results of tests, the water does not always meet these requirements, such as on the dry residue, hardness, sulfates, as well as microbiological, parasitological indicators. In coordination with the SES is allowed to use water with higher rates, affecting the organoleptic properties of water (salinity up to 1.5 g / dm 3, the hardness of up to 7).

The relief of the construction area MCC level, planned. The surface area is free of developments.

In lithological respect of the area is complicated by a thick Paleogene-Neogene rocky soils, represented by limestones with intercalations of sandstone, marl, mudstone. These deposits from a surface covered with thin (few meters) from the Upper clastic and fine-grained formations.

The geological structure of the site involved three geotechnical elements (IGE):

The first engineering-geological elements (IGE-1). Yellowish-brown sandy loam, dry, macroporous, subsident, salty, with the inclusion of fragments of limestone up to 20%. Capacity from 0,5 to 1,5 m.

Second geotechnical element (EGE-2) includes limestone, limestone-rakushnyak heavily fractured, weathered, friable. Layer thickness 1.0 meters or more. Group of soil on the development of 31b.

Third geotechnical element (EGE-3) interbedded sandstone carbonatized with mudstones, marls. Marls and mudstones in the form of thin layers of platy. At the top layer of soil cracks, the cracks plastered.

Groundwater at the study site to a depth of 10.0 m is not revealed.

Soils have a high degree of aggressiveness in relation to the concrete in sulfate-resistant cement, and a high degree of corrosivity for steel. The depth of seasonal freezing - 0,72 m. Seismicity area - 5 points.

Based on the analysis of the soil in the area of an object, we can conclude:

- Construction of the facility is on land not suitable for agriculture due to low fertility and strong salinization of soils;

- Soil area under consideration, mainly to have structural damage, so the additional physical effects of significant changes will not make;

- Chemical pollution accumulates, mostly in the upper layer of soil because of high capacitive properties of the terms of rocks.

Radioactivity of soils ranges from 18 - 20 mR / h. In accordance with sanitary norms of radiation safety of the Republic of Uzbekistan exposure dose of radiation to areas with permanent presence of humans should not exceed 30 mR / h. Thus, the natural radioactivity of soils does not exceed the MPC.

Current status of Aral Sea in a desert zone determines the nature of the vegetation of the investigated region. In connection with modern natural processes in the operation area is observed degradation of vegetation cover. One of the most difficult factors determining the current state of Aral Sea ecological community is a process of desertification.

The predominant type of desertification - soil salinity, but along with it is marked and the degradation of fragile vegetation. Manifestation of desertification are vast expanses of marshes, the unevenness in the overgrowth, the predominance of annual species of plants, a weak association of them, a small part of perennials, the incomplete development of biogorizontov, increasing the degree of mineralization of groundwater and lowering them.

In the Aral Sea in Uzbekistan, according to published data found 244 species of flora. Among the most common family of the following: buzgunovye, Asteraceae, cereals, tamariksovye, sedges, Chenopodiaceae, cruciferous and leguminous plants.

Flora of water (the Aral Sea and Lake) is very poor and about 13 species of higher plants. They are representatives of families Rogozov and sedge, they were in retreat of the sea more resilient than other groups of plants.

Changes in environmental conditions led to impoverishment of species composition (both qualitatively and quantitatively) flora. In the operation area of the most common are the following species: tezgun, mugwort, wormwood belozemelnaya, Turanian wormwood, Artemisia sandy, halophyte, Salsola, keyruk, astragalus, camel thorn, aperek, Tamariki, tamarisk, karaborak, erkek, biyur gun, tastibiyurgun, licorice , Haloxylon black ferule, ebelek, dorema, ephedra, reducing solonchak, adraspan, itsichek, klimakopetra, sakrsazan, Celine, karrak, kazi-fist, Haloxylon white.

Among the flora of the Aral Sea coasts of 30 species are valuable fodder plants. This is the tarragon and white zemeotnaya, cherekez Richter keyruk, erkek, feather, azhrek, ebelek etc.

Fauna in the study region and adjacent areas are scarce, due to poor food supply and the unfavorable conditions in the region.

Table 2 - Birds of Aral Sea

Detachment Falconiformes	- mound, steppe eagle, imperial eagle, marsh harrier;
Detachment Galliformes	- pheasant;
Detachment zhuravleobraznye	- coot, kamyshovnitsa;
Detachment Charadriiformes	- avdotka;
Detachment golubeobraznye	- rock pigeon, little turtle, common turtle;
Detachment kukushkoobraznye	- The Cuckoo;
Detachment Strigiformes	- Little Owl, buckskin scoop;
Detachment Apodiformes	- black swift, green Shchurko, Hoopoe, Barn Swallow, House Martin, Grey Lark, Black-headed Wagtail, Grey Shrike, Starling, pink starling, crow, black crow, shirohvostka, desert wheatear, dancer, whiskered tit, tit Bukhara, smoke sparrow field sparrow, biliary oatmeal.

In connection with the degradation of vegetation decreases the number of nesting birds on it. There has been a decline in the number of migrating and wintering birds as well as reduced food supply.

Since 1960, the level of the Aral Sea has decreased by more than 14 m, which resulted in a number of changes in natural conditions on its shores. There was a complete overhaul of the landscape. At present, the Aral Sea has lost all meaning fish pond. Number of waterbirds has decreased dramatically. Many mammals and birds have migrated to Sarykamysh basin in search of new places.

In the southern Aral Sea region are home to over 60 species of mammals. More than 40 species occur in the MCC. Note that half of them are rodents. Below is the species composition of animals found in this region.

Таблица 3 - Фауна Приаралья

Rodent	-	big chickweed, red-chickweed, chickweed Grebenshchikov, tonkopaly gopher Severtsev jerboa, jerboa zhirnohvosty, jerboa grebnepaly, tarbaganschik, dwarf hamster, slepushonka, mouse houses, muskrat;
Detachment-of insectivorous	-	eared hedgehog;
Detachment Lagomorphs	-	rabbit - tolai;
Detachment of bats	-	red rocket, whiskered bat;
Detachment Predators	-	sand cat, manul, steppe polecat, badger, Korsakov, wolf, jackal, fox, common, spotted cat;
Detachment of reptiles	-	tortoise, gecko grebnepaly, gray gecko, gecko Turkestan, agama, lizard black, ruled lizard, lizard striped kruglogolovka eared, zheltopuzik, snake patterned, EFA sandy, cobra, schitomordnik, an arrow-snake, viper Steppe.

As a result of changes in water balance of rivers and the consequent increase of water salinity (salinity of the Aral Sea has increased from 11 to 22 g / l), lost a number of endemic species.

Rare and endangered animals listed in the Red Book: caracal, manul, Hangul, jerboa, a giant rocket, wild ass, gazelle, mouflon, black lizard, Central Asian cobra, steppe eagle, golden eagle, imperial eagle, Balaban, peregrine falcon, Siberian crane, desert falcon, desert sparrow.

Thus, the state of flora and fauna in the Aral Sea region are characterized by disturbances in the structure of ecological communities (it is expressed in the change of the proportion of different species of organisms), which lead to changes in the functions of different organisms (primarily to a decrease in the level of reproduction and quality of offspring).

Landscape slaboizmenenny. Area refers to the location of MCC slabopologim plains

2 DESCRIPTION OF MAJOR DESIGN SOLUTIONS FOR GAS AND CHEMICAL COMPLEX

2.1 OBJECTIVE, NATURE, POWER AND STRUCTURE OF PRODUCTION

In the Republic of Uzbekistan pays great attention to the development of industrial capacity, and primarily fuel and energy complex as a basis for economic growth of the state, to strengthen its energy independence. Priority role here belongs to the oil and gas industry - one of the largest heavy industry of the country. In a short time considerable work done:

- Increased volumes of natural gas production, including enriched valuable components (ethane, propane, etc.), which makes it a valuable raw material for gas processing;

- Increased volumes of oil and condensate;

- Commissioned new gas and oil facilities;

- Reconstruction of systems for processing natural gas;

- Commissioned new high-tech processing capacity of crude oil and gas condensate, liquefied natural gas receiving.

Achieving those results contributed to the introduction of advanced technologies with foreign companies and financial institutions in foreign countries.

The country has over the years accumulated experience in the construction of environmentally sound oil and gas industry, with the participation of foreign capital. Created a favorable investment climate to attract all forms of foreign investment.

So, now introduced and is successfully operating Shurtansky gas range with an annual production of natural gas deposits Shurtan 125 thousand tons of polyethylene. The project was implemented by a consortium of companies comprising ABB Lummus Global (USA), Mitsui, Toyo Engineering, Nisho Iwai (Japan) and ABB Soimi (Italy). Its implementation will allow the country to have its own gas-chemical industry, to initiate the development of new industries based on production output of polymeric materials.

In Uzbekistan, there are considerable reserves of hydrocarbons, whose development is not without difficulties (remoteness and inaccessibility, high concentrations of hydrogen sulfide, etc.), which dictates the need for cooperation with foreign investors to bring advanced technologies and additional financial resources.

Confirmation of this is considered an integrated field development project Surgil the extraction of valuable components (Akchalak MCC).

The basis for the design of a decision of the President of the Republic of Uzbekistan № PP321 of 11 April 2006 and the Memorandum of Understanding between Uzbekneftegaz and the Korea Gas Corporation on March 29, 2006.

The aim of the project is to specify the basic technical solutions for the arrangement of GCM Surgil, trunkline product of the field, the organization of gas and chemical processing in the GCC in Akchalake.

Power craft up to 3 billion m 3 / year of natural gas and 105 tons / year of gas condensate.

Scheduled to equip development wells, GSP treatment plant, as well as build a gas pipeline and condensate to the chemical complex structures with a commercial measuring unit. Staff CPF Surgil will live in a comfortable camp (discussed in Part 1 of the draft EIS).

The main product Akchalak chemical complex - polyethylene. (Figure 6)

Polyethylene is necessary for the production of polyethylene pipes, films, articles of mass consumption, product manufacturing industry. It is also needed in the chemical and mining industries, automotive and aircraft industry, in agriculture for the efficient use of water for irrigation, etc.

An activity solves the problem of rational use of natural resources (extraction of valuable components from natural gas - ethane, propane-butane fraction, gas condensate), creating favorable conditions for the population (employment, social infrastructure), and deepening international cooperation.

Thus, the purpose and necessity of putting into effect Akchalak chemical complex due to the demands of economic development of Uzbekistan in the future, as well as social aspects of development and improvement of material well-being of staff of the complex, staffed by residents located near the settlements of Karakalpakstan. Increasing the role of ecological functioning of Akchalak Gas Chemical Compl

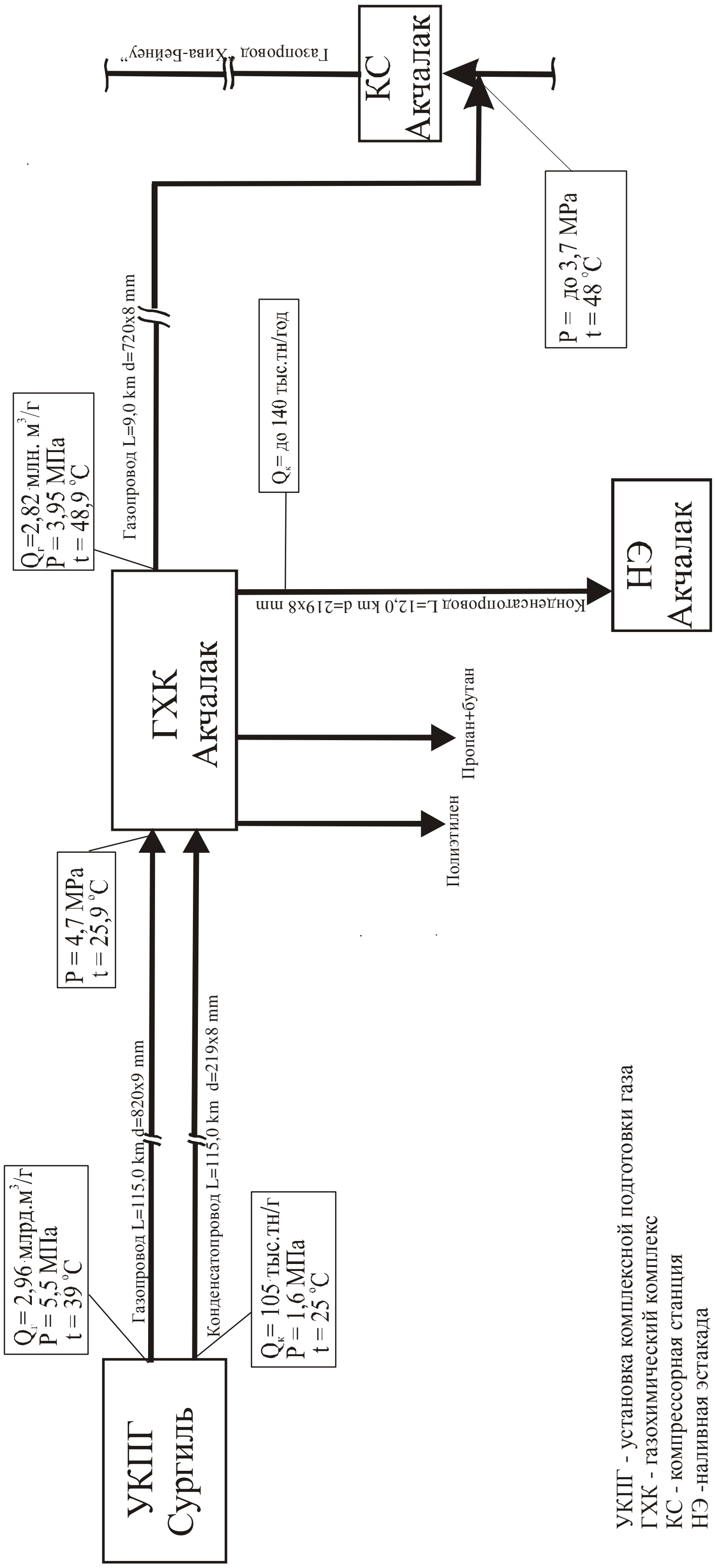

Рисунок 6 - Блок-схема транспорта газа и конденсата месторождения Сургиль

2.2 Akchalak Gas Chemical Complex

Akchalak gas-chemical complex will be located on the territory of the Republic of Karakalpakstan Kungrad district, 3 km north-east of the residential village Akchalak and projected residential village MCC.

Processing facilities are located in the area of 72 hectares. In the area of construction of MCC are high-voltage power lines 35 and 110 kV, the main gas pipeline Central Asia - a compressor station Akchalak, road and railway Kungrad - Beineu, located Kungradskiy soda factory, railway station Kyrkkiz with oil loading rack, open GCF Akchalak, Kokchalak, Karachalak, West Barsakelmes that make up the UAE Ustyurtgaz "AK" Uzneftegazdobycha "Uzbekneftegaz.

Raw materials for MCK Akchalak is natural gas condensate field Surgil. The average for the field potential content (g/m3) in the formation gas is methane homologues: ethane (C2) - 54.0; propane (C3) - 36,3; i butane (C4) - 8,33; n butane (C4) - 9.67; fractions C3 + C4 - 54.33; C5 + higher - 44.24.

Natural gas deposits Surgil carbonate hydrocarbon, light hydrocarbon composition of low-(moln.) of carbon dioxide - 0.79% and nitrogen - 1,12%, hydrogen sulfide is not detected. The methane content - 90,2%.

As a result of gas processing trade get dehydrated natural gas. In the following extract ethane from the gas for the production of polyethylene, propane and butane to produce liquefied natural gas (PBF) and gas condensate - the raw material for production of motor fuels in refineries.

In the production-based MCC is the process of extraction of natural gas of ethane, ethylene production from him and further processing of ethylene in polyethylene, which has wide application in the national economy. The project provides a set of clock work over 8000 hours per year, and reserve time for the annual preventive maintenance (similar SHGHK).

In the production processes at the site Akchalak MCC presents different types of equipment, chemical equipment, process piping, high pressure at high and subzero temperatures. This - the vertical turrets (distillation columns, hardening, saturatornye columns, etc.), reactors, absorbers, strippers, converters, absorbers, various tanks, separators, filters, heat exchangers, tube furnaces, boilers, compressors, pumps, tanks and gas tanks for the storage of products and used chemicals, flare system, etc.

All equipment and materials for construction Akchalak GCC foreign complete delivery, ie have a high technical level. However, the production of this scale still can not do without the allocation and release of harmful substances into the atmosphere, as well as liquid and solid wastes.

A distinctive feature of these chemical plants is to use both low and high temperatures in industrial processes, including at high pressures.

To ensure a higher level wastelessness most combustible emissions (exhaust gases, liquid products vat of devices, etc..) Handled in a special fuel system and go to the burning torches of pyrolysis furnaces, boilers and other consumers, ensuring the normal operation of the complex. External gas supply is used only briefly at start-up work or in emergency situations. For emergency cases, complete cessation of the cooling water, full of power failure, stop the flow of quenching water, the compressor of pyrolysis gas, ethylene and propane refrigeration units for the launch complex, and also for the neutralization of discharges from relief valves in excess of operating pressures is designed flare system management where they will be burned and scattered by the combustion products as needed, however, APC is working all the time - 8760 hours per year in the mode of emergency preparedness and volley discharges.

All the basic production cycle includes the following processes:

- Methane, drying it, and transport to the COP Akchalak MG Hiva Beyneu;

- Obtaining of ethane, propane, butane, light condensate;

- Ethylene (saturation of ethane pyrolysis, training, removal of hydrocarbons from process water, compressed Pyrolysis, Pyrolysis drying, cooling down and removal of methane, acetylene removal, fractionation of ethylene);

- Obtaining polyethylene (training materials, reactor and adsorption stage, the separation of the polymer, extrusion, granulation, dehydration, stripped solvent, mixing, classification, storage and distillation).

Auxiliary production and offsite facilities include:

- Installation of butene-1;

- Installation of the oxidation of spent caustic;

- Manufacture of steam;

- Fuel system;

- Torchlight economy;

- To provide nitrogen and instrument air;

- Installation of waste oil;

- Storage of intermediate and final products;

- Packaging line and production of polyethylene film;

- A system of source water;

- A system of boiler feed water;

- A system of cooling water;

- Fire water system;

- Installation of sewage treatment;

- Provision of electricity;

- Infrastructure.

Natural feed gas to the pressure 4.7 MPa and a temperature of 25,9 ¬ ° goes to install gas separation (Figure 7), where it is cooled in a heat exchanger, passes through a separator to separate the condensed moisture and solids. Further, the gas is dried in the zeolite adsorbers and through the separator is sent to the column demetanizatora. Bottoms demetanizatora sent for further separation of gas, and from the top of demetanizatora cleaned and dried commercial gas fed into the main pipeline Hiva Beyneu.

Indicative of the natural gas commodity:

Methane - 98.59%

Ethan - 0.0012%

Nitrogen - 0.0123%

Carbon dioxide - 0.0006%.

Part of the marketable gas is used for own needs at the plants producing ethylene and polyethylene, for regenerating the zeolites (after the fuel system).

Discharges from safety valves separators adsoberov, demetanizatora can enter the collector dry jet separator and then to the torch to burn as needed.

Solid waste is spent zeolite adsorbers natural gas dehydration.

Bottoms demetanizatora enters the column deetanizatora where stands ethane, commonly used in the production of ethylene polymer quality. Bottoms deetanizatora in the column depropanizer produces propane and then in the column debutanizer produces butane. Propane and butane are the foundation of liquefied natural gas, which accumulates in the gas-holder (the field) Mercantile Park, from time to time are shipped by tankers to the consumer.

Bottoms debutanizer is a light gas condensate, which is collected in two PBC Mercantile Park, as well as periodically for condensate is sent to the NOE Akchalak and then the consumer - oil refineries - for the production of motor fuels.

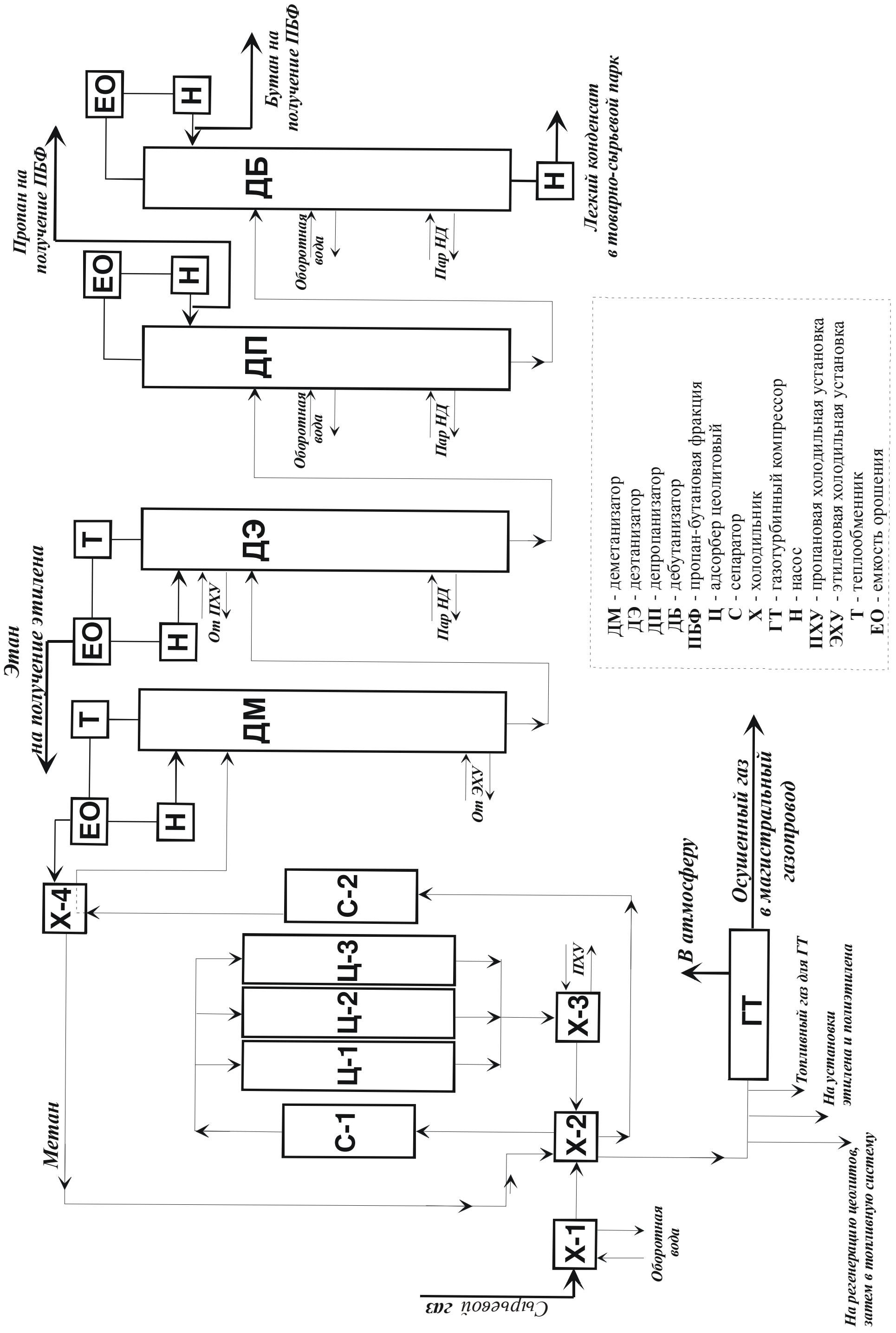

Рисунок 7 - Схема установки разделения газа (аналог ШГХК)

Safety valves deetanizatora tied to the collector dry jet separator and depropanizer and debutanizer - the collector of wet jet separator, from where appropriate discharges flared.

Installation of ethylene (Figure 8) comes from the ethane feedstock deetanizatora install gas separation. Composition can be:

Methane - 0,54%

Ethan - 98.89%

Propane - 0,56%

Carbon dioxide - 0.01%

Besides using recycled ethane from ethylene and install deetanizatora column fractionation of ethylene. Mixed materials saturated with water vapor, produced additive dimethyl disulfide (DMDS), and then subjected to cracking in the pyrolysis furnaces, of which at normal mode there are two, the third pyrolysis furnace is used to ensure continuity during dekoksovaniya. Furnace pyrolysis are sources of harmful substances during combustion of fuel from the fuel system of MCC, organized into the sources of emissions - smoke stacks. Thus, each furnace operates alternately in two modes: normal mode cracking - 6,358 hours per year and mode dekoksovaniya oven to restore its technical characteristics of the nominee - 192 hours / year.

The fuel is methane, with the installation of exhaust gas separation, gas regeneration of adsorbents ethylene plant, passing through the separator tail gas fuel system, from which the liquid phase is sent to the liquid fuel tank fuel system, and at times the working pressure of the gas phase is discharged into the flare system.

After cracking pyrogas passes quenching column and subjected to compression on a five-speed centrifugal compressor. Between the third and fourth stages pyrogas subjected to alkaline treatment of acid gases (spent lye is directed to the installation of oxidation). After the compressor pyrogas zaholazhivaetsya and passes through three stages of separators, then at demetanizator for separation of methane and ethylene plant deetanizator. Further, in a mixture with hydrogen stream passes acetylene converter and enters the column fractionation of ethylene, which receive the quality of ethylene polymer for polyethylene.

Acetylene converter for removing acetylene from the upper stream deetanizatora with hydrogen the hydrogenation of ethylene. Converter is designed for a single layer of a hydrogenation catalyst. Additional capacity is used for recovery of catalyst by using superheated steam and air, without stopping the cycle. The reaction product (a polymer of acetylene) together with the vat residue deetanizatora sent to the fuel system. Gas recovery (recovery) of the catalyst is discharged into the atmosphere

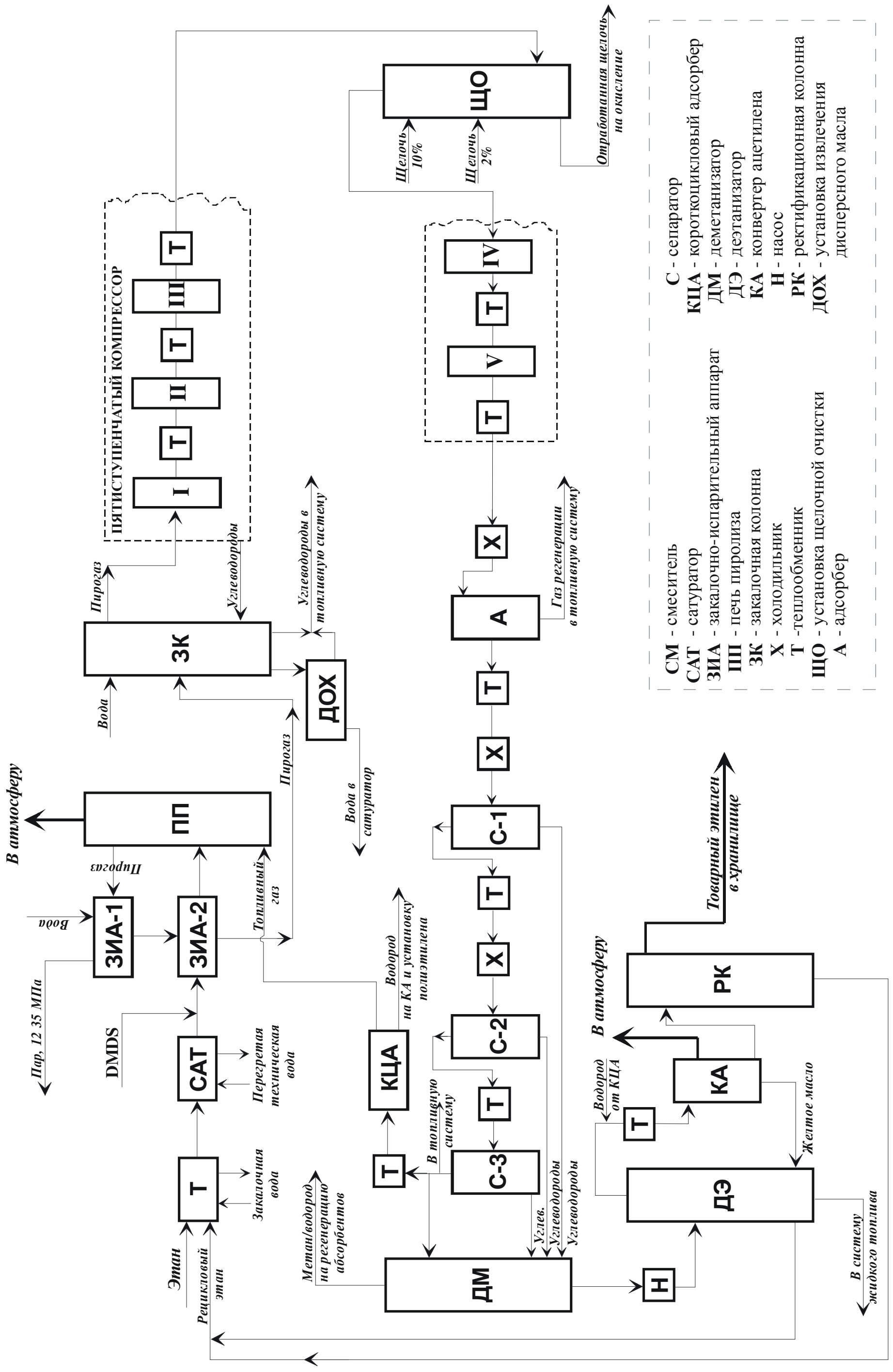

Рисунок 8 - Установка получения этилена (аналог ШГХК)

Thus, the emission sources at the facility for ethylene pyrolysis furnaces are organized into individual sources of emissions into the atmosphere. In addition, the source of isolation are acetylene converter.

Wash water saturator, columns and hardening alkaline-evaporation apparatus is discharged through the sewers to the wastewater treatment plant complex.

Solid waste are zeolites adsorbers drying pyrogas, ethylene, zeolites swing adsorption (a mixture of zeolite, activated charcoal), coke quenching, evaporation apparatus, spent catalysts of hydrogenation of acetylene. This category also includes waste pyrolysis resin hardening of the column and the oil flow from the alkaline column (yellow oil).

In the production of polyethylene (Figure 9) but uses ethylene and butene-1 comonomer and solvent - cyclohexane, bought by imports.

Butene-1 in the amount necessary to start the MCC, purchased, in what he made at the facility butene-1, adjacent to the polyethylene plant.

The polymerization reaction takes place in a reactor (tubular reactor and CSTR) in the presence of a catalyst. Prepared materials (ethylene, cyclohexane, butane-1) passing through the heat exchange equipment, absorbers, filters, absorbers enters the reactor, where the polymerization reaction. To obtain the required quality of injected hydrogen, vary the point of supply for a solution and a catalyst. To stop the reaction was added deactivator.

Water-polymer mixture is sent to the dehydrator classifier, where the removal of small and large granules. Conditioning pellets again enter the hydraulic centrifugal separator and then through the pneumatic driers in the mixing zone, the storage silos and bunkers. Granules coming from the bunkers on the packing line of finished polythene.

In the workshop of polyethylene sources of harmful substances into the atmosphere are: reservoir cyclohexane, cages large and small particles, the capacity of waste sump catalyst deactivator settler, settler separation of coarse particles, and dehydration.

All machines are working under pressure, have safety valves, relief from which at least need to gather in the flare separator installation of polyethylene, from time to time enter through the main flare header to the flare for incineration.

Liquid effluent from the septic tank of combined plastic rail installation for the installation of wastewater treatment.

Solid waste is the spent reactor selikagel drying of raw materials, waste aluminum oxide adsorbers polymer, zeolites (a mixture of zeolites and selikagelya) dehumidifiers. This group of waste include waste water from the tank of the catalyst, O-oil reactor, washing fluid for maintenance of vessels and pipelines.

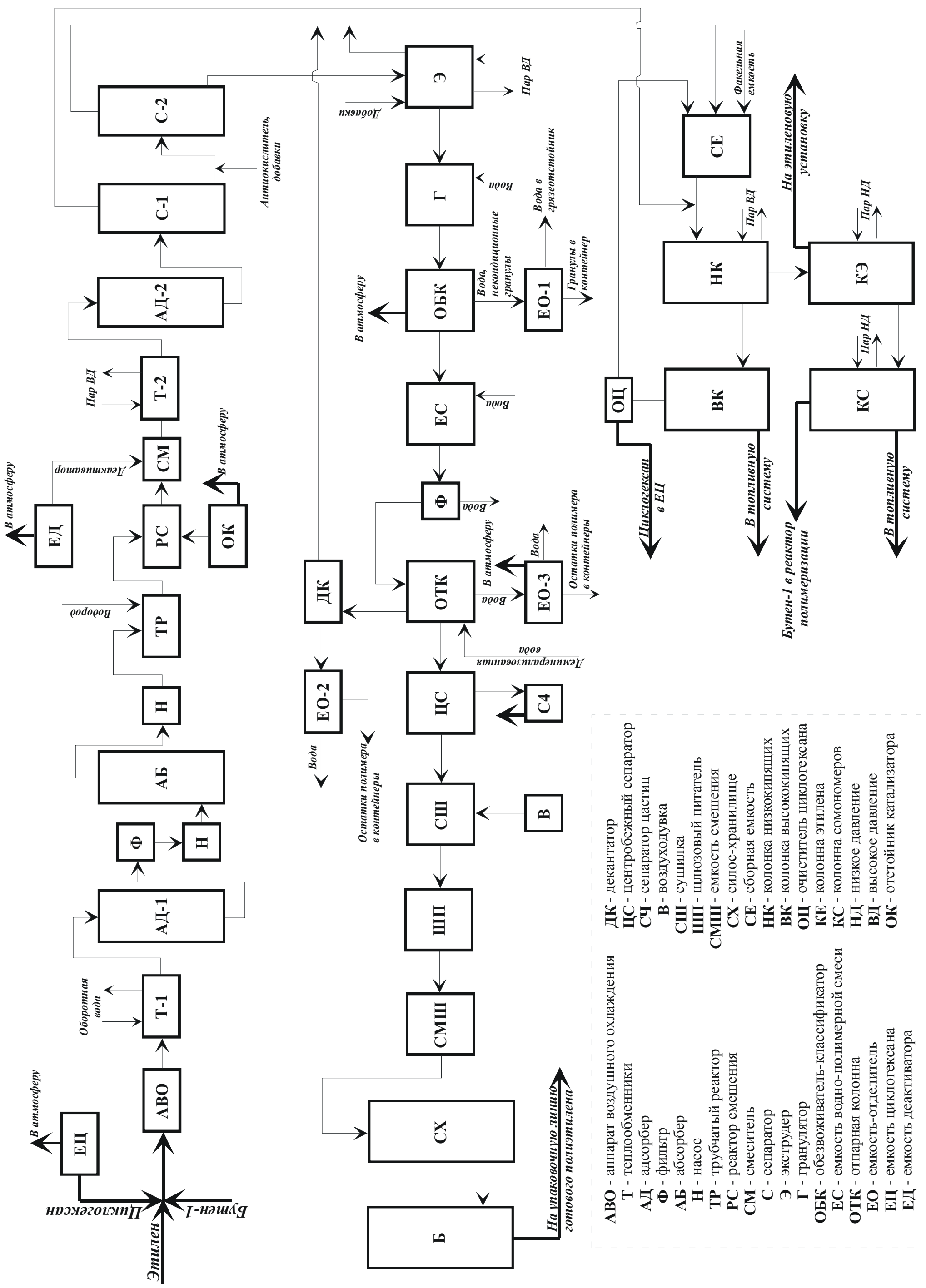

Рисунок 9 - Схема установки полиэтилена (аналог ШГХК)

To waste also includes substandard pellets of polyethylene.

The installation butene-1 includes a reactor recirculation column and the column directly butene-1, heat exchange equipment, containers of catalysts and other equipment.

Safety valves and air emissions tied to the flare separator butene-1, and from there connected to the main flare header to the flare, where the extent necessary, it will be incinerated.

The group classified as solid waste spent catalyst receiving samonomera butene-1.

Installing the oxidation of spent caustic is active for the oxidation of sulfides contained in the effluent Reflux alkaline cleaning pyrolysis gas, to thiosulfate and sodium sulfate. Oxidation by air technology at about 100 ° C. In section neutralize alkaline wastewater is neutralized with sulfuric acid to pH = 7 □ 8.

Constant ventilation flow is directed to the flare system, and liquid flow enters the wastewater treatment plants of the complex.

Technological processes Akchalak MCC are often using heat. To generate steam at the site of the complex is designed to install two steam generators (boilers) producing 300 tons per hour, which are fed from the fuel system of the complex. Burner boilers operate on gaseous or liquid fuel.

Products of combustion are emitted into the atmosphere through a common stack.

Liquid effluents of constant and periodic blowdown of boilers used in the cooling water and for washing alkaline column before being discharged to the wastewater treatment plants.

As fuel Akchalak MCC can be used combustible waste from the processing units of the complex (Figure 10). In the process of launching a complex or in emergency situations is also used as an external natural gas supply.

The fuel system is divided into two subsystems:

- Fuel gas;

- Liquid fuels.

Subsystem of the fuel gas. Distillation Products deetanizatora with ethylene plant and butene-2 from the column with a polyethylene comonomer unit is connected and get to equalizing the fuel tank. Part of this flow being throttled at the site of reduction. Couples and fluid flows into the fuel vaporizer capacity, which is designed for the evaporation of light components from the liquid. A certain amount of incoming fluid is used in the liquid fuel system, while the rest evaporates in the fuel evaporator

The separator of fuel gas, which serves the fuel gas manifold and burner fuel gas steam boiler, mix the different streams. Methane waste gas from demetanizatora, the exhaust gas rich in hydrogen and natural gas AGRS connected to the ethylene plant, and from there fed to a gas separator. In the case of regeneration of the adsorbents stream first passes through the dryers. The separator also receives the overhead stream from the reservoir evaporation and continuous gas purification installation of butene-1. In the case of high pressure in the supply line of ethane in ethane pyrolysis furnace recycle will be sent to the fuel system. All these flows are separated in a separator of fuel to prevent the ingress of liquid to gas burners of steam boilers, pressure or other gas burners. Periodically, the condensate is drained into a container of liquid fuel.

Separated fuel gas enters the sewer system of fuel gas from which the boilers are fed high-pressure steam, flare header, the pyrolysis furnace and other consumers.

The composition of the fuel gas can be as follows (% vol.):

Hydrogen - 4.14

Methane - 94.14

Ethan - 1,04

Bhutan - 0,04

Nitrogen - 0.61

Carbon dioxide - 0.03

In the case of high-pressure fuel gas is supplied to the torch.

In a separate separator off-gas is separated fuel gas for pyrolysis furnaces. This fuel gas is a mixture of methane gas from the installation of gas separation, methane waste gas swing adsorption regeneration of adsorbents with the installation of ethylene.

In the case of high-pressure part of the fuel gas is discharged into the flare separator. At higher pressure through the control valve gas will be dumped right on the Torch.

Subsystem of liquid fuel. Liquid fuel from the tank flows through the evaporator refrigerator in a container for liquid fuel. This also comes from the liquid separator fuel gas separator off-gas.

In the capacity of the liquid fuel coming from the five-step hydrocarbon steam turbine compressor, together with hydrocarbon quench column and oil cleaning apparatus. Liquid fuel is almost entirely composed of C5 + fraction Higher.

In the capacity of the liquid fuel pressure is kept to a minimum, the gas phase is discharged to the flare.

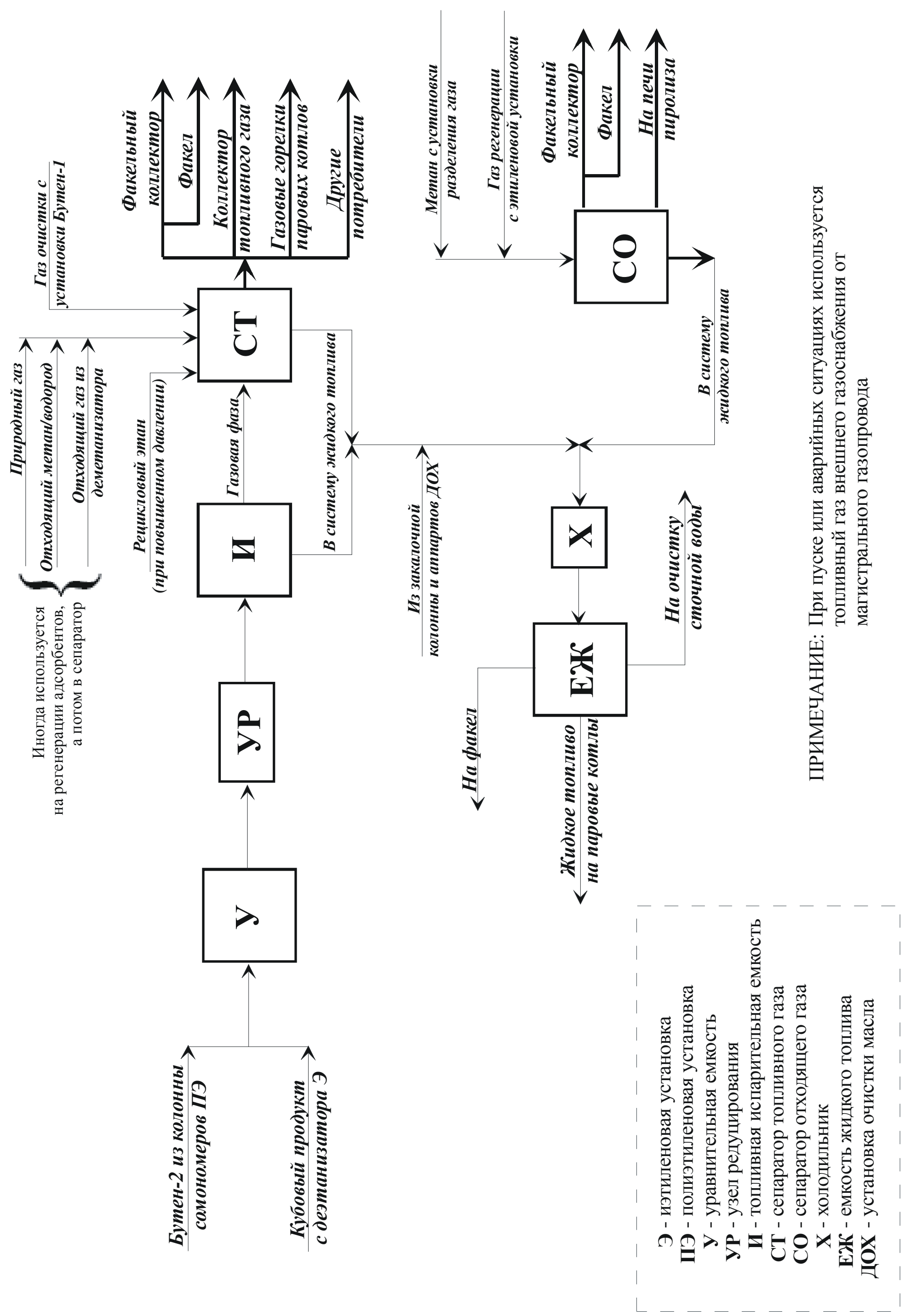

Рисунок 10 - Схема топливной системы (аналог ШГХК)

The pump sends fuel oil fuel oil through a filter at the burner boilers pressure.

Waste water discharged by gravity for the installation of waste water.

Thus, the fuel system Akchalak MCC should utilize the most combustible waste processing units of the complex, contributes to a significant reduction in environmental pollution.

To ensure trouble-free operation mode AGHK project provides flare system (Figure 11).

For the collector of wet jet separator installation ethylene connected devices, operating at temperatures above 0 ° C (absorber and desorber, quench tower, and depropanizer debutanizer, compressors and echo PRU).

For the collector dry jet separator installation ethylene connected devices, operating at a temperature lower than 0 ° C (demetanizatory deetanizatory and install gas separation and the installation of ethylene, ethylene fractionation column, compressor PRU).

By installing sewer jet separator of polyethylene connected devices installed polyethylene (separators, reactors, absorbers, adsorbers).

By installing sewer jet separator butene-1 connected devices installed butene-1 (reactor, distillation column, a column of butene-1, the capacity of the spent catalyst).

All four flare separator summed fuel gas for purging. All four flare separator connected to the flare line to it is connected and storage products and fuel system is complex. According to the flare line discharges enter the trunk flare (flare pressure) by torchlight water seal (150 mm), which prevents the flow of air into the system of flare line. When the water seal is broken, evaporation, pass the molecular sieve and burned in the flare tip. To obtain the smokeless combustion of flare headroom injected steam.

Provides periodic flare stack as necessary burning discharge and dispersion of combustion gases in the atmosphere.

Torch carries the greatest load at full power outage or a complete cessation of the cooling water. Also at starting complex for the torch will be supplied substandard product. The torch burns as required periodic discharges, whose composition can vary within wide limits.

Water from the jet drive is directed to the wastewater treatment plant.

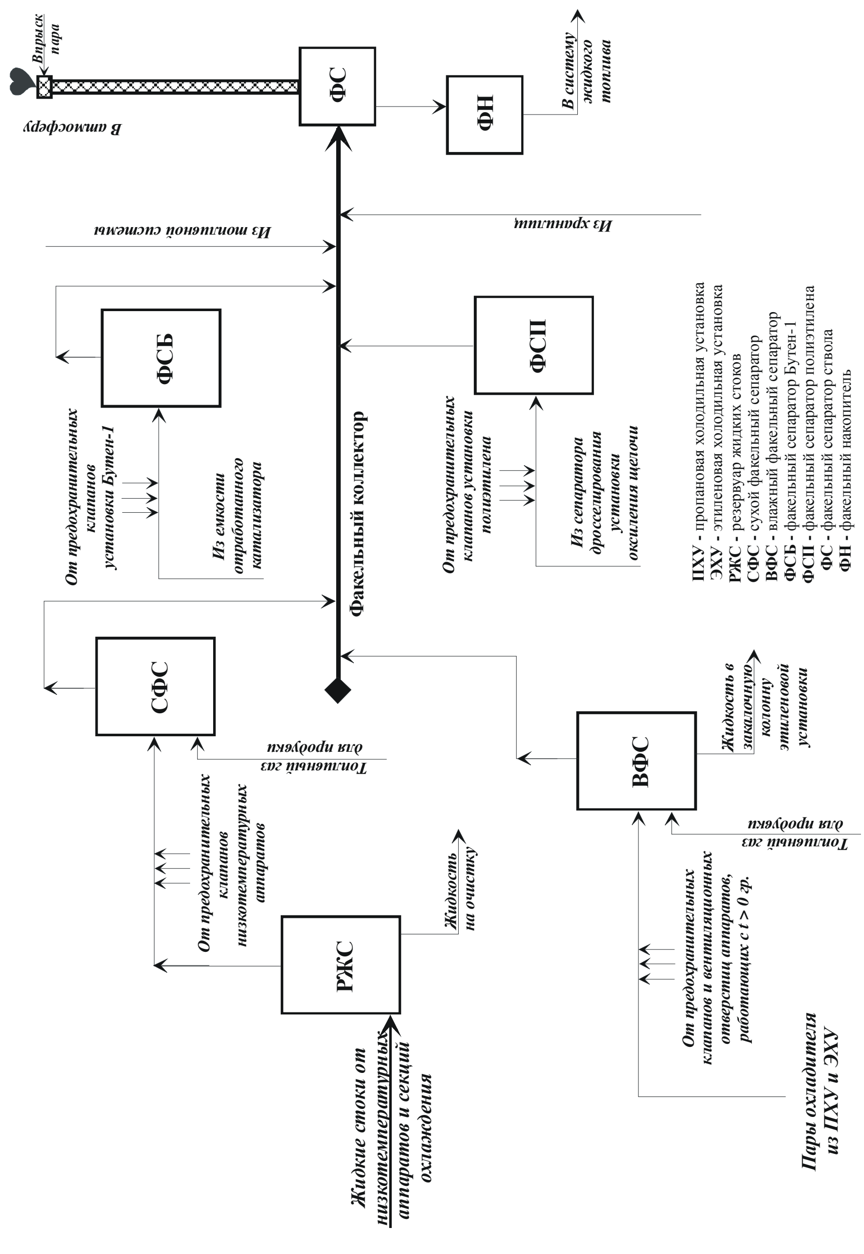

Рисунок 11 - Схема факельного хозяйства (аналог ШГХК)

For intermediate storage of ethylene and butene-1, as well as liquefied natural gas before delivery to the consumer commodity park placed gas tanks (spheres), safety valves, which are tied to the flare line. In addition, there are placed vertical steel tanks (FAR) for the interim, before shipment to the consumer, storage, condensate, as well as for storage after the unloading of rail tank oils, cyclohexane, caustic soda, sulfuric acid. On the territory of Mercantile park also houses catalysts and other chemicals used in industrial processes.

Because of the possibility of some loss of hydrocarbons in the connecting parts of valves and process piping the entire territory of Mercantile park along the rail unloading racks attributed to the fugitive sources of emissions into the atmosphere.

Despite the fact that the clearance in PBC normally filled with nitrogen to reduce the losses of storage products, to organized sources of emissions include a reservoir of cyclohexane and gas condensate reservoirs, the breathing valve which communicated with the atmosphere and work with loading and unloading operations.

Hours Mercantile Park - around the clock throughout the year.

As part of emissions vent valves will be mainly nitrogen, but may be present and a pair of stored products (cyclohexane, hydrocarbons, etc.)

Liquid effluents are sent to the wastewater treatment plant.

Nitrogen is used to regenerate selikagelya dryer reactor materials, to create cushions in the nitrogen gas tank and storage tanks of liquid hydrocarbons and chemicals, etc. Process air is used for catalyst regeneration acetylene converter, the devices and systems equipment.

Liquid effluents from the plants of nitrogen and instrument air are diverted to the wastewater treatment plant complex.

Solid wastes are zeolites dehumidifiers.

Waste oil from the technological devices and equipment of the complex is going to wastewater treatment plants in the oil separator ABB, which is an effective process for the selection of oil from waste for recycling.

Runoff from small content of oil fall on the installation of wastewater treatment industry.

Solid waste polyethylene pellets at break of bags and scraps of film material, which is planned to use in his own production of plastic products.

Water backwash filter with activated carbon is reset to the installation of wastewater treatment, saline runoff from washing exchangers discharged by pipeline to the treatment plant.

Solid waste is the spent activated carbon filters and spent ion exchangers for water softening system for the boilers.

Effluents from cooling tower blowdown is discharged to wastewater treatment plants.

Fire & Water intended for use in case of fires to extinguish.

Oily waste water and discharges himzagryaznennye processed in lagoons and then with household effluent is subjected to biological treatment. Then the effluent is discharged to evaporation ponds.

Solid waste is sand with gravel pads and sludge from vakuumfiltrov sludge dewatering.

Akchalak gas-chemical complex refers to the objects of category I and provides energy from two independent sources (the main - proper gas piston power). On campus there are step-down transformer substation, transformer points, switchboards, cable transmission line.

Gaseous emissions from the operations of gas-piston power plant. Liquid and solid wastes in large quantities is not formed.

On campus there are office buildings, control rooms, dining rooms. Household sewage are sent to biological treatment, followed by evaporation ponds. Household waste landfilled.

Ecological analysis of technology shows:

- The construction Akchalak MCC will apply the latest technologies from abroad gas processing, equipment and materials imported complete delivery, which have a high technical level;

- Will have reached a high level of extraction from natural gas deposits Surgil valuable components - ethane, propane, butane, light condensate, natural gas, after drying with high quality is served in the main pipeline Hiva Beyneu;

- Will be achieved high levels of carbon capture and disposal of oil from oily waste water (through a special design of separators;

- The complex is equipped with a fuel system, which dispose of all flammable gas and liquid waste processing units and equipment that are used as fuel in the pyrolysis furnaces, steam generators, etc. Minimized the role of the external gas supply;

- On a complex system will be implemented flare economy, which has an analog only Shurtan MCC. The torch is always in standby mode and only works when starting complex in the derivation of the working mode, or briefly at the relief device on the process equipment;

- Solved the challenge of Uzbekistan's economy and exports in PE on the basis of advanced technology with minimal environmental risk.

2.3 RESIDENTIAL VILLAGE

Projected residential village located 3 km southwest of gas-chemical complex, next to the existing compressor station zhilposelkom Akchalak.

Master plan designed to meet the rational allocation of facilities, the wind rose, building requirements, terrain and the organization of the entrances of the projected road to GCMR.

The settlement represents a single complex of buildings consisting of residential zones, zones of social, athletic and park, and areas of water supply facilities.

The bulk of the residential area of the village is busy building up a house backyard type of 1000 m2 for each apartment.

In this building include:

- 100 single-storey five-room single-family dwellings;
- 101 two-storey semi-detached dwellings with a 5 room apartment in two levels.

At every gardening project provides outbuildings, fences, concrete panels. In addition, in the southwestern part of the settlement placed five-storey dormitory for small families.

Social and sports and park area of the village includes the following facilities:

- Community Center;
- Health Centre;
- School of 384 students;
- Children's nursery on 140mest;
- 3 new hotels for 15 issues;
- The boiler room;
- Two transformer substations;
- Sport nucleus;
- Gymnasium;
- Tennis courts;
- Park.

Area water facilities located in the southern part of the settlement and is represented by:

- A reservoir of economic, drinking water and fire water storage
- With a capacity of. 400 m3 (2 pieces);
- Filter by sinks (2 pieces);
- Pumping station drinking and firefighting purposes.

In all homes and public buildings, provides water and sewerage, heating and hot water, telephone.

Total accommodation facilities residential village is shown in Figure 12.

Indicators under the general plan

The total area of 66.18 hectares of residential settlement

Total area of 10.42 ha

including

building area of 8.36 hectares of residential zones

built-up area of social and sports

and 1.82 hectares of parkland

development area zone waterworks 0.24 ha

area of 10.31 hectares of road surfaces

area landscaping public sports and

park area 9,8 ha

The draft plan provides a solid vertical layout area based on topography, drainage and building the organization claims.

Catchment network is made of concrete bins, stacked along the road according to intra-biases the relief project. At the intersections of trays with passages stacked culverts.

Projected net intra roads provides transport link every home residential development with community center and outer roads. For pedestrian walkways are provided. Along all the roads included electric lighting and planting seedlings of drought-tolerant trees: elm perestovetvisty, honey locust, Elaeagnus angustifolia, Osage orange, almond, and others.

Coverage of roads and tracks are provided from the blacktop, covering the tracks in the park - from the paving slabs.

In the public - and the sports park areas is emphasized improvement and gardening. In the center of the park area designed fountain with radial network of alleys, with park benches and small architectural forms.

- **Figure 12 - General Plan residential village**
-
- **At the community center also provides for the installation of a fountain with elements of an accomplishment.**
- **Landscaping projects selected assortment of trees and shrubs, drought tolerant and adapted to local conditions of growth. Broken flower gardens and lawns, planted saplings of ornamental trees and shrubs. For the accomplishment of the projected arbors, projected vertical gardening.**
- **Territory of the kindergarten, school and park area fenced reinforced concrete tracery railings.**
- **Fencing sport nucleus projected metal mesh panels, fencing and water facilities zone - deaf from concrete panels.**
- **Space-planning and design solutions of buildings taken on the basis of a master plan in accordance with existing regulations, with a view to ensuring a comfortable and convenient conditions for accommodation and living MCC staff and their families.**

- **Storey dwelling houses (in terms of size 16.0 x 10 8 m floor height 3.0 m) and two-storey houses (in terms of size 28.0 x10, 0 m, the floor height 3.0 m) provides the following structures: walls - brick foundations - Band monolithic concrete, slab and precast concrete floors.**
- **Roofs of buildings - pitched, attic, vented of metal on wooden rafters.**
- **In the interior design provides a high quality plaster, imported wallpaper, ceramic tile, wood. Outdoor Furniture - modern durable interior materials.**
- **Household outbuildings for residential buildings (13,9 x6, 0 m) provided with walls of brick, the foundation of reinforced concrete, pitched roof of corrugated sheets of the AC.**
- **On the territory of a residential village, there are five hostels for small families. This is a building with walls made of brick, rectangular in plan, two-story. Strip foundations of precast concrete blocks. Slab and precast concrete floors. Roof - metal roofing vented from the wooden rafters. The dimensions of each in terms of 33.0 x 10.0 m. Floor height - 3,0 m.**
- **For medical services provided clinic - a building with walls made of brick, rectangular, single-storey. Strip foundations of reinforced concrete. Precast concrete slab. Roofing - flat. Dimensions in terms of 29.1 x 16.8 m floor height is 3,3 m.**
- **For leisure leisure provides a gym and tennis court - a building with walls made of brick, rectangular, consisting of two semi-detached one- and two-story volumes. Strip foundations made of concrete. Slab and precast concrete floors. Roofing - flat. Dimensions in terms of 35.4 x12, 0 m. The height of floors: two storey side - the first - 3,3 m, the second - 3,0 m, one-storey - 6.3 m**
- **Public center of the village - a two-storey building, asymmetrical in plan, overall dimensions 35.85 x 24.0 m. The walls are brick, the foundations of tape made of reinforced concrete. Slab and precast concrete floors. Roofing - flat.**
- **On the territory of a residential village located hotel, consisting of three separate blocks, each of which provides comfortable accommodation. This is a building with walls made of brick, rectangular in plan, two-story. Strip foundations of precast concrete blocks. Slab and precast concrete floors. Roof - Ventilated of metal on metal trusses.**
- **For children in a residential campus provides for two high school buildings for teaching 384 pupils and building a nursery-garden with 140 seats. This is a building with walls made of brick, rectangular,**

double-decker. Strip foundations made of precast and reinforced concrete. Slab and precast concrete floors. Roof - vented flat. Dimensions in terms of, respectively, 44.1 x 23.4 x 48.0 m and 12.0 m. The height of floors - 3,3 m.

- Boiler room - a block box size 6.0 x 14.0 meters, installed on a prefabricated concrete road slabs.
- Transformer substation building size 6.0 x12, 0x3, 6m resolved in a rigid structural scheme with brick walls, foundations, reinforced concrete, precast concrete slabs meet.
- Sewage pumping station (SPS) - Underground construction of precast circular rings.
- Reservoirs of drinking fire water reserve are made of precast concrete panels, the bottom - of reinforced concrete.
- Pumping station hoz.pitevogo - firefighting purposes - one-storey building settled in the prefabricated one-story industrial buildings.
- In the park area is a fountain, to ensure its work provides for the pumping of recycled water.
- Impact on the OPS expressed in withdrawal for permanent use for more than 66 hectares of land in the withdrawal of a certain volume of water hozpitevogo destination in air emissions of combustion products of gas in the boiler room, the collection and disposal of household waste.
- 2.4 External Communication
- When placing the chemical complex near Akchalaka trademark dry gas from the MCC should be sent to the gas pipeline "Hiva Beyneu the shortest distance of 9.0 km from the point of tapping at the entrance to the compressor station (CS)" Akchalak.
- To transport the gas to the point of connection is projected construction of gas pipeline 9.0 km.
- Stable gas condensate from the MCC in an amount of up to 140 tonnes per year is planned to pump in kondensatonalivnuyu flyover Akchalak (railway station Kirk-Kiz), located 12 km from the complex, which zaprektirovano construction of condensate.
- Pipeline construction will be formalized allocation of land under short-term use. Upon completion of construction land will be reclaimed. Air and water impacts will not be subjected.
- To ensure the transport link between the site of MCC with the external road network project includes construction of access road 6 km long, which is adjacent to the existing highway category I Kungrad-Beyneu.

- **Access road to the traffic belongs to the III-technical category.**
- **Options road III-technical category are as follows:**
- **- Number of lanes - 2;**
- **- Width of roadbed - 10.5 m;**
- **- Carriageway width - 7.5 m;**
- **- Width of shoulders - 1.5 m;**
- **- The smallest width of the band fortification Curb - 0.5 m.**
- **The largest longitudinal slope Adopted 5%.**
- **The construction of pavement is adopted:**
- **- The upper layer of the coating of hot dense fine-grained asphalt -5 cm;**
- **- Lower layer of porous coating of hot asphalt mixtures - 8 cm;**
- **- The upper layer of the fraction of gravel in a stacked way zaklinki - 15 cm;**
- **- Bottom layer of bases from gravel-sand mixture - 25 cm**
-
- **It is envisaged podgruntovka liquid bitumen. Shoulders reinforced gravel-sand mixture.**
- **Along the access road from the residential village to the MCC arranged sidewalk for pedestrians.**
- **The entire length of the road provides electric lighting and planting tree seedlings of drought-resistant species.**
- **To ensure the transport link between the MCC and the ground outside the railway network project includes construction of access railway.**
- **The projected spur railroad track adjacent to the existing road station Kyrkkyz state of the national company "Uzbek Railways.**
- **Spur railroad track passed IV Technical category. The length of the project access railway 6.5 km.**
- **During the construction of automobile and rail roads will be removed in the long-term use of the parcels of land according to regulatory documents. In the air can be vented to the exhaust of internal combustion, although not in significant quantities.**
-
- **2.5 WATER AND SANITATION, FIRE FIGHTING**

- **Source of water supply facilities designed MCC is an existing water main with a diameter of 1020 mm Kungrad-KS Karakalpakstan, located in the Office Uztransgaz Uzbekneftegaz.**
- **Based on data Kungradskiy treatment plant performance bakhimanaliza water conduit Kungrad-KS Karakalpakiya "comply O'zDSt 950:2000.**
- **Technological and drinking water needs of MCC Akchalak are 402 m ¬ 3/chas, along with infrastructure - 490.5 m3/hr.**
- **Water flow at MCC is carried out on conduit length of 15 km.**
- **Water on the residential village is served by pipeline for drinking and firefighting needs (Figure 13).**
- **On the platform were designed waterworks consisting of:**
- **- Pumping station drinking, firefighting purposes;**
- **- Water storage tanks of drinking-fire destination for up to 400 m3 (2 pcs.)**
- **- Filter-absorbers.**

The feed water used for water supply to the water storage tanks. The input to the site provides water-metering unit with a bypass line.

Water consumed in drinking needs disinfected bactericidal lamps, installed in the pumping station drinking-fire destination.

In order to reduce the consumption of fresh water for fountains provide a pumping station to pump water recycling K100-80-160 Q = 100 m3/hr (1rab.; 1rez.).

The project provides sanitary sewer system Treated effluent pumping station is pumped to evaporation ponds.

Enough water for firefighting is 216 m3. When applying for one conduit in the reservoirs of drinking-fire destination store additional fire reserve.

External firefighting is carried out fire hydrants installed on the ring network plumbing. Placement of fire hydrants shall ensure suppression of any point of buildings and structures of the two jets. Near the fire tanks are installed wet wells for direct intake of water mobile technology. The quality of water for fire suppression of specific requirements are not established.

Design decisions include measures to minimize the water consumption for industrial purposes. At the site provides for a system of water recycling, resulting in savings of fresh water.

In the construction of facilities of Water Resources will be withdrawn in the interim and long-term use plots of land resources, water management itself is designed for the removal and use of large volumes of water. Impact on the air is not significant.

2.6 ELECTRICITY AND CP

The main power supply area chemical complex (MCC) perform on their own source of power - gas engine power plant (the project company «Nexant»). This section describes the backup power supply gas and chemical complex.

To ensure communication with the power project envisages construction of a complete two-transformer substation a block type.

To implement the project back on the power grid network must perform the following amounts of power grid construction in Table 4.

Table 4 - Amounts of power grid construction

Name of work	Eg. rev.	Number
Complete two-transformer substation block 2КТПБ-25000/110/10U1 to stress 110/10 kV power transformers ю 2x25000 кВА	комплект	1
Block breaker TDC-110 for reconstruction ОРУ 110 кВ ПС КСЗ	комплект	2
Two chain 110 kV substation LTV SS - MCC	км	30

External power supply of a residential village provides the closed-switchgear gas-chemical complex on the two air lines. The length of the line up to 5 km (2 lines)

TDP is - 1400 kW. Annual consumption of electricity - 5600 tys.kVt · h

For the reception and distribution of electricity to power 0.4 kW through a residential village provides a complete installation of two transformer substation. Power transformers is determined according to the calculations of electric loads of residential settlement. All substations complete, factory-made. Location of transformer substations are selected to account for any approach to the center of electrical loads, ease of use and reducing lengths of cable lines.

Lighting of the territory inhabited settlement runs lights, mounted on concrete piers of outdoor lighting.

The project includes the following measures of protection:

- Grounding of electrical equipment at all levels of voltage, in accordance with the requirements of the EMP;

- Lightning protection, grounding, protection from static electricity, hazardous areas in accordance with regulations;

- Selection of electrical equipment and electrical wiring in the light of the environment.

Wiring diagram for electrochemical provides for joint and separate protection. ElectroChemical by installing switchgear cathodic protection and anode bed depth of steel pipes.

It should be noted that the device is electrochemical corrosion of pipelines is one of the most effective environmental action with minimal impact on soils and subsoils.

ECP can significantly reduce the risk of corrosion destruction of gas pipelines and, consequently, emissions of hydrocarbons into the air.

During the construction and operation of the technological impact of power supply will have no significant value.

2.7 HEAT

Source of heat designed single-storey five-room single-family homes and two-storey semi-detached houses made individual gas hot water units. Coolant - hot water with a temperature of 95-70 °C.

Source of heat designed public buildings inhabited settlement MCC is its own projected boiler.

Таблица 5 - Теплопроизводительность котельной жилого поселка

Calculated Mode	Теплопроизводительность котельной МВт (Гкал/час)				established. Power e / gB. kW
	Consumption heat for heating and ventilation	Heat consumption for hot water	Consumptin heat technologial cal needs	Total consumption Heat	
Maximum winter mode	1,1456 (0,9876)	0,6644 (0,5727)	-	1,81 (1,5603)	
Most-coldest month	0,6874 (0,5926)	0,6644 (0,5727)	-	1,3518 (1,1653)	40,0
Summer mode	-	0,6644 (0,5727)	-	0,6644 (0,5727)	

Based on the aforementioned heat loads, the boiler installation approved transportable automated block with four boilers. The total installed capacity of the boiler room will be 1.72 Gcal / hour. Manufactured modular boiler - Scientific-Production Enterprise "Ista", Tashkent, Uzbekistan.

Coolant for heating and ventilation systems used hot water with a temperature of 95-70 □ C, the needs of hot water - water at 65 □ C, which is prepared in the reservoir water heaters.

Softening of raw water provided to water treatment devices with permanent magnets UVPM-1.

Fuel for boilers adopted by natural gas at low pressure. Fuel gas is supplied to the timing of paragraph (EMG), which is located near the village. Akchalak.

All the gas flow on the boiler room 225 m3/hr. Annual consumption is equal to 400,419.8 m 3 / year

As the heaters in public buildings made aluminum radiators and registers of the smooth tubes.

Heating system and two-story single-story single-family homes on their own individual heat sources. As the heating elements made of cast iron radiators.

In the main areas of projected public buildings and facilities provided for supply and exhaust ventilation with a mechanical drive and natural. To create a comfortable environment during the hot season in the administrative offices, rest rooms installed for household air conditioners.

Ventilation of residential natural. The influx of unorganized through leaks of doors and windows, extractor channel.

Adoption of the draft of the heating system, the type and parameters of the coolant, the type of heating equipment in residential and public areas provide explosion and fire during the operation.

Taken in the draft ventilation system to provide the required standards of meteorological conditions and air quality in working areas and serviced rooms.

Provides centralized remote off all ventilation systems in case of fire and ventilation equipment grounding.

Scheme ploschadochnyh heating systems residential village four-pipe. Pipeline heating systems - above ground, on low-standing pillars, partly underground in a no-go channels of the precast concrete industry.

Table 6 - Summary of the object

Name index	**Number**
Heat consumption for heating, kcal / h Gcal / year	860350 1783,8
Heat consumption for ventilation, kcal / h Gcal / year	127240 235,6
Heat consumption for hot water, kcal / h Gcal / year	822350 986,8

Technological impact of heat supply system is expressed in use in heating systems heated water, emissions to the atmosphere of combustion gases into the boiler in the removal of certain portions of land.

2.8 INFRASTRUCTURE

The objects of automated control and management according to the technological solutions are:

- Housing community;
- Treatment facilities residential village.

The residential village automation objects are:

- Tanks of drinking - fire water reserve;
- Household and drinking - fire pump station;
- Sewage pumping station.

In wastewater treatment plants inhabited settlement automation objects are:

- Sewage treatment plants waste water;
- Sewage pumping station.

Complex technical facilities provided for the project, provides the following main tasks for automation of pump stations and reservoirs:

- Management of manual and automatic fire pumps and drainage pumps;
- Pressure control pnevmobake;
- Monitoring the level in the reservoirs firefighting water storage and drainage pit;
- The alarm of the pumps;
- Collecting and transmitting information to the operator.

Complex technical facilities provided by the project of automation of sewage pumping station, provides the following major tasks:

- Level measurement;
- Level alarm;
- The alarm of the pumps;
- Collecting and transmitting information to the operator.

Provided in the draft scope of automation, ensures the normal operation of facilities with minimal staff.

Specific circuits of automation and adopted technical solutions are provided the necessary local devices, sensors and transducers.

All secondary devices of automation available on the operator panel.

Nutrition automation is carried out on 220 V ~ I a special category of electricity.

This section of the project envisages the following types of communications:

- Telephone residential village of MCC;

- Broadcast networks;

- TV;

- Chasofikatsiya.

On-site residential village provides for the allocation of space for a communications center in the projected building the community center.

Networking is automatically switched telephony is projected on the basis of electronic digital telephone exchange. As a subscriber devices used analog telephones.

As a system of radio amplification system is used, which is installed in the communications center residential village. To broadcast voice and music programs provide a CD player and recorder dvuhkassetny.

For meetings, meetings and celebrations at a community center (room conversations) is installed sound reinforcement system.

Chasofikatsiya accomplished by the electronic clock.

To receive broadcast television programs on top of buildings established by the collective antennae, which are mounted on steel towers.

With the construction of buildings readiness survey is conducted and the result is determined by the soundings of the antenna and the type of central equipment.

To connect user devices to the PBX residential village will be built on the site dvuhotverstnoy cable telephone conduit, with the installation of reinforced concrete wells, type of CCF. One channel provides cable telephony, and the other - for cables of radio.

To connect telephone subscribers to residential village TSEATS chemical complex designed cable connecting line.

For the organization of radio transmission network from the MCC to a residential village is laid cable length of 3 km.

During the construction accounted for anti-seismic and anti-corrosion activities than that achieved by improving environmental safety.

In the construction of auxiliary facilities management and infrastructure, as well as their operation would have been some increase in consumption of electricity, heat, fresh water, consumption of fuel gas, sewage, and that will cause a slight increase in induced pressure on the environment

2.9 SOCIO-ECONOMIC ASPECTS

In economics, natural gas is of paramount importance as a chemical feedstock and as one of the more efficient fuels, the most environmentally friendly, high quality and cost-effective compared with coal and oil.

Use of the national economy of natural gas gives a great economic effect. Go to the gaseous fuel significantly reduces emissions of harmful substances into the environment, improving the health of communities.

Facilities planned construction area covers a territory Kungrad which has an environmentally threatened. Salinity and particulate air pollution leads to the development of a number of serious diseases. One of the main reasons for this are the poor security of safe drinking water, inadequate sewer and low levels of sanitation of settlements.

High population growth, as well as a large proportion of the working population make acute employment problem, whose solution is among the priorities of political and socio-economic problems of the country.

Commissioning of additional capacity and gas production and gas processing, new facilities will contribute to maintaining the achieved level of production in the UAE Ustyurtgaz "and, therefore, alleviate shortages in the country of hydrocarbons.

As you know, gas fuel is the most environmentally friendly. If one considers that 85% of the electricity produced in Uzbekistan in thermal power plants that use natural gas as fuel, it can be concluded that the widespread use of fuel gas is largely reduced air pollution in the whole country.

Supply of gas for export to neighboring countries gives currency earnings needed, including separately for oil and gas development, as well as for other government objectives.

Thus, Planned construction will make a definite contribution to the improvement of socio-economic situation in the country.

Implementation of the construction and subsequent operation of the Project facilities will entail some negative consequences: exclusion of temporary and permanent use of certain areas, the risk of accidents and associated environmental pollution.

The proposed design solutions are inextricably linked with the implementation of complex measures on environmental protection on a fundamentally new scientific and technological bases of design, construction and operation, which will provide socio-economic impact of the project.

3 ALTERNATIVE SOLUTIONS

Section II of the technical project "Construction of gas-chemical complex" is considered two options for the location of MCC: near the village Akchalak and around the city Kungrad (Ravshan). Therefore, the following stand out alternative sub-options:

Table 7 - Alternative options for power and position of MCC

Ia variant	- Power of MCC processing of raw gas in the volume of 2,0 billion m3 per year with a location near the village Akchalak;
Ib variant	- Power of MCC processing of raw gas in the volume of 2,0 billion m3 per year with a location near the city Kungrad;
IIa variant	- Power of MCC processing of raw gas in the volume of 3,0 billion m3 per year with a location near the village Akchalak;
IIb variant	- Power of MCC processing of raw gas in the volume of 3,0 billion m3 per year with a location near the city Kungrad.

Analysis of the options shows that the greatest advantages has variant IIa with prey 3 billion and the location of MCC in the village. Akchalak (near the railroad and oil loading rack, roads, power lines, gas main, water main, etc.).

Technology for producing polyethylene and PBF is the latest, at the latest science and technology.

The main purpose of the proposed activity is a better use of information contained in natural gas deposits Surgil valuable components: ethane (for production of polyethylene), propane-butane fraction, and gas condensate. Also, the deeper dehydration of marketable gas.

An urgent need to design and construction of facilities for more complete extraction of valuable components, no doubt.

The designed object can be safely attributed to environmental protection and resource (rational use of mineral resources).

Thus, none of technologies designed by or for the placement of structures more difficult to choose the best option.

4 ANALYSIS OF ENVIRONMENTAL IMPACT DESIGNED OBJECTS

This chapter includes the characteristics of the sources of environmental impact from the analysis of possible technological and engineering solutions for design of MCC Akchalak, transport gas to the COP Akchalak MG Hiva Beyneu, stable condensate - NOE Kyrkkiz, a residential village for staff, as well as characterization of the impacts, associated with the additional supply of pollutants in the environment and the extraction of natural resources, technological options and the impact of the main objects of the impact during construction and operation of the designed objects. The project implementation will be affected by the following environmental components:

- Ambient air.

Soil and vegetation.

- Groundwater.

Of the total project, you can select sources of pollution for the following processing chain:

- Construction and operation of MCC Akchalak;

- Construction and operation of external communication (pipelines, road, railway, etc.;

- Construction and operation of a residential village for 1,645 people.

On the basis of design decisions analyzed the impact of emissions, discharges, waste, removal of land for the construction and operation

4.1 Impacts on the air, water, LAND AND VEGETATION DURING CONSTRUCTION

During construction, designed buildings, structures and piping the air will be affected by emissions from internal combustion engines (ICE), road construction equipment and vehicles, as well as welding equipment and painting equipment.

By road-building machinery and motor vehicles used in the construction of the Project Assets would include: excavators, bulldozers, graders, on the pneumatic roller, Tamping, crawler and truck cranes, cranes, pipe layers, portable welders and compressors, avtobetono and avtorastvorosmesiteli, dump , pipe trucks, trailers, side cars, avtotsistserna.

Таблица 8 - Ориентировочные объемы и характеристики отвода земель при строительстве ГХК и его инфраструктуры

Object name	Quality of the land	Dimensions	Width of the allotment,	The extracted land, ha	
				during construction	of them consistently
Technological objects chemical complex Akchalak	Солончак и закрепленные пески	1000x720= 720000м		72	72
Residential settlement		66,18 га		66,18	66,18
Highway		6,3 га		6,3	6,3
Railroad		2,3 га		2,3	2,3
Plumbing		19000 м	28	53,2	-
Condensate		ℓ=12000 м	28	33,6	-
Gas pipeline		ℓ=9000 м	38	34,2	-
Taps and valves on connecting pipelines		100x10=1000 м2		0,1	0,1
Total				**267,79**	**146,79**

Sources of pollutant emissions during construction of the projected objects would be:

- the exhaust pipes of road construction equipment and vehicles;
- mobile welding units and painting machines located at public construction sites.

The list of pollutants released into the air during the construction of designed objects, is presented in Table 9.

Table 9 - The list of pollutants released into the air during the construction period

Name of substance	The criteria used	Criterion value, mg/m3	Hazard Class
Iron oxide	MAC SS	0,04	3
Manganese and its compounds	MPC	0,01	2
Nitrogen Dioxide	MPC	0,085	2
Soot	MPC	0,15	3

Sulfur Dioxide	MPC	0,5	3

Продолжение таблицы 9

Name of substance	The criteria used	Criterion value, mg/m3	Hazard Class
Carbon monoxide	MPC	5,0	4
Fluorides gaseous	MPC	0,02	2
Fluorides badly soluble	MPC	0,2	2
Xylol	MPC	0,2	3
Benzo / a / pyrene	MAC SS	0,000001	1
Hydrocarbons (for gasoline)	MPC	5,0	4
Hydrocarbons (in kerosene)	TSELs	1,2	-
White Spirit	TSELs	1,0	-
Inorganic dust:	MPC	0,3	3

During the construction period projected objects in the air will go a few tens of tons of pollutants.

Thus, during the construction of surface facilities will take place air pollution from road work and construction equipment (dust emission, the exhaust gases), which is insignificant in value and short on impact.

During the construction period impacts on the aquatic environment will be provided through the removal of water resources. Water supply construction designed facilities will be carried out from the water Kungrad - COP Karakalpakstan, as well as, where appropriate, imported water in the tank.

The volume of household wastewater generated during construction in an amount equal to water consumption. Discharge of such water is carried in a cesspool system. Reset is constant, but limited period of construction works.

Works on construction of industrial sites and off-site communications related to the use of land as the construction period (short-term lease), and the period of operation of technological equipment (long-term lease).

Sources of exposure are themselves under construction, as well as, construction equipment, machinery, motor vehicles.

Necessary to allocate some of the impacts on land cover, both in the period of construction works, and during the operation of facilities:

The direct impacts associated with the withdrawal of land for construction of accommodation facilities

Seizure of land for surface facilities will be long term and short-term lease.

In the long-term lease of land allocation under the site of MCC and a residential village, linen access road and railway. To accommodate external communications pipeline underground land diverted to short-term lease.

Dimensions of land seized in the short-and long-term lease correspond to actual regulations. Area of land needed for the construction of designed structures will be adjusted to further stages of design.

Mechanical effects associated with damage to soil and vegetation cover in the course of the excavation and construction works and redevelopment of vertical relief

Vertical layout designed industrial sites and linen service roads made taking into account the existing topography, geological and hydrological features of the construction site.

When laying off-site communications impacts on soil and vegetation would be short-lived - only during the construction period. In preparing the temporary removal of the band under laying of pipelines, there is an infringement of the surface layer of soil to a depth of 2 m.

After the construction and excavation, construction of the strip (the area a short term lease) is removed debris (remnants of pipes, insulation material, etc.) are exported all temporary devices, held technical and biological reclamation. Then these lands be returned to former owners in a condition suitable for economic use.

One of the main measures aimed at protecting soil and vegetation cover, is a technical and biological reclamation of land disturbed in the process of construction works.

Technical phase reclamation includes a range of activities for the removal and restoration of topsoil and preparing the territory of the construction of the (short-term land lease) for the biological stage of reclamation.

Based on the soil conditions in the region of works, the removal shall be used in a fertile agricultural production capacity of soil 30.0 cm

Bio-remediation is done after the technical phase and aims to restore the physical and biological properties of soil, improving structure and water and air regime of the arable horizon.

Serious violations of land-cover can lead to haphazard journey of vehicles and construction equipment, and conducting planning works in a vertical layout for placing ploschadochnyh objects. On the territory of broken sand massifs possible significant activation of deflation.

Analysis of violations occurring during construction at the facilities-analogues shows that the construction activities without protection activities (lack of access roads, work outside the ROW) violations in the area 3-5 times higher than the permissible area of drainage.

Chemical contamination of soil and vegetation cover, both during construction and during operation of the **Chemical contamination of soil is possible**:

In the absence of an organized collection and placement of construction waste;

- during operation of the Project facilities - in violation of the process of technological equipment, lack of organized storage and disposal, organized by sewage and runoff.

Contamination of soil and vegetation can occur as a result of emergency situations - emergency or ad hoc spills fuel, technology products, waste water treatment. Migration routes and the accumulation of contaminants will be determined by the landscape-geochemical conditions.

4.2 Production and consumption waste during construction

Environmental pollution in the process of waste management depends on:

- their number;
- Hazard Class;
- method of placement and removal.

During the construction of designed objects produced for domestic and industrial waste.

For household waste generated as a result of human activity, working on construction projects include debris from residential premises.

Industrial waste generated during the preparatory and construction works are presented in Table 10.

Table 10 - Characterization of waste generated during construction

Name waste	Place of generation	Hazard class of waste
Household waste		
Garbage from domestic premises unsorted (excluding oversized)	Construction Sites	4
Industrial wastes		
Oils Waste	Playground construction base contractor	2
Transmission oils waste	same	2
Paint waste of funds (lump)	Construction Sites	3
Scrap and waste containing non-ferrous alloys	Playground construction base contractor	3
Cleaning material contaminated with oil (oil content less than 15	same	4

Waste Tires	same	4
Residues and stubs of steel welding electrodes	same	4
Scrap unsorted	same	4
including: the generators during construction works	Construction	
formed at service equipment	site	
Waste insulated wires and cables	Playground construction base contractor	4
Boy building brick	same	4
Waste cement lump	same	4
Waste concrete mix with dust less than 30%	same	4

In order to reduce the impact of waste on the ground and upper aquifers are proposed actions for their orderly collection, temporary storage and further accommodation.

All waste, as their education, are encouraged to collect and store in a specially equipped and designed, according to the requirements of their storage areas with hard surface, as follows:

- Refuse from domestic premises organizations unsorted (excluding oversized) - in metal containers that are installed on sites with a hard surface;

- Motor and transmission oil waste - in closed metal containers;

- Cleaning material contaminated with oil, paint waste of funds (lump) - in sealed containers;

- Scrap and waste containing non-ferrous alloys - in containers located in the premises;

- Residues and stubs of steel welding electrodes, waste cement lump, waste concrete from the dust of less than 30% waste insulated wires and cables - in containers, by type of waste;

- Waste and scrap of ferrous metals with impurities; unsorted scrap, waste tires, waste bitumen, asphalt, in solid form, the battle of building brick, asbestos cement waste in a lump - on the sites, types of waste.

4.3 EXPECTED EMISSIONS DURING OPERATION

Ambient air pollution is possible in normal use, during the periodic (routine) operations and in emergency situations.

The linear part of the source of exposure to air can occur only in an emergency, in violation of the integrity of the pipeline. The probability of rupture is extremely low, but such cases are completely not be excluded.

For new installations chemical complex and its infrastructure will have additional sources of exposure to ambient air, which are divided into two types:

1. Constant
- Pyrolysis furnace;
- Booster compressor for the marketable gas;
- Boiler room;
- Gas piston power plant;
- Fugitive (fugitive);
- Evaporation ponds, etc.
2. Periodic
- Torch;
- Degasser, drainage capacity;
- Pump pumping stable gas condensate, etc.

In this case, respectively, will increase the input of polluting substances into the air. Calculation of expected volumes of selections from the above sources was carried out in accordance with RD 39.2-170-95 [2], based on existing project data in terms of processing and the formation of gaseous waste, and by analogy with existing technological facilities (Shurtansky MCC).

Table 11 – The design parameters of emission sources

Name sources of harmful substances (plant, plant, apparatus)	Name of pollutant	The amount of pollutants emitted from emission sources	
		g / s	tons / year
Installation of ethylene			
Pyrolysis furnace (3 pieces)	Nitrogen dioxide	0,430608	10,153737
	Nitric oxide	0,107652	2,538434
	Carbon monoxide	0,969484	22,860433
	Methane	0,096949	2,286057
	Sulfur dioxide	0,008681	0,204698
	Soot	0,011000	0,259380
	Nitrogen dioxide	0,430608	10,153737
	Nitric oxide	0,107652	2,538434
	Carbon monoxide	0,969484	22,860433
	Methane	0,096949	2,286057
	Sulfur dioxide	0,008681	0,204698
	Soot	0,011000	0,259380
	Nitrogen dioxide	0,430608	10,153737
	Nitric oxide	0,107652	2,538434

	Carbon monoxide	0,969484	22,860433
	Methane	0,096949	2,286057
	Sulfur dioxide	0,008681	0,204698
	Soot	0,011000	0,259380
Turbine compressor sales gas	Nitrogen dioxide	21,713600	625,35168
	Nitric oxide	5,428400	156,33792
	Sulfur dioxide	0,066200	1,906560
	Soot	1,324000	38,131200
Mercantile Park			
Reservoir cyclohexane	Cyclohexane	0,070000	2,016000
Lung capacity of the condensate (2 pcs)	Pentane	1,280000	36,864000
	Hexane	0,856200	24,658560
	Pentane	1,280000	36,864000
	Hexane	0,856200	24,658560
Installation of polyethylene			
Storage tank cyclohexane	Cyclohexane	0,095000	2,736000
Clarifier and separating particles	Cyclohexane	0,000081	0,002333
Capacity of waste	Cyclohexane	3,466109	99,823939
Sump catalysts	Cyclohexane	5,635950	0,304341
	Hydrogen chloride	0,896000	0,048384
Playground parogeneratsii			
Steam generator	Nitrogen dioxide	9,751827	280,852618
	Nitric oxide	2,437956	70,213133
	Carbon monoxide	30,409089	875,781763
	Soot	0,093000	2,678400

Продолжение таблицы 11

Name sources of harmful substances (plant, plant, apparatus)	Name of pollutant	The amount of pollutants emitted from emission sources	
The site diesel power			
ICE	Nitrogen dioxide	0,081389	2,56668
	Nitric oxide	0,020347	0,64167
	Carbon monoxide	0,08478	2,67363
	Sulfur dioxide	0,033912	1,06945
	Soot	0,016956	0,53473

	Acrolein	0,004069	0,12833
	Hydrocarbons	0,040694	1,28334
Flare			
Torch of the normal pressure and apparatus	Nitrogen dioxide	0,017664	0,508723
	Nitric oxide	0,004416	0,127181
	Carbon monoxide	0,147200	4,239360
	Sulfur dioxide	0,000233	0,006710
	Soot	0,000315	0,009072
	Hydrocarbons	0,003680	0,105984
Wastewater Treatment Plant			
Inlet chamber	Hydrocarbons	0,074591	2,148221
Averager drive	Hydrocarbons	1,372501	39,528029
Neutralizer	Hydrocarbons	0,794119	22,870627
Mixing	Hydrocarbons	0,316509	9,115459
Field camp			
Boilers	Carbon monoxide	0,0272	0,3447
	Nitrogen dioxide	0,0079	0,1001
	Nitric oxide	0,002	0,0253
B C E F O		**93,583209**	**2482,164904**

The list of pollutants emitted from the projected sources is presented in Table 12

Table 12 - The list of pollutants

Ingredien	TLV mg/m3	Air emissions		%%
		g / sec	tons / year	
Carbon monoxide	5,000	33,576721	951,620752	35,879
Nitrogen Dioxide	0,085	15,221904	939,841012	35,118
Nitrogen oxide	0,600	25,858375	234,960506	8,779
Hydrocarbons	50	2,892941	81,909831	3,091
(Methane)	0,15	1,467271	42,131542	1,568
Soot	0,5	0,126388	3,596814	0,135
Sulfur dioxide	0,3	0,004069	0,12833	0,004
Acrolein	0,2	0,896	0,048384	0,957
Hydrogen chloride	1,4	9,26714	104,882613	9,903
cyclohexane	100	2,56	73,728	2,736
Pentane	60	1,7124	49,31712	1,83

TOTAL:		93,583209	2482,164904	100

Thus, in operation of facilities at MCC in the atmosphere will be additionally receive the products of combustion of fuel gas processing plants, as well as hydrocarbons (as methane).

As can be seen, the additional The supply in the operation of MCC in the order 2482.164904 tons of pollutants 11 titles. The main contribution in this case is made of carbon oxides (35.879%), produced during its operation torch.

A more detailed description of these emissions will be given at the next design stage, after clarifying the source data. In addition to the permanent income of pollutants into the atmosphere during operation of the facility may periodically and short-term intake of the combustion products of gas during repair and scavenging work ..

4.4 WATER AND SANITATION IN THE PERIOD OF OPERATION

For water supply facilities designed MCC Akchalak the source is an existing water main Kungrad - KS Karakalpakiya (Figure 13). Indicators of bacteriological and chemical analysis of water in the culvert Kungrad-KS Karakalpakiya "do not meet the requirements O'zDSt 950:2000.

Table 13 - Water consumption and water supply points

Name Consumer	Water consumption, m3 / h	Note
GCC market (technological and drinking needs)	402	Company data «Nexant»
Residential settlement:		
- household drinking purposes	23,2	
- Filling tanks	33,3	
Total:	458,5	
Own needs (7%)	32,0	
ВСЕГО:	**490,5**	

The reliability of water supply gas and chemical complex, according to the design assignment, defined as a consumer I category. By Category I users on the reliability of water supply include technological and drinking needs of the complex. For the technological and drinking and household needs may decrease the water supply in an emergency situation no more than 30% of design flow, lasting no more than 3 days.

Water flow at MCC is carried out on conduit length of 15 km to the challenge on a residential village.

To ensure the reliability of the water when the water supply conduit for one, there should be enough water for the liquidation of the accident at the water main and the additional stock at the time of fire suppression, which is stored in the waterworks MCC.

Before serving waterworks complex chlorinated water. This event is used to sanitize tanks and pipelines.

For industrial water to meet the following requirements:

- suspended solids - 1.5 mg /жесткость - 1.8 мг-экв/л
- - chlorides - ≤ 146 mg / l
- - sulphates - < 350 mg / l
- pH - 6.5-7.5

To ensure the required water quality provides the installation for the preparation of process water. Drinking water in the complex is carried out to ensure communal necessities workers and villagers.

In primary and secondary production of the complex formed, along with the household, various highly concentrated industrial sewage, which consists of five separate streams (analog SHGHK).

1. Himzagryaznennye waste water coming from the following process steps:

- waste water with an alkaline column;
- Spent lye;

2. The flow of oily wastewater. Residual concentration of oil after purification on hydrocyclones (ABB) is 5 mg / l, the concentration of suspended solids - 20 mg / liter.

3. The flow of sewage from the plant

suspended solids, mg / - 232

BPKn, mg / l - 268

4. Mineralized waste water

This stream is formed by the waste water from the preparation of natural, demineralised water and cooling systems (cooling towers). These effluents contain high amounts of salts.

TDS mineralized flow according to the manufacture of 5 grams per liter.

Wastewater himzagryaznennogo stream is cleaned at treatment plants. Originally sinks come in a balancing reservoir with mechanical stirring, and then fed into the mixer-converter, which simultaneously adds sulfuric acid to adjust pH. After adjusting the pH of the neutralized water flows into the primary settling tank, and then in the sump, where it is mixed with oily wastewater streams of pre-treatment on masloseparatore.

Processed reagents combined flow himzagryaznennyh and oily industrial wastewater enters the primary clarifier. After the initial settler clarified water in the receiving pit is mixed with the flow of industrial and domestic wastewater of pre-machining on the grids and sand trap. Further, the combined flow enters the stage of biological treatment in aeration tank.

After the sewage aeration tanks in the water settles in the secondary clarifier. Purified water is then chlorinated and then enters the post-treatment in the evaporation ponds, as the quality of its still does not conform to clear the pond cultural purpose

Quality of treated water is tentatively as follows

pH	-	6,5-8,5
BOD5, mg / l	-	25
COD mg / l	-	no more 120
Phenols, mg / l	-	less 0,15
Petroleum products, mg / l	-	2,0
Benzene, mg / l	-	0,05
Benzapyrene, mg / l	-	0,05
Ammonia nitrogen, mg / l	-	less 5,0
Suspended solids, mg / l	-	20

As can be seen from the above qualities of treated wastewater, they still contain quite a lot of residual amounts of organic substances that are usually difficult to oxidizing substances.

The variant of dumping of industrial waste treatment facilities after absorbing in the deep horizons in coordination with the hydrogeological services.

Water on the residential village for drinking and fire protection needs is supplied through a pipeline 4 km long (Figure 13).

Water use residential village is:

- drinking needs - 432.2 m3/day

On the platform were designed waterworks consisting of:

- pumping station drinking, firefighting purposes;
- water storage tanks of drinking-fire destination for up to 400 m3 (2 pcs.)
- filter-absorbers.

Supply of water for drinking - fire needs of - 674 m3. Structurally, the installation made two tanks of 400 m3 (water supply in one conduit).

Table 14 – Equipment in the pumping station drinking - firefighting purposes

Mark Pump	Para-Meters		Quantity, pcs		Power, kW	Type of electric motor	Power, kW	Ca.
	Ras-stroke	On-time						
	$м^3$/час	м	раб	рез.				
Pump K100-65-200 (fire-fighting purposes)	100	50	1	1	2900	4AM160S2У32	30	

Pump K65-50-160 (protivopozhar-purpose	25	32	1	1	1490	4AM100L2У3S	5,5	
Pump GNOM 10-10t (drain)	10	10	1	-	2900	with integrated motor	1,1	
Tal manual gr. 1 t			1					
Apparatus bactericidal	5		5	2			100 вт	P=0,6 МПа

The feed water used for water supply to the water storage tanks. The feed water is projected from steel electric-welded pipes with enhanced anti-corrosion and insulation is laid at a depth of 1.2 m from the grading of land marks.

The input to the site provides water-metering unit with a bypass line.

Water consumed in drinking needs disinfected bactericidal lamps, installed in the pumping station drinking-fire destination.

The network of drinking-fire line projected ring of steel electric-welded pipes with enhanced anti-corrosion and insulation are laid at a depth of 1.1 m from the grading of land marks.

In order to reduce the consumption of fresh water for fountains provide a pumping station to pump water recycling K100-80-160 Q = 100 m3/hr (1 slave., 1 rez.).

Irrigation area, near the administrative and residential buildings, carried out domestic watering valves mounted in the recesses of buildings.

The project provides sanitary sewer system (Figure 14). Domestic waste water by gravity comes into the sewer pumping station and pressure pipe are pumped to the biological treatment plant. Treated effluent pumping station is pumped to evaporation ponds.

Network of sanitary sewer projects of ceramic sewer pipes. On the network established by manholes.

Outside networks pressurized sanitary sewage from a residential village to the treatment plants are designed steel welded tubes is 2 km long with a reinforced anti-corrosion insulation.

According to the norms of water consumption in the residential village of firefighting:

- Outer-5 l / sec.

- Internal-15 l / sec.

Enough water for firefighting is 216 m3. When applying for one conduit in the reservoirs of drinking-fire destination store additional fire reserve.

Pumps, fire fighting purposes K100-65-200 (1 operating, 1 standby) water from reservoirs fed into the ring system plumbing. External firefighting is carried out fire hydrants installed on the ring network plumbing. Placement of fire hydrants shall ensure suppression of any point of buildings and structures of the two jets.

Near the fire tanks are installed wet wells for direct intake of water mobile technology.

The quality of water for fire suppression of specific requirements are not established.

Design decisions include measures to minimize the water consumption for industrial purposes. At the site provides for a system of water recycling, resulting in savings of fresh water.

4.5 WASTE EXPECTED DURING OPERATION

Akchalak MCC large modern enterprise, during the operation which produced not only the waste gases emitted into the atmosphere, liquid, waste waters, and solid waste and some liquid to be storage and recycling or disposal.

Practically at all objects of the main production generates solid and liquid wastes. Solid waste, mainly due to the use of various adsorbents and catalysts, which, as the generation to be replaced. Specific waste production are coke and pitch pyrolysis, Polymer Pyrolysis oil alkaline washing, various liquids consisting of organic solvents, dust from pylegazoulavlivayuschego equipment (ventilation systems of buildings and equipment, etc.).

In the supporting manufacturing wastes are generated by replacing the filtration material condensate treatment plants and receiving demineralized water, replacing the adsorbent in the system of obtaining nitrogen and instrument air, at breaks packages or wrong with their treatment at the facility storage and packaging of polyethylene, for clarification of waste water at treatment facilities, etc. By supporting industries also include mechanical repair shop, where the processing of metal products will be formed of ferrous and nonferrous metals, and possibly wood chips in the case of woodworking machines. Scrap metal will be formed also with time as a result of wear and tear and replacement.

In the course of life of personnel will be formed of solid waste. When using fluorescent lamps and mercury-containing devices are formed in mercury wastes.

Harmful substances according to their impact on the human body are divided into Class 4. To determine the hazard class of waste in the Republic of the Provision Provisional classification of toxic industrial waste and methodical recommendations on the definition of toxic industrial wastes.

Hazard classes, the physical characteristics and chemical composition of toxic industrial wastes are determined by technological production laboratories of enterprises, research institutes, with the participation of specialists or the State Committee of SES.

The current at the moment Provisional qualifier industrial toxic wastes (Instruction on accounting education, use and storage of toxic wastes in the form of number 3 - toxic waste) are absent most of the industrial waste generated at gas-chemical complex. In this regard, as well as the lack of waste samples, they are assigned to hazard class of theoretically intended component having the highest hazard class. However, after conducting laboratory tests and approval in the Republic of Cadastre of waste and the Classifier, the class of risk will be reviewed now.

Below is a description of some of the major types of industrial waste as the ground and in the support industries.

Spent molecular sieves (zeolites)

Formed by replacing the nozzles in a number of adsorbents and desiccants. As an adsorbent used in them so-called molecular sieves, which are a form of zeolites. Zeolites are a special group of aluminosilicates. They have a loose crystal structure, formed by sharing common oxygen atoms and SiO_4 tetrahedra AlO_4. Zeolites are capable of exchanging information contained in them water to other liquids, and the cations M - various other cations.

The molecular sieves used in a variety of devices, both in uniform and in a mixture form.

Spent molecular sieve gas separation system. Formed by the replacement of molecular sieve used in the dehydration of natural gas in the adsorber ethylene plant. Zeolite is used to the size of the holes in 4A, consisting of: $Na_2O * Al_2O_3 * SiO_2 \times H_2O$.

Spent molecular sieve desiccant pyrogas. Formed by the replacement of molecular sieve used in the dryer column ethylene ethylene plant. In this case, a zeolite with holes in 3A the following composition: $Na_2O * Al_2O_3 * SiO_2 \times H_2O$. Designed to absorb moisture.

Spent molecular sieve desiccant ethylene. Formed by the replacement of molecular sieve dehydrator ethylene plant. In this case, a zeolite with holes in 3A the following composition: $Na_2O * Al_2O_3 * SiO_2 \times H_2O$. Designed to absorb moisture.

Spent molecular sieve system for obtaining nitrogen and instrument air. Formed by the replacement of molecular sieve in the receipt of nitrogen and instrument air.

At MCC zeolite is used as a desiccant, so the composition of the spent zeolite, unlike the original, will be characterized by a high content of water. Spent zeolites are solid pellets from gray to brown, not flammable and not toxic. Possibly deposited in the open air. Spent molecular sieves (zeolites waste) are absent in the existing list of toxic waste to be taken into account. Spent zeolites should be stored in landfills to recycling. One way of disposal is to use them as a component of building material, for which the company needs to conduct laboratory tests and certification for its quality.

Multimodal zeolite and coal waste

In some molecular sieve adsorbers loading is carried out in layers with other fillers, resulting in the discharge of a mixture of spent adsorbents.

Multimodal departure of the zeolite, and coal produced in swing absorbers (PSA) ethylene plant. The processed mixture of zeolite and coal will be a solid waste black and gray. Their properties will be blend of non-toxic, a fire hazard.

Possible storage in landfills to recycling. Method of disposal is determined by the company after the laboratory studies and a certificate for its quality.

The spent silica gel

Formed by replacing the silica gel in the adsorber polyethylene plant.

For the year produced a few tons of spent silica gel. Material differs from the original high moisture content. Non-toxic, no fire hazard. Adverse impact has the dust. Discharging through a special hose in a container with a lid.

A mixture of silica and zeolite

Is formed by replacing the desiccant in the adsorbers polyethylene plant. As a filler used silica - 66.7%, and molecular sieves - 33,3%. Silica gel is a white granular powder, odorless density of 640 kg/m3. The molecular sieves used different types of zeolites.

Zeolites are white, gray or yellowish-brown balls, odorless density of 750 kg/m3.

The spent adsorbent is removed for disposal or storage. One way of disposal is to use it as a component of a building material for which the company needs to conduct laboratory tests and certification for its use. It is also possible disposal option.

Spent Alumina

Formed in plastic adsorbers installation in the absorption of chelates of activated alumina. Spent alumina will be a spherical granules white or grayish-white color. As part may be small amounts of substances adsorbed from the air. Non-toxic, no fire hazard. Unloading is carried out through a special hose in a container with a lid.

Plastic Waste

Presented in the form of plastic chips, or film. Plastic chips are formed in some areas of the polyethylene plant. Consists of 91 wt. % Polyethylene and 9 wt. % Water. The process of collecting periodic.

On the packing line of polyethylene waste in the form of granular polyethylene bags at breaks or wrong with them to use. Is a defective product. The process of collecting periodic.

Polyethylene film is formed on the packing line of polyethylene. Is a waste of packaging material (polyethylene).

Plastic waste in their state of aggregation are solids. Chemical and physical properties depend largely on brands of polyethylene.

Plastic waste is a byproduct and can be returned to the production cycle in the process of polyethylene. It is also possible to implement them to the side as a raw material for some companies.

Spent catalyst reactor, the hydrogenation of acetylene

Formed by replacing the spent catalyst in the converter of acetylene on ethylene plant. Spent catalyst in its physical properties will be similar to the original material. This is a solid granular material.

Recycling is available in several versions: the use in cement plants, the return of the manufacturer and sales on the side to retrieve a valuable component.

Coke quenching-vaporization apparatus

Formed by pyrolysis and quenching gas to the ethylene plant. Removed from the quench-evaporation apparatus.

Twice a year to clean quench-evaporation apparatus. Represents the wetted solid carbon with a specific calorific value 29 MJ / kg. Substance black, non-toxic, flammable.

Reset is carried out periodically in drums with lids.

Pyrolysis hardening resin column

Liquid products of pyrolysis are called resin. Formed in the quench column ethylene plant. Assigned to the 2 hazard class as gummed pyrolysis.

Collection will be carried out periodically in metal drums with lids.

Polymer oil (yellow oil)

Formed in the cube of the column of alkaline washing pyrogas ethylene plant. Is a polymer oil. Assigned to class 2 hazard.

Collection will be carried out periodically in metal drums with lids. Can be used as an additive to the raw material for coking in the pyrolysis of the existing delayed coker at the Fergana refinery, according to the recommendations and study ABB.

Spent ion exchangers

Is formed by replacing the nozzle filters of mixed actions (FSD) to install clean water condensation and preparation of demineralized water. Ion exchangers (ion-exchange resins) are characterized by highly pronounced adsorption capacity with respect to the cation - cation or anion - anion. Collection and storage in containers with lids. Storage at an industrial site. Inert material. Recommended for use in road surfaces.

Used oil

Formed by replacing the oils in the compressor and other facilities. State of aggregation is a liquid, belongs to II class of hazard, a fire hazard.

Will be carried over to the side, for example, "oil products".

Sand treatment plant

Formed during mechanical treatment of wastewater. Low toxic waste. Class 4.

Sludge treatment facilities

Compacted sediment from the primary clarifiers, the block containers. Dewatered sludge conveyor belt is applied to trucks for removal. Cake moisture content 78-80%.-Toxic waste. Class 4.

Spent fluorescent lamps

Formed using fluorescent lamps. The estimated number of missing. Because of mercury refers to the I class of danger, no fire hazard.

Given the nature of the effects of these wastes on the environment and human health, their processing must be performed by specialized companies such as "SELT" in Tashkent and in the city of Navoi.

Municipal solid waste

Will be generated during the life of staff.

Scrap

Formed during the processing of metal products in the machine, as well as replacement of equipment as a result of wear and tear.

Other solid waste IY hazard class and non-toxic

In operation, the company will be formed with non-toxic or low toxic industrial waste (wood, rubber, textile, building materials, etc.). Basically it is flammable materials and therefore assumed the possibility of their removal by thermal method. They can also be sent to the landfill storage of solid waste or recycling.

Thus, the company will be formed more than 20 types of waste of various states of aggregation, requiring disposal or destruction. These wastes both organic and inorganic nature of the various environmental hazards.

5 ANALYSIS OF POTENTIAL EMERGENCIES

Possible emergency situations on structures Akchalak chemical complex in many respects similar to those described in Part 1 of CPF Surgil.

Under the accident is a situation in an industrial plant in which raw materials, intermediate products, products of the enterprise and industrial wastes, established on-site processing equipment, engaging in the process of creating an emergency affecting factors for the personnel, population, environment and most of the industrial enterprise.

In accidents and injuries of the process equipment and piping are possible: a fire, explosion, electrocution.

Sources of fire and explosion are the form explosive gas-air mixture.

One of the main substances involved in the process (extraction, the main transport and processing), is natural gas. Natural gas is explosive and fire hazardous substance may have toxic effects on the human organism at high concentrations (10%), with no color or smell.

In the process of drying and processing of natural gas can be allocated to gas condensate. Gas condensate is a flammable liquid with wide fluctuations in the content of hydrocarbon components. In the production of cyclohexane is also used, relating to hydrocarbons.

In addition to these substances in the process, various lubricating oils - combustible, flammable liquid produced in the process of refining.

Emergency situations are possible because of the different types of failures:

- Technology failures, caused by disturbance of the technological mode of production or a separate process;

- Mechanical failure, caused by partial or complete destruction or deterioration of the process equipment, or individual parts;

- Organizational and technical failures, due to the termination of supply of raw materials, energy, human error, etc.;

- Natural, caused by natural disasters, fires, explosions, etc.

The level of automation that meets modern requirements, allows plants to operate equipment without a permanent presence on their staff and manage the operation of the operator, control room.

There are automatic control, alarm and emergency protection against excess pressure in the main production lines.

For the prevention of accidents or malfunctions provide motor protection. If you violate the regime of units or support mechanisms can be automatically shutdown of individual systems of the unit or a full stop.

According to the above, technological failures in the steady process conditions have a low degree of probability.

The projected production equipment complies with the rules of operation, so the possibility of accidents associated with mechanical failure is almost completely excluded.

Organizational, technical failures, causing accidents, almost impossible, because the reduction or excess volume of processed gas is in the range of installed capacity. Otherwise, the emergency stop units occur automatically or manually triggered protection by pressing the emergency stop.

With regard to emergencies caused by natural disasters, particularly earthquakes, they are unlikely, because the structures are located in a zone of low seismicity, and the buildings and equipment are calculated taking into account possible earthquakes.

Quantitative characteristics of the harmful effects of a possible emergency process are:

- The value of the possible deadweight loss (ie the number of deaths due to accidents);

- The value of the possible loss of human health (ie, the number of victims who require hospitalization);

- Expected frequency of accidents.

The object in question is classified as potentially hazardous. The severity of fire sources of substances determined by their volatility. In this case, gases are 4 class of danger with a boiling point 253oK.

Cause ignition of an explosive mixture can be an open flame, a spark from hitting an iron object, a spark of electrical devices (circuit breakers, furnaces), etc. When lighting equipment is necessary to consider the possibility of gas accumulation, so all the wiring must be explosion-proof lights, or reflectors must be installed in window openings, or special. Fire safety and explosion-proof manufacturing processes ensure the development and implementation of systems to prevent fires and explosion protection systems.

However, when the equipment is projected construction accidents can still occur due to excess pressure in the pipelines due to the formation of gas-air mixture at concentrations capable of provoking an explosion, followed by ignition of gas.

Emergency situations are impossible to predict either at their place of origin, nor in time. Therefore, in evaluating the parameters of emergencies and their harmful effects on health and safety of people allowed some assumptions.

Thus, under all operating rules and safety measures the likelihood of accidents is low and, according to RD 118.0027714.24-93 priori frequency of accidents on pipelines is 10-5.

Reliable trouble-free operation facilities designed to ensure strict compliance of technological regime, all job descriptions both production and safety, good technical training staff.

The main binding conditions of safe processes are:

- The constant scrutiny of the entire apparatus and equipment;

- Immediate removal of all defects, malfunctions, deviations from the norm in the operation of equipment;

- Systematic monitoring of air pollution of industrial premises and grounds facilities.

All devices and installations are equipped with audible and visual alarms. In addition, a deviation parameters of the technological regime triggered an automatic shutoff of gas at the inlet.

Thus, in case of emergency (in excess of pressure, power outages, loss of containment systems, etc.) on the projected plant triggered the safety valves and the gases will be discharged to the flare.

In addition, the gas industry operates a permanent monitoring by gazospasatelnoy service.

Thus, considering Planned construction, we can conclude that continuous monitoring of the process, jobs and areas of industrial plants will provide a low likelihood of accidents.

6 ENVIRONMENTAL ACTIVITIES

Monitoring

Для environmental security in the zone of possible impact of industrial objects by MCC industrial environmental control, as well as for production of facilities GCM Surgil and transport pipeline system.

Industrial environmental control determines the ecological regulation of anthropogenic impacts on the environment, to predict not only direct but also long-term cumulative effects of current loads.

Industrial environmental control is part of the structure of industrial environmental monitoring (TEM).

In the separation of FEM on the basis of the controlled part of the environment produce a number of specialized subsystems. Below are recommendations on the organization of the subsystems in the area of projected TEM facilities.

The proposed industrial environmental control include:

- Control of air;

- Control of waste water;

- Control of soil;

- Control of waste management;

General requirements of the FEM system are:

- Compliance with methods of observation requirements of normative and methodological documents;

- Site selection and control points, depending on the conditions of the natural environment and engineering features of the projected object;

- Gathering evidence on the state of the environment through the implementation of engineering and environmental observations using routing studies, and integrated local stationary observations;

- Processing of information obtained through office work, laboratory chemical analysis with computer processing and modeling the relationship of engineering structures and components of the environment.

In this scheme of placing the points of the observation network is determined by the location under consideration newly introduced industrial projects and approved by the local committee on environmental protection.

Information is collected through:

- Routine observations;

- Laboratory tests and experiments;

- Route surveys and surveys;

- Experiments for testing of environmental measures and means of engineering protection.

Accumulation, storage and processing of the results of all types of data is carried out in a single universal database, organized by the Service TEM.

For a regular sampling of air in the area and at the nearby settlements can be arranged shuttle positions the air control. Control is possible using two mobile mobile laboratories based on GAZ-66 PLA-A.

The number of controlled substances must include the basic ingredients: sulfur dioxide, mercaptans, nitrogen oxides, carbon monoxide, methane.

Control frequency is determined depending on the hazard class of a hazardous substance as follows:

- For Class I - at least 1 time in 10 days;

- For Class II - at least 1 time per month;

- For III, IV class - at least 1 time per quarter.

Controlling the sources of emissions at new industrial sites should be carried out by the Environmental Protection Laboratory MCC.

Atmospheric air

In order to protect air quality, as well as in the GCM Surgil, you must provide the following activities:

- All service equipment, fittings, gas and condensate, liquefied natural gas pipelines should be securely sealed.

- Discharge of gas through the safety valves and gas weathering should be mandatory flared;

- Height of the torch should provide permissible concentration in air of working area of the combustion products of gas.

To ensure maximum integrity and minimizing leakage into the environment mainly intended application of reinforcement with the accession of "weld".

All control valves must be in flange version to be able to audit the valves.

Provides for the protection of equipment system of safety valves, consisting of working and backup valves.

To ensure uninterrupted operation of technological installations project provides for:

- Sealing equipment and pipelines;

- Application for heat and sound insulation of pipelines and equipment non-combustible materials;

- Installation of technological equipment with all the necessary means of control, automation, safety valves (waste, check valves, etc.), providing a reliable and trouble-free operation;

- Remote control of suppressing the valves on the pipe, valves on spark discharge pressure in the supply pipeline;

- Emergency lights powered by batteries;

- The use of explosion-proof equipment for hazardous areas;

- Protection of the pipeline from electromagnetic induction, static electricity, and measures to prevent the introduction of high potentials in the building;

- The use of seamless steel pipes for gas pipelines and other process piping required hydraulic test each pipe in the factory;

- The use of welded joints on pipelines and pipelines with explosive substances;

- The use of shaped pipeline fittings (elbows, tees, transitions), prefabricated, tried and tested at the factory;

- Identification painting of pipelines and other process piping.

In order to protect personnel against heat hot surfaces of equipment and piping in the service area are insulated, providing the temperature of hot surfaces within the permissible limits of health regulations.

Sewage

Resetting the industrial wastewater produced in the GCC is projected on a sewer system and further treatment sooruzheniyav and then to evaporation ponds. Household sewage is discharged into a separate sewer system, subject to Bioremediation and too pumped to evaporation ponds.

Protection of land resources

Problem of land are similar to those considered in Part 1 of "Construction of GCM Surgil.

Reclamation of land included in the total complex of works on the construction of pipelines and in the following order:

- Removal of topsoil and moving it to a temporary dump.

- Pipeline construction (excavation, isolation-laying work, etc.)

- The distribution of excess mineral soil remaining after backfilling of trenches, the band re-cultivation.

- Cleaning of debris.

- The reverse movement of the temporary dumping CAP and its uniform distribution within the zone of reclamation.

- Planting grass.

When removing, transporting and storage of topsoil should take measures to avoid deterioration of its quality.

Between production work near existing pipelines, CFS, or at the intersection with presence of representatives of operating companies.

After the passage of isolation-productive packing columns, packed in a pipeline trench to sleep, moving the entire mineral soil from the Blade on a strip of fertile layer of soil removed by bulldozers.

After the end of works on construction of pipeline construction on the entire band performed the following work:

- Backfilling and tamping a fiber or leveling ruts and holes that have arisen as a result of construction works;

- Cleaning of debris;

- Removal of soil contamination in the ground fuel and other materials that would impair the soil.

The flora of the pipeline route after remediation is easily restored, and the animals experience during construction of the disturbance factor, after the completion of the return to former habitats. Since virtually all gas pipelines laid underground, there will be no obstacles to the migration of animals.

Upon completion of unimproved land rekultiviruyutsya are subject to improvement and gardening.

Solid Waste

In the operation of MCC Akachalak will be generated solid wastes, which are described in chapter 4.5. In the process of building forms a certain number (from 1 to 10%) of construction waste.

Necessary solid waste landfill unit that will minimize negative impacts on the environment.

Automation and control systems, communications

Information management system of technological processes is divided into three levels: supervisory control of the complex as a whole, the level of operational management of production by the gas processing and transportation of gas, the level of automatic and remote control of technological installations. Event for automation and control systems, communications technology are the key to reducing accidents, and the fastest disaster recovery, if they nevertheless occur.

Fire preventive measures

Fire prevention measures are developed in compliance with the rules and regulations. All of the designed buildings and II degree of fire resistance to the categories of explosive fire. In the design took into account the requirements for the required number of emergency exits, and avoid crossing busy freight flows. In the case of an explosion in hazardous locations provided legkosbrasyvaemye design. These can be either a cover or window openings. The premises or facilities categories: A, B, provided iskronedayuschie floors.

To respond quickly to emergencies at the site of a complex of buildings of fire-fighting purposes:

- DHW pump stations, industrial and fire-fighting purposes;
- Tanks of fire-fighting water reserve;
- Pumping station automatic fire;
- Tanks of water for automatic fire.

To reduce fire hazards in the production of the project includes the following activities:

- All valves and safety valves and adopted by a class of leak closure;
- Explosive detectors installed indoor gas concentrations;
- Electrical equipment in the fire-hazardous areas and outdoor areas are projected explosion-proof;
- Technological pipelines are laid underground or on noncombustible supports;
- Explosive and flammable substances are removed from the room ventilation system;
- To reduce accidental emissions equipment, fittings and piping are designed to pressure exceeding the maximum operating pressure;

- Stopping vehicles to repair any excess fluid merge into the drainage tank, and gases are removed at the torch.

Anti-seismic events

All buildings and structures were designed taking into account the seismic data: the selection of precast concrete and steel framing members made of types of materials designed to accommodate seismic and foundations of buildings were designed for the special combination of loads, ie under the action of seismic force. .

Thus, under anti-seismic measures are aimed at ensuring reliable and safe use of buildings, structures, and therefore the process equipment.

Service personnel

By staff permitted to perform work must meet the requirements in accordance with industry standards.

Given these requirements, the workers allowed to work only after a special briefing as an introduction, and in the workplace.

Thus, organizational, technical failures in plant operation is minimized.

In general, processing equipment, adopted in the project, meets all modern requirements for the facilities of production, processing and transportation of gas.

Thus, the proposed project activities and technical and environmental nature will allow the company to operate in safe mode.

7 PREDICTION OF CHANGES IN THE ENVIRONMENT

As a result, the functioning of the projected objects in the air will be additional impacts on emissions of pollutants such as carbon monoxide, carbon monoxide and nitrogen dioxide, various hydrocarbons, ie, the environment will be exposed to chemical attack.

Physical impacts can be expressed in the load on the soil during the construction and installation of equipment industrial sites, in laying pipelines, power lines, communication lines, roads, and also brings in noise, vibration and electromagnetic radiation.

As shown in Subsection 4.3 The supply of chemicals during the operation of the facilities will be determined primarily emissions into the air saturated hydrocarbons, as well as combustion of fuel gas and of the order 2482.164904 tons / year.

In order to determine the air pollution level projected emissions were calculated on the dispersal area of 10 x 10 km using the software package "Ecology". Calculation of concentrations was carried out only on the emissions of the projected objects. Analysis of the calculations showed that:

Carbon monoxide - the maximum concentration was 0.06 MAC (in the vicinity of the projected MCC). On the territory of the residential town of the concentration of 0 MCL (Figure 15).

Nitrogen dioxide - Maximum concentration was 0.35 MAC (in the vicinity of the projected MCC). On the territory of the residential town of concentration is 0,15-0,17 MCL (Figure 16).

Nitric oxide - the maximum concentration was 0.12 MAC (in the vicinity of the projected MCC). On the territory of the residential town of concentration was 0.01 MAC (Figure 17).

Hydrocarbons (Methane) - the maximum concentration was 0.09 MAC directly in the projected GCC. On the territory of a residential village on the emissions ingredient missing (Figure 18).

Soot - the maximum concentration was 0.32 MAC. On the territory of a residential village on the emissions ingredient missing (Figure 19).

Sulphur dioxide - the maximum concentration was 0.24 MAC. On the territory of a residential village on the emissions ingredient missing (Figure 20).

Acrolein - the maximum concentration was 0.49 MAC. On the territory of a residential village on the emissions ingredient missing (Figure 21).

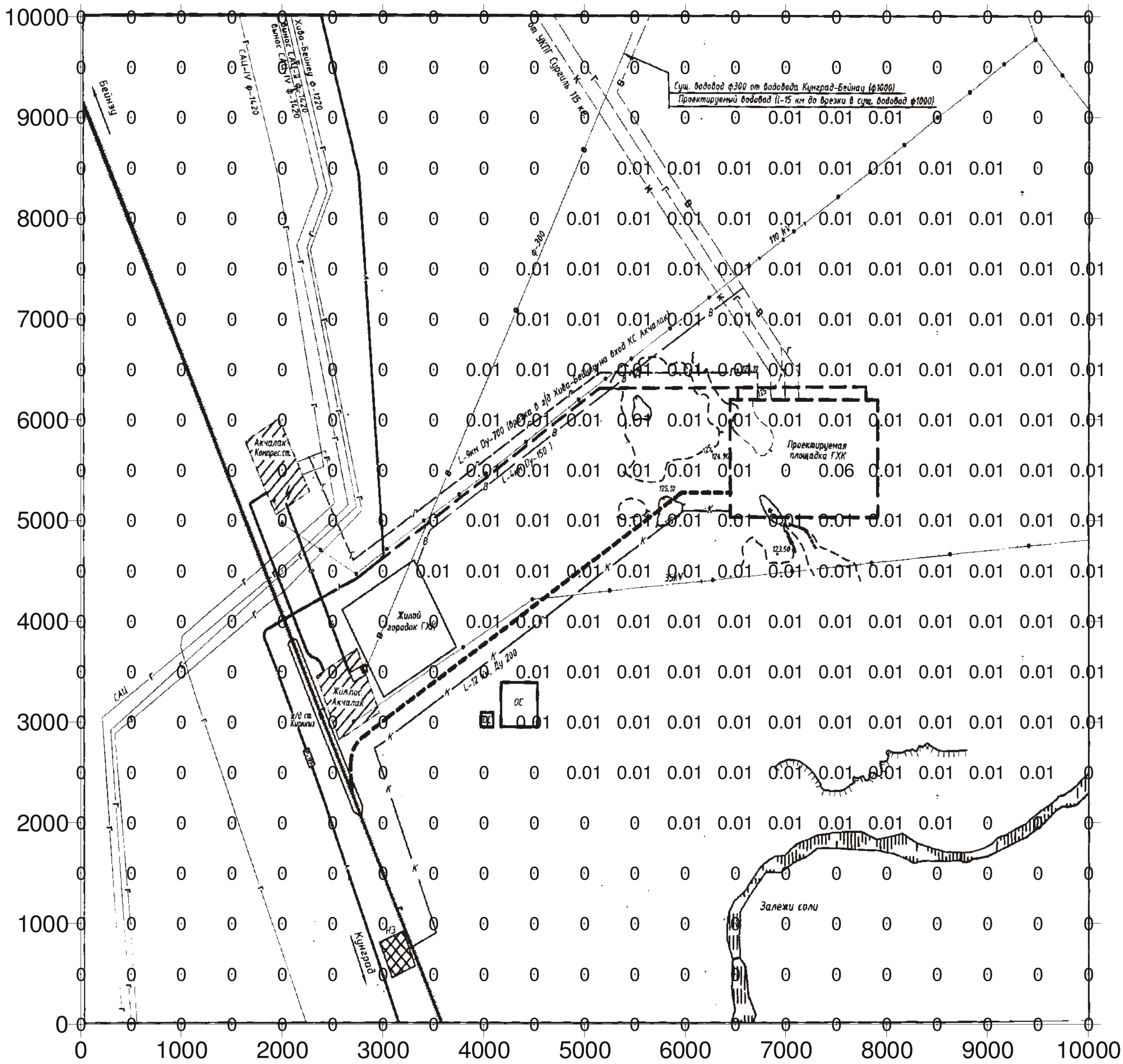

Figure 15 - Predicted level of air pollution with carbon monoxide in the vicinity of the projected Akchalak MCC

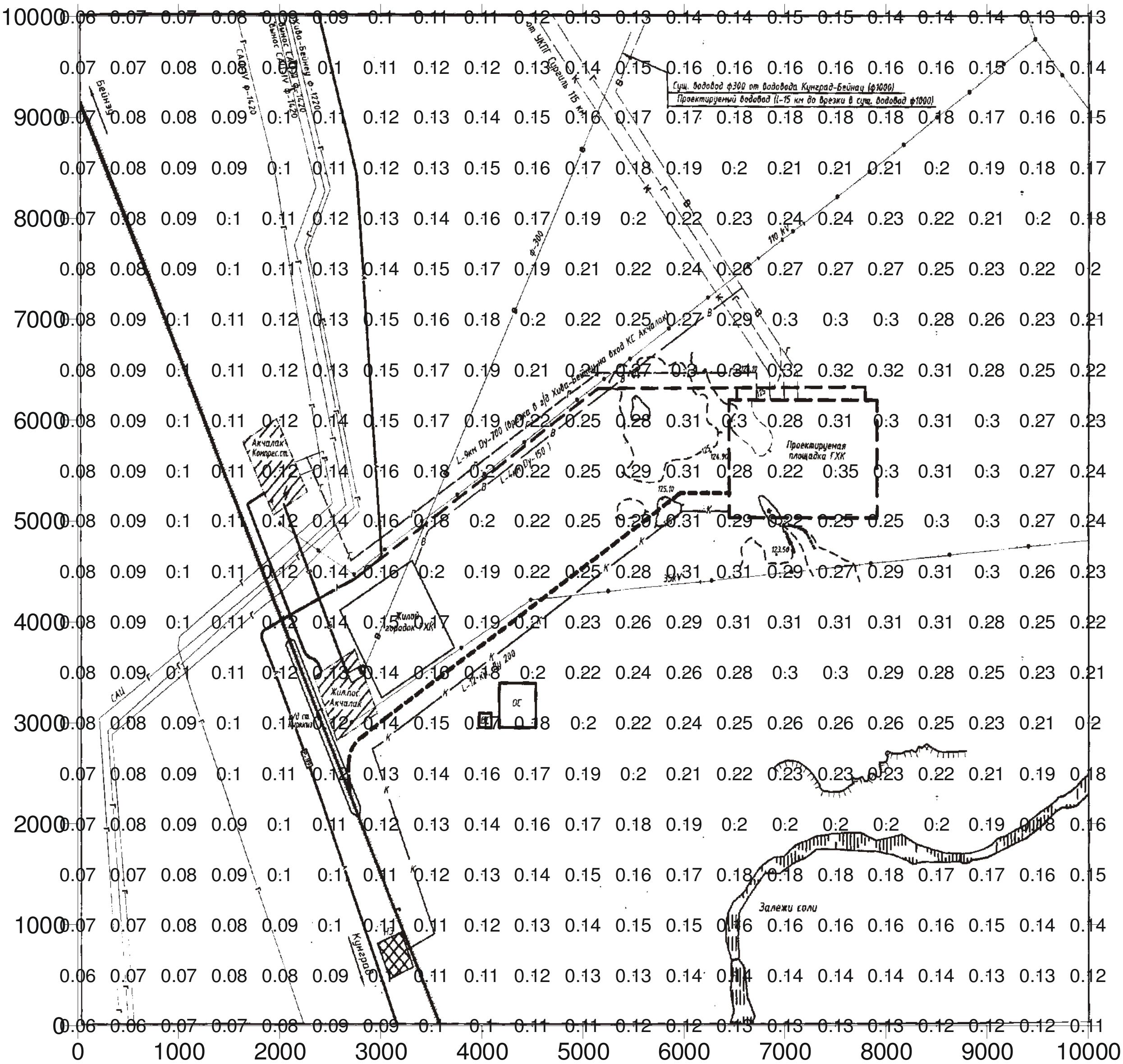

Figure 16 - Predicted level of air pollution nitrogen dioxide in the vicinity of the projected Akchalak MCC

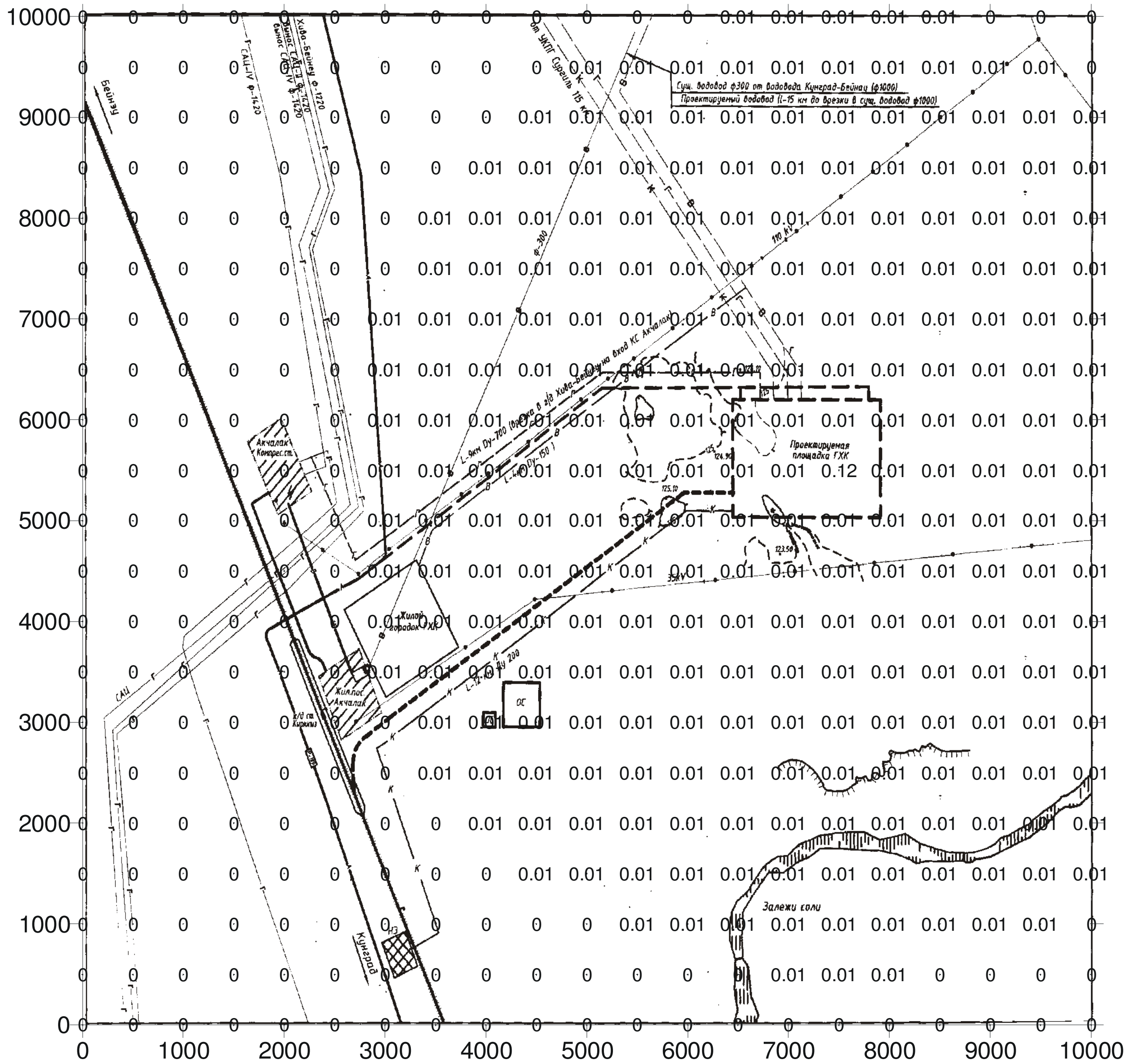

Figure 17 - Projected levels of atmospheric pollution by nitrogen oxide in the vicinity of the projected Akchalak MCC

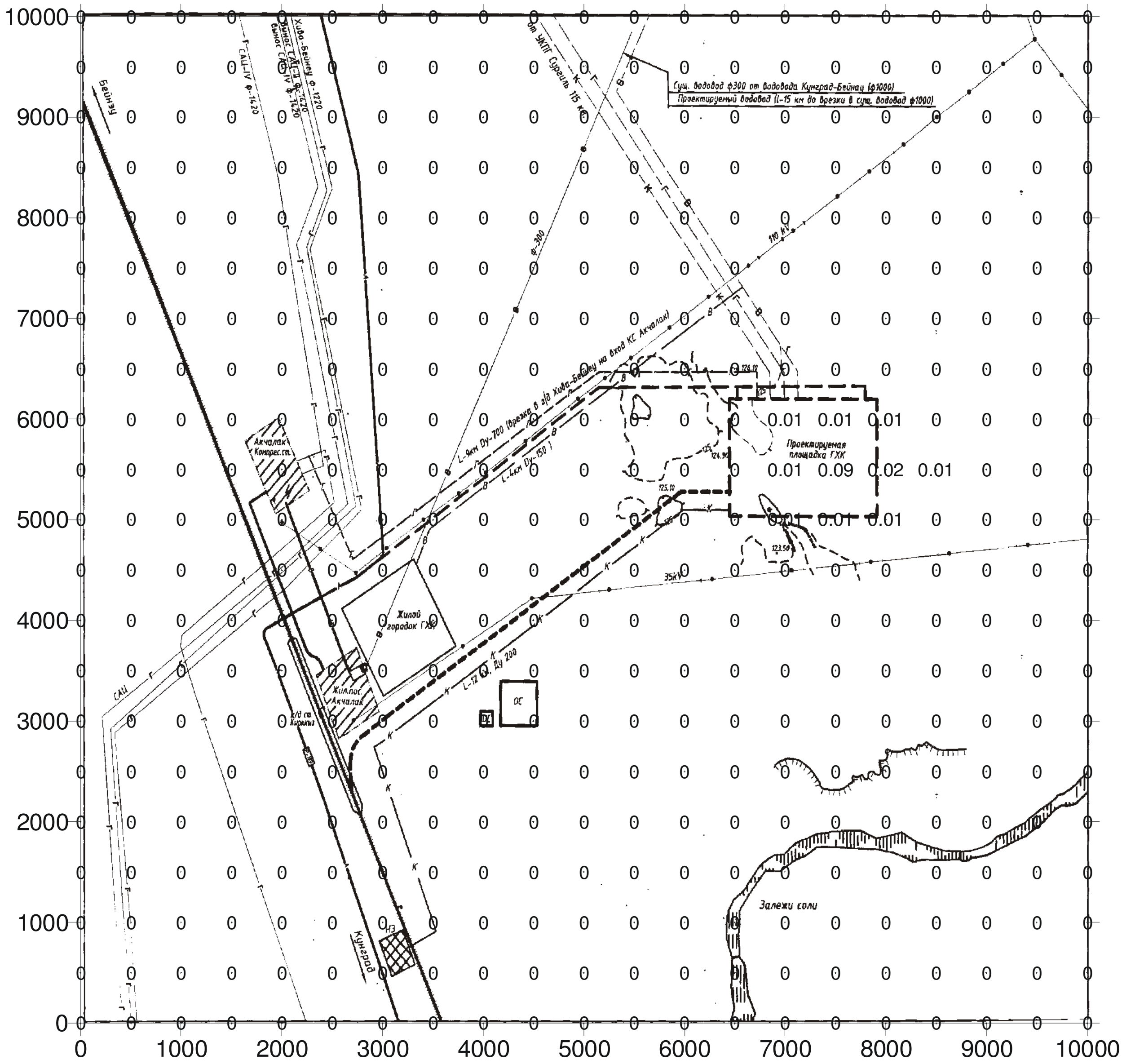

Figure 18 - Projected levels of atmospheric pollution by hydrocarbons (methane) in the area of the projected Akchalak MCC

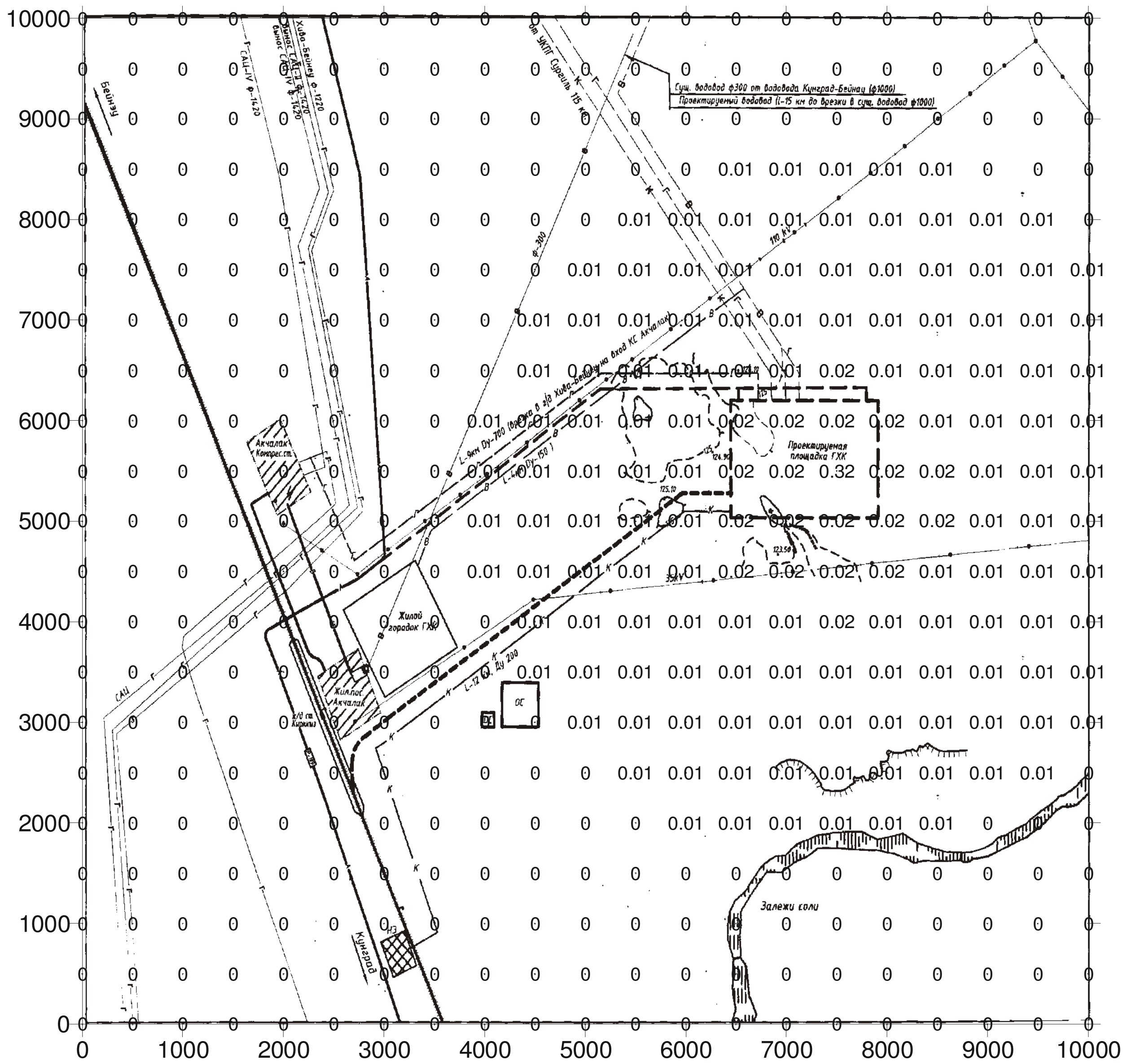

Figure 19 - Projected levels of atmospheric pollution by soot in the area of the projected Akchalak GHK

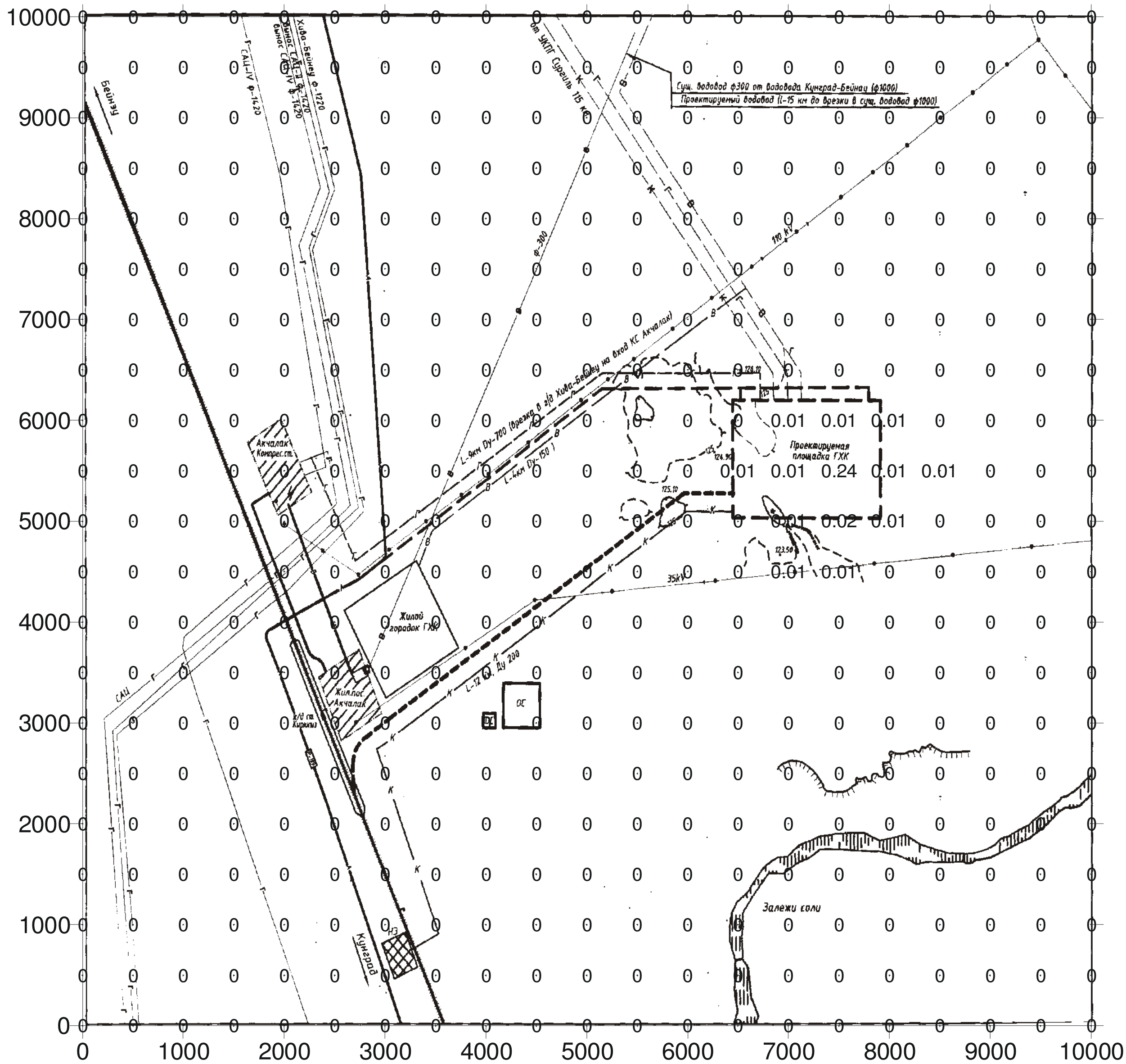

Figure 20 - Projected levels of atmospheric pollution by sulfur dioxide in the vicinity of the projected Akchalak MCC

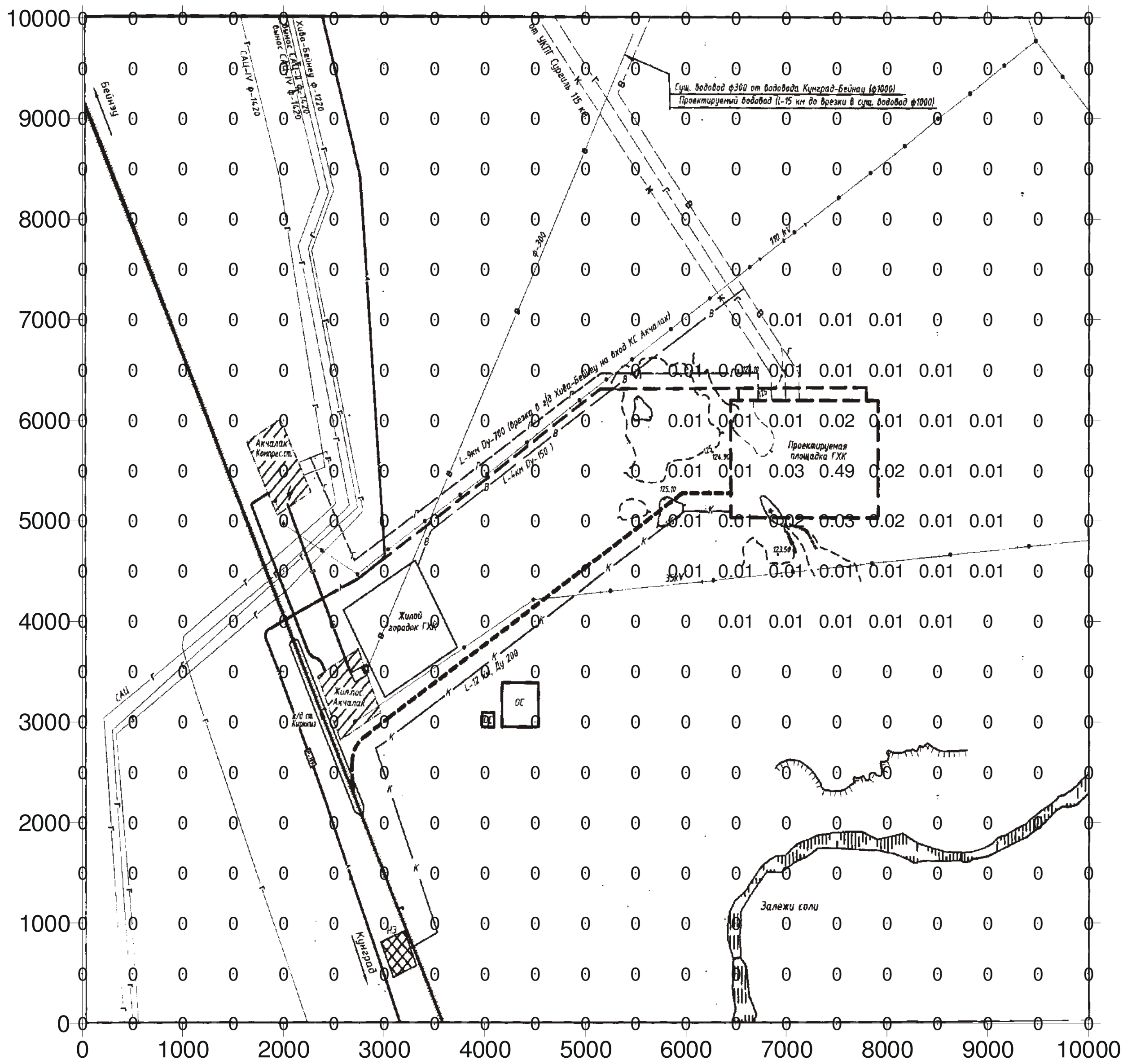

Figure 21 - Predicted level of air pollution acrolein in the area of the projected Akchalak MCC

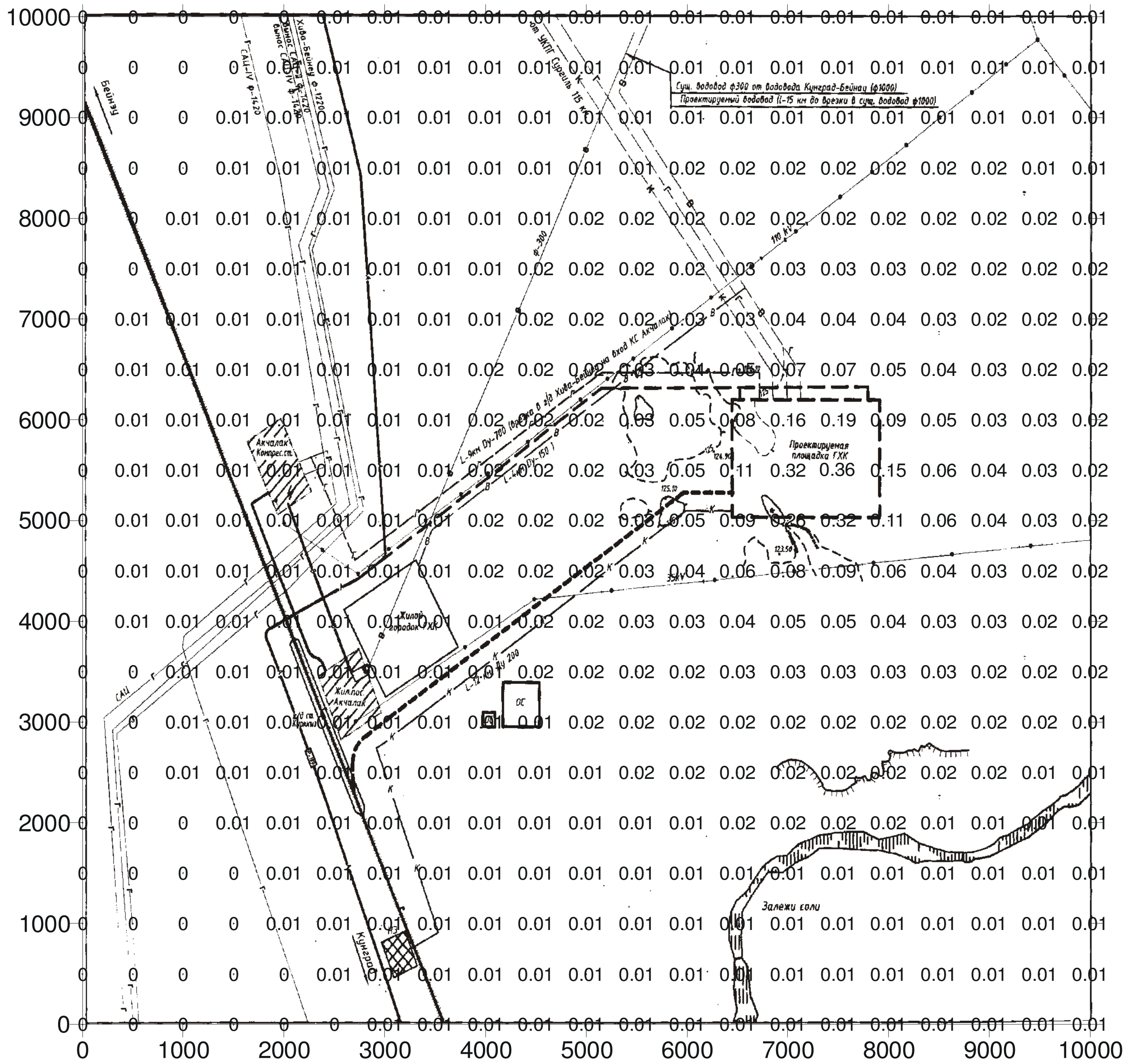

Figure 22 - Predicted level of air pollution with hydrogen chloride in the vicinity of the projected Akchalak MCC

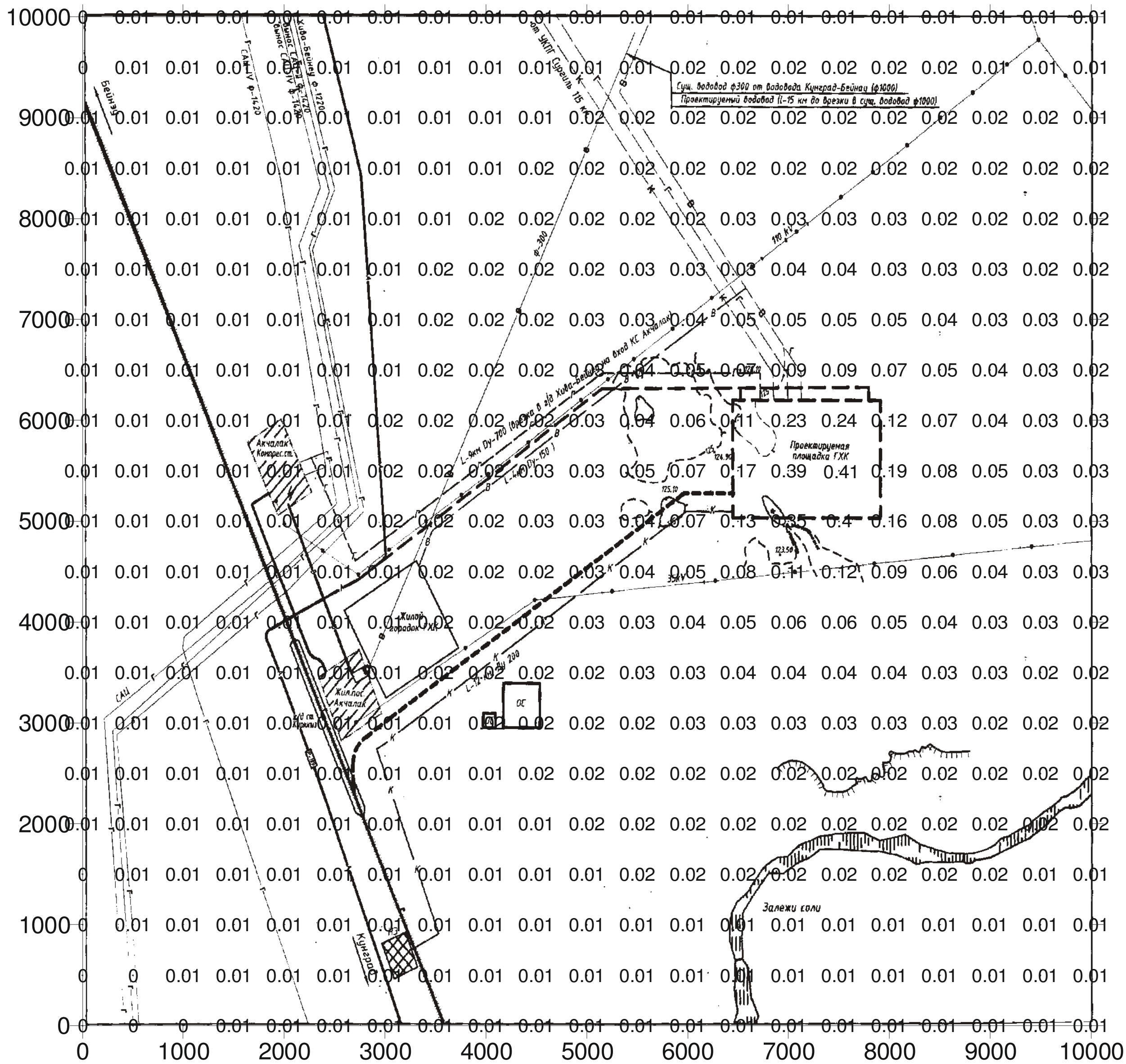

Figure 23 - Predicted level of air pollution in the area of the projected cyclohexane Akchalak MCC

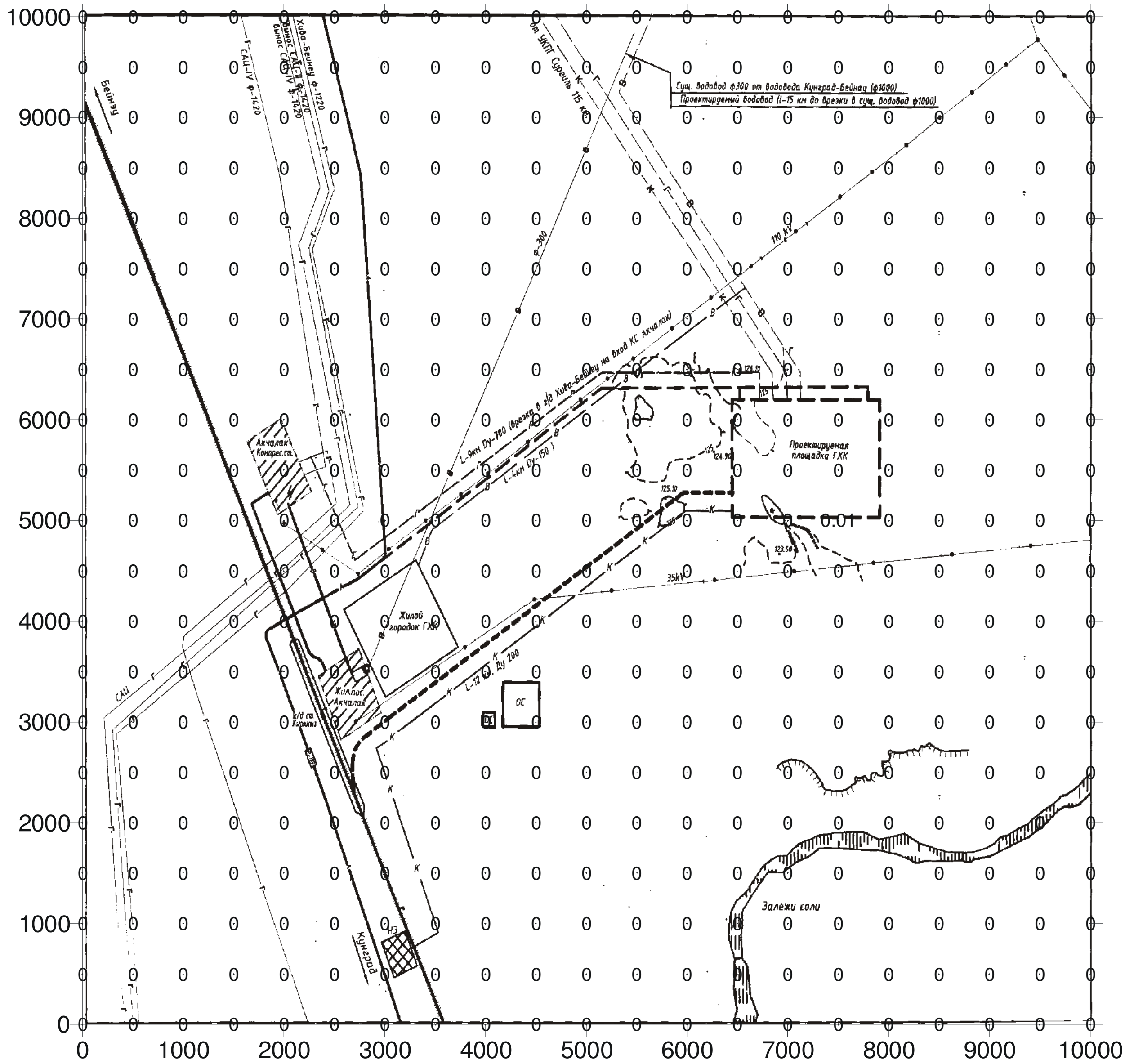

Figure 24 - Predicted level of air pollution in the area of the projected pentane Akchalak MCC

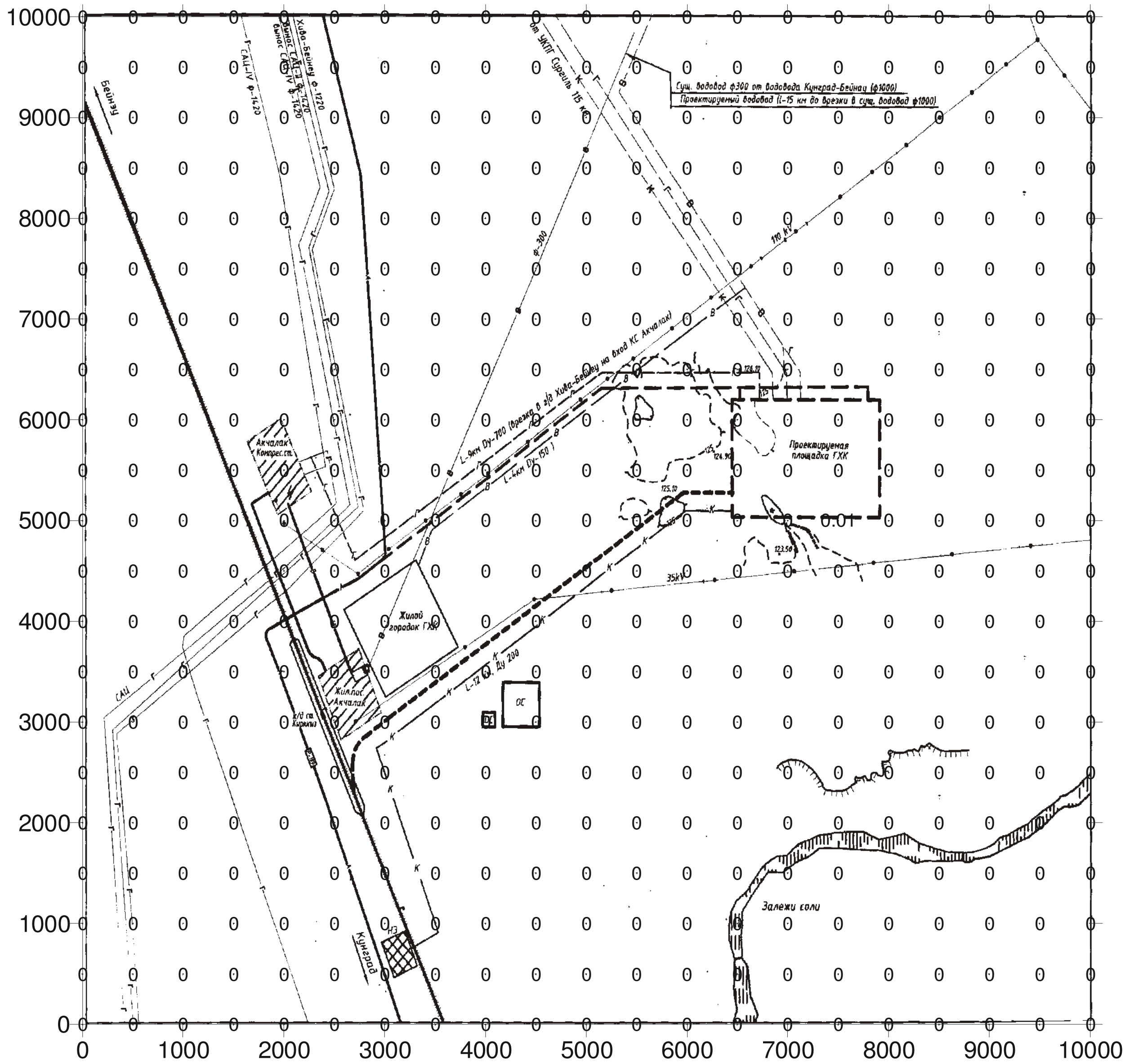

Figure 25 - Predicted level of air pollution with hexane in an area projected Akchalak MCC

Hydrogen chloride - the maximum concentration was 0.36 MAC. On the territory inhabited settlement concentration was 0.01 MAC (Figure 22).

Cyclohexane - the maximum concentration was 0.41 MAC. On the territory inhabited settlement concentration was 0.02 - 0.01 MAC (Figure 23).

Pentane - the maximum concentration was 0.01 MAC. On the territory of a residential village on the emissions ingredient missing (Figure 24).

Hexane - a maximum concentration was 0.01 MAC. On the territory of a residential village on the emissions ingredient missing (Figure 25).

Thus, air pollution sources of the projected area is moderate, exceeding acceptable standards for any of the discarded ingredients are not expected. Significant impact on the atmosphere nearest settlements emissions of harmful substances is expected.

Forecast of air pollution in the operation of the projected objects is favorable, the additional The supply is relatively low, concentrations exceeding the permissible limits for industrial sites boundaries of objects, not assumed.

By the nature of the planned construction is expected withdrawal from the environment of water and land resources.

During the preparatory and construction works ground and soil along the pipeline and industrial sites subjected to the enhanced impact. This can be expressed in a deterioration of soil and vegetation cover, changes in the structural properties of the soil. Negative impact on the soil may have vehicles that destroy their mechanical and deteriorating physical and agrochemical properties, construction, emissions of harmful substances into the atmosphere, the possible failure.

The volume of damaged land will be temporary in nature along the pipeline route and permanent - at the sites of wells, GSP and CPF.

The volume of damaged land will be temporary in nature along the pipeline (connecting pipeline and condensate, water supply).

According to the draft water playground MCC (and a residential village) will be supplied from conduit Kugrad - KS Karakalpakstan. In this economy of material resources and minimizing environmental impact.

Visual dominance in the construction area will become urban character - a torch, technological installations, administrative buildings.

Man-made noises are one type of human impact on the environment. The harmful effect of noise is determined by several factors:

- Intensity (in dB);

- Frequency (the most dangerous - high);

- Duration;

- The nature of noise (especially dangerous impulsive noise).

At the projected construction noise source can be pipes that transport gas; burner processing plants, etc. The noise from these production processes are usually very small.

The most significant source of noise are the separating device at the time of purging. In this case, noise is the result of significant pressure drops of gas, resulting in a high speed exit purging products. Etching gas from the equipment occurs before the maintenance work 1 time per year for 20-30 minutes. Blowdown separator is conducted, depending on time of year: 1-2 times per day in summer and 3-4 times a day during autumn and winter. Purge time is very small and amounts to 1-2 minutes.

Noise from venting gas are short-term episodic. If venting of gas from the equipment, as well as during purges separating device maintenance personnel should use personal protective equipment (headphones, antitifony stub, etc.).

On the territory of the projected structures permissible noise levels at work places, working areas in production facilities and in the enterprise, permanent jobs stationary machines will not exceed 80 dB, which shows the operating experience of equipment in similar enterprises.

One of the main indicators of the proposed industrial activity is characteristic of the impact on the environment.

Technology facilities, characterized by a continuous process of work associated with minor air emissions of chemicals. The main ones are nitrogen dioxide and sulfur oxides, carbon monoxide, hydrocarbons, soot.

On the basis of the calculated levels of atmospheric pollution, as shown on the maps of dispersion (Figures 15 - 25), considered the ingredients, it is evident that the nature of exposure under normal steady state operation is moderate. Maximum values of surface concentrations in residential settlement are: nitrogen dioxide - 0,15-0,17 MPC, and for other contaminants, (nitrogen oxides, carbon monoxide, sulfur dioxide, soot, acrolein, hydrocarbons) concentration does not exceed the level of 0.02 MPC.

The impact of the enterprise may be increased in case of accidental releases, the occurrence of which would be of short duration.

In addition, the direct impact on the atmosphere will occur during construction. Air emissions in this period are formed as a result of machinery and vehicles. The main ingredients would be the products of fuel combustion in engines, as well as inorganic dust in laying pipelines, digging trenches and pits, etc. It should be noted that the impact on ambient air during construction will be of short duration, which practically does not affect the background level of air pollution.

Since construction will occur in limited areas, the spatial coverage of the impact area and reduce the need to be local.

Pipeline construction will have a temporary effect on soil and vegetation after construction is completed reclamation of disturbed lands.

Impact on surface water is indirect and is related to the withdrawal of water for industrial and drinking purposes. Duration of exposure - the period of operation of the Project facilities. Temporal dynamics of water removal to be permanent fresh water.

The area of distribution in the case of sewage on the evaporation ponds are limited to an area of evaporation ponds.

Soils study region are major targets of exposure. At the same time the intensity of the impact is negligible, is periodic, increasing by accidental releases.

Duration of exposure will not change because This value depends on the time of operation facilities. The impact will be continuous. Distribution area will not increase. Nature of the impact will remain as before, right.

According to the calculations of atmospheric pollution and the experience of similar productions, it can be stated that the staff of the enterprise will breathe the air quality that meets sanitary standards at work sites, approved by the Ministry of Health of Uzbekistan.

Soils, site investigation works and the surrounding area is an area of natural fertility is not high (it is necessary irrigation). Slight humus content is not allow to develop higher forms of vegetation. Wind erosion and the total number of dusty particles is one of the reasons for soil degradation. Based on the analysis of the soil in the impact zone of the object, we can conclude:

- Construction of the facility is on land not suitable for planting crops.

- The main impact of an object due to additional soil disturbance along the pipeline route.

Due to the remoteness, surface waters are not objects of impact (only for the removal of water).

At the other components of the environment (water, flora, fauna) under the proposed project interventions to prevent or mitigate the identified potential adverse impacts, a significant influence in the operation of the object is not assumed.

The process of construction and operation of the planned facility may also have an impact on changes in socio-economic living conditions of the population of nearby settlements.

The proposed design solutions are the proof of environmental performance of the project related to improving the environment or its individual components, as well as focus on prevention of environmental risks.

Population living at a distance from the production facilities will not feel much change due to local nature of this project.

Direct impact on water bodies do not have waste water. Possible contamination of groundwater by filtering water evaporation ponds, but the long-term operation of the bottom of the ponds covered with a layer of sediment, which prevents the filtration process. Also, the filtering process prevents the composition of groundwater with high density due to high salinity. The absence of organic contamination in the analysis of

available water monitoring wells confirms the assumption that there is no contamination of groundwater.

Based on the foregoing comprehensive assessment of environmental conditions in the area of the planned construction showed the following results.

Impact on the atmosphere will increase slightly, especially for nitrogen oxides, however, in general, the functioning of the designed object will not change drastically existing level of air pollution.

Impact on soil and vegetation will be expressed in violation of the integrity of the land cover in the implementation of civil works and laying of pipelines. Does not exclude the possibility of accidental spills of condensate with a burst pipe. After completion of construction works on laying the pipeline all the land reserved for temporary use, will be reclaimed. For reclamation in the budget incorporated the appropriate means. Spills, whose probability is extremely low due to the constructive execution pipeline does not pose a significant risk to the environment (soil, air). Accidents are subject to immediate elimination of the contaminated soil must be removed, the site of the accident being a complete restoration. Thus, we can say that the design solutions include respect for the soil and soils, while conserving the agricultural qualities.

After the processes of vegetation restoration in a short time completely recovered. Accordingly, the animals after construction have the opportunity to return to their habitat. Barriers to migration routes of animals Planned construction is not installed.

Landscape change (take industrial character), but not too much.

Given the above, the impact on health service staff and people from MCC almost felt not to be.

Thus, the overall forecast impact on the OPS is favorable, the planned construction will make its contribution to environmental (natural resources).

CONCLUSION

Recent years throughout the world, including in Uzbekistan, are characterized by ever increasing use of modern gas-chemical technologies.

Thus, in particular, in the Republic of Uzbekistan on the basis of GCM Shurtan enacted and successfully operates Shurtansky gas complex with capacity of about 4 billion m3/year natural gas (125 thousand tons of polyethylene per year).

This draft EIS is an analysis of the project construction and operation of gas-chemical complex in Akchalak Kungrad area of the Republic of Karakalpakstan capacity for natural gas of about 3 billion m3/year.

Environmental impact assessment of planned activities conducted on the basis of studies of economic, social and administrative aspects, as well as analysis of existing conditions and characteristics of the environment in the area of the proposed activity.

We consider the initial state of socio-economic environment for Kungrad, as well as neighboring Muynak, districts, as well as socio-economic aspects of the organization and production work on the gas processing raw materials from the GCM Surgil.

We analyzed the fundamental design decisions (sometimes similar, already existing production) have been identified and characterized the possible sources of exposure, the type and nature of exposure, as well as objects of the impact from an environmental point of view (including socio-economic impacts).

Considered alternatives to the proposed activity and technological solutions.

Described objectively existing danger of planned activities for both staff and the environment in the context of prevention of emergency situations, outlines measures to prevent possible adverse environmental impacts.

The forecast of the possible impact of planned activities on the atmosphere, soil, groundwater and surface water, flora and fauna, as well as staff.

Generalizing, we can say that the draft EIS assessed the environmental impact of large chemical facilities, shows a slight residual environmental effects, give an estimate of the socio-economic changes.

In general, we can draw the following conclusions:

- A project aimed at maintaining stability in the supply of its gas and plastic compounds;

- The aim of the project is to increase hydrocarbon production, increasing the extraction of valuable components, and deeper dehydration marketable gas without significantly increasing anthropogenic pressures on the environment;

- In social terms, the project will employ an additional number of local residents, to create comfortable conditions for staff;

- The risk of accidents with significant consequences is low.

Thus, the main conclusion is that the implementation of planned activities in observance of technological discipline, safety, environmental activities can have an impact on the environment with long-term harmful effects.

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APPROVES
_______________Kim Kil Tae
"_____"________________2009 г.

FEASIBILITY STUDY

«Complex construction of Surgil field by recovering valuable components»

BOOK 5 **Statement project on influence on environment on construction (ZVOS) of Ustyurt GXK**

First deputy of general director -
Chief Engineer V.A. Atal’yants

Chief Engineer of the project U.H. Saidov

Chief of industrial and ecological
safety department L.I. Khegay

Tashkent - 2009

FEASIBILITY STUDY STRUCTURE

«Complex development of Surgil field with extracting of valuable components»

Book 1 Techno-process decisions.

Part 1 Development of Surgil field.

Part 2 UGCC's external infrastructure.

Part 3 UGCC.

Section 1 FEED Package from Samsung.

Section 2 GSP, ethylene plant, all-factory equipment, PP plant and PE plant.

Book 2 Estimate documents. List of expenses. Lists of necessary resources.

Part 1 Development of Surgil field. Collection and transportation. Gas pipeline. Condensate pipeline. Camp.

Part 2 Development of Surgil field. Complex gas preparation unit (CGPU).

Part 3 UGCC's external infrastructure. UGCC.

Book 3 Marketing research and financial and economic analysis of UGCC (by CMAI).

Book 4 Project financial assessment.

Book 5 Declaration of environmental impact (DEI) concerning UGCC construction.

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TERMS AND DEFINITIONS

ANTHROPOGENIC AIR POLLUTION – pollution of the atmosphere caused by human activity (GD 118.0027714.27 -93, CMEA 3403-81).

SUBTERRANEAN WATERS – ground waters of the first continuous water-bearing bed.

WATER POLLUTION – contaminants, microorganisms or heat entering water body.

ENVIROMENTAL MONITORING – natural environment state control and warning of emergencies being hazardous to public health and other lining organisms' health (expert ecologists' reference book, Tashkent, 1997).

ANTHROPOGENIC LOAD – amount of both direct and indirect influence of people and their economic activities upon the nature in whole or its specific ecological components and elements (landscapes, natural resources, animal world species).

WASTE – useless for specific produce kinds of raw stock, inapplicable residue of raw stock or generated during processes substances (solid, liquid and gaseous) and energy which cannot be utilized for specific production (including agriculture and construction). Noxious waste should be subjected to neutralization. Non-recyclable waste should be disposed (expert ecologists' reference book, Tashkent, 1997).

SURFACE WATERS – waters being on the land surface in the form of different water bodies.

MAXIMUM PERMISSIBLE CONCENTRATION OF SUBSTANCES IN WATER (MPC) – if concentration of substances in water exceeds this maximum concentration rate water becomes unsuitable for consumption.

NATURAL RESOURCES – natural objects or phenomena used for both direct and indirect consumption for the purpose of creation of material values, maintenance of the mankind existence conditions and improvement of quality of goods.

ABBREVIATIONS USED

UGCC – Ustyurt gas-chemical complex

DEI – Declaration of environmental impact

EGE – Engineering-geological element

BC – Building code

CS – Compressor station

MPC – Maximum permissible concentration

PAP – Potential air pollution

MES – Manufacturing ecological supervision

GD – Guidance document

LPG – Liquefied petroleum gas

GSP – Gas separation plant

ERU – Ethane recovery unit

MRU – Mercury removal unit

SDW – Solid domestic waste

INTRODUCTION

This work is the second stage of the «Environmental impact assessment» procedure carried out relating to UGCC construction in Kungrad district of the Republic of Karakalpakstan, 3km northeast from a dwelling settlement close to Akchalak railway station.

The purpose of UGCC construction is the deep processing of gas to arrange production of different kinds PP and PE. Annually 4.5 billion cubic meters of natural gas will be processed. The main product to be manufactured is PE in amount of 383,000 tons annually. Besides PE also PP will be manufactured in amount of 81,000 tons annually as well as gas condensate will be recovered from natural gas (103,000 tons annually) for further refining.

The base for «Declaration of environmental impact» elaboration is the target specification by «Uz-Kor Gas Chemica»l JV LLC for feasibility study of the «Complex development of Surgil field with extracting of valuable components» investment project as well as the Conclusion of the State environmental expertise of the Republic of Uzbekistan №18/56z dated February the 23rd 2007 concerning DEI project.

DEI project concerning Complex development of Surgil field with extracting of valuable components (Part 2 UGCC construction) was elaborated at the stage of selection of rational placement and the most effective technical, organizational and economic decisions relating to the Project realization (pre-feasibility study). According to the results of the expertise of DEI project it became necessary to develop DEI concerning UGCC construction at the stage of the feasibility study of the Project.

According to the Conclusion of the State environmental expertise when performing DEI it is necessary to take into account the following:

- detailed consideration of hydrological and geological engineering survey of UGCC site;
- analysis of alternatives for the process waste waters contaminated with chemicals disposal;
- consideration of the measures on prevention negative consequences of the Project implementation;
- carrying out an analysis of the extent of air pollution by the total emissions from CS-Akchalak.

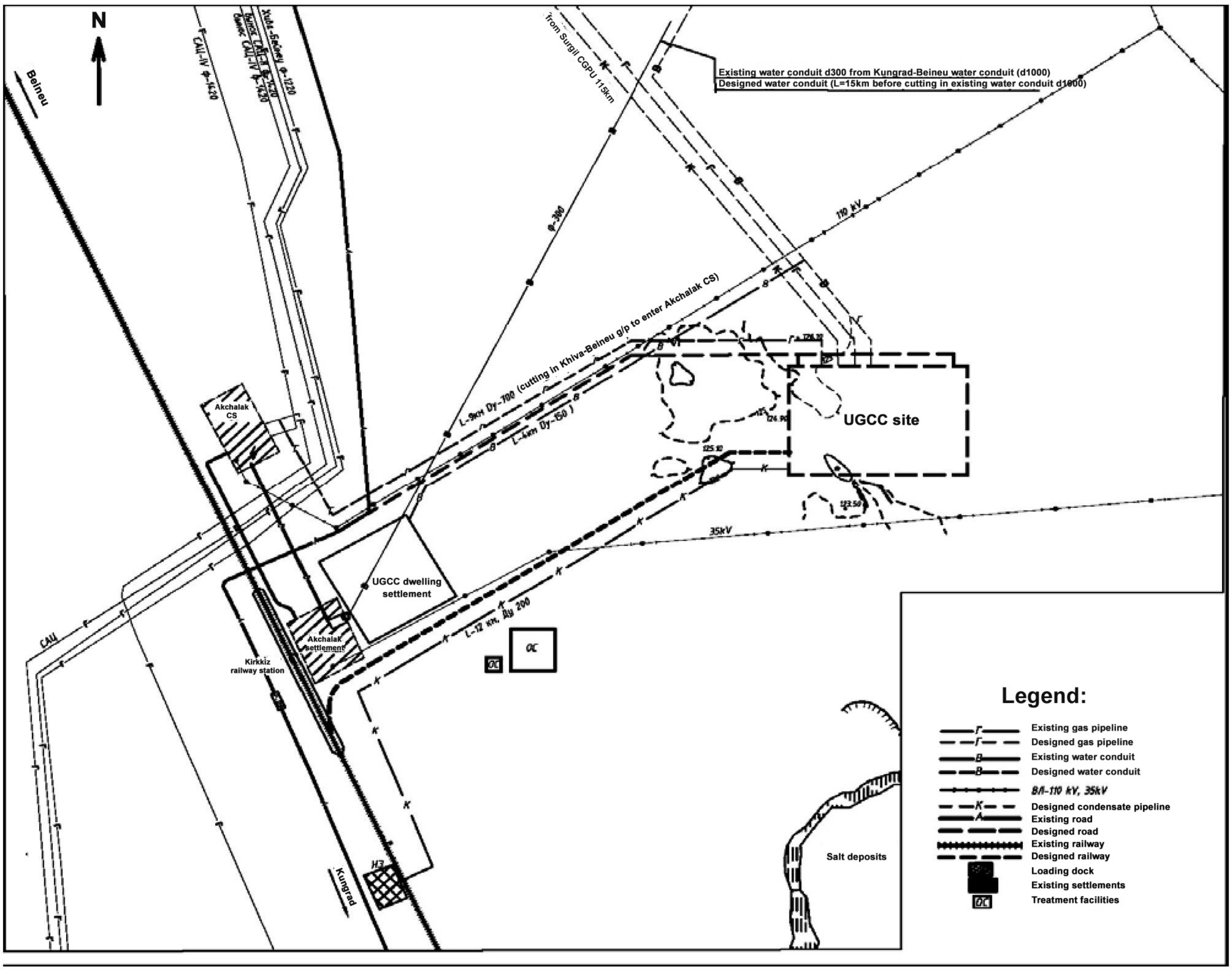
DEI is elaborated in accordance with the Regulations for the State ecological expertise acting in the Republic of Uzbekistan approved by the Resolution of the Cabinet of Ministers №491 dated December the 31st 2001 as well as in accordance with the other acting normative documents of the Republic of Uzbekistan concerning environmental protection.

1 GEOLOGICAL ENGINEERING SURVEY AND LITHOLOGICAL STRUCTURE OF ROCKS

Administratively UGCC is situated in Kungrad district of the Republic of Karakalpakstan.

UGCC site is situated on Eastern Chink of Ustyurt, 5km northeast from Kirkkiz railway station. To the west, 8km away from UGCC there is Akchalak compressor station (Picture 1). The site is on the even place having up to 2m level difference (Picture 2). Southwest there is the railway and Kungrad-Beineu highway and Central Asia-Center gas-main pipeline with Akchalak compressor station.

The nearest human settlements such as Akchalak settlement and projected camp related to UGCC are 4-6km southwest away.

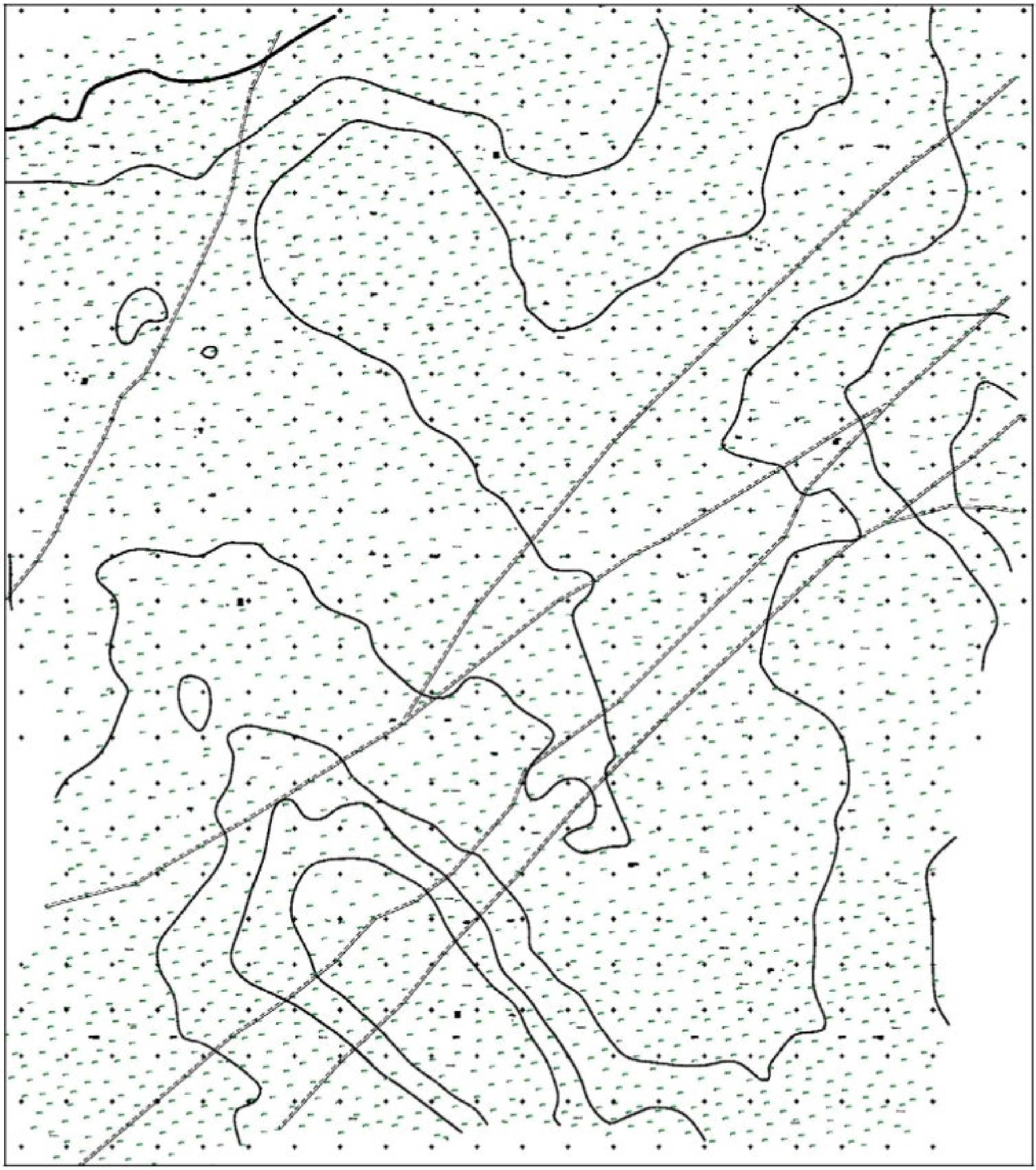


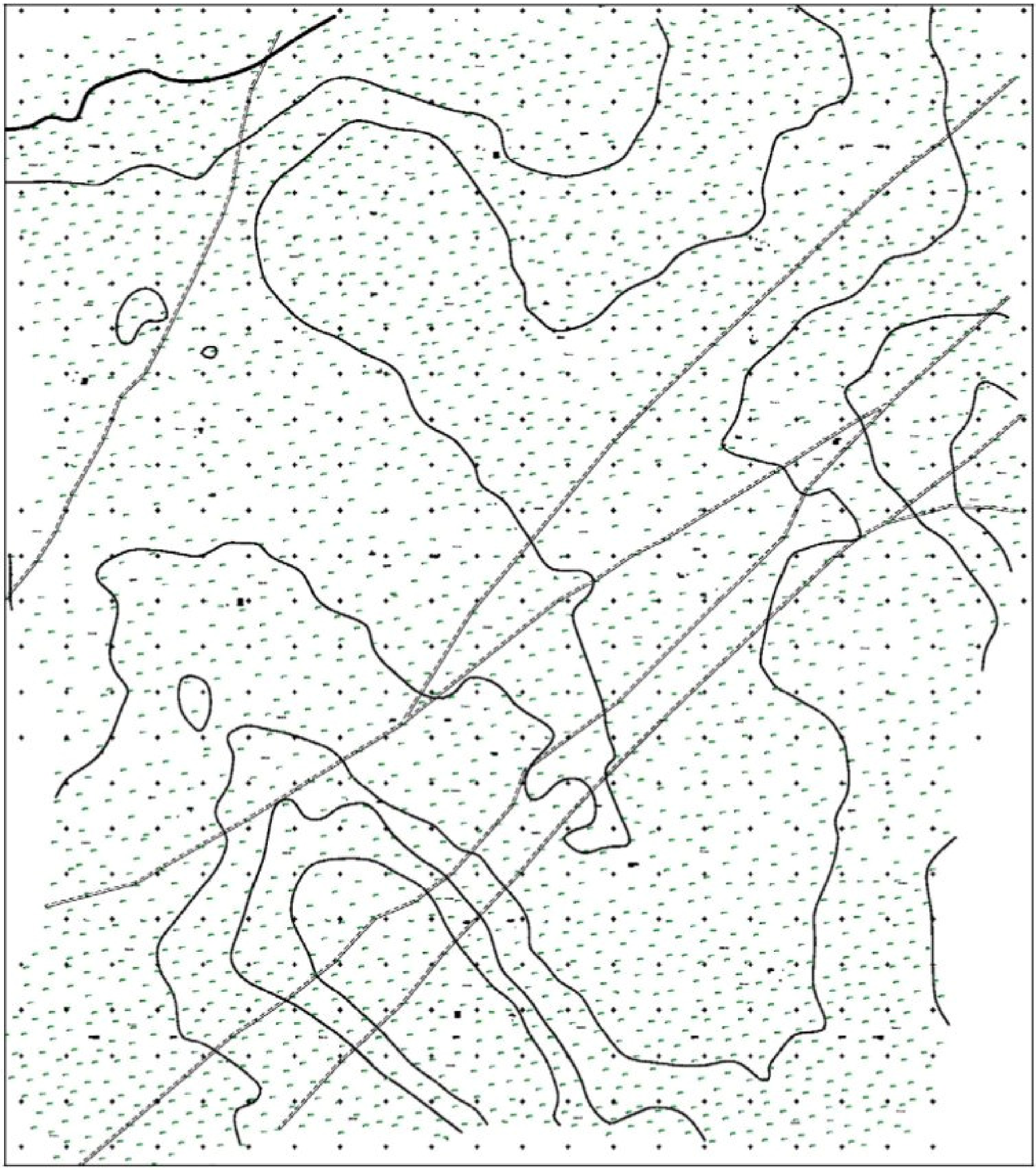
Picture 1 – Situational layout of designed objects

In **geomorphological** respect UGCC site has to do with the structurally denudational bedded plains and is in southeast part of Barsakelmes yield of Ustyurt plateau with desert and semidesert undulating land. Ustyurt plateau has low-magnitude seismicity – 6 points.

In **geological** respect UGCC has to do with the structurally denudational bedded plains.

Ustyurt plateau formation as a platform started during early Triassic period due to intensive downwarping of the earth’s surface and accumulation of the offlap during Jurassic, Cretaceous and Palaeogene periods.





Picture 2 – Topographic map of UGCC site

During the second developmental stage (Miocene period) downwarping became slower resulting in the minor thickness of the bed (25-250m) relating to this period. Later tectonic movements having low gradients of vibrations and predomination of the total rising effect turned the area in question into plateau.

Geological structure has two geological engineering rocks complexes:

1) Argillo-marlitic complex of deposits from Palaeogene period (terrigenous-carbonate formation – group of semihard rocks) presented with carbonate rocks, predominantly marls. Limestones and argillas have minor spreading and sandstones are very rare.

Complex of Paleogene deposits is practically anhydrous and serves as the regional waterproof rock.

2) Marlaceous-limestone complex of deposits is bedded over the described above complex and is from late Neogene (Miocene) period (carbonate formation – group of semihard rocks) and presented with limestones having interbeds of marls, argillas, gypsum and sandstones. The thickness of these deposits is 40-110m.

Described complexes are overlain with thin cover of overburden such as loamy sands, loams and sands.

In **hydrogeological** regard ground water in the area in question occur at a depth of over than 25.0m. Ground water has low pressure rate, 3-30g/l salinity rate and clearly defined sulfate and sulfate-chloride aggressiveness. This water can be used for the service purposes only.

Soils are characterized with the solid residue rate which is 9,560-28,160mg/kg, chlorine ions concentration which is 1,240-10,560mg/kg and sulfate ions concentration which is 2,950-17,950mg/kg. In accordance with BC 2.03.11-96 «Corrosion protection for building structures» the soils with such chlorine ions concentration are strongly aggressive to the concretes based on Portland cement and Portland-slag cement according to SS 10178-85 and sulfate-resistant cements according to SS 22266-94. According to research performed by «O'ZLITINEFTGAZ» open joint-stock company the foundation soils in question are ranged from low to high degree of corrosive aggressiveness.

During carrying out of geological engineering study at UGCC site they assigned three engineering-geological elements according to lithological profile (Attachment 1).

The first engineering-geological element (EGE-1) is presented with interstratified loamy sands and loams with non-clearly defined interfaces which are plastered, macroporous and subsiding. Type of subsidence – I due to minor thickness.

EGE-1 soils are widely spread in the upper part of profile. The thickness of the bed is up to 1.0m. Design resistance of soil in normal condition R_0 = 250kPa (2.5kgf/cm^2), in water-saturated condition R_0 = 150kPa (1.5kgf/cm^2). Group of soil according to mining – p.366. EGE-1 soils are recommended to be removed due to their strength properties and deformation behavior.

Table 1 – Physical-mechanical properties of EGE-1 soils

Characteristic	Unit	Normative value
Specific weight of soil particles	g/cm^3	2.67
Specific weight of soil	g/cm^3	1.60
Specific weight of dry soil	g/cm^3	1.56
Porosity	%	41.6
Porosity factor		0.712
Natural humidity	%	2.4
Humidity		0.1
Humidity at the yield point	%	19.1
Humidity at the rolling point	%	13.3
Plasticity number	%	5.8
Consistency index		> 0
Permeability coefficient	m/d	> 3.0

The second engineering-geological element (EGE-2) is presented with marls with interbeds of limestones and argillas from Neogene period. EGE-2 soils are spread in the middle part of profile. Penetrated thickness of the bed varies from 2.0 to 12.0m. Group of soil according to mining – p.24a. EGE-2 soils are recommended to be removed due to their physical-mechanical properties particularly due to unevenness of limestones spreading and thickness as well as for marlaceous and argillaceous deposits dilatation.

Table 2 – Physical-mechanical properties of EGE-2 soils

Characteristic	Unit	Normative value
Specific weight of soil particles	g/cm^3	2.71
Specific weight of soil	g/cm^3	1.87
Specific weight of dry soil	g/cm^3	1.58
Porosity	%	41.7
Porosity factor		0.715
Natural humidity	%	18.8
Humidity		0.7
Humidity at the yield point	%	38.8
Humidity at the rolling point	%	18.7
Plasticity number	%	20.1
Consistency index		0.3

The third engineering-geological element (EGE-3) is presented with limestones, limestones-shell rocks, slab-morphe limestones with interbeds of argillas and marls. EGE-3 soils are spread in the lower part of profile. The thickness of bed is over than 25.0m. Design resistance of soil to uniaxial compression R_e = 5.0-15.MPa (50.0-150.0kgf/cm^2). Group of soil according to mining – p.16c.

Table 3 – Physical-mechanical properties of EGE-3 soils

Characteristic	Unit	Normative value
Specific weight of soil particles	g/cm^3	2.71
Specific weight of soil	g/cm^3	1.89
Specific weight of dry soil	g/cm^3	1.87
Porosity	%	31.0
Porosity factor		0.449
Natural humidity	%	0.8

Recommended engineering measures:

1. Anticorrosion;

2. Antiseismic;

3. Antisubsiding for EGE-1 soils;

Recommendations on soil stabilization:

- EGE-1 are recommended to be removed due to their strength properties and deformation behavior;

- EGE-2 soils are recommended to be removed due to their physical-mechanical properties particularly due to unevenness of limestones spreading and thickness as well as for marlaceous and argillaceous deposits dilatation;

- EGE-1 and EGE-2 soils are recommended to be changed for artificial soil compacted to get the value of the soil skeleton' volume weight equal to 1.85kg/cm^3. Artificial filled soil should be taken out from Kungrad city area;

- as the foundation soils EGE-3 soils (limestones with interbeds of marls and argillas) are recommended for use.

Recommendations on construction in winter:

- Depth of foundation should be accepted taking into account the depth of seasonal frost penetration into the earth.

2 ECOLOGICAL ANALYSIS OF TECHNOLOGY CONCERNING SITE'S PROBLEMS REVEALED

The project of Complex development of Surgil field with extracting of valuable components includes UGCC construction. Earlier when elaborating DEI project this GCC was called Akchalak GCC for convenience and nowadays it is UGCC.

All engineering objects have 72ha site to be arranged properly. As the raw stock for UGCC operation they will use natural gas from Surgil and Eastern Berdakh gas condensate fields. Average potential content (g/m^3) of methane homologues in formation gas of the fields is: ethane (C2) – 54.0; propane (C3) – 36.3; i-butane (C4) – 8.33; n-butane (C4) – 9.67; C3+C4 fractions – 54.33; C5+higher – 44.24.

Fields' natural gases are carbonic-hydrocarbonic, light according to hydrocarbons composition with minor content of carbon dioxide – 0.79% and nitrogen – 1.12% and with no hydrogen sulfide. Content of methane is 90.2%.

After extracting of valuable components they obtain purified and dry sales gas in amount of 3.8 billion cubic meters annually, 2.34 billion cubic meters will be supplied into the gas-main pipeline.

The brief description of UGCC process plants are below:

Gas receiving plant (Zone 100)

Two feed lines from Surgil and Eastern Berdakh are combined before GSP B.L. to provide stable operation of GSP.

Feed gas being supplied to GSP will contain liquid hydrocarbons. Gas receiving plant is to separate liquid hydrocarbons from feed gas. It consists of the Feed gas filter separator where liquid hydrocarbons are stripped from feed gas and routed to a tank. In order to provide necessary pressure level there are Feed gas compressors. Compressors are to have Gas turbine drive.

Compressed feed gas is further sent to MRU.

Some mercury was detected in feed gas. Design project value of 900ng/m^3 was accepted for the further designing process. Technical specification sets the mercury content in treated gas to be 10ng/m^3.

Dehydrogenation and Mercury Removal Unit – MRU (Zone 104)

Compressed feed gas is cooled and dried.

Dried feed gas leaves the dehydrogenation units and enters Dried Feed Gas Heater where it is heated to the temperature 5^{o}C above dew point to avoid condensation and adsorbent damage. Then dried feed gas is routed to reactor for mercury removal. Feed gas is purified by the reaction between mercury and adsorbent resulting in mercury sulfide formation.

In the bottom of adsorber feed gas pass through the cartridge filter to get rid of solid particles. The filter should provide 10 micron filtering.

Ethane Recovery Unit (*Ortloff*) (Zone 105)

After purification and drying feed gas is sent to ERU. Before ERU feed gas is divided into two flows. The first flow is routed to reboiler in demethanizer. The first flow rate is adjusted by the temperature control in the bottom of demethanizer and the liquid methane content in the bottom of demethanizer. Then the first flow is sent to the secondary reboiler in demethanizer where it is cooled with the bottom liquid of demethanizer. The second flow is fed to exchanger for cooling with residual gas. Two flows are further combined again and sent to separator to remove condensed liquids.

Then one flow is directed to turbo-expander/compressor for pressurizing to get the proper inlet pressure.

The overhead reflux flow for demethanizer is obtained by the cooled and condensed recycled residual gas. This cooled flow then vaporized and expanded to get working pressure value and fed to demethanizer as reflux flow. Such unsaturated reflux flow allows RSV process to generate the product with extremely high content of ethane.

Deethanizer is a reflux fractionation column where overhead ethane product with propane, LPG and heavy bottom products are obtained. These bottom products are then sent to Fractionation Unit (Zone 107).

Sales gas Compression Unit (Zone 106)

After compression in turbo-expander/compressor residual gas flow is routed to Sales Gas Intercooler. Part of the flow is recycled and the other part is sent to the plant battery limit.

Fractionation Unit (Zone 107)

Deethanized bottom product is processed in Fractionation Unit. This unit consists of LPG fractionation column, LPG fractionation column condenser, LPG fractionation column reflux drum and reflux pump. Fractionation column operation is to LPG stream (overhead liquid product) generation. Bottom product is an unstable gas condensate which contain C5+higher components.

Overhead gas in fractionation column is cooled with the air and is finally condensed at 50^{o}C in the fractionation column condenser. LPG product is then fed to the drum.

Unstable Condensate Purification Unit and Mercury removal System (Zones 104 and 114)

Unstable condensate from Surgil field is sent to Unstable Condensate Purification Unit. This unit consists of vaporizer and condensate stabilizer.

This unit recovers volatile components from feedstock. In fractionation column there stabilized condensate with gasoline vapors tension by Raide is obtained.

In case excess gas appears in compressor it is discharged to flare system:

Pressure valve up along 1st layer of compressor intake capacitance of outgoing gas for 1st layer;

Pressure valve of upper product of 2nd layer of compressor intake capacitance of outgoing gas for 2nd layer.

Bottom product from stabilizer is sent to reactor where mercury removal occurs and is further mixed with unstable gas condensate in LPG fractionation column.

Refrigerant system (Zone 111)

Refrigerant system should be installed for additional cooling in GSP. Propane or propylene refrigerant unit consists of the closed loop where refrigerants are instantly separated, vaporized, compressed and condensed. The requirements for dehydration freezing at low tempreratures, mercury filtering device and ethane clearance device should be provided by cycle of regfrigirating medium

Refrigerant compressor consists of three centrifugal compressors with electric engine drive.

Refrigerant compressor protection is provided by the special anti-surging control.

Purified gaseous ethane is undergoing drying in molecular sieve dryer before entering ethane unit.

Energy resources requirements are given in table below. Pre-design assessment of energy consumption will be produced and approved during detailed engineering stage.

Table 4 – Combined data on energy resources consumption

Energy resources	Requirement
HP steam, kg/h	2,046
MP steam, kg/h	7,372
LP steam, kg/h	32,362
Cooling water, kg/h	1,304,018
Nitrogen, m^3/h	801.0
Instrument air, m^3/h	819.0
HP fuel gas, m^3/h	18,758
BFW, kg/h	660.0
Demineralized water, kg/h	19,800

Warm, cold and acid flare headers will be assembled in accordance with specific requirements.

Design of preliminary operating conditions for these headers is performed according to the table below:

Table 5 – Combined data on flare load

Flare	Flow rate (kg/h)	Preliminary size of header (inches)
Warm	437,372	30

Cold	648,182	32
Acid	54,063	24

Table 6 – Combined data on raw materials, catalysts and chemicals

№	Zone	Name	Specification	Initial filling (m^3)	180 days consumption	Total (m^3)
1	104	MRU catalyst	Carbon enriched with sulfur	55.42	Attachment	55.42
2	104	Ceramic spheres for MRU reactor	By catalyst manufacturer	8.32	Attachment	8.32
3	104	Molecular sieve for dehydrogenation	3A or 5A type	188.40	Attachment	188,40
4	104	Ceramic spheres for molecular sieve dehydrogenation	By catalyst manufacturer	15.07	Attachment	15.07
5	114	MRU catalyst	Carbon enriched with sulfur	7.06	Attachment	7.06
6	114	Ceramic spheres for MRU reactor	By catalyst manufacturer	1.06	Attachment	1.06
7	116	Molecular sieve for dehydrogenation	3A or 5A type	30.00	Attachment	30.00
8	116	Ceramic spheres for molecular sieve dehydrogenation	By catalyst manufacturer	2.04	Attachment	2.04
9	116	Charcoal	Activated charcoal	3.49	Attachment	3.49

Note: Catalyst shelf life is 6 months minimum

Table 7 – Main chemicals

№	Zone	Name	Specification	Initial filling (m^3)	180 days consumption	Total (m^3)
1	103	Corrosion inhibitor	NALCO EXXON EC 1154 or equivalent	1.00	15.10	16.10
2	104	Methanol	Methanol 98%	Attachment, 2.0	13.30	13.30
3	105	Methanol	Methanol 98%	7.30	73.30	80.60
4	116	Antifoam agent	Crompton SAG 7133 or equivalent	1.47	0.65	2.12
5	116	Amine solvent	UCARSOL AP-800 (100wt.%)	42.00	2.25	44.25

Note: Utilization of these chemicals should be within 6 months in normal operating conditions

Waste waters, depending on the contaminants kind, are the following:

- contaminated with chemicals;

- contaminated with oils;
- sanitary;
- mineralized.

For the purpose of waste waters treatment it is necessary to arrange treatment facilities. In case it is necessary to treat waste waters locally it is performed.

Also it became clear that it is necessary to arrange areas for temporary storage of solid wastes. Generally this waste includes used catalysts, molecular sieves, ceramic spheres, etc. There is the proposal being considered regarding construction of a landfill where waste will be stored and further managed or disposed.

Ecological analysis for the technical decisions shows the following:

- during construction of UGCC they will be applying up-to-the-minute gas treatment technologies, hi-tech equipment and materials of the complete delivery;
- the ratio of the valuable components recovery from natural gas from Surgil field will be extremely high; those valuable components are ethane, propane, butane and light condensate; high-quality natural gas after drying procedure will be pumped into the gas-main pipeline;
- the ratio of oils recovery from the oily wastewaters (with the help of separators of special construction) will be high;
- UGCC will be equipped with the fuel system utilizing all combustible both gaseous and liquid wastes produced by the process units as the fuel in the cracking furnaces, steam generators, etc.; incoming gas supply will be minimum;
- UGCC will have flare system similar to one in Shurtan GCC. The flare system will be continuously in ready mode and work during start-up while entering production mode or short-run when safety devices of the process equipment have actuated;
- the problem of supply of PE product for the Republic of Uzbekistan and other countries based on advanced technologies carrying minimum environmental risks will be solved.

3 WASTE WATERS SPECIFICATION AND DISPOSAL

Water supply for UGCC will be carried out via 630x7mm water conduit of 75km length. For the purpose of uninterruptable water supply in situation with the single water line it is necessary to provide for the pondage during water conduit breakdowns elimination and an additional pondage for fire-fighting system.

According to «SAMSUNG» company the amount of circulated water will total 38,375m^3/h.

During the normal operation of UGCC water consumption will total:

- service/potable water requirements – 11m^3/h;
- process water requirements – 917.9m^3/h including cooling water system – 772m^3/h, HP, MP, LP steam system – 145.9m^3/h
- fire-fighting system (basins filling) – 360m^3/h.

Major water losses will be in steam generating and cooling systems.

The total amount of waste waters from UGCC will be 80m^3/h including domestic waste waters – 10m^3/h, oily waste waters – 50m^3/h, potentially contaminated waste waters – 20m^3/h.

Waste waters from off-site pressured water systems are fed to the treatment facilities.

UGCC will generate three kinds of waste waters (picture 3):

- potentially contaminated waste waters from the cooling water system;
- domestic waste waters;
- oily waste waters.

Oily waste waters will be routed to the pits where oily fraction is separated from water and pumped to the Oil Collection Drum and clean water is collected in Check Basin. Oil from drum is further sent to the ethylene plant. In Check basin clean water is mixed with potentially contaminated water and discharged to the Out Side Fence Limit of UGCC. The way of the process waste waters disposal has not been decided by Customer.

Process waste waters disposal method is assumed to be carried out one of the following ways:

1. utilization as service water for irrigation;

2. utilization as water for bio-ponds;

3. filling of depressions or abandoned open cast;

4. filling of ponds for vaporizing;

Domestic waste waters from UGCC after leaving pits are mixed waste waters from Camp and sent to the biological treatment facilities and then to the ponds for vaporizing.

Biological treatment facilities include the following:

1. Inleak chamber package which is a ferroconcrete basin receiving waste waters and reducing flow rate;

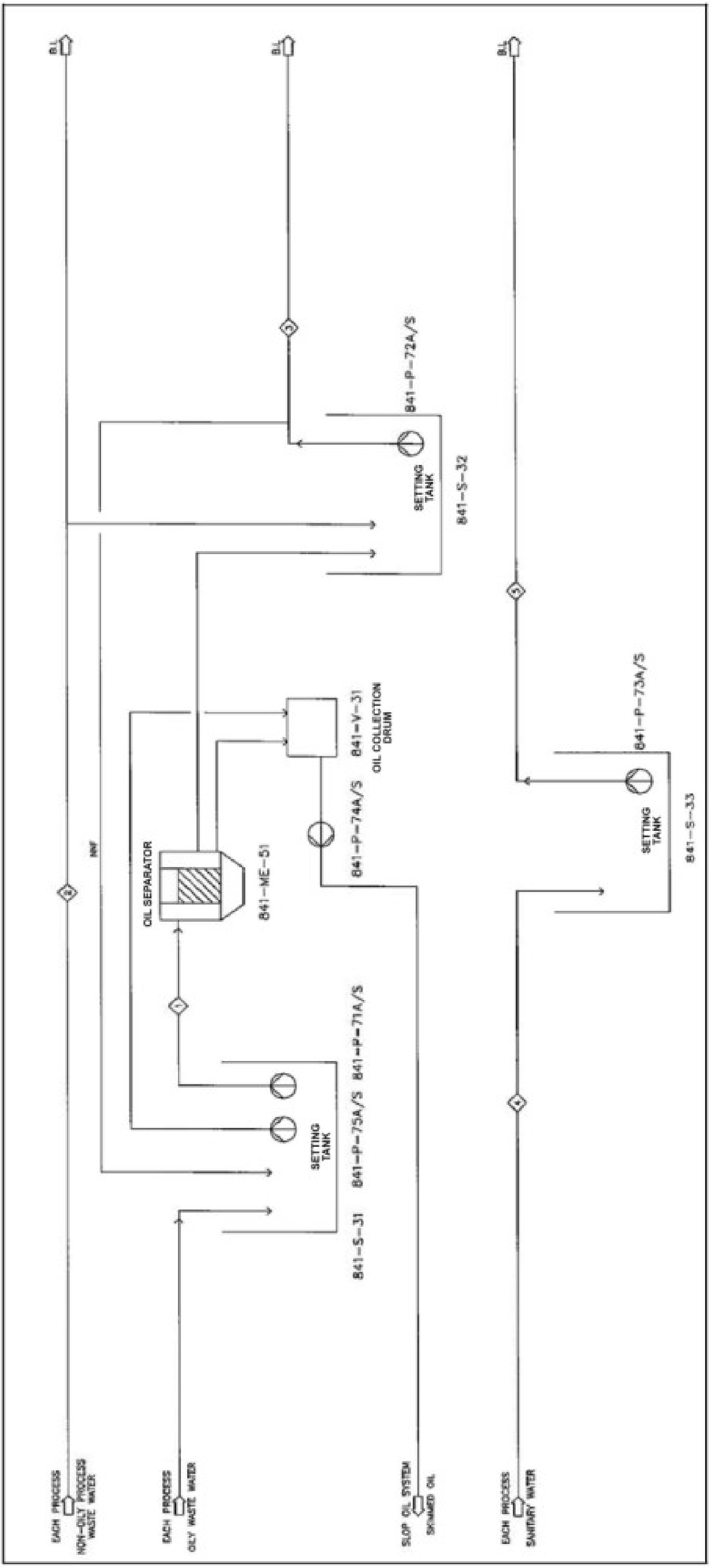
2. Three compact units with thin-layer modules KUTM-210 and consisting of aeration tank and pit;

3. Contact tank for decontamination of purified waste waters which occurs due to application of exported disinfectant (chloric chemical) fed from chlorination plant in process building;

4. Sludge banks for storage of excess sludge from KUTM-210 units during their operation;

5. Process building with subsidiary service rooms: operator, chlorination, electric panel, compressor services.

6. Ponds for vaporizing discharged purified waste waters.



Picture 3 - Waste water treatment diagram

Waste waters from the inleak chamber package via inlet fitting is sent to distribution tray and then via adjustable spillway get into aeration tank. This method is based on application of microorganisms eating organic pollutants being in waste water. To provide life support for microorganisms it is necessary to maintain continuous oxygen feed performed by compressor in the process building.

Excess activated sludge is periodically removed from units via lock valve fitting and is sent to the sludge banks for drying. It is not prohibited to use this sludge for agricultural purposes.

The main advantage of biological treatment is independence from reagents while the efficiency of waste water treatment for organic pollutants amounts 95% and for suspensions – 92%.

The main structures for domestic waste water treatment are described below:

- three compact units with thin-layer modules KUTM-210 with capacity of 210m^3 per day each;
- sludge banks with total area of 600m^2 (6 maps., 10x10m);
- ponds for vaporizing with total area of 2ha (5 maps., 180x140m);
- process building (36x24m);
- inleak chamber package with capacity of 50m^3;
- contact tank with capacity of 50m^3.

Thus according to «SAMSUNG» company waste waters from UGCC after have been treated will completely meet established requirements and MPC will not be exceeded. However the main problem is to dispose purified process effluents, which is to be solved during the next design phase.

4 LEVEL OF ATMOSPHERIC POLLUTION IN CONSIDERATION OF EXISTING MAN IMPACT SOURCES (CS – AKCHALAK)

When operating UGCC facilities and its infrastructure objects in the area of Akchalak CS new sources of influence upon the air will arise. They are: furnaces of process plants, sales gas booster compressors, boiler-room, gas-piston power station, fugitives, flare, degasifier, drain tanks, stable condensate pumping station, etc.

According to pre-designs given in DEI project the total volume of emissions will amount 93.58g/s or 2,482.165 tons annually.

List of contaminants from UGCC units is below

Table 8 – List of contaminants from UGCC

Component	MPC, mg/m^3	Emissions into the air		%%
		g/s	tons annually	
Carbon monoxide	5.000	33.576721	951.620752	35.879
Nitrogen dioxide	0.085	15.221904	939.841012	35.118
Nitrogen oxide	0.600	25.858375	234.960506	8.779

Hydrocarbons (methane)	50	2.892941	81.909831	3.091
Carbon-black	0.15	1.467271	42.131542	1.568
Sulfur dioxide	0.5	0.126388	3.596814	0.135
Acrolein	0.3	0.004069	0.12833	0.004
Hydrogen chloride	0.2	0.896	0.048384	0.957
Cyclohexane	1.4	9.26714	104.882613	9.903
Pentane	100	2.56	73.728	2.736
Hexane	60	1.7124	49.31712	1.83
TOTAL		**93.583209**	**2,482.164904**	**100**

Thus during UGCC operation atmosphere will receive products resulting from fuel gas combusting in the process plants as well as hydrocarbons (methane).

It is clear that during UGCC operation 11 kinds of emissions will be discharged into the air in amount of 2,482.164904 tons annually. The main part is carbon monoxides (35.879%) generated during flare operation.

Since UGCC site is 4-5km away from Akchalak CS level of air pollution from the total emissions of GCC and CS was assessed to decide concerning appropriateness of the dwelling settlement construction in this area.

Akchalak CS consists of four compressor departments equipped with gas-blower park each. CS had only three aggregates of GTK-10-4 type with capacity of 10MW and 17-23% real efficiency. Averaged specific emissions values for these aggregates are: carbon monoxide – 150mg/m^3; nitrogen oxide – 120mg/m^3.

Table 9 – List of contaminants from CS – Akchalak

Component	MPC, mg/m^3	Emissions into the air		%%
		g/s	tons annually	
Carbon monoxide	5.000	15.748	298.454	21.43
Nitrogen dioxide	0.085	11.549	218.866	15.71
Nitrogen oxide	0.600	46.195	875.464	62.86
TOTAL		**73.492**	**1,392.783**	**100**

Table 10 – Total emissions of contaminants

Component	FROM UGCC		TOTAL	
	g/s	tons annually	g/s	tons annually
Carbon monoxide	33.576721	951.620752	49.324721	1,250.074752
Nitrogen dioxide	15.221904	939.841012	26.770904	1,158.707012

Nitrogen oxide	25.858375	234.960506	72.053375	1,110.424506
Hydrocarbons (methane)	2.892941	81.909831	2.892941	81.909831
Carbon-black	1.467271	42.131542	1.467271	42.131542
Sulfur dioxide	0.126388	3.596814	0.126388	3.596814
Acrolein	0.004069	0.12833	0.004069	0.12833
Hydrogen chloride	0.896	0.048384	0.896	0.048384
Cyclohexane	9.26714	104.882613	9.26714	104.882613
Pentane	2.56	73.728	2.56	73.728
Hexane	1.7124	49.31712	1.7124	49.31712
TOTAL	**93.583209**	**2,482.164904**	**167.075209**	**3,874.948904**

Thus 11 various contaminants emissions from GCC and Akchalak CS will amount around **167.075209g/s** or **3,874.948904 tons annually**.

For the purpose of identification of the level of the air pollution with potential emissions from the considered facilities an estimation of contaminants spreading for 10x10km area was performed with the help of «Ecologist» software package. The analysis showed the following:

Carbon monoxide – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.72 MPC, Out Side Fence Limit of Akchalak CS – 0.23 MPC (picture 4). In the area of UGCC dwelling settlement concentration is 0.11 MPC.

Nitrogen dioxide – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.33 MPC, Out Side Fence Limit of Akchalak CS – 0.16 MPC (picture 5). In the area of UGCC dwelling settlement concentration can reach 0.07 MPC.

Nitrogen oxide - maximum concentration Out Side Fence Limit of UGCC is estimated around 0.09 MPC, Out Side Fence Limit of Akchalak CS – 0.49 MPC (picture 6). In the area of UGCC dwelling settlement concentration can reach 0.24 MPC.

Hydrocarbons (methane) – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.01 MPC, Out Side Fence Limit of Akchalak CS – 0.00 MPC (picture 7). In the area of UGCC dwelling settlement this contaminant is not detected.

Carbon-black - maximum concentration Out Side Fence Limit of UGCC is estimated around 0.28 MPC, Out Side Fence Limit of Akchalak CS – 0.02 MPC (picture 8). In the area of UGCC dwelling settlement concentration can reach 0.02 MPC.

Sulfur dioxide – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.02 MPC, Out Side Fence Limit of Akchalak CS – 0.00 MPC (picture 9). In the area of UGCC dwelling settlement this contaminant is not detected.

Acrolein – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.00 MPC, Out Side Fence Limit of Akchalak CS – 0.00 MPC (picture 10). In the area of UGCC dwelling settlement this contaminant is not detected.

Hydrogen chloride – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.29 MPC, Out Side Fence Limit of Akchalak CS – 0.02 MPC (picture 11). In the area of UGCC dwelling settlement concentration can reach 0.04 MPC.

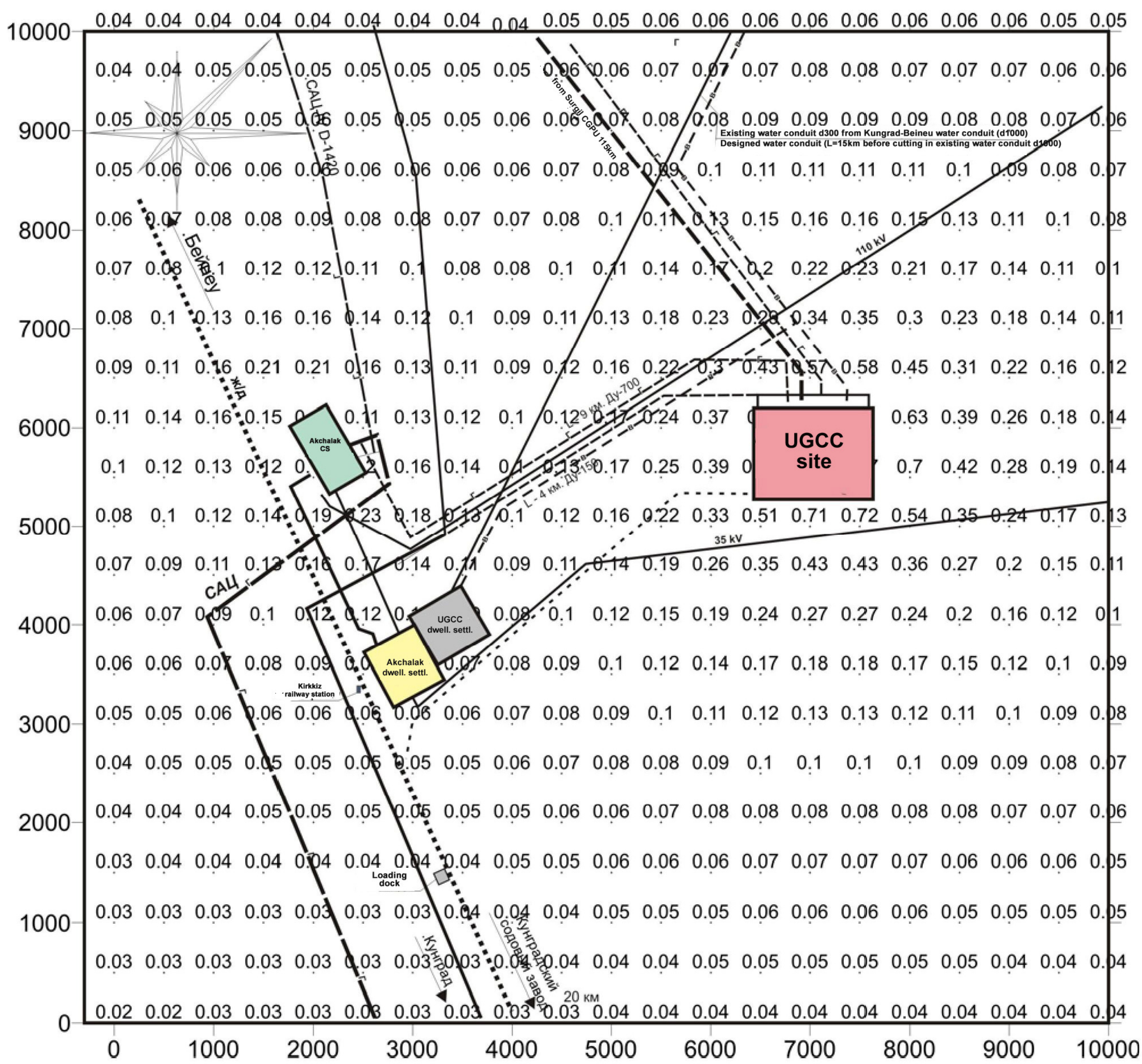
Cyclohexane – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.32 MPC, Out Side Fence Limit of Akchalak CS – 0.03 MPC (picture 12). In the area of UGCC dwelling settlement concentration can reach 0.05 MPC.

Pentane – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.00 MPC, Out Side Fence Limit of Akchalak CS – 0.00 MPC (picture 13). In the area of UGCC dwelling settlement this contaminant is not detected.

Hexane – maximum concentration Out Side Fence Limit of UGCC is estimated around 0.0 MPC (picture 14). In the area of UGCC dwelling settlement this contaminant is not detected.

«Ecologist» software package

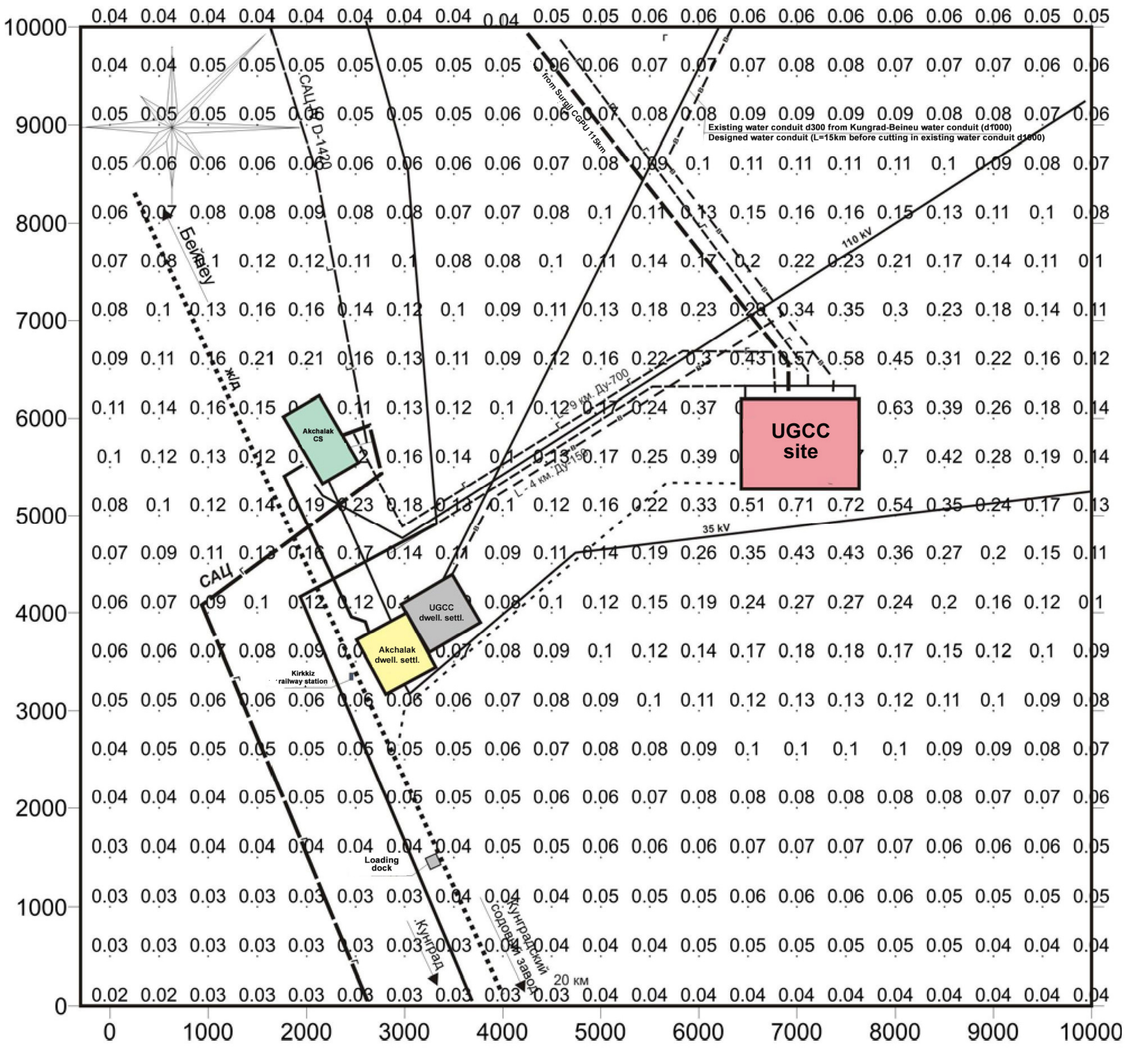
Quota = 1.00 MPC. **MPC = 5.00 MPC.** **MPC fractions.**



Picture 4 – Highest concentration of carbon monoxide Out Side Fence Limit of UGCC

«Ecologist» software package

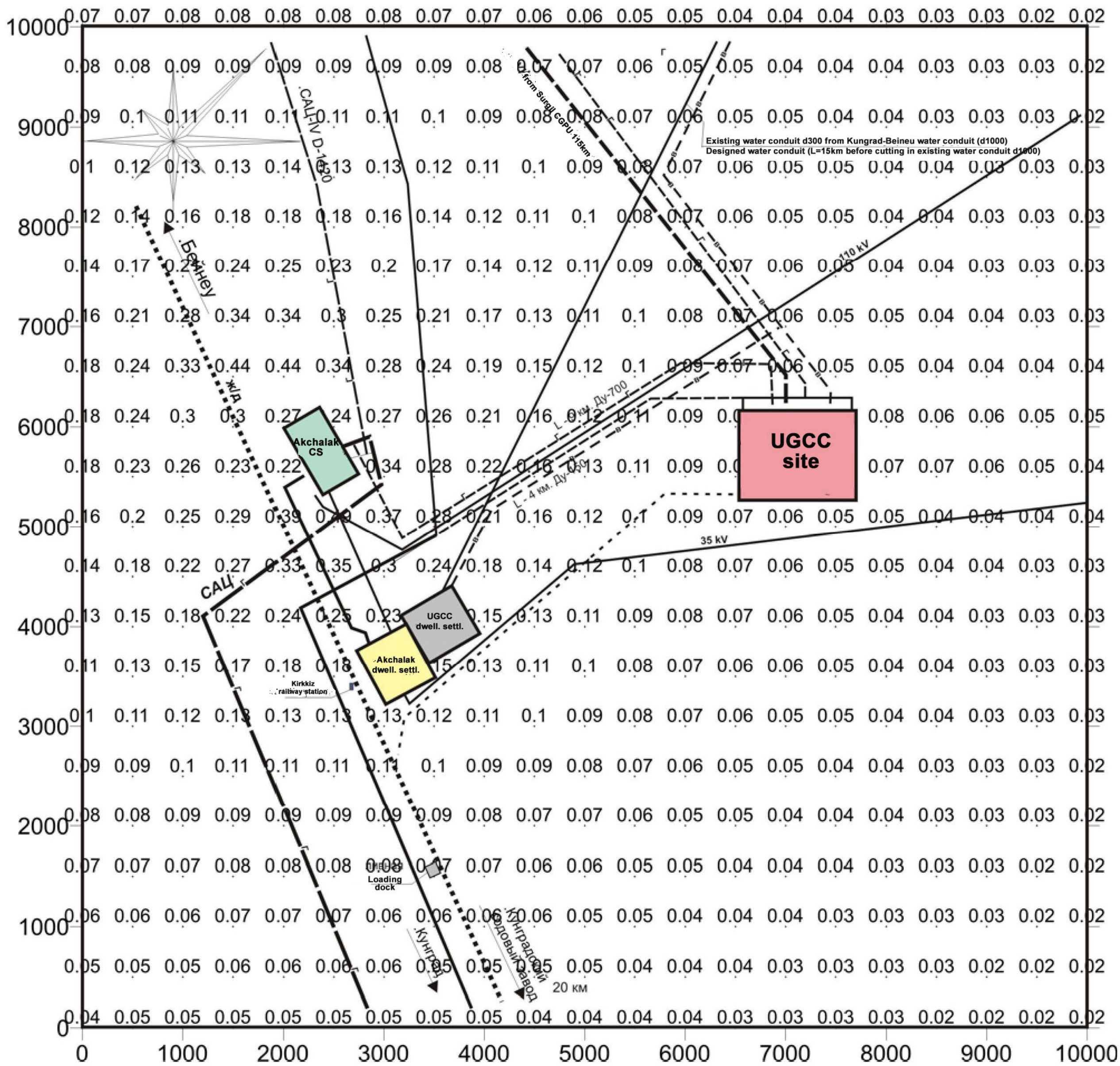
Quota = 0.33 MPC. **MPC = 0.085 MPC.** **MPC fractions.**



Picture 5 – Highest concentration of nitrogen dioxide Out Side Fence Limit of UGCC

«Ecologist» software package

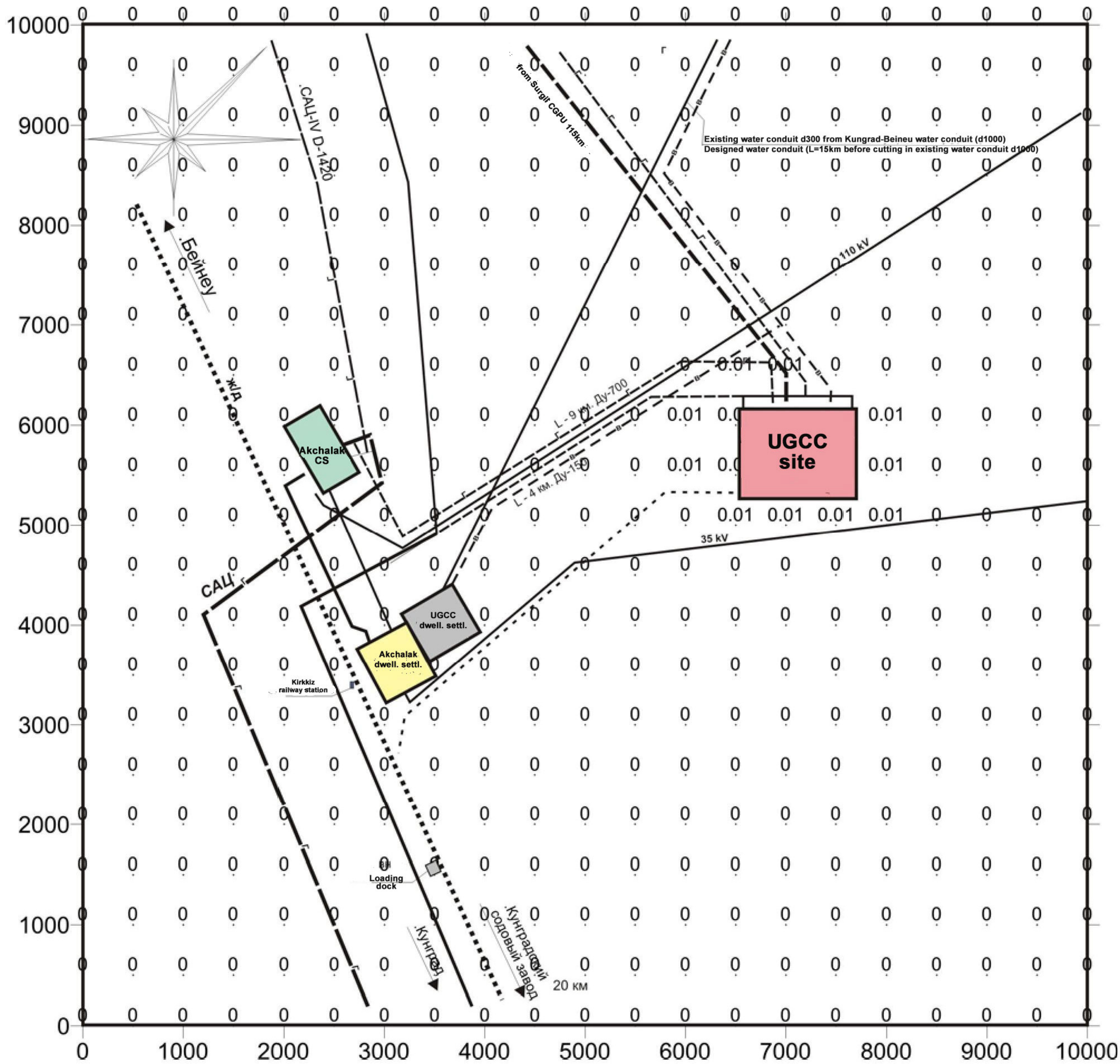
Quota = 0.50 MPC. **MPC = 0.6 MPC.** **MPC fractions.**



Picture 6 – Highest concentration of nitrogen oxide Out Side Fence Limit of UGCC

«Ecologist» software package

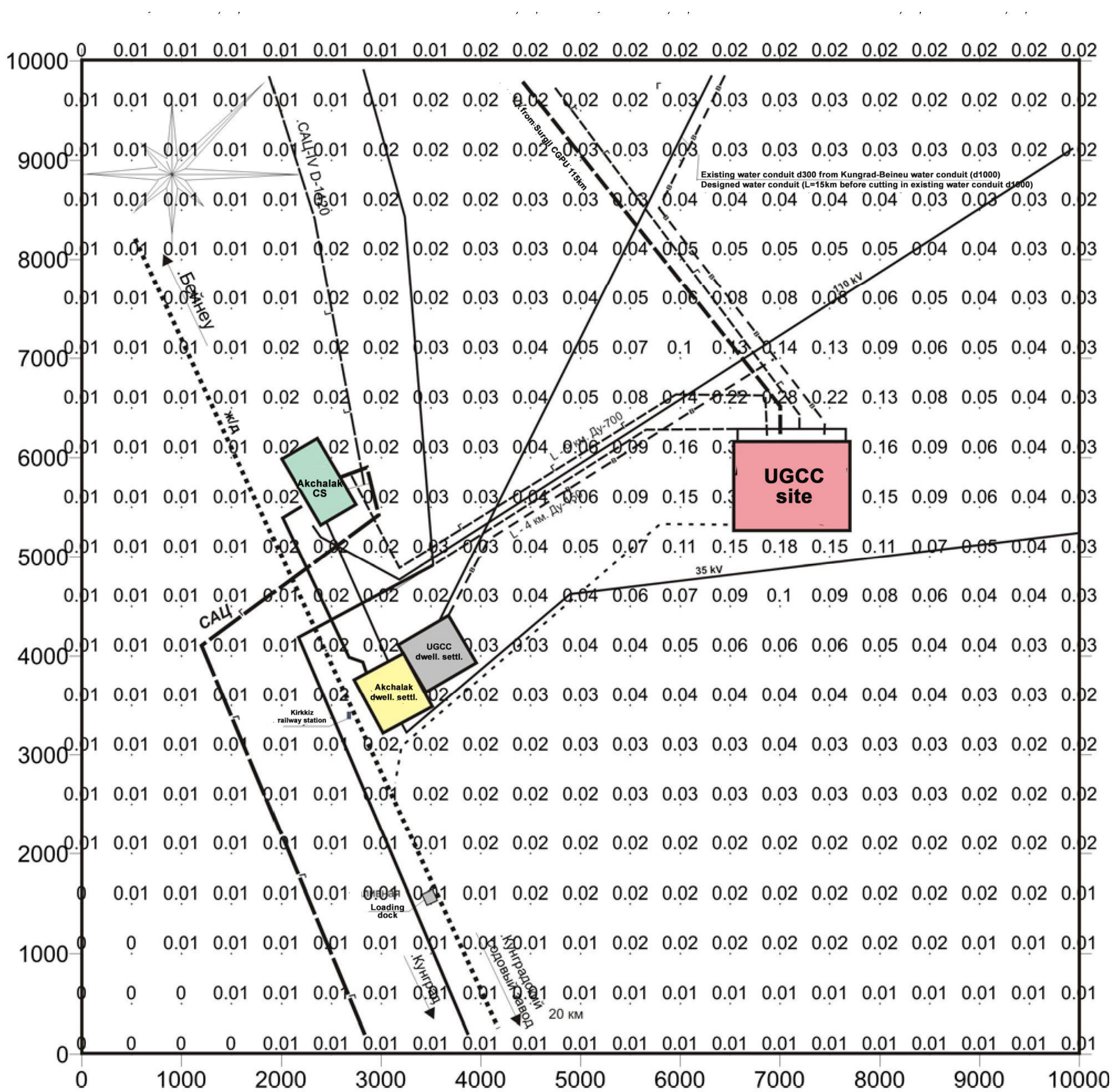
Quota = 1.00 MPC. **MPC = 50.0 MPC.** **MPC fractions.**



Picture 7 – Highest concentration of hydrocarbons (methane) Out Side Fence Limit of UGCC

«Ecologist» software package

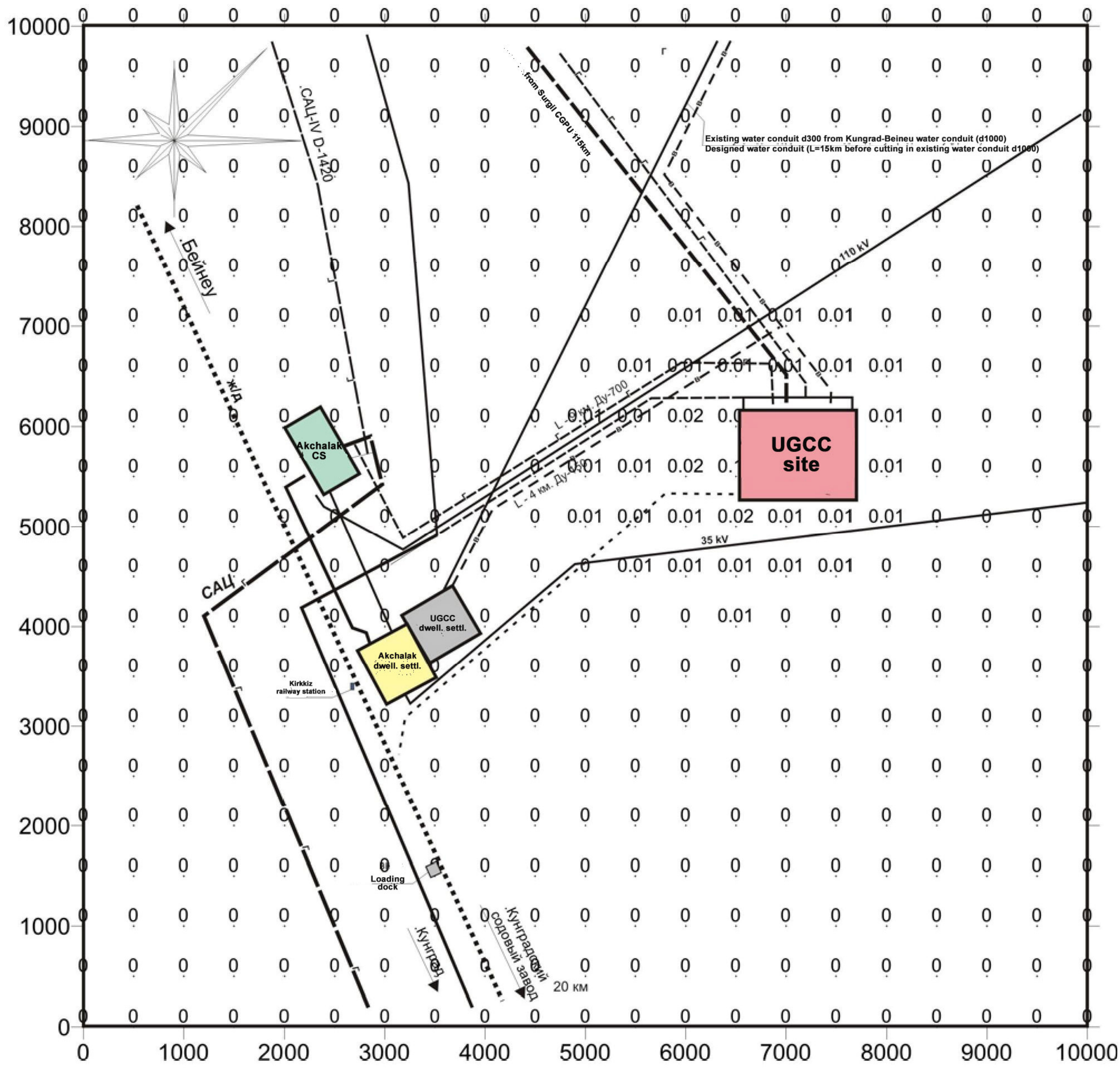
Quota = 0.50 MPC. **MPC = 0.15 MPC.** **MPC fractions.**



Picture 8 – Highest concentration of carbon-black Out Side Fence Limit of UGCC

«Ecologist» software package

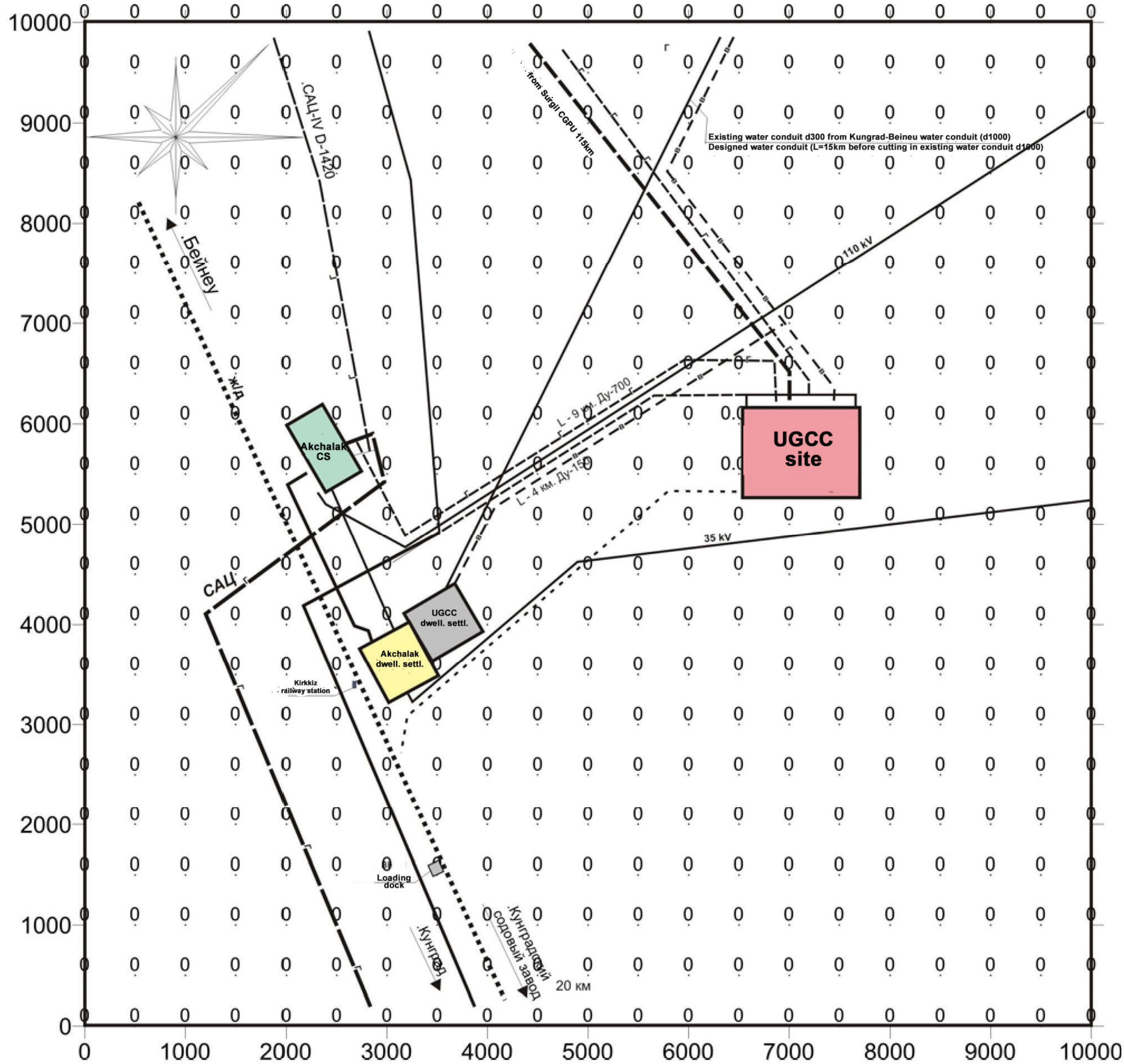
Quota = 0.50 MPC. **MPC = 0.5 MPC.** **MPC fractions.**



Picture 9 – Highest concentration of sulfur dioxide Out Side Fence Limit of UGCC

«Ecologist» software package

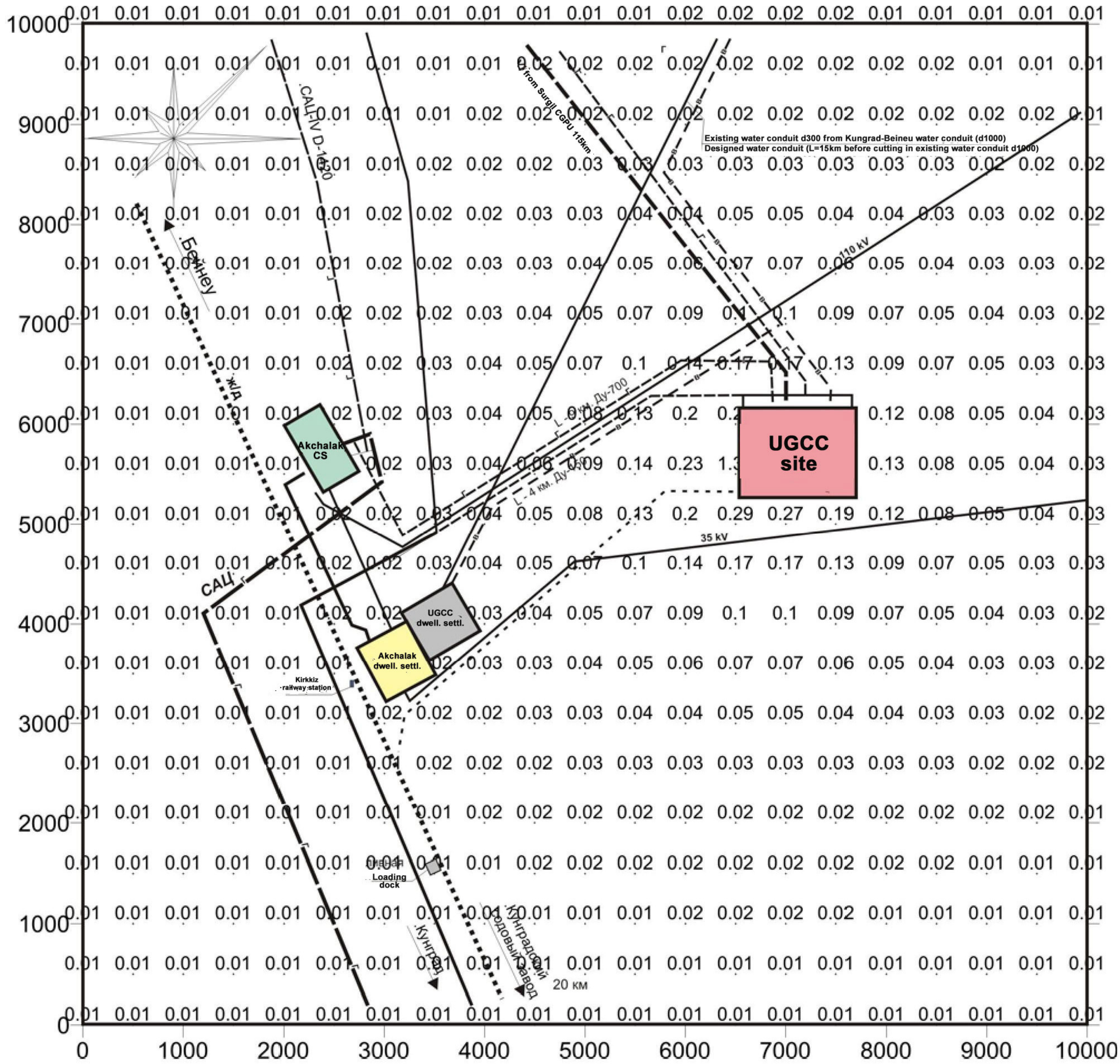
Quota = 1.00 MPC. **MPC = 0.3 MPC.** **MPC fractions.**



Picture 10 – Highest concentration of acrolein Out Side Fence Limit of UGCC

«Ecologist» software package

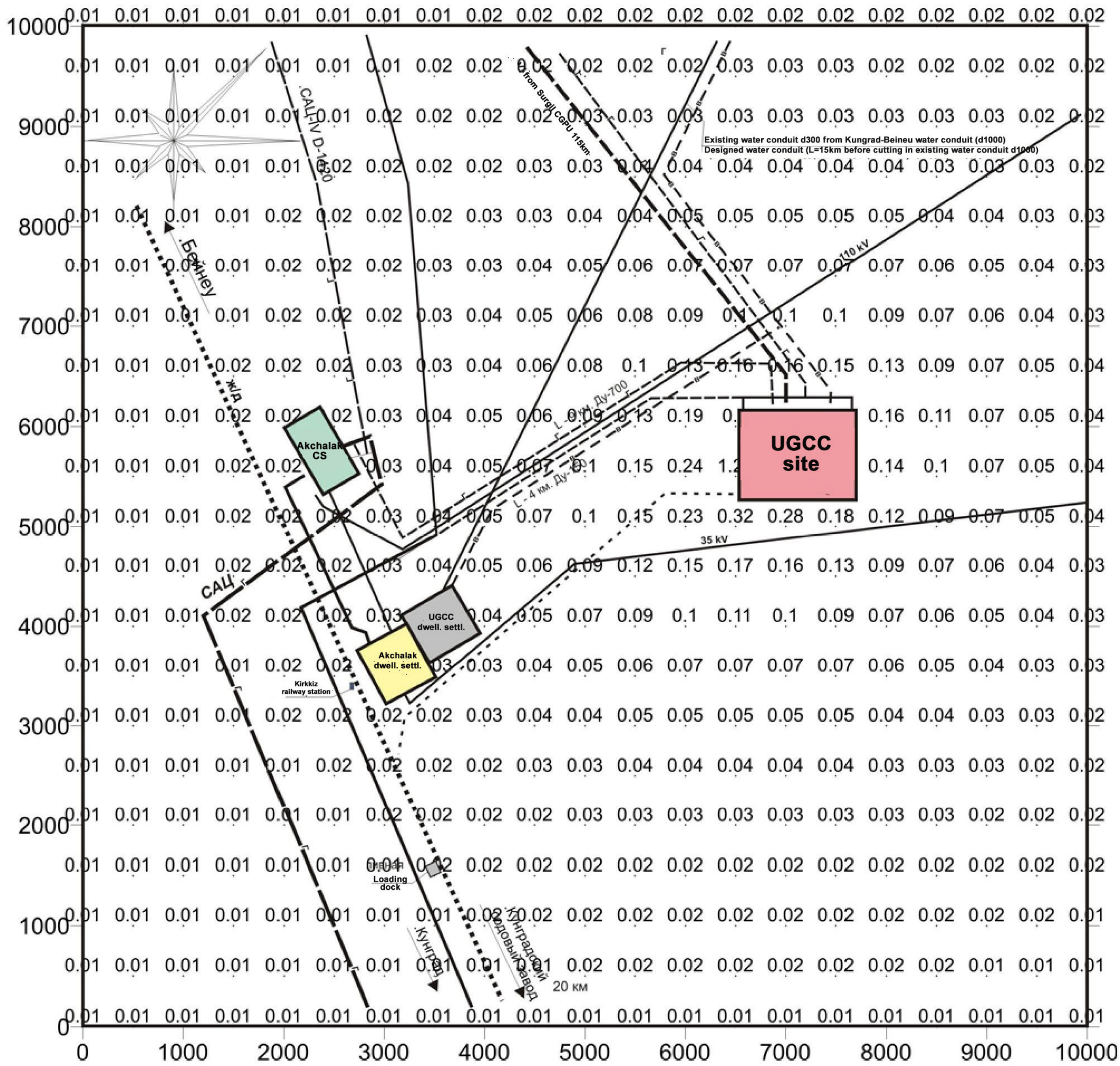
Quota = 0.33 MPC. **MPC = 0.2 MPC.** **MPC fractions.**



Picture 11 – Highest concentration of hydrogen chloride Out Side Fence Limit of UGCC

«Ecologist» software package

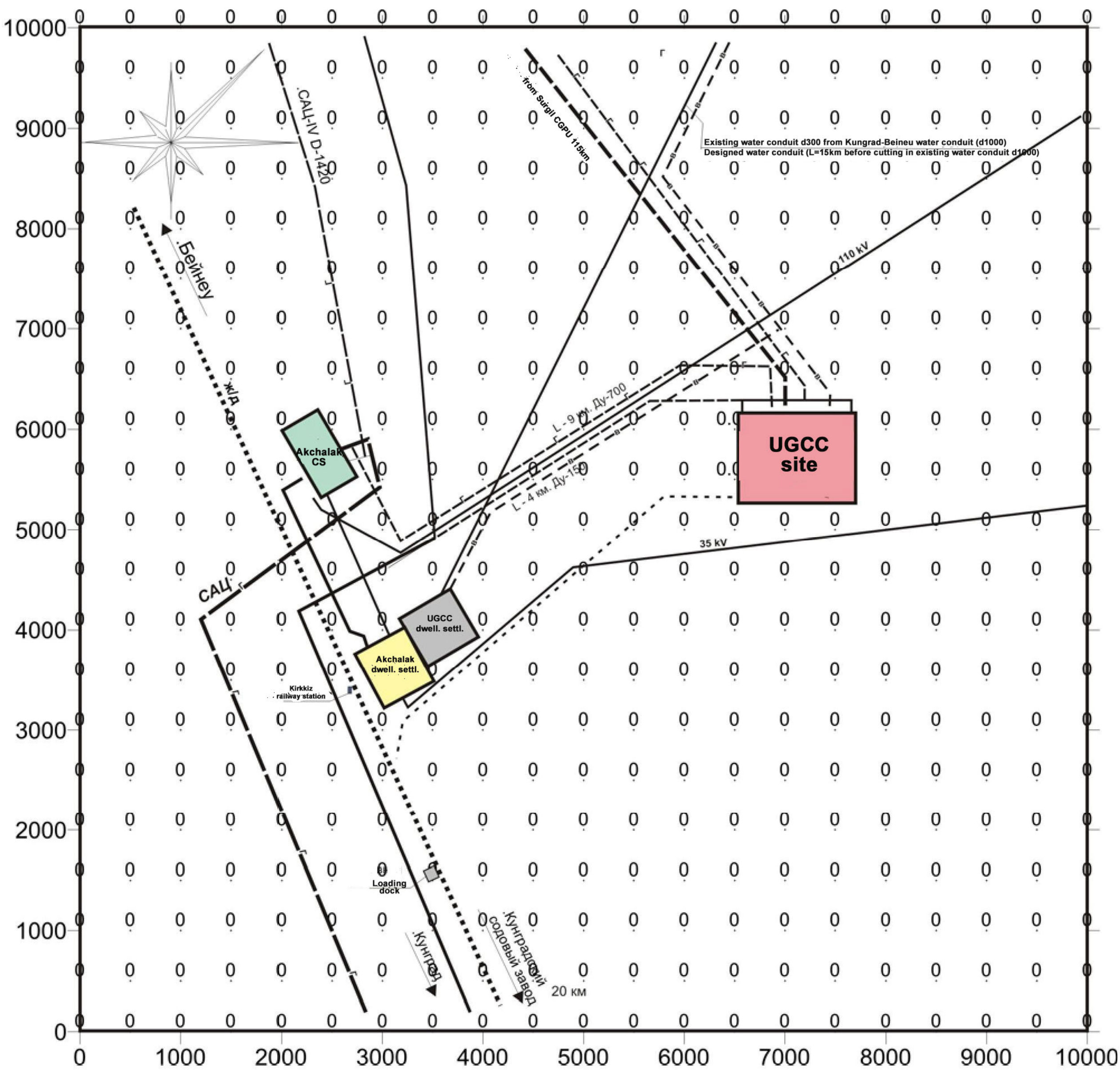
Quota = 1.00 MPC. **MPC = 1.4 MPC.** **MPC fractions.**



Picture 12 – Highest concentration of cyclohexane Out Side Fence Limit of UGCC

«Ecologist» software package

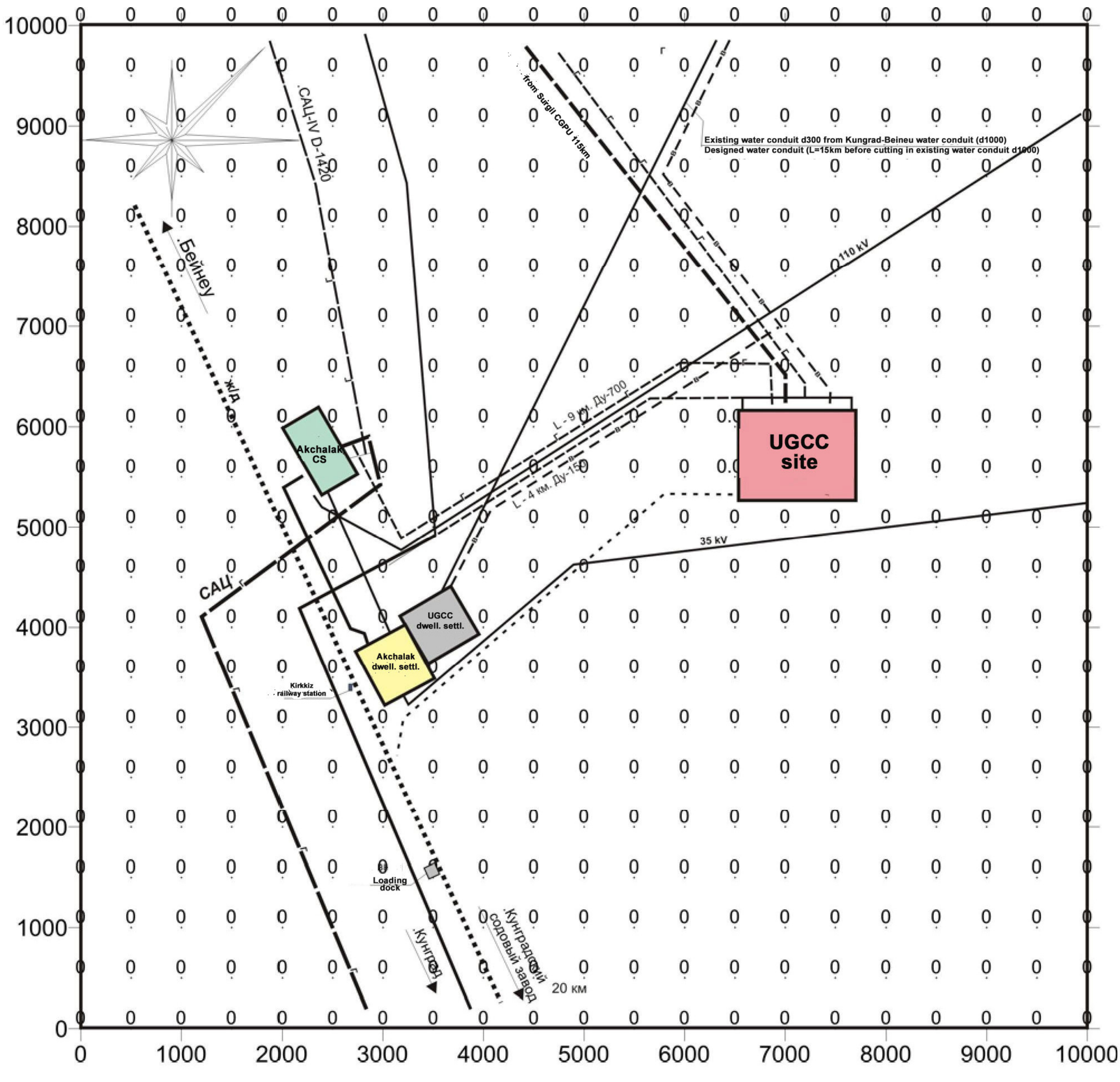
Quota = 1.00 MPC. **MPC = 100.0 MPC.** **MPC fractions.**



Picture 13 – Highest concentration of pentane Out Side Fence Limit of UGCC

«Ecologist» software package

Quota = 1.00 MPC. **MPC = 60.0 MPC.** **MPC fractions.**



Picture 14 – Highest concentration of hexane Out Side Fence Limit of UGCC

Thus when considering total emissions from UGCC and Akchalak CS in the area of design UGCC dwelling settlement and existing Akchalak settlement maximum concentrations of contaminants in surface layer of the atmosphere will not exceed established MPCs.

5 ENVIRONMENTAL IMPACT MITIGATION MEASURES

PE and PP production technology has been completely tested. The units are designed in accordance with the present-day conditions and applicable normative and standards. The facility will have those plants and equipment fitted out with safety aids to meet all environmental protection requirements, ensuring safe operation and required values of permissible concentration of contaminants.

The most dangerous aspect of plants is explosion hazard due to the great amounts of flammable gases and liquids available. In this respect the greatest attention during implementation of design phases related to the safety issues should be paid to consideration of possible explosion/fire hazardous situations.

Process equipment and appropriate contamination control systems are designed to ensure observance of environmental regulations concerning emissions. In addition environmental regulations of organizations making investment to the Project such as EHS IFC's official directions will be applied.

For the purpose of emissions and discharges control Good International Industrial Practice will be applied. In case local authorities will have more exacting requirements to design during pre-starting procedures on the permission approval then those requirements are to be legalized by Contractor based on compensation and on condition that possibility of changes of schedule will be considered.

Atmosphere.

The volume of NOx emissions in flue gas leaving cracking furnaces will be reduced by the low-NOx burner application. As a result concentration of NOx will be 120mg/m^3 (dry base and 3vol.% O2) during normal operation of cracking furnaces.

Smoke pipe's height and flow rate will be designed so that maximum dispersion of gases will be obtained. Smoke pipe will be at least 5m higher than any platform being within 30m in horizontal direction. Analysis of atmospheric emissions dispersion will be performed to identify safe places for emissions discharge concerning environmental and explosion safety requirements.

Smoke pipes for cracking furnaces will be equipped with NO2 and O2 analyzers operating in on-line mode.

In addition places for sampling will be arranged in all smoke pipes and emissions vents for the purpose of regular check of flue gases. Secure access to those places is to be provided as well.

Gases and vapors emerging during plants start-up and shutdown as well as during plants failures get into the closed storage loop and are sent to the plants' battery limits and then to flare.

Rates of volatile components flows leaving tanks, flanges, compressors, seals, etc. will be reduced as much as possible or prevented. To control volatile emissions the following measures are provided in the Project:

- reduced number of flanged connection and application of high-quality sealing systems;
- application of high-quality valves occupying sealing package or packing on all liquids containing benzene or 1.3-butadiene over 5vol.% when gaseous phase or over 25wt.% when liquid phase;

- application of high-quality compressor sealing system;
- connection of vents, vent lines and provision of superpressure protection devices when managing flammable or poisonous substances in flare system;
- process recycle or feeding discharges to flare;
- pumps when processing any liquids should have dual mechanically-operated gates or connected pressurizing systems at the high level containing benzene or 1.3-butadiene over 5wt.% or other hydrocarbons with steam pressure over 0.3kPa at 20^{o}C;
- tanks for volatile organic compounds storage pressurized over 10kPa at 20^{o}C with capacity of 150m^3 and more will have floating roof or stationary roof with pressure control;
- limiting valves will be provided (for volatile organic compounds over 10wt.% pressurized over 1.3kPa at 20^{o}C). They will be dual shut-off valves or just protected with a cover to avoid fouling.

UGCC will have separated sewerage network. Process waste waters discharges will be sent to the treatment facilities and then to the ponds for vaporizing. Domestic waste waters will be discharged to separate sewerage network, subjected to biological treatment and then sent to the ponds for vaporizing as well.

For a number of plants there is a local treatment of chemical waste waters is provided:

- neutralized spent caustic is routed to PCD setting tank via sediment of the pump, oil separator and steam column on pretreatment sewage unit is pumped to the plant's battery limit for the further processing at the treatment facilities;
- PCSS via sediment of the pump oil separator and steam column on pretreatment sewage unit is pumped to the plant's battery limit for the further processing at the treatment facilities;
- OWS via sediment of the pump, oil separator and steam column on pretreatment sewage unit is pumped to the plant's battery limit for the further processing at the treatment facilities.

In order to avoid environmental casual pollution and safe keeping the following facilities are supposed to be enclosed:

- methanol storage;
- flushing oil storage;
- sulfuric acid storage;
- boilers residual fuel storage;
- DMDS storage;
- spent caustic storage;
- spent caustic purification and processing/disposing unit;
- inhibitor/other chemicals dosing unit.

Chemicals dosing unit can be arranged close to each other in areas protected with embankments in case there are no critical reactions between chemicals and such storage is safe concerning fire-prevention requirements.

Contractor will provide material safety data sheets (MSDS) for all hazardous materials used in the process. They are all solid materials, liquid and gaseous chemicals and catalysts used and consumed in the process.

One of the fundamental arrangements concerning environmental protection from generated solid wastes is creation of a landfill for their disposal there.

In this regard the following decisions of the wastes managing issues are possible.

Effective work regarding wastes managing provides in every instance for a number of logistical arrangements and the processes performance taking into account the following:

- list of wastes according to their types and phase;
- physicochemical properties of both specific components (types) and their mixes;
- wastes generation nature and volume;
- possibility and appropriateness of creation of the facilities for complex neutralization and processing of wastes as well as disposal of wastes to off-site consumers as recyclable energy resources;
- state of natural environment in the region and the local socioeconomic conditions;
- level of industrial development in the region, transportation development, etc.

Possible directions of wastes managing are following:

- reduction of wastes volume during their generation;
- separation and concentration;
- off-site disposal;
- recycling;
- processing (including valuable components recovery, toxic components neutralization or conversion into the less hazardous state for further disposal);
- temporary storage at the specially arranged site;
- secure disposal.

Reduction of wastes volume during their generation is the most preferable direction, since expenditures for these actions are less as compared with the possible expenses for wastes storage, neutralization, etc. However there are restrictions concerning technologies at the every stage of production development.

Separation and concentration of wastes. Separation and concentration of hazardous wastes allow reducing of their total volume but weight of dangerous components remains the same. For instance dehydration is used for higher concentration resulting in the less volume of transported and disposed wastes. Besides during dehydration concentrated volatile components of wastes might evaporate.

As soon as expenditures for disposal are as a rule in direct proportion to the volume (weight) of wastes and not to the volume (weight) of hazardous components separation and concentration procedures allow reducing according expenditures considerably.

Off-site disposal. This type of activities is regulated by the environmental legislation, technical or economic appropriateness factors or on a contractual basis. With all this the technicality of wastes processing, transportation to the place of processing and secure disposal of unrecyclable residual must be provided for.

Recycling. In technological respect this method does not differ from the previous one except wastes processing occurs at the site. Appropriateness of such processing depends on economic factors.

Secure disposal. This method is the least preferable one among the others concerning neutralization of hazardous components.

Taking into account physical and geographical conditions of UGCC location, wastes disposal technologies availability and profitability of wastes disposal they decided to arrange a special site for the process wastes neutralization and temporary storage as well as the solid domestic wastes disposal.

The primary reasons for such decision are both lack of effective enough technologies and economical appropriateness of the other methods.

Storing and long-term storage of wastes is carried out at the specially conditioned site. This site is an area divided into two sections. One section is intended for domestic wastes disposal by carting method. This section is divided into carts filled with domestic wastes taken here by dump trucks, evened then by excavators and finally covered with earth. Carts are separated from each other by concrete roads for dumpers access. This section receives solid domestic wastes from UGCC and UGCC dwelling settlement as well as low-hazardous process wastes such as water-conditioning coagulants' slime and compacted sediments.

The second section is equipped with the special tanks and bunkers. Method of storage is safe for environment. The following types of wastes are stored here:

- activated coal;
- molecular sieve;
- catalysts from sulfur recovery unit;
- sodium salts;
- silica gel;
- high-viscous fuel;
- aluminum oxide, etc.

Since generation of the I and II hazard class wastes occurs episodically – catalysts and adsorbents change, process drums and equipment cleaning, accumulated during operation watered residues (oil-slimes, condensates, oils, etc.) they are discharged into accumulator tanks. For disposal of content of those tanks they apply burning or off-site disposal as the most appropriate method.

The Project provides for the actions on the noise level abatement.

Out Side Fence Limit of UGCC the noise generated by UGCC units should not exceed 75dB value. Mentioned Out Side Fence Limits are shown in the picture below.

When arranging plants in one building the following noise limit should be maintained – 85dB in any section 1m away from the equipment's surfaces easily accessible for the personnel. There are sections where combined sound-pressure level exceeds 85-115dB at the distance of 1m from equipment's surfaces. Those sections are in compressor stations and in several small areas around gas expander reactors, major pumps and actuating mechanisms.

In sections where possible noise shields would prevent personnel from access to the working site there will be «Restricted area» signs. Besides, time of stay there will be restricted. In those sections ear protectors will be provided for the personnel.

All warning facilities such as alarms, alarm valves, etc. should be working in all operating conditions. Public address system is designed and installed in order to provide effective voice communication in all appropriate sections. In case the noise level rises considerable there should be additional appropriate alarm warnings provided for.

6 MANUFACTURING ECOLOGICAL SUPERVISION AND MONITORING

The law on «Environmental protection» adopted on December the 9th, 1992, article 32, clause 2 says: «Manufacturing supervision in the field of the natural environment protection is to be carried out by environmental service of enterprises, associations and organizations for the purpose of verification of the programs and individual arrangements concerning environmental protection, rational use and regeneration of natural resources, environmental enhancement and compliance with environmental legislation implementation».

Manufacturing ecological supervision (MES) is a part of the state ecological monitoring system. MES organization and carrying out is to be performed by the business entities and its targets are the site, buffer area and adjoining to it areas: built-up territories, specially guarded natural objects and recreation areas. MES implementation is carried out based on the specially elaborated program which identifies specifics of the supervisory network arrangement, sampling periodicity, list of supervised parameters, type of route inspections as well as the content of reports with a glance at the engineering features of the designed plant and potential influence upon the natural environment components relating to it. The major priorities of MES are the following: tracking of contaminants concentration changes in all natural environment components; identification of flora and fauna response to anthropogenic impact; obtaining of materials to forecast dangerous geological processes and phenomena occurrence possibility; estimate of the nature-conservative measures efficiency and minimization of ecological risks activities efficiency; control of changes in ecological situation during emergencies and assessment of adequacy of anti-damage arrangements concerning ecological issues.

MES should be complex, i.e. all natural environment components must be cover with it: atmosphere air, surface and ground waters, geological environment, soils, flora and fauna as well as all types of waste generated during process activity.

Supervision system should be created and started before preliminaries begin. Such early start of supervision system is necessary to fix the ecosystem's background state before construction machines invade the area in question to have the reference point when interpreting obtained supervision results at the later phases of the Project implementation and operation.

During construction period when starting new objects the most considerable alteration of the natural environment. That is why MES of each natural environment component should be carried out with particularities: grid of atmospheric air, soils and surface waters sampling and routes of the hazardous geological processes state supervision should be condensed and sampling frequency – increased. Periodicity of supervision routes should be every three months annually. Supervised territory should not be confined with the site area and must include buffer area and adjoining to it areas.

During operation period MES is carried out using well-developed system of fixed points (as for sampling) and existing routes of supervision (hazardous geological processes, relief, vegetation, animal world). During normal operation of the plant all observations are performed according to existing methodologies and standardized frequency and analytical study – in authorized laboratories having all necessary certificates.

During emergency situations MES should be carried out much promptly and all samplings are performed more frequently and sampling grid is condensed covering emergency area and adjoining to it areas (sampling area should initially exceed emergency area). Analytical study is performed as promptly as possible to define the time of emergency elimination activities termination.

MES program is designed for every natural environment components individually and includes four periods of supervision: background state, construction, operation and emergency situation (for each type of emergency individually).

MES of atmospheric air within the site area, within the buffer area and within the dwelling settlements can be carried out with the help of automatic hardware and air and snow cover sampling at specific points defined taking into account the wind rose and pre-design of emissions spreading. Also nitrogen dioxide, carbon monoxide, sulfur dioxide, saturated hydrocarbons and hydrogen sulfide are to be monitored. Both organized and unorganized sources of emissions should be controlled. Besides the law on «Air protection» adopted on December the 27th 1996, articles 24, 27, 28, normative basis of the air pollution MES is presented with the decrees by Cabinet of Ministers, Sanitary Norms and Rules and other documents.

MES of the ground waters state and their potential contamination is carried out through the system of special inspection wells drilled near the potential point of contamination along the stream. In each well four times a year they measure ground waters level, water temperature and take out samples for further comprehensive chemical analysis. The most frequently controlled parameters of ground waters are the following; pH, nitrates, nitrites, phosphorous, nitrogen (ammonium, nitrate, nitrite), permanganate oxidability, iron, petrochemicals, heavy metals, etc.

When carrying out background state of soils supervision they perform complex soil-chemical examination of soils for area objects in scale 1:5 000, and for linear – in scale of 1:10 000 and selection of key sections for further control. During construction period supervision they track soil covering response to anthropogenic impact: from key sections (background and check) they take samples for chemical analysis to control heavy metals, arsenic, organochlorine compounds, full range of oil hydrocarbons, etc. content. When assessing chemical composition changes special attention should be paid to the high-toxic contaminating substances appearance.

After completion of construction recultivated areas are supervised for regeneration of soil covering's initial agrochemical state.

MES of vegetation is carried out on the sample areas for geobotanical control spatially combined with ones for soil covering control.

Such areas are selected as a rule where there are typical plant associations, at the site bounds and on erosive areas. Sample areas are divided into control sections and strips where they control the following: species composition, abundance, vitality, vegetation strength and phytomass and fertility if necessary. Control section area depends on type of vegetation: for woody associations – 100-400m^2; for scrub and herb associations – 10m^2; for moss and lichen associations – 1m^2.

Rather often it is necessary to perform geobotanical survey during which they obtain data on plant associations' composition and structure not only within the site and buffer area but within the whole affected by UGCC area as well including emergency situations. During geobotanical survey they get information about trees level, off-level vegetation; inventory protected and rare species of plants and their ecotope; perform territory zoning according to strength of UGCC influence upon the natural complex; carry out geochemical study including selection of plants for different special analyses.

MES of the surface fauna includes the following: inventory and assessment of present state of animals' ecotope and their number; assessment of biotopes transformation degree before construction started; assessment of ecotopes according to ecological risks of anthropogenic impact degree; assessment of animal world condition in the region (territorial populations of birds, mammals, reptiles, amphibian, etc.), number and characteristics of hunter animals. Ecological control of birds' population within anthropogenic impact bounds is carried out in late May and in early June (time of arrival for brooding). Sections for MES are 1 km routes cleared evenly across the area in question or along the whole length of a line. MES of mammals is performed when they are mostly vulnerable: during migrations (2-3 decades of May) as well as during reproduction period (end of spring-beginning of summer). MES is carried out during the whole construction period and further annually for 5 years and yet further – once in 3-5 years. During route supervision it is necessary to take into consideration the following: species composition, number according to biotopes, migrations routes, brooding places. During points and areas supervision they perform mapping of ecotopes of the rare and vanishing species of native mammals.

In accordance with the acting normative legal documents when carrying out MES it is also necessary to track generation, accumulation, temporary storage, transportation, neutralization, utilization and disposal of all types of wastes produced in the plant. They do inventory of wastes, separate accumulation and temporary storage of wastes according to their toxicity as well as separation of wastes according to the safety during transportation matter, issue passports for the toxic wastes and MES of the disposal areas.

All the foregoing proves the validity and necessity of the complex MES to get optimum information about every natural environment component state in order to reason and adjust forecasts of environment changes occurring due to specific anthropogenic impacts in the region. Data obtained during regular systemic supervisions allows prompt correcting of the nature-conservative arrangements and preventing emergency situations.

Thus MES at UGCC must include the following:

- atmospheric air condition control;
- waste waters control;
- soil covering control;
- wastes managing control;
- biocontrol.

MES system requirements are the following:

- supervision methods must comply with the normative-methodological documents;
- points and areas selection must depend on the natural environment condition and the Project specifics;
- actual data on the natural environment condition acquisition must be performed by the engineering-ecological supervision using routes study, complex and local stationary supervision;
- acquired data processing is performed by the office work, laboratory chemical-analytical researches with electronic data processing and modeling of interconnections of engineering structures with the natural environment components.

In case mercury availability in the feedstock is confirmed it should be included in the list of contaminants to be controlled.

Layout of points of the supervision network is defined according to the location of the newly considered complex and is to be approved by the local environmental protection committee.

CONCLUSION

Feasibility study of the Project as for UGCC has been carried out by CMAI (Singapore) concerning marketing research together with «SAMSUNG ENGINEERING» and «HYUNDAI ENGINEERING» (Republic of Korea) concerning process technology and all-factory equipment. This process technology provides for gas and condensate processing with extracting of valuable components such as: HDPE, PP, sales gas.

Based on the data provided DEI research was performed taking into account the State environmental expertise requirements made during DEI project examination.

Results of hydrological and geological engineering survey of UGCC construction area have been studied thoroughly. In hydrogeological respect the area in question is arid. Ground waters occur at the depth of over 25.0m, they are strongly mineralized and unsuitable as potable or service water. Conducted geological engineering survey indicates the necessity of EGE-1 soils removal due to its macroporosity, subsiding and deformability. EGE-2 soils are also recommended for removal due to their physical-mechanical properties particularly unevenness of limestones spreading and thickness as well as marlaceous and argillaceous deposits dilatation. As the foundation soils EGE-3 soils are recommended for use and EGE-1 and EGE-2 soils are recommended to be changed for artificial soil and making impervious cushion of loamy soils by compacting.

Domestic waste waters are to be purified at the treatment facilities. Normative clean waters are to be discharged to the ponds consisting of 5 maps with total area of 12ha for vaporizing.

Method of purified process waste waters disposal to the Out Side Fence Limit of UGCC has not been worked out yet. Several ways of disposal are being considered:

- utilization for irrigation;
- utilization for bio-ponds;
- filling of depressions or abandoned open cast;
- filling of ponds for vaporizing.

Analysis of degree of the air pollution with total emissions from UGCC and Akchalak CS has shown that in the area of design UGCC dwelling settlement and existing Akchalak settlement location maximum concentrations of contaminants in surface layer of the atmosphere will not exceed established MPCs.

UGCC project implementation will undoubtedly negatively affect environmental complexes being close to it. In this respect all the technological decisions are to be directed to prevent those negative effects or minimize them as much as possible. On-site and off-site emissions sources will be equipped with appropriate analyzers to detect and control contaminants in the atmosphere. Carrying-out of monitoring will be based on the specially designed program specifying supervision network arrangement particularities, sampling periodicity, list of components to be control, character of route supervision as well as the content of reports with a glance at the technological peculiarities of the Project and relating estimated degree of influence upon the natural environment components.

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