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Integrated solid waste management system for the Absheron peninsula project

Environmental impact assessment

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ABBREVIATIONS AND ACRONYMS

AG	Azerbaijani Government
PEL	Permissible emission level
ALL	Admissible leakage level
IDA	International development association
BEP	Baku executive power
IHO	International Health Organization
BWLCP	Balakhani waste landfil cover project
WB (or Bank)	World Bank
SEE	State Ecologic Expertise
EA	Environmental assessment
EA	Environmental analysis
EMP	Environmental management plan
EIMMP	Environmental impact mitigation and monitoring plan
MENR	Ministry of Ecology and Natural Resources
NGO	Non-governmental organization
EGR	Economico-geographic region
PEE	Public environmental expertise
EIA	Environmental Impact assessment
GG	Greenhouse gases
GWP	Global warming potential
GCC	General concentration of carbohydrates
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
PAC	Polyaromatic carbohydrates
JSC	Joint-stock company
MH	Ministry of Health
GOC	General organic compounds
PCL	Permissible concentration limit
IEC	Important Environmental Components
PAL	Permissible Approximate Limits
PL	Permissible Levels
VOC	Volatile organic carbon compound

SUMMARY

A1. Purpose of an environmental assessment

Approximately 80% of wastes from the Absheron peninsula is transported to the Balakhani Landfill. A modern project for management of Balakhani landfill compliant with environmental and health standards is at the stage of preparation, with consideration to the existing conditions of Balakhani landfill and environmental impact level of the landfill. "Integrated Solid Waste Management System for the Absheron Peninsula Project", proposed and financed by the World Bank, consists of 5 components (according to the first draft of the Project Evaluation Document of the World Bank):

Component A: *Balakhani Landfill upgrading and management ($11.4 million).*

Component B: *Closure and management of other dumps ($6.4 million).*

Component C: *Urgent collection equipment for 5 outer Baku districts ($21.1 million).*

Component D: *Institutional reform, capacity building and project management ($6.5 million).*

Component E: *Studies and preparation of Phase II project ($2 million).*

The activities within this project will include implementation of some necessary measures for a management of the landfill in compliance with modern requirements, including appropriate construction and assembly works (dam, drainage system, collection and management system of filtrates, waste waters and landfill gasses, including provision of necessary infrastructure, etc), landfill covering and other necessary measures.

The purpose of the presented "Environmental Management" report is to assist ecological reliability and durability of the proposed project for financing of the World Bank and provide compliance of the project proposal with the legislation requirements of Azerbaijan Republic.

The project of "Integrated solid waste management system for the Absheron peninsula project relates to the B Category as per ecological classification category of the World Bank projects.

An ecological analysis should be carried out for a B category project, in compliance with the requirements of OP/BG/GP 4.01 document of the World Bank and requirements of the existing legislation of Azerbaijan and compliance of procedures and guidelines with Azerbaijan legislation and the with Bank's policy and procedures should be povided, subject to ecological appropriation.

As part of project preparation, *conseptual environmental assessment of the project* has been carried out, environmental requirements have been set and mitigation of

environmental impacts of the project activities and monitoring principles (requirements) have been estimated.

Furthermore, the presented EIA report will provide the project management group with the environmental management recommendations with regard to the project activities.

A2 Structure and main results of the environmental assessment report

The EIA report includes summary of legislation and regulation documknts, initial environmental condition, its contamination background, summary of socio-economic situation in the region, comments of the planned works of the project, assessment of current and expected environmental impacts, reduction of possible negative environmental and socio-economic impacts, protection of health and safety, principle of carrying out ecological monitoring and environmental quality standards to be used during monitoring of environmental components.

The report includes analysis on assessment of current condition of Balakhani landfill and potential impacts expected during the project activities and results of appropriate field surveys. The general summary of the existing environmental condition is given below.

Atmospheric air

No monitoring of atmospheric air quality is being performed at the project site and adjacent areas. However the spread of fumes from incineration of wastes at Balakhany waste landfill and nearby illegal dumps to the adjacent territories can visually observed.

Radioactive background at measuring stations and adjacent areas was below admissible levels (4-5 uSv/h).

Surface Water

To assess surface water contamination in the project region, some analysis samples have been taken from 2 spots directly on a shore of Boyuk Shor lake and from water body that currently has lost water contact with the lake

- BOD figures are within 6-50 mg/l range.
- a COD figures are within 169-2690 mg/l range.
- GOC density at reaserach stations is within 91-1270 mg/l range

This index from the records complies with a quality index of filtrates discharged from the landfill

General Concentration of Hydrocarbons (GCHs)/ Polyaromatic Hydrocarbons (PHs), Permanent Organic Compounds (POCs), volatile fractions

Results of the analysis characterise extreme contamination of the water basins. As per results of the carried out analysis, various substances have been discovered in water samples, from general hydrocarbors to pesticides.

Underground Water

The area to the north from Balakhani trash damp is considered to be a waterless zone (arid zone). Water retaining rocks participate in the geology of trash damp area but ground water has not been formed in this strata.

Soil contamination level

The studied area undergone a strong human impact. On the basis of the results of a visual study there are ground areas in the project and adjacent areas that have been locally contaminated with hydrocarbons, including industrial, ground and waste waters and undergone an erosion.

According to the results of a visual study there are ground areas locally contaminated with bitumen, oil and waste water discharged from the landfill. Some soil samples have been taken from different depths of the geological boreholes No 2 and 4 and from 4 monitoring stations (Annex 5. Sections 2.1.1 -2.1.4) and analysis have been carried out during field surveys in the project area.

It was discovered that Co - in samples taken from topsoil in stations 1, 2 and 4 and Ni - in all stations appeared to be 3-11 times higher than the standards and Zn - in all stations was 1.5-5 times higher than the standards

Various PACs and Pesticides/POCs were detected both in the top soil layers (see Attachment 4, Table 4) and in samples taken from wells at various depths (see Attachment 4, Table 4).

Flora

The studied area is ecologically poor. New private housing contsruction and contaminating of the area with domestic wastes are regular activites causing destruction of natural plant cover. As it was clear from the observations, after some period of time plant cover gets restored at some oil contaminated areas where oil wells were abandoned

Fauna.

Most of the area has lost its ecological sensitivity and its value as an inhabitation for wildlife, being contaminated with industrial pollution and extreme exposure to a man impact.However, few fragments of some natural areas are available, keeping its value and ecological sensitivity as an inhabitation.

Historical, cultural and religious monuments

- There are cultural and historical monuments of state importance in Binagadi and Balakhany settlements, located close to the project area.

PROJECT IMPACTS

Environmental impacts of uncovered waste dumps

The following are general environmental problems related to the active part of the landfill and numerous open dumps located in the project area and adjacent territories:

Air Pollution Impacts: Atmospheric pollution associated to waste burning (emissions of particulate matter, CO, C02, **NOx, SOx,** and dioxins) with related **generation** of toxic fumes and odors.

Social and Health Impacts: Proliferation of sanitary vectors (pests, **inhalation** and **skin** contact with wastes can increase risk of contracting sicknesses, gas **and** aerosol emissions can cause serious health problems). This may be increased with the presence of pathogenic and hazardous wastes. Negative impacts **on** traffic, deterioration of existing roads and vehicles. Creation or augmentation df marginal population settlements (informal workers settled in inadequate sites and **undertaking** selective waste collection activities that generally involve child labor, **poor** housing conditions, and insufficient income to cover basic needs). Also high **nutritional** and sanitary risks.

Impact on Water quality: Generation and dispersion of leachates **through** water bodies. Continental and coastal water pollution (superficial and **underwater** contamination).

Impact on soil: Soil pollution due to unmanaged waste collection and burning.

Impact on landscape: Negative impact on landscape (both in accepted and **clandestine** dumps).

Impact on fauna andflora: Disposal in inadequate sites impacts protected areas and natural habitats, affecting natural flooding and groundwater zones.

EnvironmentalCommon enviromental and sosial impact ralated with **construction activiti**

The following are the most common potential environmental and social impacts arising from the construction phase:

Impacts on soil: Removal of the soil's superficial layer creates a negative impact on the quality and capacity of the land, its compacting capacity and also **in** terms of erosion. The soil will be permanently and irreversibly modified as **compared** to its natural condition. Construction work and later operation will alter the soil's original compacting capacity and its structure eroding it and modifying its **original** capacity. Changes in the terrain and digging will modify the original **superficial** draining process and may increase erosion in dry and windy areas.

Impacts on faun andflora: Indigenous fauna will suffer a negative **impact** as the vegetable cover is completely removed, although this will be partially reverted at the time the landfill's final cover is placed in the ground.

Impact on air quality and noise: Construction works can trigger erosion and

atmospheric pollution including: increased noise, odors, particulate matter and gases.

Impact on water quality: **The use of fine materials (limes and sand) on the sides of the roads being built and as part of any infrastructure works generates water erosion risks that can threaten the stability of those works. The equipment operating during this phase will generate residues (oils, fuels, and dirty water).**

Potential Social impact: **new sources of employment will temporarily arise'.However, closing waste dumps may generate negative economic impacts on the nearby dwellers living out of waste picking and recycling.**

Environmental and social impacts during operation of the landfill

(considering works to be carried out for the landfill covering)

Surface contact between the main part of the landfill and morphologically formed natural structures is a zone with high risk for an environmental contamination.

Landfill wastes are exposed to a structural decomposition through a combihation of a chemical, physical and biological combination. Decomposition products appear in the form of solid, gaseous and liquid through this decomposition and the landfill plays a role of biological reactor.

Methane and carbon dioxide, nitrogen oxides, hydrogen sulphide, ammoniac,mercaptans and other substances created by a waste decompositon will be discharged into atmosphere that consequently will cause a climate change.

Harmful substances and odors will be emitted into environment through burning of the landfill gasses and wastes in an open air during an operation of the landfill.

Installation of a system for collection of treatment of landfill gasses in paralel with landfill operation will minimize these environmental effects.

Filtrates and waste water (mostly precipitation waters) are deemed to be the most hazardous liquid wastes. Filtrates contain hazardous substances, as well as may cause infectious deseases through bacteria. Collection and processing of filtrates in the designed treatment facility will reduce these effects.

The followings are the main potential environmental and social impacts in addition to those listed above:

- *Land impacts:* Risks like removal of topsoil (changing of plant cover and local fauna), deformation of land and contamination of top layer, leveling of hillsides, land erosion.
- *Water impacts:* Surface rain waters will be collected and drained off through internal ditches and rain water drain designed for a construction. Contamination of surface waters and ground waters may take place, so that they may penetrate inside and under the landfill because of improper isolation of filtrates.
- *Air quality impacts:* Dust emissions due to moving of transport and unloading process at the entry stations and landfill area, including air and noise emissions generated by motors. Emissions of toxic gasses due to various industrial wastes of the landfill. Other effects are given above.
- *Change of landscape:* topographic changes, changes from regular activities on the site.

- *Potential social impacts:* There are risks in connection with work related accidents. There are also employment opportunities (short-term). Landfill personnel may be exposed to a risk of illness due to harmful effects.

Environmental and social impacts after covering of the landfill

- *Impact to landscape:* rehabilitation of plant cover and fauna.
- *Potential impact to water:* Contamination of surface and ground waters; so that after covering filtrates may penetrate inside and under the landfill due to reasons of mismanagement. In addition, probably, improperly treated filtrates and waste waters may contaminate surface and ground waters.

- *Potential impact to air quality:* Mismanagement of landfill gasses and filtrates may cause emission of odors and harmful substances. In addition, emission of gasses into atmosphere is possible due to various available and probable cracks on the landfill covering.

- *Social impact:* Communities may have some opportunities to use some geographical areas. Increase of land prices of the adjacent areas. Decrease of employment sources. This may economically affect local community members who have been recycling landfill wastes for a long period of time.

ENVIRONMENTAL IMPACT MITIGATION MEASURES

The Environmental Impact Mitigation Measures are to be impelmentted by the Cotractor during the construction works and service orividers (landfill poperator and enteprises involoved in waste managemengt (waste transporters, sorters, etc) as part of their contratcual obligations on landfil opeartion and covering.

The Environmental Impact Mitigation Measures are to be implemented by the Contractor (during the construction works) and the service providers (landfill operator and enterprises involved in waste management (waste transporters, sorters, etc)) as part of their contractual obligations on landfill operation and covering.

The principles of environmental impact mitigation are provided for project phases.

Environmental protection principles at the stage of construction and operation of the waste disposal site

Waste management

- Adoption of all transport and waste disposal measures established in valid regulations.
- Proper storage of hazardous materials in a specially allocated place, provision of drainage for waste waters and treatment if necessary.
- Daily removal and disposal of all construction wastes in dully approved locations.

Occupational health and industrial safety

- Training sessions regarding workers' safety before construction works begin.
- Provision of adequate equipment to workers and demand their use.

Contingency Plan

- Training of personnel to make sure that it has clear and precise instructions in case of contingencies, in order to protect the environment and minimize impacts.
- Suspension of work in case of intense rain or when emergencies occur.

Materials sourcing and management

- Extraction of materials limited to authorized zones.
- Avoidance of material to be accumulated in areas that can obstruct natural draining.

Traffic management

- Sufficient signals and barricades to ensure public safety and the environment.
- Construction traffic only to take place at the assigned areas and to existing roads.
- Information available to the community regarding the timelines for constructions, the interruptions of services and the traffic routes as appropriate.

Air quality and noise control

- Watering of access roads and accumulated materials as necessary to reduce erosion caused by wind and suspended dust.
- Dust and noise walls built as necessary
- Night shifts for construction works avoided as possible.
- Noise associated with the operation of equipment and transport not to exceed 90 db, as possible.

Soil management

- Removal of superficial soil and vegetation only to take place strictly in the designated and necessary areas, minimizing the exposure time of soils.
- Once construction works have concluded, restoration of the site and its conditions to be left as similar as in their original stage: roads will be cleared and re-vegetation promoted.
- Land extraction to take place in such way that it will not cause big leveling in the terrain.

Water management

- Commencement of operations will not impede the flow of water ad will not contribution to flooding or alternations in human or animal movement.

Protection of natural and heritage resources

- No hunting, capturing or harassing of wild animals.
- Fires prohibited.

- Procedures in place in case of archaeological or historical finding takes place during excavation. The company will notify the pertinent authorities and will temporarily interrupt its works. It will protect the findings as good as possible, avoiding access of unauthorized personnel.

Principles of protection of environment in the stage of covering of waste disposition site.

The covering plan must include closing measures for the covering as such and for post-covering. This last phase requires the definition of how the land will be used (for recreational or sports purposes, etc) before the design and constructiop activities begin. The following guidelines must be followed by contractors engaged in closing open dumps:

Perimeter covering with wire fencing

Identification of discharges of hazardous residues and management procedures

Removal of hazardous components identified in the solid waste add disposal according to legislation

Removal of soils affected by hazardous residues or substances and their management and disposal according to legislation

Removal of solid waste disposed in canals and natural draining systems bn site and surroundings

Removal of solid waste from access roads to the open dumps as well as from clandestine dumps and their transport to the selected landfill site.

Removal of plastic and other residues that might be spread both in the area where waste was discharged as well as in other clandestine dumps and access roads.

Compacting of the wastes purposely thrown in the dump to avoid migrations or waste dissemination

Changes in slopes to reach between 5 and 10% to guarantee that when the slope has settled, it won't be greater than 1%

Construction of drainage system and capture of leachates: construction of canals that will capture the liquids and drain them to the pumping areas. The bottom must be waterproofed and the canal's lateral walls and slope must be 3% on the side where the pipes are installed. The value of the flow must be determined on the basis of hydro balances, taking into account the water flows and leachates produced.

Biogas ventilation: construction and distribution of chimneys throughout the area. Biogas may also be treated with collection systems and flaring or may also be used for electricity generation.

Water drainage systems: they run rain water conducting it to the closest reception point, minimizing absorption in the areas that have been filled for waste. They include gutters and drains. The covering of the dump must allow for adequate drainage of the water that falls on it to those perimeter drains to guarantee that rainwater is properly evacuated from the site.

Final coverage: the waste must be covered in three phases, the first with a **0,20** m layer compacted until an adequate density is obtained to avoid rainwater from filtering. The second one will take place immediately after the first one and will be as follows: a low permeability layer of soil will be distributed and compacted with a minimum depth of **0,40** m. The depth of the two layers built on this phase will be of a minimum of **1,00** m in the closest area to the perimeter road and **will** begin to uniformly diminish until it reaches a depth of minimum **0,60** m at a distadce equal to a third of the length between the perimeter road and the top of the **dump.** At that point it will remain stable until reaching the maximum height of each **section.** The third layer will entail the distribution of a vegetable soil layer, with **0,20** minimum height, conveniently distributed and compacted. The area will then be covered with vegetable species that can easily develop in the area and indigenous, as possible.

Vectors control: development of control programs to prevent plagues and control insects and rodents.

Guidelines for post-covering activities

After closing open dumps, post-covering plans must be in place, including:

- Environmental control: a monitoring and tracking plan for all environmental factors must be developed.
- Definition of the use of the site: recreational, forestry, agricultural and commercial.

(Institutional Responsibilities: Landfill operator: PIU (MED), Baku city executive power)
Main principles of monitoring activity on Environmental Management **Plan** (EMP)

The following variables shall be monitored, regardless of the requisites of the Environmental License, and will be included in the EMPs:

Weighting and registry of each of the vehicles that enter the site to dispose of wastes

Annual characterization of solid residues according with technical **specifications** and norms.

Annual control of sanitary installations

Monitoring and control of the compacting system according **with** technical specifications.

Monitoring and control of water quality (including PH, electric **conductivity,** oxygen dissolved, heavy metals, COD, BOD, ammonia and nitrates; water **coming** from drainage systems will also be analyzed).

Monitoring and control of the air quality (including biogas composition, **CH_4, CO_2,** CO, **SO_2, NOx , O_2,** suspended particles and breathable particles)

The Department of Ecology and Natural Resources of Baku sity use a Manual for Monitoring and Follow-up, which includes a series of templates for reporting on the administrative steps, and on the project environmental performance. Every 3 months a follow-up visit is to be conducted by the environmental authority to assess performance. Based on the EIA, the approved environmental license document, and on the periodic Environmental Performance Report, a visit is prepared to complete or appraise the pre-set follow-up templates.
The monitoring standards and guidelines for control of air, water, soil, noise, electromagnetic radiation and vibration based on Azerbaijani and international standards are provided in Annex 2.

Air Quality

The relevant parameters with respect to air quality relate to the emission of particulate matter, gas, odor and noises.

- Gas: in case methane is generated in landfills more than 4 m deep, instrumental monitoring shall be conducted. A weekly review is recommended to prove that biogas does not exceed the explosion range throughout the landfill.
- Odor: monitoring will analyze whether the population perceives any odors and will verify with specific inspection.
- Landfill operation implies noise emissions from vehicle transport and discharge and from operation of heavy equipment. The noise level will need to be monitored to ensure it is within the limit established.

Water quality

Periodic monitoring of water quality both superficial and underground is required. Indicators include:

- Environmental indicators such as pH, biochemical oxygen demand, nitrates, chlorides, sulfates, fecal levels, conductivity, among others to control pollution of underground and superficial water.
- Leachate indicators: hardness as CaCO3, total alkalinity such as CaCO3, total suspended solids, specific conductivity, pH, total organic carbon, biochemical oxygen demand.
- Common anions and cations: Calcium, Manganese, Sulfate, Magnesium, Ammonia, Chloride, Sodium, Carbonate, Potassium, Bicarbonate, Selenium, Iron.
- Metals: Antimony, Chrome, Selenium, Arsenic, Cobalt, Silver, Copper, Thallium, Beryllium, Nickel, Mercury, Cadmium, Zinc, Lead.

These parameters should be monitored every three months in wells to be identified and agreed with the competent authority. Monitoring will be analyzed by a specialized water analysis laboratory which should be dully authorized. Environmental monitoring should include measurements and impact control. Superficial and underground water analyses should be conducted according to the standards existing in Azerbaijan. (Annex-2).

Implementation and Management

During the project implementation period project management potential will be formed in the Ministry of Economic Development .

The control over implementation of EMP will be effected by MED on a regular basis and by WB during WB missions.

Environmental licensing and EMP developement and implementation generally involves technical interdisciplinary aspects including atmospheric, fauna and flora, geologic, hydrologic, economic, social, cultural and archaeological variables. Monitoring of such variables requires institutional arrangements that include the establishment of a targeted team and the use of specific equipment in order to ensure adequate assessment and control. Landfill operators contract third party monitoring with environmental control companies who possess the equipment and qualified personnel.

Visits from the environmental authorities and timely reports are also necessary and must be prioritized according to:

(i) relevance of environmental impacts as established by the project's conditions and characteristics;

(ii) environmental sensitivity level of the project's site;

(iii) presence or frequency of community complaints or any complaints received from public or private entities (collected by the environmental authority); and,

(iv) type of environmental impacts that might take place of that have occurred as a result of inadequate implementation or unexpected negative impacts.

The assessment proves that the designed project is feasible on ecological $actors and effective on social and economical considerations.

1. INITIAL INFORMATION

INTRODUCTION.

Waste management in compliance with modem standards is a new area in Azerbaijan as in other countries of the region. At present Azerbaijan is at the stage of introduction of modern standards of waste management.

There are no landfills compliant with modem sanitary and environmental standards and norms in the cities. They are unorganised and uncontrolled. Prevention of discharge of waste water and filtrates, collection and use of landfill gasses, drainage and protective dams, including regular covering of wastes and other measures are not implemented properly.

Level of wastes (domestic) collection in Baku city is relatively satisfactory. Most of the urban wastes is disposed to the allocated dumps (open places).

At present 90% of wastes collected from Baku (1.9 mln. Population) is disposed to Balakhani landfill.

The purpose of the EIA document presented for the project on "Integrated solid waste management system for the Absheron peninsula" is to assist environmental reliability and durability of projects financed by the World Bank and provide appropriate reqdirements of project proposals to the legislation of Azerbaijan Republic.

In the EIA report conseptual environmental assessment has been carried but for the proposed project, measures on prevention, minimizing or mitigation of possible negative impacts, including appropriate monitoring have been specified.

Environmental Management Plan (mitigation of impacts, monitoring plan and management) included in IEA will provide environmental management opinions for activities to be financied within the "Integrated solid waste management system for the Absheron peninsula Project" .

1.1. WASTE MANAGEMENT IN AZERBAIJAN

There is no sufficient data about collection, disposal of and treatment of urban wastes (domestic) in Azerbaijan. Inventory and analysis of wastes have not been carried out properly up to date. There are some existing data on the quantity of urban wastes that also needs clarification. (Table 1.1).

Current operations on collection, transportation and disposal of (treatment) wastes do not meet environmental, safety and health requirements. Some of the wastes (paper, steel, tissue, bread, plastic, glass) is sorted out by workers at collection and transportation stages. These components of waste are sorted out at landfill sites by the local people.

Collection level of wastes (domestic) is relatively fair in Baku. At present most of urban wastes is transported to the determined areas (open areas). Volume of urban waste in Baku varies depending on the on season. Volume of waste collected in summer is 48% higher than in winter time.

According to the results of the surveys carried out in Baku in 2000 volume of wastes collected in Baku consists of combustible (80.8 %) and non-combustible (19.2 %) components. Industrial waste makes up 13 % of the whole city wastes and becomes more in summer time. Most of non-dangerous and treated industrial wastes, as well as various wastes of small enterprises are also mixed into urban wastes.

Table 1.1: Quantity of wastes discharged from the main cities in 2002

City	Quantity of population	Quantity of discharged urban wastes. ton/year	Quantity if waste per person. ton/year
Baku	1,818,000	641,435	0.352
Ganja	301,000	120,450	0.400
Sumgaıt	288,000	166,667	0.578
Mingechaur	95,000	20,888	0.219
Ali Bayramli	71,000	10,791	0.151

Note: data is calculated as 3 m^3 = 1 ton ratio
Source: Information of the Ministry of Ecology and Natural Resources, 2003.

1.2. WASTE MANAGEMENT IN BAKU CITY

Housing and Communal Services Department of the Executive Power of Baku City is an institutional deparment responsible for collection, transportation and disposal of waste. Some Departments of Baku Executive Power and private companies like Up Azerbaijan, Kasko and others are involved in collection, transportation and disposal of wastes. There are 2450 waste collection points in the city. Special containers are used, for waste collection. Special trucks with compression equipment and sometimes trucks provided with special devices are used for transportation of waste to dumps. Waste is not sorted.

Disposal of wastes. There are four suburban dumps in Baku area for waste disposal with relatively better conditions (Table 1.2). Surakhani dump is not operational at present.

Only Balakhani landfill is being operated after all appropriate permit and approval of the Ministry of Ecology and Natural Resources were obtained. Other dumps are operated only after the land allocation by an Executive Power of a region.

Table 1.2: Disposal of wastes in Baku city

Dumps	Years	General area, ha	Used area, ha	Percent of the general area	Quantity of disposed waste m^3/year

Balakhani	1963	200.0	27.0	13.5	2200.0
Azizbeyov	1980	5.0	1.8	35.0	70,0
Surakhani	1994	2.5	0.4	15.0	-
Garadagh	1994	25.0	3.0	12.0	60.0

Furthermore, there are a lot of unofficial dumps covering the area of a nearly 200-250 hectares in suburban areas of Balakhani.

Quantity of wastes collected and disposed from Baku areas estimated at 2400 thousand m^3 in 2007. Approximately 10-13 % of these wastes were construction and renovation debris. 1330 thousand m^3 of waste was disposed to registered dumps while 70 thousand m^3 of waste was disposed to unregistered dumps. (Picture1.1)

There are no dumps meeting modem sanitary standards and norms in the cities. They are unorganized and uncontrolled. These areas are neither fenced, nor controlled. Wastes are not packed and covered with soil after unloading. Wastes are not cycled and incinerated in special equipment; wastes on the disposal areas are simply burnt in the open air. This results in spread of smoke containing combustible gasses and hazardous substances to wider areas. Consequently, contamination of environment with permanent organic pollutants (dioxides, benzpyrene and others) takes place, including harmful substances discharged into the air.

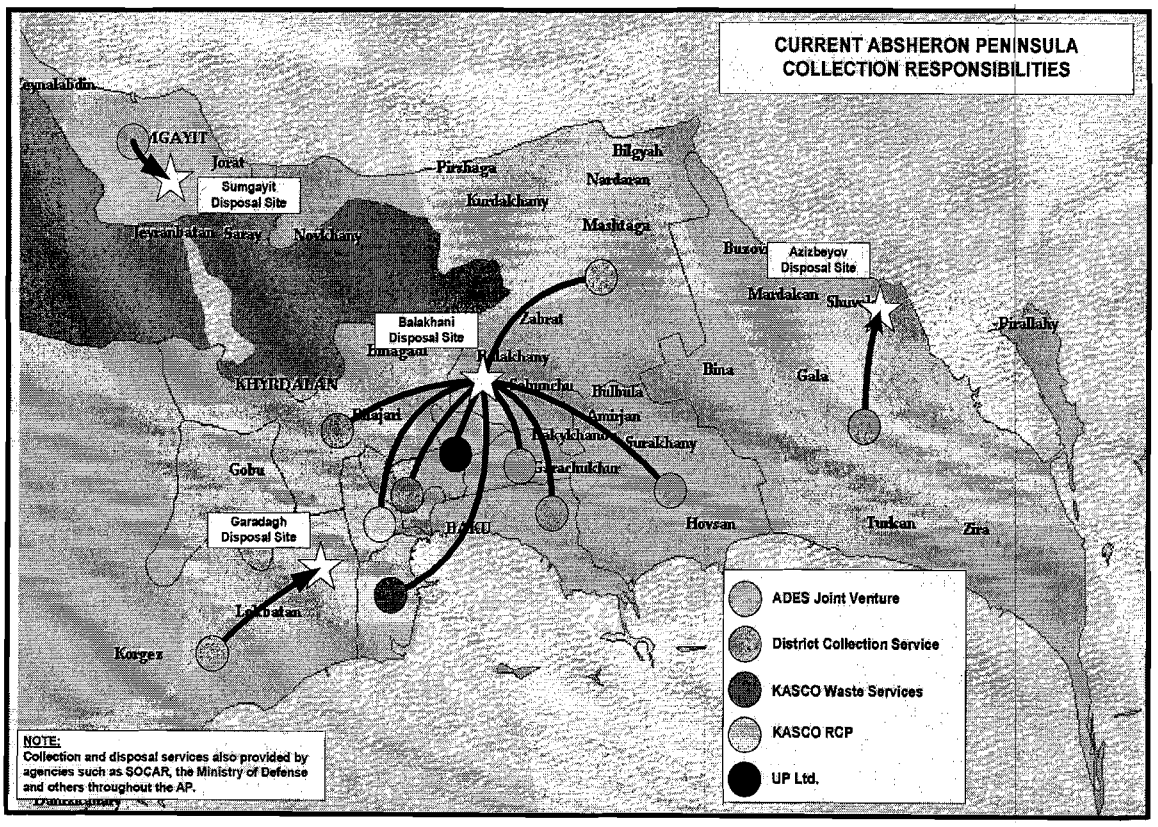


Figure 1.1 Collection of wastes and their transportation to the landfill on Apsheron peninsula.

Bottom of the dumps is not provided with protective layers to ensure isolation of hazardous substance from leaking into ground waters. In addition, no measures are taken to collect and treat surface waters in these areas. Surface water might contaminate ground water. No research and analysis are carried out around the dumps.

1.2.1. BALAKHANI LANDFILL.

Balakhani landfill is the main area for disposal of most of the urban wastes. Approximately 2000-2400 thousands m^3 of urban waste is transported to this area.

The landfill is on the balance of Housing and Communal Department of BCEP. Functioning since 1963, the landfill is located on north-easten shore of Boyuk Shore lake of Sabunchi district of Baku city, 15 km away from Baku. Total area is 200 hectares, but the active part is 27 hectares. Total volume of waste stockpiled in the landfill is nearly 55-60 mln kubic meters.

Remainders of Balakhani experimental facility on processing of domestic wastes are in north-western part of Balakhani landfill, built in 1980. This facility with its previous production capacity of 400000 $m^3$1year (180 thousand ton/year) had been producing compost through technical processing.

Buyers of compost were formers kolkhoz and sovkhoz, forestry and greenery planting enterprises throughout the country. According to historical data the facility had been pocessing only 25 % of the stockpiled wastes. The facility has been producing 41 thousand tons of compost from 1991 to 1995.

Products of the factory have not been sold for a long period of time as the wastes were not sorted out from stone, ceramic, glass and biologically indecomposable components mixed with wastes and the city administration had to close the facility in 1996.

A number of individuals, sorting out steel, plastic and glass components from the wastes can be observed on the way to the landfill access road.

General information of the project area:

- There is a metal booth at the entrance provided with mobile phone which registers trucks delivering wastes;
- The number of staff is 5;
- Two bulldozers are used for moving of wastes;
- Wastes are sorted (glass, plastic, steel) and carted away by the local people;
- There is no lighting in the night;
- The power supply line is of low voltage;
- Content of wastes located in the area is mixed;
- A small part of wastes is covered with a soil;
- The landfill is running out of waste storage area;
- No drinking water supply;
- Internal roads are in a poor state;
- There are a lot of oil contaminated places and pools;
- The nearest residential area is located in a 2.7-3 km distance;
- The area is not fenced (not protected);

No covering of waste with a clay is carried out to prevent spreading of odors and dust to the adjacent areas;

- No drainage system available in the area;
- Boyuk Shor lake is located on the south-west, near the landfill;
- A dangerous hillside area stretches alongside the Boyuk Shor lake;
- No study has been carried out in relation to heavy metals contained in wastes, dangerous mixtures, availability of radioactive wastes, level of ground water, natural screening factors of soil, filtrates, etc.
- No system for collection and treatment of filtrates and waste water.
- Waste water and filtrates flow into Boyuk Shor lake and adjacent areas.
- No system is installed for collection and treatment of gasses discharged from decomposition of wastes available in the landfill. These gasses and wastes burn during the whole year.
- Smoke and odors spread towards the city as the landfill is located in the northern part of the city.
- The surrounding landscape along 1-1.5 km distance is contaminated with wastes.

1.3 PROJECT

Waste management is considered in Azerbaijan an environmental management priority same as in other developed countries. Currently implementation of Absheron Rehabilitation Program is envisaged. One of the projects included in this program is Integrated solid waste management system for the Absheron peninsula project, proposed and financed by the World Bank (first draft of Project Evaluation Document). The project cosnsist of 5 components:

Component A: Balakhani Landfill upgrade and management ($11.4 million)

Component B: Closure and management of other dumps ($6.4 million)

Component C: Urgent procueremnet of waste collection equipment for 5 other Baku districts ($21.1 million)

Component D: Institutional reforms, capacity building and project management ($6.5 million).

Component E: Investigatrions nad preparation of phase 2 ($2 million).

The main purpose of this project is improvement of waste collection mdthods and their placements at Balakhany landfill.

Component A. The proposed investment is aimed at upgrading operations at the current site and commencing the closure of inactive areas so as to mitigate potential environmental effects. This component will finance the equipment (weighbridges, bulldozers, etc) and civil works (fencing, waste coverage, drainage control, internal roads, etc.) to improve the effectiveness of the site's use while other solid waste management options are being developed.

Component B. In addition to Balakhani, there are two other formal and a number of informal dumps in the Greater Baku area. This component of the project will finance closure and cleanup of the informal dumps and improved management of the formal ones

Component C. This component will help to increase waste collection servicequality and availability throughout the region including those areas that do not have effective collection at present.

Component D. This component will finance institutional reform, training, development of the legal framework, tariff and tariff collection reforms, accounting and data systems, as well as the analytical work and implementation plan for the institutional transitibn.

Component E. This component will finance the feasibility studies and environmental impact assessments needed for development of a new landfill and the introduction of transfer stations to maintain effectiveness of the enhanced collection system. Long term solid waste management needs will be defined through these studies.

The purpose of the proposed project is covering and use of Balakhani landfill, by providing environmental, health and safety measures (collection and treatment of waste water and filtrates, collection and use of landfill gasses, for example, generation of electricity, fencing of tha landfill, including development of necessary infrastructure, etc).

In the EIA report conseptual environmental assessment has been carried out for the proposed project, measures on prevention, minimizing or mitigation of possible negative impacts (including respective monitoring), including appropriate monitoring have been specified.

1.4. PROJECT REGION

Balakhani landfill is located at the cross-section of Binagadi and Sabunchi regions of Baku city, in the territory of Sabunchi residential district.

The landfill is located in north-eastern part of Boyuk Shor lake, 15 km from the city (See Picture 1.1). Total area is 200 hectares, but active part is 27 hectares.

Remainders of Balakhani experimental facility on processing of domestic wastes are located in north-eastern part of Balakhani landfill, built in 1980.

A highway, pipelines (Baku-Novorossiysk oil and gas pipelines) and high voltage power lines from the North Power Station pass through this area.

There are a lot of operating oil wells owned by Balakhani Oil/Gas Producing Unit and Binagadiyol JV, directly on the area and around it.

1.5. EIA REQUIREMENTS

EIA report has been prepared in compliance with the law of Azerbaijan Rpublic on "Environmental Protection" (1999), By-law on EIA process in Azerbaijan (1996) and requirements of WB Environmental Assessment policy (OP 4.01). In addition, EIA report has taken into consideration the existing legislation on waste management and quality standards of AR on environmental components (air, water, soil) that are potential impact sources of the project acivities.

1.6. ANALYSIS OF THE PROJECT ALTERNATIVES

Balakhani landfill, including ecological and and social problems around it becessitates review of 2 alternatives within this report: i. Covering of the landfill; ii. Operation of the landfill in its current condition.
Review of these alternatives would be more logical after an option of these alternatives and decision to be made for covering of the landfill. Once the decision on the landfill covering is made, other alternative solutions, covering variants and technical solutions will be reviewed during preparation of environmental impact assessment document. Covering of the landfill or, for instance, less likely alternative options such as disposal of wastes to a new landfill, collection and utilization of landfill gas and other options will be reviewed.

Alternative 1. "No project" option and maintaining of the existing condition.

"No project" option is not desirable neither economically, nor ecologically and socially, considering costs of a "no project". This alternative actually requires much more costs though it seems to be economically sound. Keeping of the existing conditions of the landfill will result in regular harmfull impacts on the natural resources (soil, water, flora, fauna) and human health, that also requires huge costs for mitigation of these aspects and management of the landfill in its current conditions.

Keeping the landfill with its current conditions and regular inceneration of 'wastes will cause smoke, odours, various organic and inorganic hazardous wastes and more hazardous Permanent Organic Pollutants (POPs) (this is unavoidable process as to methane gas emitted from wastes) to a greater area, including spreading of insects and gnawing animals to the area as a results of existing landfill condition and great risks to environment and human health. As an important factor, it should be considered that the landfill is located on the northern part of Baku city and prevailing norhern winds carry harmful gasses and odours to the residential areas of the population.

Surface water with containing hazardous substances, collected from the landfill and filtrates affect Boyuk Shor lake with its sorrounding housing and industrial facilities.

Keeping current condition of the landfill will also cause a big problem for execution of the plan for "Use of Boyuk Shor lake for rehabilitation and recreation", included in the water complex plan of Azerbaijan Republic on "Improvement of Ecological situation in 2006-2010" and bring to great social and economic losses.

Actually, it is impossible to provide environmental standards at the landfill and adjacent areas at the moment.

Alternative 2. Covering of the Balakhani landfill

Covering of the landfill, collection and utilization (generation of electricity) of a methane gas from decomposition of landfill wastes (organic substances) will have positive effects for environment and human health.

- Initial calculations prove that negative effects to environment and human health caused by regular discharge of gasses (methane, carbon dioxide etc.) from 55-60 million mubic meters of waste available at the landfill site and harmful substances would be significantly reduced:
  - ✓ Collection and use of methane gas as a fuel will create a new source of income.
  - ✓ Collection and use of methane gas as a fuel will enable Azerbaijan to participate in projects for collection and use of methane gas with Global Warming Potential (GMP) of 21 which is one of the gasses with Heating Effect in atmosphere and bring new technologies to Azerbaijan as it has ratified UN Framework Convention on Climate Changes and Kyoto Ptotocol and has a right to participate in Clean Development Mechanizm of Kyoto Protocol.
- Treatment of surface water containing harmful substances and filtrates collected from the landfill site and prevention of uncontrlolled flow into the surrounding areas and water bodies (pools, ground waters) will lead to the reduction of impacts to environment and human health.
- Regular reduction of contamination of the landfill area will create pastures for domestic animals around landfill area, increase of farming products and reduction of feed for insects and gnawing animals and reduction of human health impacts as a result of these measures.
- Stabilization of ecological condition of the landfill surrounding areas will result in the increase of land prices around the adjacent areas.

Thus, ecological, economical and social efficiency of the proposed project is higher in comparison with a "no project" alternative.

2. ENVIRONMENTAL ASSESSMENT POLICY

2.1. WB SAFEGUARD POLICY

World Bank requires environmental analysis (EA) of the projects proposed fof financing by the Bank to assist provision of environmental reliability and durability of these projects and make a fair decision. (OP 4.01. Yanuary, 1999).

Environmental assessment is such a process that it's scope, soundness and type of analysis depend on potential environmental impact, nature and framework of the proposed project.

EA – evaluates potential environmental risks of a project and it's impact areas; reviews alternatives for the project; determines the ways of improving a project option, location, planning, design and implementation by minimizing, preventing and compensating harmful effects and strengthening positive measures throughout the project. Where possible, the Bank prefers preventive actions, rather than mitigating or compensating measures.

EA – assumes natural environment; human health and safety; social aspects *{involuntary resettlement, indigenous population and cultural heritage);* transbounary and global environmental aspects. It will also include changes within the project and country; results of environmental studies on the country; plans of local environmental measures; general political framework of the country; local legislation; institutional structures in respect of environmental and social aspects; as well as responsibilities of the country for the project activities in compliance with appropriate international contracts and agreements1

World Bank is not financing any project activities (EA) that contradict the country's legislation and obligations.

EA process will include the following key issues:

- Initial general review to determine appropriate environmental assessment;
- Compliance with existing environmental standards applicable in Azerbaijan;
- Interrelationship with social assessment;
- Analysis of alternative options;
- Public participation and consultation with communities and enterprises tb be affected by the project;
- Publication of information

2.2. APPLICATION OF WB SAFEGUARD POLICY RULES TO THIS PROJECT

Prior to constructing incinerator, operation and covering of Balakhani landfill relate to environmental type of projects. Execution of the project will lead to reduction of current negative environmental impacts caused by Balakhani lanfill which are a great environmental hazard and it is expected that the project design will be invirpnmentally friendly as seen from the results of EA carried out within the framework of EIA.,
It will be possible to prevent or mitigate negative effects of the project throughpreventive and mitigating measures (Section 5). However, it is expected that execution of the project may have some environmental and social impacts. It is also expected that there will be some environmental impacts from the execution of works on the existiqg landfill, operations required for the landfill covering (dams, collection/treatment of waste water, collection/treatment of landfill gas, etc), and other activities under the project until the new

incenerator is constructed. These negative effects require application of the World Bank Environmental Assessment (OP 4.01, BP 4.01) policy.

Table 2.1 Safeguard Policies

Environmental Assessment (OP/BP/GP 4.01)
Natural Habitats (OPIBP 4.04)
Pest Control (OP 4.09)
Cultural Heritage (OPN 11.03, being revised as OP 4.11)
Involuntary Resettlement (OP/BP 4.12)
Indigenous Peoples (OD 4.20, being revised as OP 4.10)
Forests (OPIBP 4.36)
Safety of Dams (OPIBP 4.37)
Projects in Disputed Areas (OPIBPIGP 7.60)
Projects on International Waterways (OP/BP/GP 7.50)

Possibility of application of WB safeguard policy rules (Table 2.1) during preparation of EA has been assessed. The followings are the results of EA on application of the this policy in EIA:

- **Environmental Assessment (OP[1] 4.01, BP[2] 4.01, GP[3] 4.01)**

  There will be some environmental and social impacts from the improvement works of the existing system for providing activity of the landfill, operations in connection with landfill covering (dams, collection/treatment of waste water, collection/treatment of landfill gas, etc).This requires a necessary application of WB Environmental Assessment (OP' 4.01, BP[2] 4.0~1)policy to the proposed project.

- **Unforeseen resettlement. (OP 4.12, BP 4.12).**

  This operational policy of the Bank, assumes to avoide or minimise an involuntary resettlement and wherever not feasible to avoid it, execute resettlement activities within a sustainable development program to enable the displaced persons to share project benefits. The policy also aims at

[1] Operations Policy (OP) –are short and collected statements of World Bank Agreement Clauses, general conditions and management. OP determines parameters of opetations.
[2] Bank Procedures (BPs) explain how to implement the policy determined in OP by the Bank personnel. They also explain the procedure and documentation that provide succession and quality of Bank operation.

assisting the displaced persons to improve their welfare and living standards or at least to rehabilitate their life to better levels, prior to project implementation.

*EA has determined that there is no need for application of resettlement policy (OP **4.12, BP 4.12)** envsaged in the initial proposed project.* It is expected that the project activities will take place on the existing landfill area only. The project does not include any resettlement of the indigenous people and no property and housing will be removed. It is expected that disturbances to be created during the project works would be temporary, short-term and have a low level of impact.
This policy can be applied as a warning message.

The Involuntary Resettlement Policy should be activated in a precautionary manner. When the Involuntary Resettlement Policy (OP-4.12 is activated, open dumps are closed and the familises benefited from a recycling activity apprear jobless. The national regulations prohibit recycling activities and workers in the dumping areas of the new landfills. It was therefore agreed that the Involuntary Resettlement Policy Framework would be developed as an instrument to enable the pertinent entities to address these problems, subject to the Bank's directives.

- **Cultural Heritage Protection (OPN 11.03)**

  Project activity will be carried out on the existing landfill area that has already been used for a long period. *Taking into account the views of the project personnel there is no cultural heritage units and archaeological monuments on the project areas (Section3).*
  Therefore, principles of Cultural Heritage Protection (OPN 11.03) will not be applied during EA process. In compliance with Environmental Assessment (OP 4.01) principles and EMP plan (Section 4) an action will be taken, if any property is regarded or realized as a cultural-heritage unit..

- **Other Safeguard Policy**

  EA has also proved that there is no need to apply other WB policy for the following reasons. Mitigation and avoidance of the impacts assumed in that safeguard policy will be included in the EMP plan as to an appropriate environmental category of the project.

- **Pest Control (OP** 4.09, BP 4.09).

There is no need to include neither pest control, nor it's means in this project. EA proves that there is no ground to apply a pest control policy **(OP 4.09, BP 4.09)** in EA process of this project.

- **Projects on International Waterways (OP 7.50, BP 7.50)**

  As implementation of this project excludes any impact on International waterway projects, there is no need to apply this safeguard policy (OP 7.50, BP 7.50) to EIA in compliance with section 7 of WB OP.

- **Safety of Dams (OP 4.37, BP 4.37).** As this project does not include construction of any dam, there is no need to include this safeguard policy that comprises safety and regulation of dams in the EIA.
- **Forests (OP 4.36, BP 4.36).** The project does not include any forest or forestry area.
- **Natural Habitats. (OP 4.04, BP 4.04)** The project does not include removal of any natural habitats or impact to any sensitive area.
- **Indigenous People. (OP 4.2).** This project does not include any people, ethnic minority or tribe, therefore, this policy of the bank will not be applied.
- **Projects in Disputed Areas. (OP 7.60, BP 7.60)** This project will not be implemented in a place where application of this policy is required.

2.3 Means of Environmental Assessment

In compliance with bank's social environment policy environmental assessment procedure of the project is carried out. All project activities will be reviewed as potential sources of impacts to social environment and a certain assessment of social environmental will be required.

Potential environmental impacts of the project are being assessed, alongside with preparation of an EIA document.

2.4. Environmental legislation and procedues of Azerbaijan

"Environmental Protection Law" (1999) is the main framework Law for protection of environment and regulation of management and efficient use of natural resources. This law determines main principles of environmental protection, rights and responsibilites of state, public orqanizations and citizens in connection with this law. This law also determines preparation of environmental assessments, environmental quality stardards, requirements of licences concerning activities with environmental impacts, prevention and reduction of environmental pollution, environmental monitoring and control, including role of public and sanctions for breaking the law.

A series of laws related to sanitary-and-epidemiologic welfare, land reform, energy, health, water, forests, cadastre and land use, industrial and household wastes, water supply and sewerage, protection of air, including other laws regulating specially protected areas have been passed starting from 1992.

Water Code (1997), Land Code (1999), Forest Code (1997), Bowels of the Earth (1998), Plant Protection (1996), Fauna (1999), Obligatory Environmental Insuarance (2002), Radioactive Wastes (1994), Industrial and Domestic Wastes (1998), Radiation safety of Population (1997), Sanitary-and-epidemiologic Safety (1992), State Land Cadastre, Land Monitoring and Land Structure (1998), Pesticides, Agricultural and Chemical Substances (1997), Protection of Fertility of Land (1999). Especially Preserved Natural Areas and Objects (2000) etc.

In addition, a series of (over 75) decrees of the Cabinet of Ministers of AR and decrees and orders of the President of Azerbaijan Republic have been signed to support the environmental legislation.
Criminal legislation and administartice code of Azerbaijan Republic also include a range of measures concerning environmental protection and efficient use of nature.

2.4.1 International cooperation

International agreements and conventions, to which Azerbaiajn is a party, also constitute an integral part of legislation system. Azerbaijan has signed and confirmed 15 conventions in connection with environment.
The following conventions directly relate to this project:

- UN Framework Convertion on Climate Changes. (New York, 1992), ratified in 1995. (impact: *landfill gas-methane causing climate changes)*

- Stokholm Convention on permanent organic pollutants (2001) ratifidd in 2003. (impact: *organic pollutants from incineration)*

Some paragraphs or clauses available in Azerbaijan laws stipulate application of international documents, if international agreements contain other rules in comparison with existing rules of Azerbaijan.

2.4.2 Waste management. legal framework

Waste management is a relatively new phenomenon in the legislation and administative matters of Azerbaijan like in most of other countries of the region. At present waste management is one of the government priorities.

These are legal-standard documents on regulating waste (including hazardous wastes) management:

- *"Industrial and Domestic Wastes Law"* of Azerbaijan Republic (30 June, 1998, N 514 – IQ).
- *"Environmental Protection Law"* of Azerbaijan Republic (08 June, 1999, N 678-Q)
- *"State strategy ofhazardous waste management"* gecree of the cabinet of Ministers of AR (21 August, 2004)
- *«Law on Municipalities))*of Azerbaijan Republic (30 November,1999)
- *((EnvironmentalSafety Law»* of Azerbaijan Republic (8 June, 1999, N 687QG).
- *"Paymentsfor use of natural resources, environmental pollutants and use of those payments ",* decree of the Cabinet of Ministers of AR (03 March 1992, N 122), together with amendments made to the decree No 216, dated from 1993, on payments for environmental pollution.
- *"Release ofspecial licencesfor recycling and* disposal *of industrial waste",* decree of the Cabinet of Ministers of AR (6 December, 2000, N217).
- *"Licencing rules for recycling equipment of hazardous waste ",* decree of the Cabinet of Ministers of AR (29 June, 1999, N112).

- *((Transportationrules for disposal of hazardous waste",* decree of the Cabinet of Ministers of AR (27 Yanuary 2000, N10).
- *"Certification rules of hazardous wastei"*, gecree of the Cabinet of Ministers of AR (31 March, 2003, N 41)
- *"Instructions on inventory rules and classification system of industrial and utility wastes"*, the Ministry of Justice (01 July, 2003, Certificate N 419).

The Law of Azerbaijan Republic on "Industrial and utility waste" (1998) is a framework law. This Law includes provision of environmental protection of industrial and utility wastes (hereinafter - wastes), reduction of their hazardous impacts, provision of ecological balance; determines state policy for using of waste as a raw material, as well as regulates relationship in connection with wastes, except hazardous gasses, sewage and radioactive wastes.

This document relates to both intustrial and municipality wastes (hazardous). But more attention here is paid to industrial wastes. Principles of state policy on waste management has been determined within the limits of this law. But this law needs improvement for modern level of waste management.

Most of the standards, documents and rules *set out in Clause 5 of the law* (responsibilities of state governing bodies on regulation of relationship in connection with waste) necessary for implementation have not yet come into the force.

Clause 9 and 10 of the law set out **requirements for recycling provisions of waste and recycling areas of waste:**

- It is important for environmental protection to ensure maintainidg of waste storage and treatment areas is a safe condition.
- Treatment areas should be provided with boundary-marks and controlled entries, ensuring full environmental safety of technological sites. It should be forbidden to place and recycle wastes in the areas that are not intended for that purpose.

Clause 11 of the law specifies requirements for waste disposal. The folowing parts of the law relates to this project:

- It is forbidden to dispose of waste in the areas such as cities and other residential areas, health resorts, forests and recreation zones, near the drinking water sources, near water reservoirs as well as in the areas of minerals and mining.
- It is necessary to carry out special surveys (geological survey, hydrological study, etc) when selecting areas for waste disposal of and waste neutralization. While selecting waste disposal and waste neutralization areas, it is recommended to carry out special surveys, with consent of relevant state authorities.
- Owners of waste disposal and waste neutralization sites or areas should carry out necessary rehabilitation works after completing operation on such sites or areas.

Decree of the President of Azerbaijan Republic No.609, dated from 31 July 2007 on the application of the law about "Amendments and Alterations to the law of Azerbaijan Republic on industrial and domestic wastes" requires harmonization of all normative legal acts of the Cabinet of Ministers of Azerbaijan Republic and relevant central executive powers with this law. There are some ongoing acivities in this respect.

"Requirements for medical wastes management" has been confirmed by the Decree No 213 of the Cabinet of Ministers of Azerbaijan, dated from 28 December, 2007.

Clause 47 (Environmental protection from industrial and domestic wastes) of the framework Law of Azerbaijan Republic of "Environmental Protection" (08 June 1999, N 678-Q) stipulates that collection, disposal of and elimination of industrial and domestic wastes should be carried out in such areas agreed with appropriate executive powers and municipal bodies.

The project of "Technical assistance for establishing hazardous waste management system" implemented in Azerbaijan in 2000-2002 within the framework of Urgent Environmental Investments Project includes proposals prepared for strategic assessment of existing hazardous waste management, preparation of hazardous waste management strategy of Azerbaijan, compliance with International Conventions, classification of wastes, regulation of hazardous waste management and economic incentive, management of facilities (landfill, equipment) for hazardous wastes, including strengthening of potential capabilities.

The document on "State strategy on hazardous waste management in Azerbaijan", confirmed by Cabinet of Ministers in 2004, plays a role of activity plan to obtain necessary results, alongside with determining future reviews of these matters. The strategy indicates mechanism of hazardous waste management by efficient use of natural recourses and provides a necessary access for each waste producer to this procedure.

For the purpose of applying modern management system of hazardous wastes, the documents on "Certification rules of hazardous wastes", "Guidelines for inventory rules and classification system of industrial and utility wastes" came into force in 2003-2004.

2.4.3. Construction standarts and legal acts

Engineering surveys, design and construction standards and rules in Azerbaijan are regulated by the State Committee for Construction and Architecture. Rules of Control measures by the State Committee for Construction and Architecture of Azerbaijan Republic (some safety measures by recently established Ministry of Emergency Situations) have been confirmed by the Cabinet of Ministers in 2003. All construction operations, where rules of State Construction and Architecture Committee are applicable, should be carried out, subject to requirements of environmental protection. In compliance with existing construction standards, all constructionlrepair works can be carried out only on the basis of authorized design documents. State Committee for Construction and Architecture issues special licenses for engineering surveys and design.

Project documents include description of proposed projects or related works as well as geological surveys on soil quality, fire safety, public health, utility (gas, water, power and communications) and applications to government offices for permits in connection with environmental assessment. Respective state bodies are allowed to carry out inspections to ensure maintenance of licenses and impose reasonable fines in case of infringement.

2.4.4 Economic mechanism of environmental protection management

The main economic mechanism of environmental protection is the principle of charged use of natural resources in accordance with the Law on environmental protection. The law specifies that environmental safety and efficient use of natural resources, including increasing of incentives to prepare, design and implement measures for rehabilitation and increase of natural resources are the main economic principles of environmental protection and regulation of using nature. Decree No. 122 dated from 3 March, 1992 of the Cabinet of Ministers of AR on *"Application of Payments for Naural Resources and payments for environmental pollutants and use ofsoursces thereof"* is the main document specifying economic mechanism of using natural resources, payments for environmental pollution and withdrawals from payments and use of the sources obtained form such payments. Main principles of payment for using nature is determined on the basis of these Rules.

Normative payments for natural resources and disposal of wastes (emission, discharge, effluent, disposal of solid wastes) are compensations for economic impact to the environment and are charged from the users of nature (enterprises, legal entities and natural persons) on the basis of established rates. Payment for environmental pollution is determined on an appropriate ecological efficiency of an area. Additionally, accidental discharge payment is charged tenfold. During accidents Activity of an enterprise that uses nature can be suspended or limited in case of accidental discharge, in connection with breaking of rules. Design, construction, reconstruction or operation of environmentally harmful activity can also be suspended. This decision can be made by the Ministry of Ecology and Natural Resources, Ministry of Emergency Situations or Ministry of Health (State sanitary and epidemiological control department).

2.4.5 Standards & rules

Sanitary-hygienic norms - Permissible Concentration limits (PCL) are applied to determine environmental quality, assessment and control of human health effects. PCLs are different depending on working places as well as recreation areas.

PCLs do not determine environmental impact objects (sources of impacts) and do not regulate their acivity. Permissible Emission Level (PEL) and Admissible leakage level {ALL) norms (Annex 2) , Ecological monitoring standards) are used to regulate quantity of emissions from enterprisese, determine emission limits and get these limits agreed with authorised bodies.

As rainwater and waste water discharged from Balakhani landfill (mostly treated on the treatment plant, filtrates to be dischaged) is designed to flow into Boyuk Shor 'lake, resort water requirements should be taken into account while calculating ALL .

There are requirements for soil contamination, noise, vibration and electromagnetic radiation as specified in the law. These requirements (standards) are given in Annex 2.

The following principle is the basis of implementation of ecological standards: the content of any compounds emitted by the enterpirses located in the region in soil and air should be in compliance with requirements of sanitary-hygienic standards.

The list of standards and norms applied in Azerbaijan is given below, taking into consideration environmental impacts of Balakhani landfill and monitoring of these impacts in compliance with EIA plan:

- "Rules of protection of surface water from comtarninating with waste water". State Committee for Egology and Control of Using Nature. Baku, 1994
- Decree No.216 of the Cabinet of Ministers of AR, 22 September, 1998 on "Rules of using water bodies for recreation and sports purposes",.
- Decree No.112 of the Cabinet of Ministers of AR, 13 July, 2002 on "State registration rules on atmospheric emissions of harmful substances and coercion to atmosphere".
- Decree No.63 of the Cabinet of Ministers of AR, 15 April, 2002 on "Inventory rules on sources of dangersous substances emitted into atmosphere and coercion to atmosphere".
- Decree No.63 of the Cabinet of Ministers of AR, 15 April, 2002 on "Rules of implementation of atmospheric air protection by the legal entities with sources of harmful chemical, biological and coercion impact".
- Development of a project by enterprises on Permissible Discharge Limits and recommendation on its content. State Committee for Egology. 1994
- "Guidelines of inventory rules and classification system of industrial and utility wastes", Ministry of Justice (01 July, 2003, Certificate No 419).
- GOST 17.2.1.03-84. Protection of Nature, Atmosphere. Terms and Definition of Contamination control. M. 1984
- GOST 3223-85 "Sanitary standards of permissible noise levels at working areas", M.1985
- OND-86 State Hydrometeorology Committee. Methods of calculating concentrations of a substance in atmospheric air contained in wastes from enterprises. Edition of Hydrometeorology. 1987.
- GOST 17.2.3.01-86. Atmosphere. Air quality control rules in residential areas. 1986
- RD 52.04.52-85. Treatment of waste in an unsuitable meteorologic conditions. L.: Edition of Hydrometeorology. 1987.
- GOST 17.2.3.02-78. Protection of Nature. Atmosphere. Rules of determination of permissible wastes of harmful substances by industrial enterprises. M.1978
- GOST 12.1.005-88. Labor safety standards system. General sanitary-hygienic requirements for a working place. M. 1988
- Guidelines for standardization of harmful substances emitted into air and atmosphere. State Committee for Nature, USSR. M. 1989
- Normative documents of nature preservation and efficient use of natural resources. State Committee for Ecology. 1994

GOST 17.0.0.01-76. Standards of environmental protection and nature preservation.
GOST 17.4.3.06-86. Environmental protection. Lands. General classification of soil, considering impact of chemical substances.

- Methods of assessment of contamination of lands with chemical substances to define contamination level of lands. M., Ministry of Health of USSR, 13 March, 1987, No. 4266-87.
- GOST 27535-87. "Internal and external noises of vehicles". "Permissible levels and measurement methods", M.1987
- GOST 12.1.002-84. Electric field with industrial frequency. Permissible voltage level and control of electric field at working area.
- GOST 12.1.003-83.. Noise. General safety requirements.
- GOST 12.1.012-90. Vibration safety. General requirements.
- SanPiN 42-128-4433-87. Sanitary standards for permissible density df chemical substances in soil.
- SN N 3077-84. Permissible noise levels in residential and public buildings.

2.5. EIA PROCESS

In 1996 the Government of Azerbaijan adopted Environmental Impact Assessment (EIA) procedure similar to that adopted in many other countries. The new rules were described in the Background of environmental impact assessment in Azerbaijan (UNDP/State Environmental Committee, 1996). .

This document should be prepared before the decision on implementation of any project is made.

EIA is a document which determines all potential forms and characters, as well as hazard level of impacts from an intended economical activity and estimates results of a project from environmental, social and economical point of view.

In compliance with Clause 42 of Environmental Protection Law, the Ministry of Ecology and Natural Recourses is a governmental authority, responsible for EIA process,
The MENR or State Expertise Department of MENR can be requested for agreement of EIA document.
While providing it's opinion for EIA process, NENR (State Expertise Department) pays special attention to the followings:

- Use of a new technology;
- Scope and complexity of a new technology;
- Expected environmental results;
- Impacts of social-economical spheres of a project region;
- Public opinion of a project, etc

Main purpose of EIA process:

- Rehabilitation of natural systems disturbed as a result of previous economical activity;
- Prevention of environmental degradation;
- Environmental-economic balance of future economical development;
- Development of suitable living conditions for people;
- Reduction of environmental hazard level of intended activity.

EIA process for a concrete project should start with design and technical-economical assessment stage and it's execution. An applicant (Project owner, user of nature) is responsible for content and final version of EIA document to be presented to the Ministry of Ecology and Natural Recources. An applicant is responsible for implementation of provisions shown in the Permit given to him/her, including monitoring of the poject.
While providing it's opinion for EIA process, NENR pays special attention to the followings:

- Use of a new technology;
- Scope and complexity of a new technology;
- Expected environmental results;
- Impacts of social-economical spheres of project region;
- Public opinion of a project, etc

Stage I: initiator (applicant) of an activity should apply to the Ministry of Ecology and Natural Recourses and inform it about main project solution and potential negative environmental impacts.
After reviewing the application, MENR advises the applicant on importance and scope of EIA process. In rare cases, an applicant can immediately be licensed for commencement of works (paragraph 2.5).

Stage II: An EIA document prepared by an applicant is reviewed by an expertise and a Summary document is released. That document includes proposals and remarks made by public.
Summary document can mostly be licensed by the Ministry of Ecology and Natural Recourses or rejected by stating any grounds for this.

Review period of an EIA document should be maximum 3 months.

Regulations provide requirements for the contents of EIA and the summary dosument. The applicant receives mandatory requirements with the permit. The main purpose of the above requirements is to ensure concrete definition of environmental impacts and strengthening of control (i.e. management monitorig is considered to be necessary). The requirements also specify environmental monitoring parameters.

The ministry of Ecology reserves the right to check reliability and accuracy of monitoring results.
The main purpose and responsibilities of State Environmental Expertise and Public Environmental Expertise are specified in Environmental Protection Law (Clause 42) (At present a new law on State Environmental Expertise is prepared). Implementation of the

recommendations made by the State Environmental Expertise is obligatory. Public opinion is necessary for optimal and alternative decision-making. But Public Environmental Expertise has an informative and proposal character in comparison with official State Environmental Expertise.

2.6.Impact assessment criteria

The criteria for determining significance of impacts include *acuteness, scope, exposure time, frequency, likelihood of occurrence and reversion index* of an impact. Description of each criteria is based on assumptions and not on any digital gradation.

The indicators have changable levels of potential impacts and there is a matrix ditermined for describing direct and indirect potential impacts and results of each of them. There are also a mitigation measures described for these impacts. Prior to applying mitigation measures, significance level of each impact and implementation of mitigation measures are presented.

Table 2.2: Significance level of potential impact

Significance level	Description
Top	Potential impact of the project may affect SEC* in a wider area (i.e. loss of significant housing environment, biodiversity or productive ground area). No mitigation measures are applicable and the impact is irreversible-irremediable.
High	Potential impact of the project may affect minor area (i.e. location of the object) in an irremediable manner; or a potential impact may affect SEC* in a wider area, but ecosystem can keep workability (i.e. contamination of surface water may partially affect water ecosystem). This impact may be eliminated during a long period of time.
Medium	Potential impact may affect small area, but ecosystem can rehabilitate itself and this effect can be eliminated in a long period of time. Such ecosystem retains self-regenaration capability and can be rehabilitated unlike wider area ecosystems.
Low	Potential impact of the project may affect SEC in a small area, but ecosystem can properly keep its workability and can be rehabilitated within a short period of time.
No impact	There is no measurable impact.

* - Significant Environmental Component (SEC) is such an environmental component that society considers its protection within an implementation of a general activity, for example, building-assembly works.
Determined significant environmental components during implementation of projects with prevailing bulding-assembly works include phisical components, such as (soil quality, land erosion, air quality, hydrological regime, quality of ground waters, quality of surface waters, landscape, disposal of wastes. Etc) , biological components (forests, greenery, flora, fauns. Water ecosystem) and socio-economical components (historical-cultural monuments, employment, income generation, poverty reduction, education, health, institutes, communities, migration, etc.)

2.7 Participation of public in discussion of environmental issues

As a part of WB requirements on financing of projects and as one of the main provisions of sustainability, WB requires a public discussion of projects depending on their characteristics. Taking into acount that this project falls into the B category, discussions with pulbic will be held in the process of EIA on specific project tenders and the final document will include results of such discussions.

Rights of citizens (public) to participate in discussions and decision-making on environmental issues are set out in legislative acts of AR in compliance with appropriate, ratified international conventions.

As specified in Clause 3 of the Environmental Law, one of the main principles of environmental protection is full participation of public in the discussions of environmental issues.

In compliance with EIA process, designers of the project should inform the public through mass media of project issues, submit copies of reports, as well as provide additional information. Prior to final release, this information should include remarks to EA made by public.

3. EXISTING ENVIRONMENTAL CONDITIONS

This section describes the environmental conditions of Balakhani landfill area (project area) and the adjacent area. This is very important subject to assess possible negative environmental impacts, as well as impacts to separate components of environment during intended covering of Balakhani landfill.

The main purpose of EIA framework comprising current environment conditions of the project region is to formulate a desciption about the current poor environmental conditions around the project area and adjacent regions, characterisation of the current environmental conditions of Balakhani landfill area as a lond-lasting potential source of

negative impacts, physical-geographical condition, its biodiversity and existing contamination level of separate environmental components of the region.

In compliance with the regulation on "Environmental Impact Assessment process in Azerbaijan" physical, biological and socio-economical aspects of the impact were described.

The environmental description is written on the basis of published facts, report materials, information based on the long-lasting observations of various entities, expert assessments and results of field studies conducted on the stage of the document preparations.

During assessment of the existing environmental conditions (Figures 3.1 and 3.2) preparation of this document were discussed with authorised representatives of the Ministry of Economic Development and WB and the agreed the EIA report was prepared within a limited framework, in compliance with structural provisions and requirements of a EIA procedure to be prepared for temporary operation and covering works of the existing landfill.

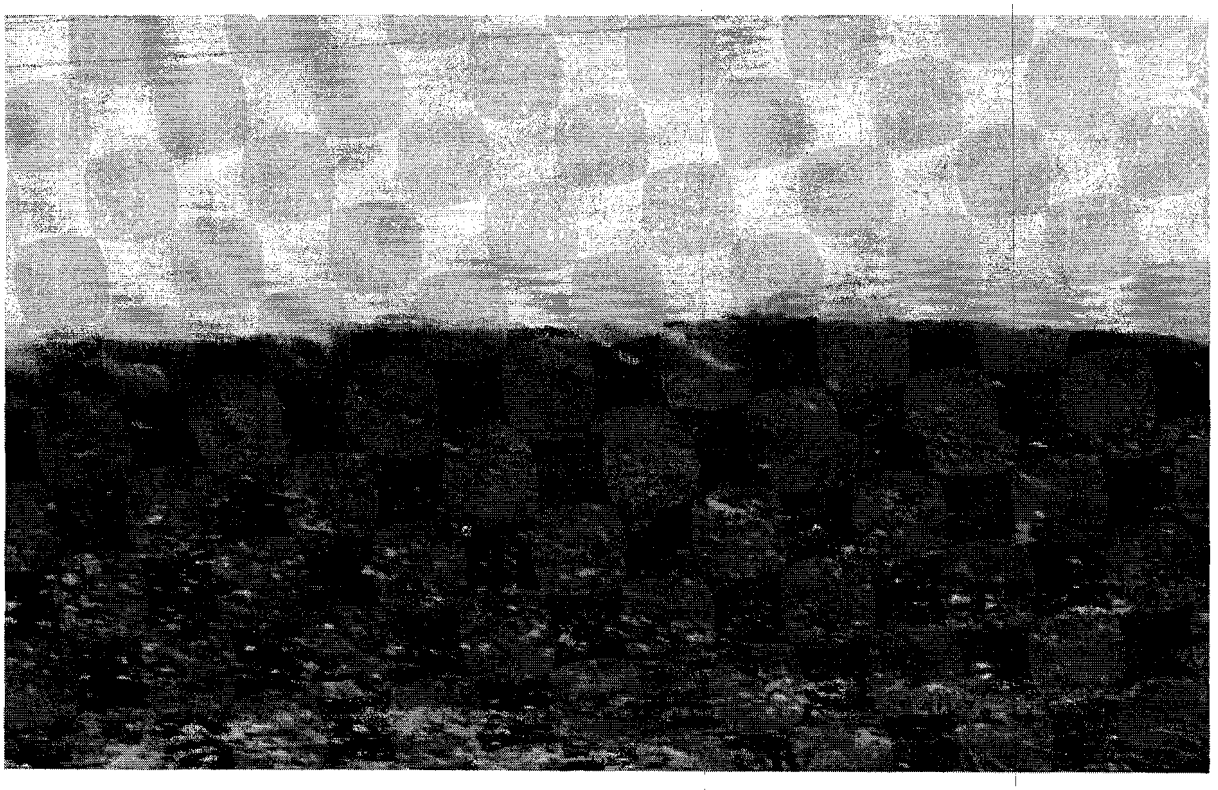


Figure 3.1 Balakhany waste landfill

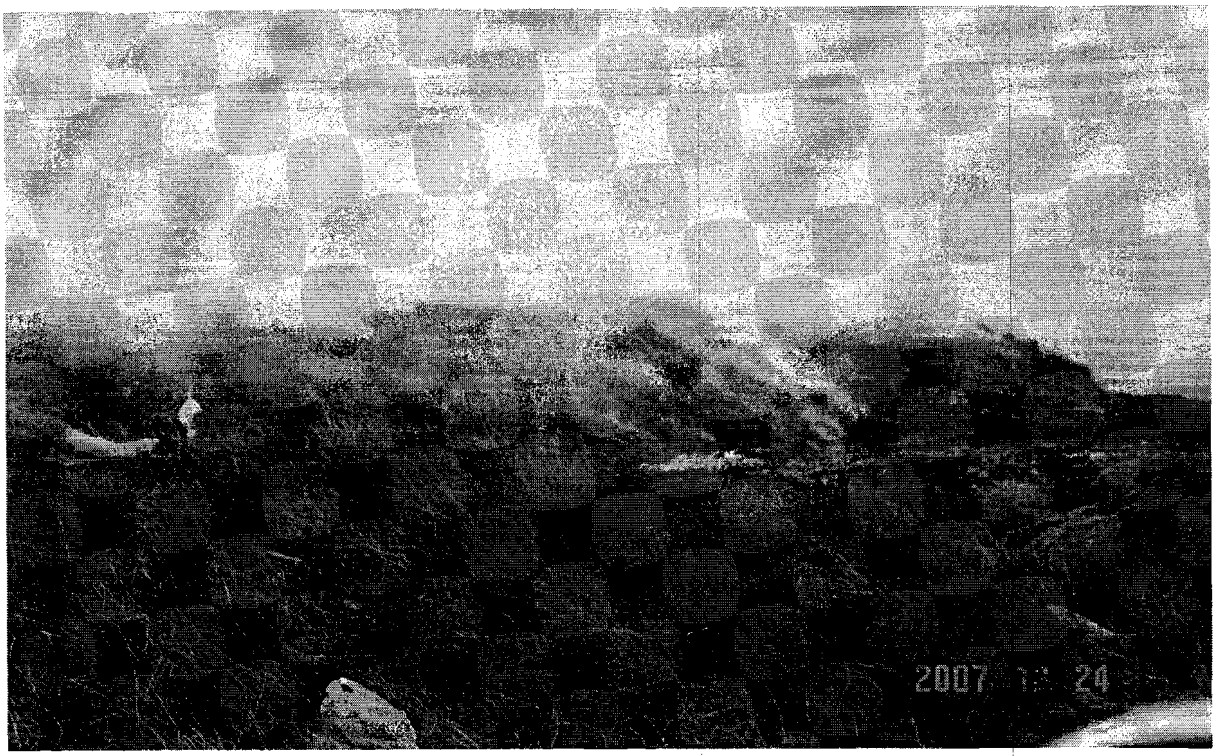


Figure 3.2 Nothern slope of Balakhany waste landfill

Completed comprehensive bibliographical analysis, broad spectrum of observations and results of completed laboratory analysis provide more serious idea on objectivity of the proposed report and its general assumptions.

As it is seen from the description of the existing condition of the project area (Balakhani landfill and the adjacent areas) given below, comprehensive study should be carried out to characterise environmental impact and effect to Boyuk Shor lake (on the bank of which the lake is directly situated) from a long-lasting, unsystematic mismanagement of Balakhani landfill.

This should be taken into consideration in an EIA document to be prepared for the proposed project of Balakhani landfill covering.

3.1. Climate conditions and atmospheric contamination

The area has a dry, hot and semi-desert climate. Atmospheric processes taking place in Eurasia aridity zone, relief of the Caucasian mountains, semi-desert areas of Caspian Sea and Caspian Sea region have a geat effect to formation of the region's climate. Synoptic conditions of the area is characterised by frequent changes of air masses during a year and separate cases through significant, daily observed atmospheric pressure changes. More intensive meridional atmospheric processes are observed in the area. Sharp changes of atmospheric pressure take place during outgoing deep cyclone and passing of strong

anticyclone. This area is under atmospheric pressure of Central Asia maximum and Iceland minimum areas in winter, under Azore maximum and soutn-western periphery of Siberian maximum in hot season of a year. Asian anticyclone and Iceland maximum rise again towards autumn.
As project region has no permanent 0° C air temperature, 5° C is accepted as transitional average daily temperature for the beginning and end of winter period. Temperatures higher than 18-20°C can be accepted as beginning and end of summer. Considering these criteria, climate of seasons is determined as followings: summer – 15 May. Autumn – 15-Oktober and winter (before winter) -20 December.

Air temperature. Average annual temperature of the peninsula is +14°C, in January average annual temperature is 3,9°C and in July 25,7°C.
Maximal temperatures (37-42°C) are observed in August, and minimal temperatures in January (-8-12°C). .

Cloudiness. Formation of cloudiness in Absheron peninsula mostly depends on regional frontal circulation and orographic characteristics of the said region.

In connection with annual prevailing anticyclonic processes on the peninsula, frequent clear and cloudless air conditions take place in Absheron area. Such situations take place in hot periods of a year and makes up 45-80%.

But cloudiness takes place frequently and makes up 50-75% in the cold periods of a year.

Humidity regime. Humidity regime is the result of cross effect of all climate aspects. Daily changes of cloudiness is increased from winter to summer and reaches maximum in July.
Humidity. Humidity of the atmospheric air in the peninsula mostly directly depends on circulation processes taking place in the atmosphere as cold and highly humid air masses enter the peninsula in winter months and consequently humidity of air makes 71-80%. But in summer season, vice versa, hot and dry air masses enter the peninsula area and humidity of the air falls to 46-66%. Humidity relatively increases in autumn in comparison with summer and makes up 60-75%. Average annual humidity of the peninsula makes up 62-70%.

Evaporation, Possible evaporation in the region is high and reaches 1000-1200 mm annually. Actual evporation (200-250 mm) is 4-5 times less than a possible evaporation and this is one of the main reasons for semi-desert landscape formulation.

Precipitation. Atmospheric precipitation in Absheron peninsula mostly take place when a cold air masses enter the area and quantity of average annual precipitation makes up 250 mm.
High valleys of cold air masses on Caucasian, Caspean Sea and Scandinavia are the main reasons for precipitations in the cold period of a year. Northern cyclone develops on Sourthern Caucasia while high pressure expands on northern regions of Europe. Air

masses are activated passing through Southern Caucasia Mountains. Frontal zones emerge, followed by precipitations.

Maximum precipitations (60-70%) fall in the cold period of year and make up 144 mm, but in the hot period of a year this figure ranges around 106.

Maximum precipitations during a year fall in November (43 mm) and April (29 mm), but minimum in July and August (5-6 mm). Atmospheric precipitations mostly fall in a liquid form (rain) as atmospheric air temperature of the peninsula becomes relatively high (January+3,9°C, July +25,7°C). But in connection with cold air masses entering to Absheron in cold the period of a year, precipitations fall in a snow form and snow cover continues to stay 8-10 days.

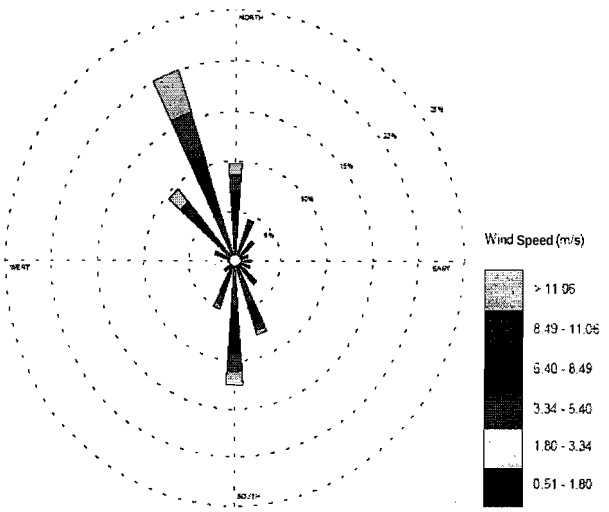
Rain makes up 86% of annual atmospheric precitations falling in the peninsula, but 8% is mixed precipitation (snow with rain) and 6% snow.

Winds. Winds are one of the main aspects causing a strong impact to the environment and the processes that take place in the atmosphere.

Northern winds (38%) are prevailing in Absheron peninsula, southern and nobth-western winds are relatively rare and make up 19% and 17% correspondingly. Other winds with different directions have less frequency (2-8%).

Repetition of northern winds (October-March) in cold period of a year makes up 35%, north-west winds 20%, but southern winds 21%. In the hot period north winds increase making up 42%, figures of other winds with different directions stay unchanged.

Winds with a speed of 5 m/s (40%) and 6-9 m/s (30%) prevail during a year in the peninsula, but the figure of winds with a speed of 15 m/s makes up 20%.



Picture 3.3. Windy days (according to the report of the airport meteorological station)

It should be noted that, there are winds with a higher speed - 20-25 m/s speed winds, lasting 15-22 days and 30 m/s speed winds, lasting 3-6 days in a year, alongside with those described above.

In winter and spring months frequently repeated fyon winds (blowing from sea) with a speed of 15-20 m/s are observed which consequently brings to a relative increase of atmospheric temperature in the peninsula.

Storms. Storms are the most complicated and dangerous processes of atmospheric disturbances. Usually, during heavy rains and severe winds and sometimes bail type of precipitations are observed.
Storms in the peninsula are observed mostly in hot period of year and they are frequently repeated in May-August.
The average number of stormy days in a year is approximately 5 days and maximum 19 days.

Mists. Mists are mostly made of condensations concentrated in air masses and their availablity reduces visibility of horizon up to 1 km.

In Absheron mists are observed mostly from October to April, maximum mists occur during February-March (22 days).
Usually mists are observed on the seashore strips and last 10-12 days.

Table 3.1. Main metereological characteristics of the area – according to the report of the airport meteorological station

Characteristics	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	X I	XII	Year
Air temperature, ^{0}C													
-average	3,4	3,8	6,3	10,8	11,7	22,4	25,5	25,4	21,5	16,6	10,8	6,4	14,2
-maximal	22	27	32	33	36	37	40	41	39	34	28	25	41
-minimal	-16	-10	-5	-1	5	7	12	12	8	1	-6	-14	-16
Precipitations	30	22	25	23	12	9	6	8	15	25	3 8	52	247
Average wind speed, m/s	6,1	6,6	6,9	6,5	6,2	6,5	6,8	6,3	6,2	6,1	5 , 7	5,6	6,3

3.1.1 Atmospheric contamination

The atmospheric air of Absheron peninsula is mostly contaminated by harmful substances discharged into atmosphere from oil and gas production facilities, oil refineries, petrochemical industry, power engineering, engineering industry and transport vehicles.

On the basis of statistic information from 2006, the annual volume of emissions discharged into the air from enterprises located on Absheron peninsula makes 560 thousand tons, but harmful emissions discharged into the air from transport vehicles make up 500 thousand tons. (Table 3.2). It should be noted that these figures were higher in 1993 and were 975 thousand tons and 247 tons correspondingly.

Table 3.2. Quantity of atmospheric pollutants

Description	1993	2000	2001	2002	2003	2004	2005	2006
Atmospheric pollutants - total, thousand tons	1222	908.1	978.9	620.7	837.9	975.3	1054.3	1060
ditto:								
From stationary sources	975	515.4	577.1	217.4	425.9	539.8	557.9	560
From means of transport	247	392.7	401.8	403.3	412	435.5	496.4	500

According to the reports of Environmental Monitoring Department at the Ministry of Ecology and Natural Resources, the quantities of the major pollutants discharged into atmosphere is much higher in western part (around Baku and Sumgait) of the peninsula and they exceed the accepted standards (10%) as much as 4-5 times. But in eastern direction this figure reduces by 2-3 times and ranges within sanitary standards.

Absheron peninsula belongs to the areas with favorable conditions for spreading of substances. However, the huge industrial potential and the great number of transport vehicles available in the peninsula keep the contamination of atmospheric air in a high level.

Table 3.3
Daily average density of atmospheric pollutants in Baku and Sumgait cities.

City/Year		Daily average density of atmospheric pollutants, mg/m^3			
		Dust (suspending agents)	Sulphur anhydride	Carbon 2 oxide	Nitrogen 4-oxide
Permissible daily average density		0,15	0,05	3	0,04
Actual average density per cities					
Baku	1995	0	0,068	1	0,07
	2000	0,1	0,032	1	0,06
	2001	0,2	0,022	-	0,06

City/Year		Daily average density of atmospheric pollutants, mg/m^3			
		Dust (suspending agents)	Sulphur anhydride	Carbon 2 oxide	Nitrogen 4-oxide
	2002	0,2	0,036	2	0,08
	2003	0,2	0,036	2	0,06
	2004	0,2	0,025	2	0,06
	2005	0,15	0,021	2	0,05
Sumgait	1995	0,2	0,025	2	0,07
	2000	0,2	0,022	1	0,07
	2001	0,2	0,016	3	0,07
	2002	-	0,031	1	0,08
	2003	-	0,024	1	0,08
	2004	-	0,023	1	0,08
	2005	0,1	0,024	1	0,08

The quantity of harmful substances discharged into air in Baku has been increased recently as a result of industrial development in Azerbaijan (Table 3.4).

Table 3.4. Discharge of pollutants from stationary sources into the air (thousand tons)

	1995	2000	2001	2002	2003	2004	2005
Azerbaijan Republic	878,6	515,4	577,1	217,4	425,9	539,8	557,9
Baku, including surburbs	623,9	333,8	306,8	110,3	331,4	417,325	464,6
ditto:							
Binagadi region	1,1	1,08	1,044	1,464	2,013	1,8	1,5
Sabunchi region	2	1,6	1,414	1,972	1,673	3,8	2,2

This leads to increase of density of harmful substances in atmosphere.
An impact from oil-gas production, power engineering and other industrial facilities located in the centre and southern parts of the peninsula where the landfill is located and concentrations (of these compounds in connection with long-lasting period of hydrocarbon and sulphur anhydrides) exceed sanitary standards, being in a higher level in the southern and eastern parts of Absheron.
Background concentrations of atmospheric air, calculated on observations carried out at Mashtaga monitoring station (near Balakhani landfill) of National Monitoring Centre under the Ministry of Ecology and Natural Recources, exceed the standards (Permissible

Discharge Limits) on some ingredients: dust -2.6 PDL, nitrogen oxide -1.5 PDL, C1-1.3 PDL.

(http://eeaşeionet.europa.eu/irc/envirowindows/info/data/azerbaijan/az...)

3.1.2. Atmospheric air quality studies

Some research works have been carried out to study atmospheric air quality at Balakhani landfill area. Reserach program included measuring of :

- Dust/Soot
- Combustion gasses -CO, NO_x, SO_2, H_2S
- Methane (CH4)
- Volatile organic substances
- Determination of quantities of organic substances through GC/MS mass-spectrometer and radiation background.

Two stations have been selected in the project area to study atmospheric impact of pollutants on Balakhani landfill. (Annexes 5, 2.18, 2.19). Selected stations are located in the boundary of sanitary-protection zone of the area.
Sanitary-protection zone (SPZ) – is an area from technological process with a human health effects and environmental impacts till the safe distance. The following minimal SPZ limits are determine for each polluting object depending on its production capacity, character of harmful environmental impacts, a physical-chemical content of pollutants, including noise, odors generated for the environment. (San. SRI 2.2.1/2.1.1.1200-03 "Designing ... Sanitary-protection zone and sanitary classification of enterprises, installations and other objects"):
SPZ of the objects selected as a pollution source in the surveyed project area can be determined at 100m distance.
Research works have been carried out by measuring (Annex 5, Pictures 5, 5a) with portative devices directly in monitoring stations and taking of an air samples for measing in lab.

Results of dustlsoot densities measured through a portative device and lab are given in table 3.4.

Table 3.5. Wind speed (m/s) and dust/soot indices (ug/m^3) in monitoring stations

Description	Measurement unit	Monitoring stations	
		A1	A2
Wind direction		South-east	South-east
Wind speed	m/s	1.5-2	1.5-2
Dust PM <2.5 um	ug/m^3	52	38
Dust PM 2.5 um<d<10 um	ug/m^3	105	150
Soot	ug/m^3	45	62

Densities of combustion gasses were below detection limit of the portative device.

Table 3.6. Quantity of combustion gasses (mg/m^3)

Description	Measurement unit	Monitoring stations	
		A1	A2
CO	mg/m^3	<0.12	<0.12
NO_x	mg/m^3	<0.2	<0.2
SO_2	mg/m^3	<0.26	<0.26
H_2S	mg/m^3	<0.1	<0.1
CO	mg/m^3	<0.12	<0.12

Results of dust and combustion gas densities measured in the working area exceeded PDLs.
Such low densities of dust/soot and combustion gasses are explained for the reason of some continuous rainy days before and on the day of measurements.
Quantity of methane has been studied in a lab through a gas chromatograph.
Volatile carbon compounds (VCC) has been studies in a lab through GC/MS gas chromatograph /mass spectrometer (Table 3.7).

Table 3.7. Quantity of methane (mg/m^3) and volatile compounds in the monitoring stations (ug/m^3)

Description	Measurement unit	Monitoring stations	
		A1	A2
CH_4	mg/m^3	11	15
Benzene	ug/m^3	0.41	0.98
Toluene	ug/m^3	0.18	3.77
ethyl benzene	ug/m^3	<0.1	0.31
m-Xylene/ p-Xylene	ug/m^3	<0.1	1.26
o-Xylene	ug/m^3	0.3	0.72
3/4 ethyl-toluene	ug/m^3	<0.05	<0.05
1,3,5 trimethyl benzene	ug/m^3	0.16	0.65
2 Ethyl Toluene	ug/m^3	<0.05	0.12
1,2,4 trimethyl benzene	ug/m^3	0.3	0.73
1,2,3-trimethyl benzene	ug/m^3	0.18	0.23

Results of the measurements prove that methane and volatile hydrocarbons, being connected with the landfill, have been observed within the limits of sanitary-protection zone, despite measurements have been carried out in a humid weather.

Values of radiation background were detected to be below permissible level in the measurement stations and adjacent areas (4-5 uSv/h.

3.1.3. Precipitation background.

Natural (climate, relief, t°C etc.) and human factors mostly effect formation of a chemical background of atmospheric precipitation.

Hydrocarbons, sulphates, chlorine, calcium and natrium prevail in the content of precipitations of Absheron area according to the results of observations carried out for a long period of time. Their concentration appropriately range within 20-250 mg/l, 12-170 mg/l, 10-120 mg/l, 5-25 mg/l va 3-23 mg/l, correspondingly.

It should be noted that, seasonal changes are observed only in the contents of sulphates, hydrocarbons and calcium from among the abovementioned schemical substances. Their quantities reach maximum level in hot summer days as intensive summer evaporations take place in the sea and bring great quantities of salts of abovementioned compounds into atmosphere.

Quantities of other substances, as well as nitrates, ammonium, phosphates and magnesium mostly stay unchanged during a year as precipitation process has very little effect to their concentrations. During a year concentrations of these substances range within 5-45 mgll, 0,8-4 mgll, 0,01-0,16 mg/l, correspondingly.

Precipitation of the peninsula as per an appropriate classification of acidity (hydrogen ion) relates to an alcali and weak acid class and their pH indicador is observed around 5,5-7,5. This indicates that there is no appropriate natural condition for a formation of any acid precipitation in Absheron region.

3.1.3 Baseline content of precipitations.

Natural (climate, relief, t°C, etc) and man-made factors have effects on formulation of chemical background content of atmospheric precipitations.

According to observations carried out for a long period, precipitations in Absheron peninsula contain prevailing hydrocarbons, sulphides, chlorine, calcium and natrium ions. Their annual concentrations range around 20-250 mgll, 12-170 mg/l, 10-120 mg/l, 5-25 mgll va 3-23 mgll, correspondingly.

It should be noted that only figures of sulphides, hydrocarbons and calcium from among the chemical substances have seasonal changes, so that their quantity reach maximum level in the hot period of a year. The main reason of it results from entering of salts of above given compounds into atmosphere during intensive evaporations taking place in the sea.

As other chemical substances, like nitrates, ammonium, phosphates and magnesia concentrations have very little effect from the precipitation process, their figures stay unchanged during a year. Annual concentrations of these chemical substances range around 5-45 mg/l, 0, 8-4 mg/l, 0,01-0,16 mg/l, correspondingly.

Precipitations of the peninsula belong to alkali and weak acid class according to appropriate classification of acidity level (hydrogen ion) and pH indicator of their content range around 5,5-7,5. This indicates that there is no natural conditions for formulation of acid precipitations in the region of Absheron peninsula.

3.2. Geological characteristics

3.2.1 Orography, hydrography and Landscape

The territory of investigated Balakhani trash damp is located in the central part of Absheron peninsula, south-east of Balakhani district, and north-east of Boyuk Shor Lake. Absolute elevation of Boyukshor lake which is located to the north of Baku, is 12.6 m. Absolute ground elevation gradually rises as one moves away from the lake bank, and this figure reaches up to 25-30 m in the north of trash damp.

The studied area differs from other areas of Absheron peninsula by its landscape. Low ridges and hills with smooth surface are observed in the central anticlinal zone and hollows are observed in synclinal zones. Salt lakes occur in most of these places. It is the main encounter hollows in anticlinal folding. Closed hollows are one of geomorphological peculiarities of the central Absheron landscape.

Drainage network is weakly developed in the Absheron peninsula. There are no rivers in the peninsula except Sumgayit River and dry Jeyrankechmez valley in north-east. On the contrary, there are many lakes here. Majority of Absheron lakes are located to the north of Baku plateau. The greatest lakes are Masazir and Boyukshor. The origin of lakes hollows to a great extent depends on wind activities. It is necessary to note that, composition of lake's water depend on salts that winds bring.

3.2.2 Area geology

Baku is situated in the northern branch of circular Baku mold in the area of Balakhani trash damp. Geological section of trash area is presented by Pliocene and Eopleystosene sedimentaries monoclinal dip is 20-40°. These rocks are covered by middle Pleistocene and Holocene subhorizantal sediments.

Pleistocene aged rocks are represented by clay and sand sediments interlace of Balakhani, Sabunchu and Surakhani strata of productive layer (H_2^1 пр).

Agchakil stage (H_2^2 ak) clay with volcanic ash layers are laying above these sediments. Black clays end in Agchakil section top. Pleistocene aged sediments thickness is approximately 1400 m. Eoplestosene sediments are lying over Pleistocene aged rocks. These rocks are represented by Absheron stage lower and middle semistage sediments. Low Absheron sediments consist of clays with limestone strata. Middle Absheron rocks are represented by limestone, sandy clay and sand layers.

Middle Pleistocene is represented by gravel, limestone, shell and loam of Xhazar stage (Q_2h_3). These sediments are stretched along lake bank in a fine stripe (till 50-60 m) and go down towards its bottom under angle 1-4°. The sediments thickness is 1-5 m.

Delluvial-proluvial gravels, clays, clayish sands and loams are laying here and there over Pleosen Pleistocene sediments. These sediments refer to new Khazar stage. The youngest sediments mostly spread in the area are elluvial-delluvial sediments of modern period. Lithologically these sediments consist of loam and sand loams. Here Quaternary period sediments thickness is about 5.0 m. Geomorphologically, this flat area is formed under the influence of abrasive accumulative processes. This area is complicated due to eroded products of sea terrace sediments as the result of numerous transgressions in the Caspian Sea.

As for seismicity, the studied area is included into 8 point earthquake zone inaccordance with the letter No. HH-0213-1611191 dated 17.09.1991 from the State Committee on Construction and Architecture of the Republic of Azerbaijan and SNiP II-7-81 (Annex 1, Table 1).

3.2.3 Hydrogeological Condition

A) Surface Water

Surface water of Balakhani waste dump is represented by Boyukshor lake – a salt pond of Absheron Peninsula. In the past, this lake was mainly fed by precipitation and highly salted pressure water of productive layer. White salt was extracted from this lake until mid XX century; only in 1926 24 thousand tons of white salt were extracted from this lake.

Development of petroleum production around the lake, and as well as Baku city expansion and its economy progress, along with weak management of industry caused afterwards to

intensive pollution of the lake. Several physical and chemical indices of the lake is presented below:

Water surface area - 9,9 km^2

Average length – 7,0 km

Average width – 1,04 km

Maximum depth – 5-7 m

Water analysis – $ClSO_4$, Na-Mg

Salinity – till 50 gr/l

Water clarity – 0,3 m

Water pollution –very high (A category)
Radiation phon in water surface level – 8-12 mkp/hour

In the soils around lake radiation phone is 15-24 mkp/hour which exceeds the average index (9 mkp/hour) for several times in Baku.

B) Underground Water

From weak up to high salted ground water is met at the territory of Balakhani trash damp in Absheron peninsula.

Ground water in Absheron peninsula is divided into two zones as per depth of occurrence: the first zone covers areas where ground water depth of occurrence is from 0.2 m up to 2.0-10.0 m (ground water depth of occurrence equals to 0.2 m in Novkhani resident). The areas where ground water depth of occurrence is over 10 m are included into the second zone. Balakhani trash damp area is included into second zone.

The area to the north from Balakhani trash damp is considered to be a waterless zone (arid zone). Water retaining rocks participate in the geology of trash damp area but ground water has not been formed in this strata.

Ground water depth is 10-15 m, there salt load is approximately was determined 15 gr/l according to prospecting wells previously drilled at 3 km to the east (between residents Balakhani and Sabunchu) from Balankhani trash damp. Nearby Boyukshor lake ground water is uploading. Approximately 2.5-3.0 km to the north-west from Balakhani trash damp in Mehdiabad resident ground water depth of occurrence is 15-20 m as per prospecting wells drilled previously. Water salt load in this area varies within 1.2-2.0 gr/l. uploading zone of this water is in western direction towards Masazir lake.

Precipitation infiltration and slightly condensation processes caused to ground water formation. Ground water in some areas (oil deposits) is fed by oil waste water. Water pipelines and effluent disposal lines are feeding source for ground water in residential massive (Balakhani village).

3.2.4 Engineering-Geological and Hydrogeological Condition of the Bridges Location Area

Engineering-geological and hydrogeological condition of the location area is studied by mechanical and core drilling of prospecting boreholes (Figures 3.4 and 3.5). 2 boreholes

(with each one's depth 30 m) and 2 boreholes (with each one's depth 10 m) were drilled with this purpose (prospecting boreholes total volume is 80 m).

Figure 3.4 Drilling of test boreholes

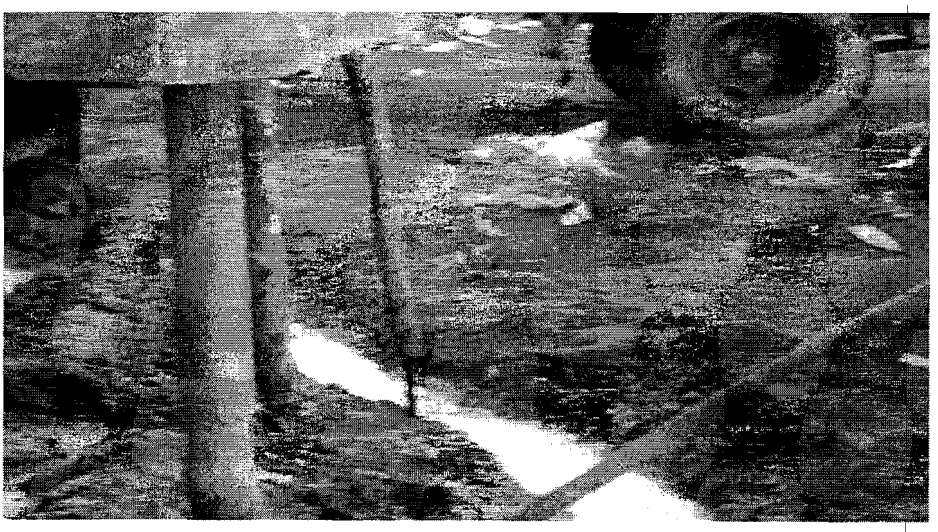


Figure 3.5 Drilling of test boreholes

Figure 3.6 Clay samples

With the purpose of the studying the rocks physical-mechanical and compression properties the samples from disturbed structures (monolith) and undisturbed structures are analyzed in laboratory condition.

Lithological sections for boreholes were prepared basing on drilling works (see Annex 5).

With the purpose of studying the rocks (Figure 3.6) physical-mechanical and compression properties 10 samples are analyzed in laboratory condition. Average values of the rocks physical-mechanical and compression properties are as follows:

Clays:
Clays physical-mechanical and compression properties indexes are given basing on 6 samples.

No	Physical and mechanical properties	Unit	Maximum value	Minimum value	Average value
1	Granulometrical composition: a) sand fraction (2-0,05 mm) b) dust fraction (0,05-0,005 mm) c) clay fraction (<0,005 mm)	% % %	11,5 53,2 52,0	4,2 38,9 42,7	6,4 43,8 47,8

2	Plasticity	%	25,37	19,74	22,61
3	Humidity under liquid limit	%	51,92	41,01	46,25
4	Humidity under plastic limit	Y_0	26,55	21,27	23,64
5	Natural humidity	%	1,95	1,88	1,91
	Bulk density under natural humidity	g/sm^3	1,64	1,48	1,58
7	Bulk density under dry state	g/sm^3	2,74	2,74	2,74
8	Specific weight	g/sm^3	26,99	17,12	21,13
9	Porosity	%	46,0	40,1	42,3
10	Porosity index		0,851	0,671	0,732
11	Wet degree		0,87	0,67	0,75
12	Absorption capacity	%	31,0	25,6	27,3
13	Consistency		0,16	<0	
14	Internal friction factor		0,300	0,250	0,275
15	Angle of internal friction	degree	16°30′	14°	15°15′
16	Cohesion	kgf/sm^2	0,60	0,60	0,60

Compression tests of the clays without water and under water are conducted by steps 0,0; 0,5; 1.O; 1,5; 2,0 kg/cm^2 under load till 2.0 kg/cm^2 (see Annex 5). The clays relative compression is 0,013 under 0,5 kgf/cm^2 load, 0,023 under 1,0 kgf/cm^2 load, under 1,5 kgf/cm^2 load, 0,029 under 2,0 kgf/cm^2 load, 0,036 under 2,0 kgf/cm^2 load i.e. settling module corresponding to the loads is 13 mm/m, 23 mm/m, 29 mm/m, 36 mm/m. Thus, clays under load till 2.0 kgf/cm^2 as per compression and settling module i s referred to strongly compressed (III category) type.

Compression tests under water showed the clays swelling ability while wetted.

Average value of the clays compression coefficient *(a)* under load 1,0÷2,0 kgf/cm^2 is equal to 0,021 under natural density and 0,016 in saturated water. Deformation module (E) average value is correspondingly 59,24 and 49,51.

Loams

Loams physical-mechanical and compression properties indexes are given asing on 4 samples.

No	Physical and mechanical properties	Unit	Maximum value	Minimum value	Average value
1	Granulometrical composition: a) sand fraction (2-0,05 mm) b) dust fraction (0,05-0,005 mm) c) clay fraction (<0,005 mm)	% % %	34,2 61,2 19,4	21,2 51,2 15,8	26,7 56,2 17,1

2	Plasticity	%			1063
3	Humidity under liquid limit	%	34,26	29,11	32,25
4	Humidity under plastic limit	Yo	23,40	20,14	21,60
5	Natural humidity	Yo	1,84	1,82	1,83
6	Bulk density under natural humidity	g/sm^3	1,55	1,54	1,55
7	Bulk density under dry state	g/sm^3	2,71	2,71	2,71
8	Specific weight	g/sm^3	19,45	13,92	17,16
9	Porosity	%	43,4	43,2	43,3
10	Porosity index		0,768	0,760	0,764
11	Wet degree		0,86	0,69	0,78
12	Absorption capacity	%	28,0	21,0	24,5
13	Consistency		<0	<0	<0
14	Internal friction factor		-	-	
15	Angle of internal friction	degree	-	-	-
16	Cohesion	kgf/sm^2	-	-	-

Rocks are found in the all boreholes in the course of drilling works.

The soils are average salted as per water extract, thus, dry residual maximum value equals to 1,76 per cent, minimum value 0,64 per cent, and average value 0,93 per cent.

According to difficulty of exploitation the soils in the bridges location area are referred to the following groups of ERER (collection "Common unit region cost, 1982")

Clay – 8 r
Loams – 33 6

The loads given to the rocks are as follows as per SNIP 2.02.01-83:

For clays – 3,0 kgf/cm^2
For loams – 2,5 kgf/cm^2

The rocks slopes inclination is accepted as following during drilling works as per SNIP 2.06.03-85 (till 5 m depth):

- Clays and loams:

Over water 1:1
Under water 1:1,5

3.2.5 Hydrological network

Landscape of the Absheron peninsula is characterized with a lot of saline lakes (salinity) that cover the area. There are nearly 200 large and small lakes with a total area of 50 km^2, including more than 50 saline lakes.

An oily stratal waters play a great role in a water supply of most lakes in the Absheron peninsula. Therefore, the hydrological regime of Zikh, Gırmızıgol, Boyuk Shor and other lakes has dramatically changed.

Balakhani landfill is directly located on the shore of Boyuk Shor Lake. Southern part of the lake stretches along the direction of geographical width, but the northern part stretches from the north-west to the south-east. The greatest length is 10 km, but the greatest width is 1.5-2.0 km. The north-western and eastern areas of the lake turned into a marshland.

Geomorphologic character of Boyuk Shor lake relates to Boyuk Shor ravine. The mentioned ravine makes up the southern wing of Balakhani-Binagadi anticline arc that covers Baku trough plateau from the north.

Depth of the lake's ravine is 20-30 m. The northern shores of the lake make up an old caspian terrace with slight slopes. The southern shore is relatively steep and vertical. Both shores are covered with limestone-shell layers. Eastern shore is an uneven surface. Ground water is not extented in these areas as the lake is located in clay layers.

Boyuk Shor lake relates to a range of saline lakes with an disturbed water feed. During natural feeding regime Boyuk Shor lake used to be filled by atmospheric precipitations, waters from slopes and partially ground waters. Probably, ground waters of producing layers also had been playing a great role in this process. This can be confirmed by the hollows of travertin cavities and washed out grooves observed in the northern part. A range of springs were still active in 80th of XIX century, but since 40th and 50th of XX century ground waters failed to feed the lake as they were below the lake level. Later, since 1949-1950 the level of the lake began rising as a result of intensive influx of formation waters.

Ministry of Ecology and Natural Resources prepared a project on Cleaning of Boyuk Shor lake and Improvement of its shores for using as a recreation zone for the city population in compliance with Clause 4.1 of the decree of the President of Azerbaijan Republic, dated 28 September, 2006 on "A Complex of Measures to be implemented in 2006-2010 on Improvement of Environmental Conditions in Azerbaijan Rebublic". This project includes a range of proposals alongside with other acivities in connection with environmental assessment and improvement in Boyuk Shor lake:

- Installation of drainage along perimeter of the lake and provision of water outlet;
- Prevention of waste water inflow into the lake and provision of sewerage lines in surrounding settlements;
- Geological, geomorphological and orographic structure of the lake do not guarantee that possession of the dried areas would not face any geological and ecological tension in future. Therefore, development of a special geological and ecological monitoring network in the water collection part, as well as in the dried and possessed areas and permanent control of components of ecosystem should be provided.
- Dried area of the lake should be provided with a soil cover and planting of greenery.

On the other hand, probability of horizontal flow of ground water from deeper bottom layers of the lake is also in the centre of attention. Every year some 3660 thousand m^3 of such a water mass enter into the lake according to the results of various studies.

Boyuk Shor lake is specially preferred among Absheron lakes in connectibn with its surface area, use of the lake for farming purposes by the communities, including formation and feeding of the lake. This lake has been attractive for being a source of table salt and therapeutic mud in accordance with its initial natural development chdracteristics. Production of table salt in this lake started in 1932. For this purpose, 44 ponds owned by "Bakusalt" created on the western shore of the lake. But the lake salt had a low quality so far. Bottom cross-section of Boyuk Shor lake consists of 5-8 sm deep sulphur, bromine and natrium chlorine salt layer with iodine residue, 5-25 sm deep yellowish, fatty clay with a little salt crystals and 5-24 m deep seddimentary clay layer of black to green-grey color.

The area of the lake was 8,97 square krn, and volume of its water 0,5 mln. cubic m in early XX century. Starting from 70th, daily volume of formation water discharged into the lake is 100 thousand m^3. This figure includes fecal waste waters discharged from a range of enterprises, production and residential units. Apparently, these waters are discharged without any treatment facilities and therefore create an unbearable sanitary cohditions for the lake itself, as well as for the surrounding area. Water surface of the lake is covered with oil layer, but the coastal strips are contaminated with wastes and bituminous oil production wastes.

3.2.6 Analysis of water samples taken from surface water bodies

The shore of Boyuk Shor lake is neighboring directly with Balakhani landfill. The lake is exposed to a strong human impact as a result of filtrates and waste water brought by rainwater from the landfill area, direct landfill wastes, including impacts of oil facilities. (Figure 3.7) As a result of these impacts environmental condition of Boyuk Shor lake is very poor at present. These impact are also given in the results of the analysis carried out at the water sources.

Figure 3.7. Boyuk Shor lake and landfill side shore of the lake

To assess surface water contamination in the project region, some analysis samples have been taken from 2 spots directly on a shore of Boyuk Shor lake and from water body that currently has lost water contact with the lake (Annexes 4). Location of monitoring stations as per the project area are given in Annexes 5 and 6.

The sample were taken by the specialists of AZECOLAB. Sample glass containers were specially prepared to avoid occasional contamination. Lab analysis have been carried out through internationally recognized methods (See Annex 2) and standards.

Analysis have been carried out to define pH indicator, salinity, BOD, COD, General Organic Compounds (GOC), General Concentration of Hydrocarbons (GCHs) and Polyaromatic Hydrocarbons (PHs).

3.2.7. Result

pH indicator and electroconductivity

According to the results of sample analysis taken from surface waters (Annexes 4 Table 11) pH indicator, relevant to general physical-chemical indicators of the water and electroconductivity values have undergone a man impact that is characteristic indicator for a water body with a low salinity.

BOD, COD

Analysis of water samples taken from study areas has been carried out for BOD and COD that characterise contamination of the lake water with various organic pollutants.

Biological Oxygen Demand (BOD) is a quantity of oxygen required for biological decomposition of organic and inorganic substances contained in water under a reaction of various oxidants.

As per results of the carried out analysis quantity of BOD in study stations No 2 and 3 is higher than PDL (6 mgll). (Annexes 4,Table 11). As per a classification category of water bodies 2nd station (BOD =6) is contaminated, but 3rd station is characterised as a more contaminated (BOD =50) water body.

Chemical Oxygen Demand (COD) – is a quantity of oxygen required for oxidisation of organic and inorganic substances contained in water under a reaction of various bxidants.

As per results of the carried out analysis quantity of COD in station 1 and 2 were 171 mg/l and 169 mgll, but in 3rd station 2690 mg/l/This index from the records complies with a quality index of filtrates discharged from the landfill.

General Organic Compounds (GOCs)

Densities of GOC of the research stations range between 91-1270 mgll intervals. These results are in compliance with results of the analysis carried out for BOD and COD and are indices of a strong man impact of the water bodies. GCH / PHs (Annexes 4,Table12) and Pesticides/POP (Annexes 4,Table13) have been analysed through fraction test procedure by GC/MS device through "full scan mode", but volatile fractions of water (Annexes 4,Table14) have been analysed through GC/MS "head space" method.

Results of the analysis characterise extreme contamination of the water basins. As per results of the carried out analysis, various substances have been discovered in water samples, from general hydrocarbors to pesticides. The indices confirm catastrophic ecological condition in the 3rd water source.

3.3 LANDSCAPE & SOIL

3.3.1 Analytical Review

Survey area located in Absheron peninsula is characterized with its natural landscapes that have been totally changed and exposed to degradation. Most of the natural landscapes have been replaced with mining-anthropogenic landscapes.

Landscapes of the area, exposed to high human impact, appear to be a bemi-desert complex. Arid-dry climate, low relief and lithological composition strata may be indicated as main aspects of formation of this complex. The area is characterized with plain and cavity landscapes. Ravines has been shaped in north-west direction of survey area, near Balakhani waste treatment plant that is not operated at present. Actually these ravines mostly appeared after previously used sand quarries in that area and in connection with errosions.

The widespread saline soil and saline lakes have resulted from semi-desert climate.

During a year semi-desert landscape of the area is provided with 130-133 cal/sm^2 sun rays. In summer months number of sunny hours reach 990-1000. Value of annual radiation

balance is 50-52 kal/ sm^2. Possible evaporation is 900-1100 m. Actual evaporation (200-250 mm) is 4-5 times less that a possible evaporation. Average temperature in July-August is 25-26', in January +3. Maximum temperatures (41-42') are observed in summer months.

Average annual relative humidity in the morning hours is 80-85%, in daytime 65-70%. Northern and north-western winds make up 25-30%, but south winds make up 15-20%. Average annual speed of them equals to 5-8 dsec. Winds with a speed of 2-5 m/sec make up 45%, but winds with 6-10 dsec. make up 30-40% annually. The quantity of average annual precipitation reaches 110-250 mm, in summer moths only 8-10 mm.

In cavities, landscapes of adulatory relief with poor skeleton of grey soils with camel's-thorn wormwood and feather-grass formation of semi-desert.
Plant cover in saline soil appears as fragments.

Soil components of these landscapes have poor, grey skeleton, humus quantity reaches 1,23%. In deeper places quantity of humus reaches 0, 63%. (K.Alekberov, Z.Zeynalov, 1953). Organic substances are poor in soil composition.
Wormwood contains 8-10%, but ephemeral plants 50-70% of the plant cover. These areas are used as a pasture in winter period. In watershed part the embankment is collapsed into two parts with tectonic crack and cavity between these parts is mostly cdvered with ephemeral plants. Sometimes soil cover is characterized as brown-grey.

3.3.2. Field Studies

A range of ravine is developed on a plain area with slightly sloped, terraced sandy-clay layers.
The area was fully exposed to an oil contamination in connection with an oil extraction from the area over the last 100 years. In some places oil facilities are abandoned and wormwood and ephemeral plants have begun to rehabilitate previous natural landscape. Soil cover has typical skeleton of grey characteristics. Quantity of humus in soil is very low due to aridity of climate, and poor growth of plant cover. Humus is totally low in deeper layers of soil.

Ravines and hills are located near the project area and the area is exposed to erosions (Figure 3.8) due to iregular operation of nearby sand quarry that is not active at present. One of the main reasons of this ecological disturbance is waste treatment facilities and unofficial landfill.

On relatively higher places quantity of humus reaches 1,5-2,5%. In deeper places quantity of humus reaches 0,6-0,8%. Camel's-thorn is prevailing (30-35%) plant cover; ephemeral plants equal to 20-25%. There are some weeds in humid cavities.

Current saline soils are formed around Boyuk Shor lake area (1). In rainy season salinities are filled with water and evaporate in summer seasons. Part of Boyuk Shor Lake at the north-eastern edge, including part of Balakhani landfill area of the lake have dried recently and deposits appeared in the bottom of the lake Quantity of salt is high in these deposits.

Deflation process is strengthening as a result of strong and frequent winds and no soil-plant cover appear in these areas. Here the landscape is in a dead-useless state consisting of salinity.

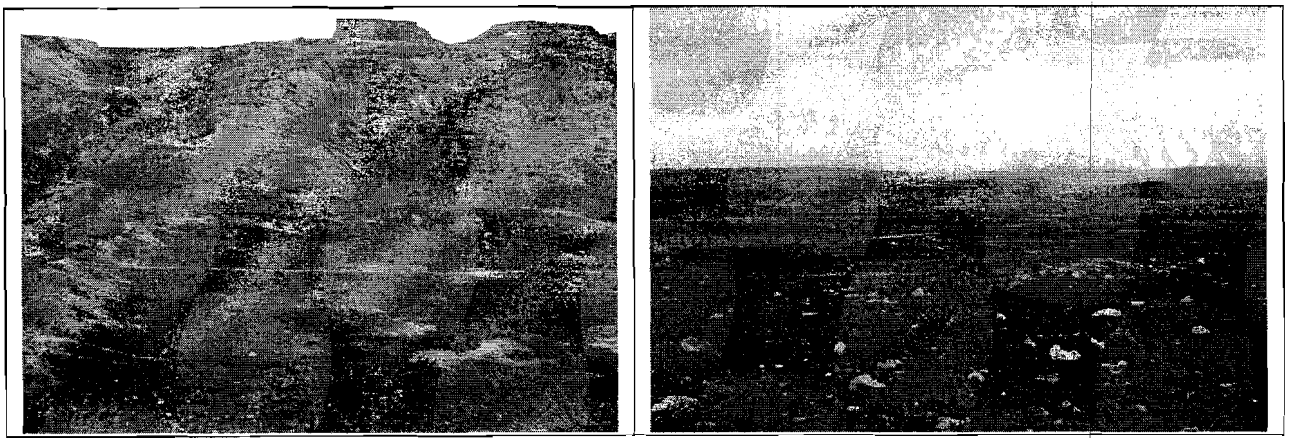


Fig 3.8. Soils in project area eroded and became polluted with oil and wastes

The most expanded landscape complex in project area consists of improved housing complex and industrial-technogenic landscapes.
These premises have destroyed the landscape of the area and set up a new man-made landscape. In connection with rapid development of chemical industry, composition of wastes is sufficiently complicated, heavy metals and toxic compounds, like dioxin from thermal and natural decomposition of wastes are spreaded in the surrounding areas through ground waters by penetrating into soil. Therefore, project area with threatening environmental limits and neighboring unofficial landfill are additional sources of tension.

In some places of the area natural semi-desert landscape is likely to be rkhabilitated resulting from a recent reduction oil contamination and weak oil extraction process.

Generally, the area is a complex exposed to a huge environmental tension and this will lead to an undesirable process in future.

3.3.3. SOIL CONTAMINATION LEVEL

The studied area undergone a strong human impact. On the basis of the results of a visual study there are ground areas in the project and adjacent areas that have been locally contaminated with hydrocarbons, including industrial, ground and waste waters and undergone an erosion.

According to the results of a visual study there are ground areas locally contaniinated with bitumen, oil and waste water discharged from the landfill. Some soil samples have been taken from different depths of the geological boreholes No 2 and 4 and from 4 monitoring stations (Annexes 5) and analysis have been carried out during field surveys in the project area.

Purpose of sample taking from different depths was to determine how deep had a contamination(if any) penetrated, subject to the studied indices in the survey areas.

As per research program, GCH / PHs (Annexes 4,Table12) and Pesticides/POP (Annexes 4,Table13) have been analysed through fraction test procedure in GC/MS device with "full scan mode", but volatile fractions of water (Annexes 4,Table14) have been analysed through GC/MS "head space" method.

Metals

A. Results of analysis taken from a topsoil
It was discovered that Co - in samples taken from topsoil in stations 1, 2 and 4 and Ni - in all stations appeared to be 3-11 times higher than the standards and Zn - in all stations was 1.5-5 times higher than the standards (Annexes 4,Table 7).

B. Analysis samples takenfrom the boreholes
Analysis samples taken from the boreholes have given similar results. Density (concentration) of some metals appears to be higher if penetration is deeper. (For example, it was determined that quantity of zinc in 1.0-1.3 m depth was 56.1 mg/kg, in 2.8-3.0 m depth 65.2 mg/kg, but in 9.3-9.5 m depth 83.5 mg/kg in samples taken from borehole No 2 (Annexes 4,Table 3)

General Organic Compounds (GOC)

A. Quantity of GOC in analysis samples taken from a topsoil of 1-3 stations ranged between 1.1 % -1.8 %, but in 4th station less than the detection limit (0.1%).
B. *Quantity of GOC in all analysis samples taken from boreholes* was less than detection limit (0.1%). These indices can be interpreted as features of a topsoil (i.e. humus) or result of a contamination with an organic pollutant.

General Concentration of Hydrocarbons (GCH)
As per results of the carried out analysis on GCH and PH, soil has been contaminated .
As per results of the carried out analysis, density of *general concentration of hydrocarbons* on fractions appears to be less if penetration is deeper. (Annexes 4,Table 4)
As per results of analysis quantity of GCH in samples taken from a topsoil is less than the quantity of GCH in samples taken from boreholes. (Annexes 4,Table 8)
This difference in densities may due to various impacts to topsoil GCH, for example, through decomposition of various microorganisms.

Polyaromatic Hydrocarbons (PH)
Different PHs have been detected in both sample analysis taken from topsoil Annexes 4, (Annexes 4,Table 8) and different depths (Annexes 4,Table 4). Number and quantity of PHs detected in samples from topsoil are higher than the quantity of GCH in samples taken from boreholes.

Pesticides/POCs

As per the results of sample analysis taken from topsoil (Annexes 4,Table 9) and different depths of boreholes (Annexes 4,Table 5) densities of pesticides and POP were in the detection limit of the device. This proves that contamination of soil samples with Pesticides and POP has a minimum level.

Volatile fractions

Density of volatile fractions is in the detection limit of the device in accordance with the results of the analysis of soil samples taken from topsoil and various depths of boreholes of the monitoring stations of the project area. (Annexes 4,Table *6*, Table 10)

3.4.FLORA

3.4.1. Analytical review

The relief of the project and the adjacent areas is a 40-100 m high plain developed from a range of embankment-valley. The plant cover has the following types in respect to the area relief: wormwood-ephemeral, wormwood-saline, ephemeral and semi-desert.

Growth of semi-desert plants is clearly observed in the rhythm of seasons. The plants germinate in spring, germination continue in summer and in autumn, it continues and activates in winter. Vegetation (germination) period is 10 months (L.I. Prilipko,1970).

Content of phytocenosis changes appropriately depending on mechanical and chemical composition of salts, humidity and such other aspects. Most of ephemeral grain-crop plants have been grown in a low alkaline soil with prevailing bulbous bluegrass (Poa bulbosa), (Aegilops squarosa, A.cylindrica), (Eremopyrum triticeum, E.orientale) and some others.

Availability of various type of grasses in plant association is specific for plant cover of the area. Some of these grasses are white germander (Teucrium polium), (Allysum desertorum), (Chamaemelum praecos).

Growth of these ephemeral plants totally depend on changing rhythm of seasons, so that growth of ephemerals begin immediately after precipitations in autumn. This process brings to germination in spring and bearing in autumn, by slow growth in winter and quick growth in spring. By the end of May growth cycle of ephemers completes and they fade away.

Ephemeral plants provide a winter pasture with valuable grass feed.
Wormwood semi-desert is developed on saline, low saline, brown, light-chestnut and greyish color soils. Composition of ephemeral plants in typical wormwood phytocenosis consists of bulbous bluegrass (Poa bulbosa), a range of annual ephemers like $rain-crops, squaw-weeds, cuneiforms, labiates and other families.

3.4.2. Field study and results of the recent study

Results of the recent studies have been used and necessary (initial) survey/study carried out to assess current condition of flora in the project and adjacent areas. Results of the studies given in this section include results of the studies carried out in the recent years (2005-2007).

Northern part of Boyuk Shor lake. This is a hilly plain consisting of grey soil. It is mostly covered with wormwood-ephemeral plants, but ephemerals from dried grain-crops are:
(Aegilops squarosa)
(Aegilops cylindrica)
Foxtail brome (Zerna *rubens)*
Panicle-shaped timothy (Phleum paniculatum).

The areas covered with ephemeral plants contain 80-90 % of the undisturbed areas. They make up second layer of phytocenosis. Top layer of the plant cover consists of 15-20 sm high wormwood (Artemisia *fragrans*). Wormwood bushes are dispersed at 10-20 sm distance from each other. One can see Alhagi (Alhagipseudoalhagi) everywhere.
Desert ephemeral feather-grass (*Stippa* szovitsiana) plants grow on relatively humid eastern hillside. Couch-grass (Cinodon dactilon) and imperial eagle (Peganum *harmala*) are grown in cavities among hills filled with rain-water.
The ecological situation is very bad: these areas are free from plant cover because of discharge of oil well water into the surrounding areas and at present surroundings of Boyuk Shor lake are full with bitumen wastes, and consequently there's no vegetation.
Northern edge of Boyuk Shor lake. This area is grey, hilly clay plain. Most of the plant consists of ephemeral semi-desert. 90% of the general area is covered with plant. Ephemerals consist of 10-15 sm high dry grain-crops.

(Aegilops cilindrica)
Slender oat (Avena barbata)
(Eremopirum triticeum)

Few sagebrush, wormwood, (Artemisia vulgaris). Many types of weed:
Alhagi (Alhagi pseudoalhagi)
Various thorny thistles (Onopordon heteracantum)
Thistle (*Carduus* arabicus).
There is less oil contamination in the areas with few oil derrricks. Active growth of plant cover seen in the areas free from lake water.

Results.

The studied area is ecologically poor. New private housing contsruction and contaminating of the area with domestic wastes are regular activites causing destruction of natural plant cover. As it was clear from the observations, after some period of time plant cover gets restored at some oil contaminated areas where oil wells were abandoned.

3.5. FAUNA

3.5.1 Analytical review

Balakhani and landfil sites are located on Absheron peninsula, in Binagadi and Sabunchi residential areas of Baku city. These are semi-desert, arid ecosystem areas in connection with their environmental and landscape peculiarities and vary with dry, warm climate in comparison with other landscapes, including wormwood, ephemeral plants formation, mostly grey clay and some sandy soil. This area has been mostly used for oil extraction for the last 100 years, including waste landfill, partial stock-raising business and vegetable farming. But growing urbanization, including improved and extended oil producing processes have totally changed the landscape of the area and turned it into a park landscape. At present most of the area is under residential, industrial-technological and farming objects, various communication features (roads, oil-gas pipelines, power suppy lines, etc) or oil-contaminated, fully abandoned sites. A smaller part of the area is under a strong man impact despite consisting of semi-free areas, isolated from each other, rich with some natural elements and repeatedly rehabilitated landscapes. Most of the local fauna species (amphibia, reptilia and mammals) are environmentally sensitive to the human impact, therefore, these species are being restricted from the natural habitation.

Scientific literature includes sufficient data about fauna species of Absheron peninsula, as well as survey area (1-6). However, these data does not fully cover current situation of fauna as it mostly refer to the period before 1980-1985. Probably, changes of economical and social situations and demographic process during the past period have made impacts affecting biodiversity and content of fauna in the survered areas. As a result of abandoned oil wells that have been operated earlier, in some areas landscape has been repeatedly rehabilitated and new qualities and new biotopes appeared recently.
Furthermore, demographic changes has taken place in the area, particularly, recent inhabitation areas of fauna species, are now in a possession of new settlements (for example, from Mehdiabad settlemet towards Balakhani landfill direction) and even semi-free areas have been populated.

However, there is a great need to determine current situation of fauna, species and inhabitation, including hazardous aspects that might eventually impact fauna.

Therefore, results of previous studies have been used and necessary studies implemented to assess existing status of fauna available in project region and adjacent areas. Study area conditionally consists of "Boyuk Shor" (Boyuk Shor Lake, comprising Balakhani landfill side shore and adjacent areas) and "Balakhani" parts (Balakhani landfill area, including Balakhani settlement).

3.5.2. Amphibia and Reptilia

Absheron peninsula, as well as survey area is a semi-desert landscape with wormwood, plant formation of ephemeral – saline soil and arid ecosystem characterized with a long-lasting warm period of year. Therefore, amphibia, reptilia and mammals of semi-desert landscape have been populated on theses areas with specific biodiversity and some sufficient feed. List of these species is shown in Table 3.8. On the basis of available literature, the local fauna has 2 species of arnphibia, 17 species of reptilia and 13 species of mammals. They are as followings:

Amphibia:

1. Green toad *(Bufo viridis Laurenti),*
2. Lake frog *(Rana ridibunda Pallas)*

Green toad lives in various source of water and is a prevailing species. But Lake frog is a species with nocturnalism, specific for semi-desert area. It is a prevailng species. It also moves into residential areas, gardens, vegetable farming and parks. Is a very sensitive species against a man-made pollution. There is a great need to study the current condition of these amphibia species taking into account that the survey area is affected by huge man-made pollution.

Reptilia:

1. Spur-thighed tortoise *(Testudo graeca L.)*
2. European pond terrapin *(Emys orbicularus L.)*
3. Gecko *(Cyrtopodion caspius Eich*
4. Lizard *(Stellio caucasicus Eich)*
5. Long (-legged) skink *(Eumeces schneideri Daud)*
6. Snake-eyed Lizard *Ophisops elegans Men.*
7. Eremias *(Eremias velox Pallas)*
8. Stepperunner (*Eremias arguta Pallas*)
9. Blind snake *(Typhlopidae vermicularis Mer.)*
10. Sand boa (*Eryx jaculus L.)*
11. Water snake *(Natrix tessellata Laurenti)*
12. Pallas Coleber *(Coluber ravergieri Menet*
13. Dahl whip Snake *(Coluber najadum Eich)*
14. Ring-necked snake *(Diadophis)*
15. Cat Snake (*Telescopus fallax Flei.*)
16. Montpellier Snake *(Molpolon monspessulanus He.)*
17. Blunt-nosed Viper (*Vipera lebetina obtusa Dw.)*

Spur-thighed tortoise, Gecko, Eremias, Snake-eyed Lizard, Sea serpent, Blind snake, Montpellier Snake, Cat Snake and poisonous snake species of *blunt-nosed Viper* are a characteristic and prevailing creeping species for the area. As *Spur-thighed tortoise* is a rare creeping species for European region, it is included in the "Red Book" of Azerbaijan and the List of International Society of Protection of Nature. But *European pond terrapin*

is included in the List of International Society of Protection of Nature. Blunt-nosed Viper is a poisonous snake and is a preferent species as its poison is used in medicine.
As ground-water creeping species are sensitive to a man impact, there is a need to determine current condition of these species on the study area.

3.5.3 Birds

Analysis of scientific data (7, 8, 10, 11, 12, 13) indicates that during migration, hibernating and nesting period Absheron-Gobustan are becomes rich with birds of various species from various ecological groups (Table 3.9). Here and in the adjacent areas 236 bird species can be encountered. 33 species of them (Dalmatian pelican, White *pelican,* Pygmy cormorant, Spoonbill, Greater *flamingo,* Mute swan, *Bewick's* swan, Lesser white-fronted goose, Brent goose, Marbled teal, Ferruginous duck, White-headed duck, Osprey, *White*-tailed (sea) eagle, Pallid harrier, Black vulture, Steppe eagle, Golden *eagle,* Spotted eagle, Imperial eagle, Short-toed eagle, Purple gallinule, Great *bustard, Tetra,* Sociable plover, Slender-billed curlew, Snipe, Clareola nordmanni, Black bellied *sand-grouse,* Sakerfalcon, Lanner, Peregrine, Lesser kestrel) are in the Red Book of Azerbaijan and in the list of International Association for Protection of Nature (3, 8).
Furthermore, Absheron-Gobustan area is situated on the way of migration of many bird species. During migration, most of the birds fly to the south of Caspian Sea, South-western Asian countries and Africa for wintering, but in spring they fly to Kazakhstan, and middle-north parts of Russia for nesting. Water and shore birds make a great collection in shallow waters of the Caspian Sea when they fly through Absheron-Gobustan and during wintering period.
As a result of human activity, most of Absheron-Gobustan water and moorland areas including semi-desert landscapes, home for birds, have been disturbed, oil-cqntaminated still in 70th of XX century.

3.5.4. Mammals

Absheron fauna of mammals contains 5 orders of 13 species. They are as followings:

- Insect-eating mammals (Insectivora);
- Wing-handed animals (Chiroptera);
- Duplicidentates ((Lagomorpha);
- Gnawing-animals (Rodentia);
- Carnivarius animals (Carnivarius).

Mammals:

1. Long-eared hedgehog (Hemiechinus *auritus* Gmelin),
2. Kuhl's pipistrelle (Pipistrellus kuhlii Kuhl),
3. Asian jerboa (Allactaga williamsi Thomas),
4. Brown Rat (Rattus norvegius Berkenhout),
5. Red-tail sanderling (Meriones erytrourus Gray),
6. House mouse (Mus *musculus* L.),
7. Striped field mouse (Apodemus agrarius *Pallas),*

8. Common vole *(Microtus arvalis Pallas),*
9. Field vole *(Microtus socialis Pallas),*
10. Rabbit *(Lepus europaeus Pallas*),
11. Fox (*Vulpes vulpes L.),*
12. Jackal *(Canis aureus Linne),*
13. Wolf (*Canis lupus L.).*

More specific species of mammals of the studied area: *Long-eared hedgehog, Red-tail sanderling, House mouse, Common vole, Field vole, Jackal, Fox, Rabbit*

There is a great need to determine condition of mammal species, as the natural habitation in the studied area has significantly changed as result of human impact.

Table 3.8 Fauna species on the study area

№	Species		Project region
	Amphibia		
1.	Green toad	*(Bufo viridis Laurenti),*	+
2.	Lake frog	*(Rana ridibunda Pallas*	+
	Reptilia		
1.	Spur-thighedtortoise	*Testudo graeca L.* ®	+
2.	European pond terrapin	*Emys orbicularus L.* ®	-
3.	Gecko	*Cyrtopodion caspius Eich.*	+
4.	Long (-legged) skink	*Eumeces schneideri Daud.*	-
5.	Lizard	*Stellio caucasicus Eichw.*	-
6.	Snake-eyed Lizard	*Ophisops elegans Men*	+
7.	Desert lacerta	*Eremias velox Pallas*	+
8.	Stepperunner	*Eremias arguta Pallas*	-
9.	Blind snake	*Typhlopidae vermicularis Mer.*	+
10.	Sand boa	*Eryx jaculus L.*	-
11.	Water snake	*Natrix tessellata Laur.*	+
12.	Pallas Coleber	*Coluber ravergieri Menet.,*	-
13.	Dahl whip Snake	*Coluber najadum Eich.,*	+
14.	Ring-necked snake	*Eirenis collaris Men.*	-
15.	Cat Snake	*Telescopus fallax Fleisch.*	+
16	Montpellier Snake	*Molpolon monspessulanus He*	+
17.	Blunt-nosed Viper	*Vipera lebetina obtusa Dw*	+
	Mammals		
1.	Long-eared hedgehog	*Hemiechinus auritus Gmelin*	+
2.	Kuhl's pipistrelle	*Pipistrellus kuhlii Kuhl*	-
3.	Small Asian jerboa	*Allactaga williamsi Thomas*	+
4.	Brown Rat	*Rattus norvegius Berkenhout*	+
5.	Red-tail sanderling	*Meriones erytrourus Gray*	+

6.	House mouse	*Mus musculus L*	-
7.	Striped field mouse	*Apodemus agrarius Pallas*	+
8.	Common vole	*Microtus arvalis Pallas*	+
9.	Field vole	*Microtus socialis Pallas*	+
10.	Rabbit	*Lepus europaeus Pallas*	+
11.	Fox	*Vulpes vulpes L.*	+
12.	Jackal	*Canis aureus Linne*	+
13.	Wolf	*Canis lupus L.*	+

(+) available species; (-) unavailable species;
®- included in the Red Book of Azerbaijan and the List of International Association of Protection of Nature.

Table 3.9 Species and number of birds in the project area.

Species		Project region	
		"Boyuk Shor" section	"Balakhani" section
1. Little grebe	*Podiceps ruficollis*	0	3
2. Cormorant	*Phalacrocorax carbo*	0	7
3. Grey heron	*Ardea cinerea*	0	2
4. Lesser kestrel	*F.tinnunculus*	4	6
5. Long-legged buzzard	*Buteo rufinus*	0	2
6. Marsh harrier	*Circus aeruginosus*	0	2
7. Water rail	*Rallus aquaticus*	0	8
8. Moorhen	*Gallinula chloropus*	0	4
9. Purple gallinule	*Porphyrio porphyrio*	0	6
10. Coot	*Fulica atra*	0	4
11. Caydaq cullut	*Himantopus himantopus*	0	2
12. Herring gull	*Larus argentatus*	8	6
13. White-winged black tern	*Chlidonias hybrida*	0	6
14. White-winged black tern	*Ch.leucoptera*	0	2
15. Common tern	*Sterna hirundo*	0	7
16. Rock dove or feral pigeon	*Columba livia*	23	32
17. Turtle dove	*Stretopelia turtur*	4	0
18. Turtle dove	*S.senegalensis*	0	0
19. Ringdove	*S.decaocto*	2	0
20. Little owl	*Athene noctua*	2	0
21. Cuckoo	*Cuculus canorus*	2	4

22. Swift	*Apus apus*	7	2
23. Blue-cheeked bee eater	*Merops superciliosus*	4	4
24. Hoopo ovok	*Upupa epops*	2	2
25. Calandra lark	*Melanocorypha calandra*	0	4
26. Lesser short-toed lark	*Calandrella rufescens*	0	5
27. Lark	*C.cinerea*	0	1
28. Crested lark	*Galerida cristata*	14	21
29. Bank swallow	*Riparia riparia*	0	0
30. Common swallow	*Hirundo rustica*	3	4
31. House martin	*Delichon urbica*	11	18
32. White wagtail	*Motacilla alba*	1	3
33. Wheater	*Oenanthe oenanthe*	3	2
34. Isabelline wheater	*O.isabellina*	4	3
35. Great reed warbler	*Acrocephalus arundinaceus*	0	48
36. Getti's warbler	*Cettia cetti*	0	18
37. House sparrow	*Passer domesticus*	100	215
38. Field sparrow	*P.montanus*	0	11
39. Starling	*Sturnus vulgaris*	33	48
40. Great grey shrike	*Lanius excubitor*	0	1
41. Blackbird	*Turdus merula*	2	2
42. Bearded tit	*Panurus biarmicus*	0	61
43. Blackcap	*Sylvia atricapilla*	0	6
44. Chaffinch	*Fringilla coelebs*	4	11
45. Goldfinch	*Carduelis carduelis*	8	11
46. Magpie	*Pica pica*	2	3
47. Red-billed chough	*Pyrrhocorax pyrrhocorax*	0	0
48. Hooded crow	*Corvus cornix*	2	4

3.5.5. Field study and results of recent studies

The results of recent studies have been used and a necessary general (initial) study has been carried out to assess current status of fauna species in project region and adjacent areas. As the study within the project framework was carried out in winter time, there was less probability of an appearance of fauna species characteristic for warm period. Therefore, results of studies carried out in recent years (2005-2007) have been used in the study results given in this section **(Binagadi** OIL).

Study area conditionally consists of "Boyuk Shor" (Boyuk Shor Lake, comprising Balakhani landfill side shore and adjacent areas) and "Balakhani" parts (Balakhani landfill area, including Balakhani settlement).

a. Boyuk Shor lake and adjacent ground areas

A greater part of the area has been disabled and appeared to be totally useless for fauna as a results of a man-made contamination. Balakhani landfill shore side of the lake has been contaminated with industrial and domestic wastes for many years (Annex 4), even now these wastes continue to contaminate the water bodies.

b."Balakhani"study area

"Balakhani" study area is situated in Sabunchi administrative region of Baku, in the vicinity of Balakhani settlement. This study area has been broadly expanded as a result of a recent new population and complex of a private house construction. There are several active oil producing facilities, industrial and other economical activities owned by Balakhanineft Oil Producing Enterprise.
Therefore, most of the area has lost natural landscape features and turned into into a park landscape. Some parts of other areas have undergone degradation, contaninattd with oil and waste, disturbed for fauna, being under an industrial and strong man impacts. However, there are some places left, partially available for fauna, consisting of natural area fragments, surrounded with oil derricks and housing property. During the study wildlife has been met, namely, in these areas.

3.5.6 Methods

For the purposes of investigation of fauna content in the studied area observations were made on selected control land strips (transects) in these biotopes. Size and configuration (line tansect, circular and formless), observation time and method of transects were determined depending on relief of the area and biological categories of the species. Size of transect was within 1000 – 3000 square m. Existence of species was determined by visual observation of species or by finding various elements (dead body or parts of body, voices, excrement, nest, track) of life activity of the species, including discussions and clarification with local people. Discussions on this subject were held with oil-workers and other residents. During these discussions they precisely described the species they recognised or observed by their octal appearance or behaviour and they helped to determine species of animals. Where possible, photographs or signs of the species have been taken.

3.5.7. Results

All characteristic biotopes and natural ereas, despite partially available for species, have been discovered to determine species of fauna in study areas. These areas, partially available for fauna, consist of natural fragments, surrounded with private housing, abandoned sites, oil derricks and semi-desert landscape with wormwood-ephemeral, saline plant formation of saline soil. The following biotopes are mostly discovered:

1. Semi-desert plain and hills with wormwood – ephemeral plant formation;
2. Semi-desert plain and hillsides with ephemeral and saline plant formatiop;
3. Deserts and hills with ephemerial plant formation;
4. Repeatedly rehabilitated cavities or hills;

5. Ravines and cavities of different size
6. Steep ravines left from locations of old sand and stone quarries;
7. Cane pools.

a. Amphibia.

This area is located at north-eastern edge of project site. Notwithstanding large scale of housing and oil producing facilities (derricks) of Binagadi Oil Producing Unit No 2, there are some existing fragments of natural area, available for fauna. These natural inhabitation (biotopes 1,3,4,7) is under a strong human impact, surrounded by private housing, located near oil derricks and numerous communication lines (roads, pipelines, power lines). There are many oil pits around the oil derricks and marshland and the inhabitation is contaminated with domestic wastes.
As the study was carried out in winter time, there was less probability of appearance of reptilia in study area.
As per results of studies of researchers carried out in this area during hot period of year, *Bufo viridis Laurenti* of amphibia was seen under a stone. In daytime these frogs can be found in shelters (under stones and bushing).

b. Reptilia.

Creeping species are represented in a relatively broad spectrum as the are? goes with landscape characteristics and available biotopes.
Species of creepers such as *Snake-eyed Lizard, Desert lacerta, Gecko, Blindsnake, Water snake, Cat Snake.* have been met. As per words of oil workers, the poisonous snake *Blunt-nosed Viper* is also met in hot summer months.

c. Mammals.

These mammal species are likely to be available: *Rabbit, Fox, Small Asian jerboa,* and *Brown rat.*

Single nests *(Small Asian jerboa)* and grouped nests *(Common vole, Field vole and Brown Rat)* of some small gnawing animals, as well as nests of *Fox* have meen found. Local people reported appearance of *Jackal* in the area.

d. Birds.

Each of 2 sections of a bird study of is exposed to a certain level of man impacts. Species and quantities of birds in these sections are variable. (Table 9.2)

Boyuk Shor lake is extremely contaminated with oil and oil products and bec am e useless for inhabitation of birds. Also there are a lot of oil wells and domestic wastes ava ilable on the ground areas adjacent to the lake. Some oil pits can be met around the oil wel ls. There are roads, power lines, oil and gas pipelines passing to various directions throu gh the area. 75-80% of natural landscape has been destroyed. Repeatedly rehabilitated natural areas of birds are left, like small stips among oil facilities. The local community permanently feeds flock and herd in these areas. Oil workers from the oil facilities create an uninterrupted

disturbance factors in the area. general quantity of birds is likely 242 individuals of 24 species in this part of area. All of them are small in numbers and sinantrope species.

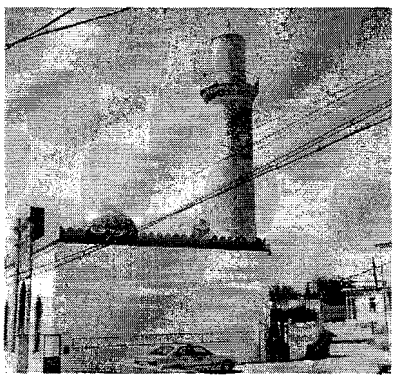
3.5.8 Summary

Ecological sensivity. Most of the area has lost its ecological sensitivity and its value as an inhabitation for wildlife, being contaminated with industrial pollution and extreme exposure to a man impact..
However, few fragments of some natural areas are available, keeping its value and ecological sensitivity as an inhabitation.
Wildlife species are restricted to those biotopes which are loaded with less man,impacts as a result of disturbance and reduction of natural inhabitation. (Biotopes 1-7).
There is a growing man impact continued until now, so that housing, industrial and utility impacts are still in progress.

3.6 Historical, cultural and religious monuments

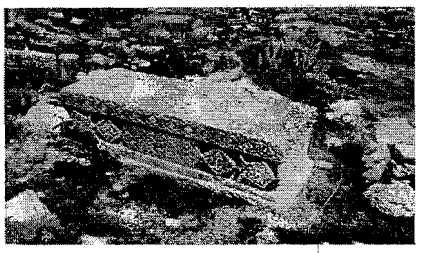
Archaeological materials discovered in the territory of Absheron peninsula prove that humans inhabited Absheron since ancient times. Archeological monuments dating to the III-I millennium B.C. were discovered in Pirallahi, surroundings of Zigh lake, Shuvelan, Mardakan, Binagadi, Amirjan and other areas.

The *State pal(a)eontology reservation* located in Binagadi settlement that is one of the valuables of the pal(a)eontology period (ancient stone century). Bones and skeletons of some ancient animals - cave bear, rhinoceros, wolf, fox, horse, buffalo, gazelle, etc were discovered from clay strata (inspissated oil) near the village. Seeds of some plants such as willow-leaf pear, juniper, pistachio-tree, pomegranate, vineyard, etc. have also been discovered. The settlement and its surrounding areas are rich with monuments and findings relating to different historical periods.



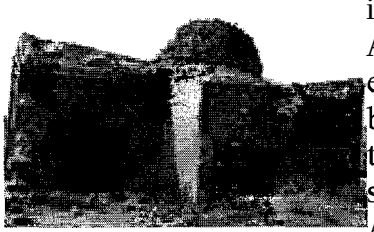
Unfortunately, no full archeological research has been conducted in this area so far. At present some characteristic monuments like mosque, bathroom and old cemetery are visible in the center of the settlement.

Rectangular Cume(Friday) Mosque consists of a vestibular and a square praying hall, constructed on the arrow-shaped arc columns. Dome of mosque is supported by conus-shaped tent construction on circular-shaped barrel. Local design and elements characteristic for Absheron architecture are clearly visible on this building. But single minaret provides a magnificent view to the whole mosque composition. Some European features are felt on some elements of the entry portal. The mosque was constructed in 1909-1914 by masons Aga-bala and Husseinbala, who hailed from Novkhanı village.



Research of some fragments of Binagadi *double-dome Haci Amrah bathroom foundation* (Picture 116b) prove that it had been repeatedly rehabilitated or capital reconstruction works were carried out. The bathroom consists of 2 parts, changing-room and shower-room separated from each other with 4 eight-comer stone columns of the same design. 2 arrow shaped domes of the bathroom are installed on stone columns. At the moment the bathroom is in a poor state and needs urgent repair works. As the bathroom is surrounded by various premises, only flat roof and 2 arrow-shaped domes are visible from a distance.

At edge of the settlement, there is a cemetery left from Middle Ages, not far frqm the new cementry. Some stone chests have been preserved here. There are dilapidated epitaphs in Arabic language on some cemetery stone chests, alongside with engravings of traditional plant ornament elements.



Balakhani tower, without any documented history until today, is located in Balakhani, one of the historical settlements of Absheron. İ.Y.Lerx, former representative of Russian embassy in Iran wrote in 40th of XVIII: "Still there is a 4 bastion, rectangular tower near Balakhani village?. In one's time, the wedding party of parents of the well-known Azeri scientist Abbasqulu Aqa Bakikhanov took place in this tower. At present part of this tower is under ground. The remainder of the tower is uncared for and collapses.

The monuments of Middle Ages located in Balakhani settlement; underground storages, currently filled with 4 types of oil products and called Oil storages; *Shakir Aga Tomb*, built in 1472 by Clerk of Ibrahim Shirvanshah to the honour of his son and religious-historical monument Nusretali Mosque are not properly preserved and collapse.

Shah Shefi Place related to Balakhani historical monuments was constructed in 1643. All the merchants of that time used to travel through these areas as the monument was on the historical silkway.

3.7 Social and economic situation in the region

Main progress in socio-economical development of Azerbaijan is connected with development of oil and gass deposits of the Caspian Sea. In the first half year of 2007 oil production was 21 mln. 48,2 thousand tons (this was 45,2% more than the same period of 2006), but gass production was 4 bln. 469,1 mln. cubuc meters that was 32,9% more in comparison with the same period of 2006.
Gross Domestic Product increased in the last five years and reached 17 bln. 735,8 mln. manat in 2006. Share of private sector reached 81%. GDP per man made 2150 (2530 dollar). Unit weight of industry within GDP structure made 62,2%, construction – 6,7%,

transport – 5,4%, communication – 1,6% (State Statistics Committee, July, 2007). Baku had the maximum share of GDP per person and this was equal to 1750-4450 manats ($2000-5250 dollar). This share was higher in the oil producing and oil refining regions of the city.

Welfare of the population has improved thanks to improvement of economical situation in the country. Increase of country budget resulted in increase of the average monthly salaries of people involved in different sectors of the economic activity. Average monthly salary made 102 manats ($117,7 dollars) in Azerbaijan in the first half year of 2006. According to the report of State Statistics Committee level of average mothly salary in the first half year of 2006 increased for the employees working in mining industry, constructioh, financial sector, including consumer and rental services.

In particular, average monthly salary in the industrial sector made 225 manats ($262 dollars), but this figure made up 308 manats ($358 dollars) in oil/gas industry. average monthly salary in oil industry made 310 manats ($360 dollars) in January-February, 2006. For reprocessing sector this figure made 119 manats ($138 dollars), for construction workers 364 manats ($423 dollars). In 2005 monthly average income per person from domestic activities made up 59,2 manats ($70 dollars), 50,4% of which was salary, 22,7% - income from private activity, 9,1%- pensions and social benefits (Table 3.10).

Table 3.10 Monthly income level on Baku city (2005)

Income	Country		Baku city	
	Per person share monthly (manat)	Percent	Per person share monthly (manat)	Percent
Total	**50.4**	**100**	**59.2**	**100**
Employment	15.2	30.2	29.9	50.4
Private ativity	11.8	23.4	13.5	22.7
Agriculture	9.4	18.6	1.5	2.5
Rent	0.7	1.4	1.2	2.0
Property	0.2	0.3	0.3	0.4
Current purchased transfers	5.9	11.7	5.8	9.9
Pensions	4.8	9.5	4.9	8.2
Social benefits	0.6	1.3	0.5	0.9
Social transfers in kind	0.4	0.9	0.4	0.7
Other income	7.3	14.4	7.1	12.1
Income from other families	5.6	11.1	5.3	8.9

Reforms in the field of health are being implemented since the beginning of 2006 to equally provide all necessary types of medical and social assistance for the entire population of the country. Main purpose is to improve health care for mothers and children. The government is planning to increase share of health care in the government budget in various forms (insurance, state, private etc.) that has made up 8% of the total

budget in 2006. The government supports expansion of initial circle (out-patients department-polyclinics facilities) of health policy, control of paid services (this time current prices of rendering medical services has been reviewed to determine whole urgent services on health), development of modern private medical services, including improvement of infrastructure and training of medical personnel.

Poverty reduction is still an urgent problem in socio-economical development program of Azerbaijan Republic. According to the information of the State Statistics Committee specific weight of the population living in poverty in 1996 made up 68, 1% that covered 29% of the population in 2006.

Gradual economic development of the country allowed successful implementation of the special program set forth by the President of the country on socio-economical development. We think the following are the most important of them:

State Program on reduction of poverty level and socio-economical development prepared together with World Bank in 2002;

State Program on development of fuel-power engineering of Azerbaijan during 2005-2015;

Program of measures on acceleration of socio-economic development of Baku and suburbs.

Demographic structure

The number of population in Azerbaijan was nearly 8,436 mln by the end of 2005 (Table 3.11). Ratio of men and women equaled to 1:1. Quantity of workable people (16—59 years old men, 16—54 years old women) make up 54,1%. Population of AR is young; number of people up to 35 years old makes up 67,6% (Statistics, 2006)

The population has a stable increasing tendency. Population of Azerbaijan has been increased by 1,3 mln since 1999. Increase of the population is natural, though births have been decreased in the last 5 years. (from 21,4 to 15,5 on each 1000 persons). But there is a low tendency of deaths (from 7,4 to 5,9 for each 1000 persons)

Table 3.11. Population (thousand persons)

	1990	1995	2000	2001	2002	2003	2004	2005	2006
Azerbaijan Republic	7131.9	7643.5	8016.2	8081	8141.4	8202.5	8265.7	8347.3	8436.4
Urban population	3847.3	4005.6	4086.4	4107.5	4130.1	4154.3	4254.3	4298.3	4356.6
Rural population	3284.6	3637.9	3929.8	3973.5	4011.3	4048.2	4011.4	4049	4079.8
Baku city (including suburbs)	1807.8	1765.5	1796.6	1807.3	1817.9	1828.8	1839.8	1~855.3	1873.6

4. ENVIRONMENTAL ASSESSMENT

4.1 Purpose

Main purpose of environmental assessment (EA) is to conceptually assess necessary environmental and social (positive and negative) impacts of the proposed project, to determine appropriate measures (including monitoring) for minimization, prevention and mitigation acivities for potential negative impacts of the project.

This EIA is a framework document for the intended works as there was no concrete engineering solutions (projects) for Balakhani landfill covering and construction of a new landfill while preparating current EIA report.

Project solution, covering options and engineering solutions will be definately assessed in the process of environmental impact assessment to be carried out for a concrete project proposals for the landfill covering and construction of a new landfill.

Carrying out of a EIA process for the intended project activities and requirements for a structure of EIA report have been prepared (Annex 3) an the basis of environmental impact assessment, given in this report.

EIA process to be carried out for a concrete project will provide implementation of all required necessary environmental issues and consideration of special clauses on environment, health and safety as specified in the tender documents.

4.2. ENVIRONMENTAL CATEGORY OF THE PROJECT

Waste-to-Energy Project relates to the Environmental Category of "B" in compliance with appropriate option of the World Bank Integrated Safeguard Categories of projects. (Annexl. Environmental categories).

During initial environmental assessment it was determined that adverse effects of this project may be reduced by adequate preventive and mitigating measures. (section 3) Considering the nature of the project environmental impacts, a complete EIA process for the project activity will be required in future.

EIA principles of the proposed project are set out in Annex 3 provided that this report is designed as a framework for environmental assessment aspects of the proposed project activities and an instrument for determining principles of project activity assessment.

5. PROJECT IMPACTS

The current project objective is covering of Balakhany landfill, which is a source of great environmental and human health impact, and which is to be operated in accordance with the modern requirements. Due to the main objective of the BTPB project being mitigation of potential environmental and human health impacts, this project is included in ecological projects group and accordingly the impacts of the completed project are expected to be positive.

Characterization of project impacts in EIA will cover the following project related activities:

Use of Balakhani dump site within the process of implementation of this project untill construction of the new dump site in the future.

Implementation of contsruction works (construction of dams) necessary for covering of dump sites,

Impacts for the periods after shutting down other illegal dumps
The impact of changes in waste management that would occur as result of implementation of this project has been analyzed. It was taken into consideration that great positive changes will take place in waste management sector in Baku as result of implementation of this project, many official and non-official landfills in Baku and surrounding areas will be closed down and systematic transportation of waste will be arranged.

5.1 Environmental impacts of uncovered waste dumps

The following are general environmental problems related to the active part of the landfill and numerous open dumps located in the project area and adjacent territories.

Air Pollution Impacts: Atmospheric pollution associated to waste burning (emissions of particulate matter, CO, C02, NOx, SOx, and dioxins) with related generation of toxic fumes and odors.

Social and Health Impacts: Proliferation of sanitary vectors (pests, inhalation and skin contact with wastes can increase risk of contracting sicknesses, gas and aerosol emissions can cause serious health problems). This may be increased with the presence of pathogenic and hazardous wastes. Negative impacts on traffic, deterioration of existing;roads and vehicles. Creation or augmentation of marginal population settlements (informal workers settled in inadequate sites and undertaking selective waste collection activities that generally involve child labor, poor housing conditions, and insufficient income to cover basic needs). Also high nutritional and sanitary risks.

Impact on Water quality: Generation and dispersion of leachates through water bodies. Continental and coastal water pollution (superficial and underwater contamination).

Impact on soil: Soil pollution due to unmanaged waste collection and burning.

Impact on landscape: Negative impact on landscape (both in accepted and clandestine dumps).

Impact on fauna andflora: Disposal in inadequate sites impacts protected areas and natural habitats, affecting natural flooding and groundwater zones.

5.2. Common enviromental and sosial impacts related with construction activity

The following are the most common potential environmental and social impacts arising from the construction phase:

Impacts on soil: Removal of the soil's superficial layer creates a negative impact on the quality and capacity of the land, its compacting capacity and also in terms of erosion. The soil will be permanently and irreversibly modified as compared to its natural condition. Construction work and later operation will alter the soil's original compacting capacity and its structure eroding it and modifying its original capacity. Changes in the terrain and digging will modify the original superficial draining process and may increase erosion in dry and windy areas.

Impacts on fauna: Indigenous fauna will suffer a negative impact as the vegetable cover is completely removed, although this will be partially reverted at the time the landfill's final cover is placed in the ground. The main impacts on the indigenous fauna are directly related with the damage, modification or elimination of its habitats. The clearing and leveling of the site as well as the soil movement required during the construction phase translate into direct impacts that determine a reduction in the availability of habitats for affected species. Additionally, drilling with heavy equipment and the use of explosives are sources of noise that can temporally affect the local fauna forcing it to migrate to other areas.

Impact on air quality and noise: Construction works can trigger erosion and atmospheric pollution including: increased noise, odors, particulate matter and gases. Movement of heavy equipment and machinery will permanently generate dust. Also, combustion gases from machinery and vehicles will affect air quality during this phase. Any use of equipment will generate odors as a result of the combustion process.

This pollution is not going to cause some significant impacts considering the fact that it is of temporary character and that the location of the landfill is far away from settlements. It has been stated that these impacts are not going to cause major consequences on the environment.

Impact on noise and vibrations. Noise and vibrations will appear while using heavy mechanization, during the construction of the plant. However, they will not have any substantial influence on the environment and workers.

Impact on water quality: The use of fine materials (limes and sand) on the sides of the roads being built and as part of any infrastructure works generates water erosion risks that can threaten the stability of those works. The equipment operating during this phase will generate residues (oils, fuels, and dirty water).

Potential Social impact: new sources of employment will temporarily arise. However, closing waste dumps may generate negative economic impacts on the nearby dwellers living out of waste picking and recycling.

5.3. Environmental and social impacts during operation of the landfill

(considering works to be carried out for the landfill covering)
Surface contact between the main part of the landfill and morphologically formed natural structures is a zone with high risk for an environmental contamination.

Landfill wastes are exposed to a structural decomposition through a combination of a chemical, physical and biological combination. Decomposition products appear in the form of solid, gaseous and liquid through this decomposition and the landfill plays a role of biological reactor.
Methane and carbon dioxide, nitrogen oxides, hydrogen sulphide, ammoniac,mercaptans and other substances created by a waste decompositon will be discharged into atmosphere that consequently will cause a climate change.
Harmful substances and odors will be emitted into environment through burning of the landfill gasses and wastes in an open air during an operation of the landfill.
Installation of a system for collection of treatment of landfill gasses in paralel with landfill operation will minimize these environmental effects.
Filtrates and waste water (mostly precipitation waters) are deemed to be the most hazardous liquid wastes. Filtrates contain hazardous substances, as well as may cause infectious deseases through bacteria. Collection and processing of filtrates in the designed treatment facility will reduce these effects.

The followings are the main potential environmental and social impacts in addition to those listed above:

- *Land impacts:* Risks like removal of topsoil (changing of plant cover and local fauna), deformation of land and contamination of top layer, leveling of hillsides, land erosion.
- *Water impacts:* Surface rain waters will be collected and drained off through internal ditches and rain water drain designed for a construction. Contamination of surface waters and ground waters may take place, so that they may penetrate inside and under the landfill because of improper isolation of filtrates.
- *Air quality impacts:* Dust emissions due to moving of transport and unloading process at the entry stations and landfill area, including air and noise emissions generated by motors. Emissions of toxic gasses due to various industrial wastes of the landfill. Other effects are given above.
  Change of landscape: topographic changes, changes from regular activities on the site.
- *Potential social impacts:* There are risks in connection with work related accidents. There are also employment opportunities (short-term). Landfill personnel may be exposed to a risk of illness due to harmful effects.

5.4. Environmental and social impacts after covering of the landfill

- *Impact to landscape:* rehabilitation of plant cover and fauna.
- *Potential impact to water:* Contamination of surface and ground waters; so that after covering filtrates may penetrate inside and under the landfill due to reasons of

mismanagement. In addition, probably, improperly treated filtrates and waste waters may contaminate surface and ground waters.

- *Potential impact to air quality:* Mismanagement of landfill gasses and filtrates may cause emission of odors and harmful substances. In addition, emission of gasses into atmosphere is possible due to various available and probable cracks on the landfill covering.

- *Social impact:* Communities may have some opportunities to use some geographical areas. Increase of land prices of the adjacent areas. Decrease of employment sources. This may economically affect local community members who have been recycling landfill wastes for a long period of time.

5.5. POTENTIAL POSITIVE ENVIRONMENTAL AND SOCIAL IMPACTS

5.5.1 Potential positive environmental and social impacts of the project

Prevention or minimization of release into the environment of landfill has, smell, hazardous matters, resulting from incineration of landfill gases and wastes in the open air, waste waters and untreated filtrates will lead to reduction of environmental and human health impacts.

At present the problem of upgrade of methods of waste management, lowering of impacts to humans health is considered as one of mayor problems of protection on environment.

In this respect, the project is helping:

Reducing disease risks, therefore positively affecting people's health.

Reducing exposure to, and bad odors which may generate unpleasantness, headaches, and nausea.

- Reducing emissions of dust and particle matter, which may affect vision and create respiratory and pulmonary diseases.

Reducing exposure to contaminated water and soils, direct or through the food chain, which may convey gastric and respiratory diseases.

5.5.2. POTENTIAL NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACTS

Implementing project activity may generate negative social and environmental impacts. In particular:

Loss of income sources. Closing open waste dumps and improving landfill management practices may reduce or eliminate the income sourcks of waste pickers and live-in dwellers working at the disposal sites. There might also be a change in the formal working structure, moreover if the landfill operator changes.

- *Geomorphological changes.* Permanent landscape and geomorphological changes will result from landfilling.

  Effluents. Leachate effluents will result from the organic decay of the wastes to be piled up and disposed. There is the risk of water and soil contamination.

- *Erosion.* When excavating during construction works , the soils and talluses may get unstable and erosion might be created.

- *Loss of vegetable cover.* Excavations and landfilling will generate loss of vegetable and plant cover.

- *Health risks.* Workers in the landfill will be exposed to wastes and potential illnesses.

6. ENVIRONMENT MANAGEMENT PLAN

Environment Management Plan (EMP) includes Mitigation Measures designated for lowering of pollution level, carrying out of monitoring and institutional strengthening.

6.1 Major principles (guidelines) for mitigation of impacts to Environment

The principles (general guidelines) of mitigation activity include procedures designated for mitigation of potential negative impacts to environment.

Use of these principles in reports in EIE (Environment Management Plan – EMP) and contracts to be signed with contractors, and in dump sites operational guidelines is recommended.

The principles for mitigation of impacts to Environment included to the Project are given for stages:

i) Stage of operation of Balakhani dump sites till carrying out of construction works necessary for covering of Balakhani dump site (land works, development of drainage and dump site perimeter dams, construction of network for collection of dump site gases and leachates) and construction and operation of new dump sites, and:

ii) Stage of covering of Balakhani dump sites. Carrying out of some preparatory works for covering of dump sites.

iii) post-covering activitity

The EIA reports submitted after preparation of concrete proposals for the project will provide more concrete potential environmental impact mitigation measures based on these principles (for instance, land relief and material selection for construction of the bund and drainage, seletcion of aporoiate methods of pest control, etc).

This principles are recommended for use during preparation of EIA's for the landfill (Environmental Management Plans), contracts signed with contractors and landfill operation guidelines.

The principles of environmental impact mitigation are provided for project phases.

6.1.1 Principles of protection of environment in the stage of construction and operation of the waste disposition site

Waste management

- Adoption of all transport and waste disposal measures established in valid regulations.
- Proper storage of hazardous materials in a specially allocated place, provision of drainage for waste waters and treatment if necessary.
- Daily removal and disposal of all construction wastes in dully approved locations.

Occupational health and industrial safety

- Training sessions regarding workers' safety before construction works begin.
- Provision of adequate equipment to workers and demand their use.

Contingency Plan

- Training of personnel to make sure that it has clear and precise instructions in case of contingencies, in order to protect the environment and minimize impacts.
- Suspension of work in case of intense rain or when emergencies occur.

Materials sourcing and management

Extraction of materials limited to authorized zones.

- Avoidance of material to be accumulated in areas that can obstruct naturpl draining.

Traffic management

- Sufficient signals and barricades to ensure public safety and the environment.
- Construction traffic only to take place at the assigned areas and to existing roads.
- Information available to the community regarding the timelines for constructions, the interruptions of services and the traffic routes as appropriate.

Air quality and noise control

- Watering of access roads and accumulated materials as necessary to reduce erosion caused by wind and suspended dust.
- Dust and noise walls built as necessary
- Night shifts for construction works avoided as possible.
- Noise associated with the operation of equipment and transport not to exceed 90 db, as possible.

Soil management

- Removal of superficial soil and vegetation only to take place strictly in the designated and necessary areas, minimizing the exposure time of soils.
- Once construction works have concluded, restoration of the site and its conditions to be left as similar as in their original stage: roads will be cleared and re(-vegetation promoted.
- Land extraction to take place in such way that it will not cause big leveling in the terrain.

Water management

- Commencement of operations will not impede the flow of water ad will not contribution to flooding or alternations in human or animal movement.

Protection of natural and heritage resources

- No hunting, capturing or harassing of wild animals.
- Fires prohibited.

- Procedures in place in case of archaeological or historical finding takes place during excavation. The company will notify the pertinent authorities and will temporarily interrupt its works. It will protect the findings as good as possible, avoiding access of unauthorized personnel.

6.1.2 Principles of protection of environment in the stage of covering of waste disposition site

The covering of open dumps takes place upon final covering of a solid waste disposition site at the end of its useful life, or because it is necessary to close it because of negative environmental impacts.

The covering's first step involves the characterization of the site considering its environmental impact. It is implicit that the environmental benefits of eradicating open dump sites (ODS) are greater than any potential impacts triggered by the works involved in the process of covering. Thus, covering will therefore contribute to improve the environmental conditions of the site.

The covering plan must include closing measures for the covering as such add for post-covering. This last phase requires the definition of how the land will be used (for recreational or sports purposes, etc) before the design and construction activities begin.

The following guidelines must be followed by contractors engaged in closing open dumps:

- Perimeter covering with wire fencing
- Identification of discharges of hazardous residues and management procedures
- Removal of hazardous components identified in the solid waste and disposal according to legislation

  Removal of soils affected by hazardous residues or substancels and their management and disposal according to legislation
- Removal of solid waste disposed in canals and natural draining systems on site and surroundings
- Removal of solid waste from access roads to the open dumps as well as from clandestine dumps and their transport to the selected landfill site.

  Removal of plastic and other residues that might be spread both in the area where waste was discharged as well as in other clandestine dumps and access roads.

  Compacting of the wastes purposely thrown in the dump to avoid migrations or waste dissemination
- Changes in slopes to reach between 5 and 10% to guarantee that when the slope has settled, it won't be greater than 1%

  Construction of drainage system and capture of leachates: construction of canals that will capture the liquids and drain them to the pumping areas.

The bottom must be waterproofed and the canal's lateral walls and slope must be 3% on the side where the pipes are installed. The value of the flow must be determined on the basis of hydro balances, taking into account the water flows and leachates produced.

Biogas ventilation: construction and distribution of chimneys throughout the area. Biogas may also be treated with collection systems and flaring or may also be used for electricity generation.

Water drainage systems: they run rain water conducting it to the closest reception point, minimizing absorption in the areas that have been filled for waste. They include gutters and drains. The covering of the dump must allow for adequate drainage of the water that falls on it to those perimeter drains to guarantee that rainwater is properly evacuated from the site.

Final coverage: the waste must be covered in three phases, the first with a 0,20 m layer compacted until an adequate density is obtained to avoid rainwater from filtering. The second one will take place irnmediately after the first one and will be as follows: a low permeability layer of soil will be distributed and compacted with a minimum depth of 0,40 m. The depth of the two layers built on this phase will be of a minimum of 1,00 m in the closest area to the perimeter road and will begin to uniformly diminish until it reaches a depth of minimum 0,60 m at a distance equal to a third of the length between the perimeter road and the top of the dump. At that point it will remain stable until reaching the maximum height of each section. The third layer will entail the distribution of a vegetable soil layer, with 0,20 minimum height, conveniently distributed and compacted. The area will then be covered with vegetable species that can easily develop in the area and indigenous, as possible.

Vectors control: development of control programs to prevent plagues and control insects and rodents.

6.1.3 Guidelines for post-covering activities

After closing open dumps, post-covering plans must be in place, including:

- Environmental control: a monitoring and tracking plan for all environmental factors must be developed.
- Definition of the use of the site: recreational, forestry, agricultural and commercial.

6.2 Main principles of monitoring activity on Environmental Management Plan (EMP)

The following variables shall be monitored, regardless of the requisites of the Environmental License, and will be included in the EMPs:

i. Weighting and registry of each of the vehicles that enter the site to dispose of wastes

ii. Annual characterization of solid residues according with technical specifications and norms.
iii. Annual control of sanitary installations
iv. Monitoring and control of the compacting system according with technical specifications.
v. Monitoring and control of water quality (including PH, electric conductivity, oxygen dissolved, heavy metals, COD, BOD, ammonia and nitrites; water coming from drainage systems will also be analyzed).
vi. Monitoring and control of the air quality (including biogas composition, CH_4, CO_2, CO, SO_2, NOx , O_2, suspended particles and breathable particles)

The Department of Ecology and Natural Resources of Baku sity use a Manual for Monitoring and Follow-up, which includes a series of templates for reporting on the administrative steps, and on the project environmental performance. Every months a follow-up visit is to be conducted by the environmental authority to assess performance. Based on the EIA, the approved environmental license document, and on the periodic Environmental Performance Report, a visit is prepared to complete or appraise the pre-set follow-up templates.
The monitoring standards and guidelines for control of air, water, soil, noise, electromagnetic radiation and vibration based on Azerbaijani and international standards are provided in Annex 2.
Following are some parameters to be considered regarding air and water quality monitoring

6.2.1 Air Quality

The relevant parameters with respect to air quality relate to the emission of particulate matter, gas, odor and noises.

- Gas: in case methane is generated in landfills more than 4 m deep, instrumental monitoring shall be conducted. A weekly review is recommended to prove that biogas does not exceed the explosion range throughout the landfill.
- Odor: monitoring will analyze whether the population perceives any odors and will verify with specific inspection.
- Landfill operation implies noise emissions from vehicle transport and discharge and from operation of heavy equipment. The noise level will need to be monitored to ensure it is within the limit established.

6.2.2 Water quality

Periodic monitoring of water quality both superficial and underground is required. Indicators include:

Environmental indicators such as pH, biochemical oxygen demand, nitrates, chlorides, sulfates, fecal levels, conductivity, among others to control pollution of underground and superficial water.

- Leachate indicators: hardness as CaCO3, total alkalinity such as CaCO3, total suspended solids, specific conductivity, pH, total organic carbon, biochemical oxygen demand.
- Common anions and cations: Calcium, Manganese, Sulfate, Magnesium, Ammonia, Chloride, Sodium, Carbonate, Potassium, Bicarbonate, Selenihm, Iron.
- Metals: Antimony, Chrome, Selenium, Arsenic, Cobalt, Silver, Copper, Thallium, Beryllium, Nickel, Mercury, Cadmium, Zinc, Lead.

These parameters should be monitored every three months in wells to be identified and agreed with the competent authority. Monitoring will be analyzed by a specialized water analysis laboratory which should be dully authorized. Environmental monitoring should include measurements and impact control. Superficial and underground water analyses should be conducted according to the standards existing in Azerbaijan. (Annex-)

6.3 Implementation and Management

To achieve satisfactory implementation of project activity , this EMP will ensure that:

a.implementation is monitored;

b.adverse environmental impacts are mitigated;

c.implementation will meet the requirements of the environmental law of the Republic of Azerbaijan and the World Bank safeguard policies.

During the project implementation period project management potential will be formed in the Ministry of Economic Development

The control over implementation of EMP will be effected by MED on a regular basis and by WB during WB missions.

Environmental licensing and EMP developement and implementation generally involves technical interdisciplinary aspects including atmospheric, fauna and flora, geologic, hydrologic, economic, social, cultural and archaeological variables. Monitoring of such variables requires institutional arrangements that include the establishment of a targeted team and the use of specific equipment in order to ensure adequate assessment and control. Landfill operators contract third party monitoring with environmental control companies who possess the equipment and qualified personnel.

Visits from the environmental authorities and timely reports are also necessary and must be prioritized according to:

(v) relevance of environmental impacts as established by the project's conditions and characteristics;

(vi) environmental sensitivity level of the project's site;

(vii) presence or frequency of community complaints or any complaints received from public or private entities (collected by the environmental authority); and,

(viii) type of environmental impacts that might take place of that have occurred as a result of inadequate implementation or unexpected negative impacts.

ANNEXES

ANNEX 1. ENVIRONMENTAL CATEGORIES

As per classification of the WB Environmental Assessment (OP 4.01) policy, proposed projects are divided into A, B, C or F1 categories depending on their type, location, sensitivity, scope of a project as well as nature and size of potential impacts expected from a project.

According to Azerbaijan laws environmental requirements on EIA process are classified on four groups of environmental categories, three of which approximately comply with the Bank's A category.

The 4th category on Azerbaijan relates to the project activities without an impact to environment, requiring certain permissions.

Projects relating to the Bank's A Category (Category-1 of Azerbaijan as per existing; classification)

Projects relating to A Category may cause a harmful environmental impact that could bring to significant, irreversible damages. These impacts might cover relatively greater areas in comparision with construction areas and facilities. They might have a serious irreversible impacts to a human health.

The Ministry of Ecology and Natural Recourses is in charge of issuing licenses on environmental protection for this type of activity category. There is no need for environmental protection licences for all A Category activities. The followings are integrated parts of procedures of environmental protection licences:

In connection with this project, a complete environmental assessment process and an Environmental Impact Assessment (EIA) report (Azerbaijan) are being prepared in comliance with WB rules; EIA is broadly regulated by the document of "EIA Process in Azerbaijan Republic", worked out in 1996 through State Ecology Committee, under UNDP control. This document determines EIA succession procedure and reviews a participation opportunities of the public.

State environmental expertise; this procedure should be carried out in the manner specified in the "Environmental Protection Law" (1999).

- Participation of public in decision-making.

During EIA, carried out for a project of A Category, potential positive and negative effects of the project are being assessed, they are compared with possible potential alternative impacts ("no project" scenario is also reviewed) and necessary actions are recommended to prevent, minimize, mitigate or compensate negative effects and improve environmental implementation.

Projects relating to Bank's B Category (Category-2 or 3 of Azerbaiian as per existing classification)

Projects relating to B Category bring to adverse effects to residential areas and environmentally fragile areas as well as affect water, soil, meadows and other natural residential areas – these impacts have less adverse effects in compariosn with projects of A Category. These are specific impacts depending on areas; few of them have mitigating characters; in many cases, mitigation for this category can easily be worked out in comparison with A Category projects.
Environmental assessment procedure is also carried out for B Category projects.

Ministry of Ecology and Natural Recources will release environmental licences having the following procedures:

- This time Environmental Impact Assessment (EIA) procedure will be implemented in a simplified manner or depending on the character of the project; will be examined by the State environmental expertise as set out in the "Environmental Protection Law" (1999).
- Participation of public in decision-making.

Proiects relating to Bank's C Category (Category-3 or 4 of Azerbaiian as per existing classification)

Projects relating to C Category have minimal negative environmental impacts or no impact at all. After reviewing, no subsequent environmental impact assessment will be required.
C Category includes such activities, scope, location and content of which do not contain any serious environmental impact.
Regional units the Ministry of Ecology and Natural Recourses, as well as Environmental Department of Nakhchivan Autonomous Republic issue licences on environmental protection. The followings are the integrated parts of procedures for issuing licences:

- State environmental expertise; this expertise is carried out through the rules stipulated in the law;
- Notices to public on the designed activities.

F1 Category : The **F** Category includes projects with environmental impact consequences, financed by financial intermediaries, through WB funds.

ANNEX 2. ECOLOGICAL MONITORING STANDARDS

ANNEX 2A. REQUIREMENTS FOR WASTE WATER CONTENT

Standards of harmful substances quantity contained in waste water is regulated by a character of effluent and requirements set for surface water body standards.
All standards have been worked out and apply for the following types of water bodies, subject to their content and characteristics:

a. household-drinking,
b. cultural-household,
c. *fishing* activity.

These standards specified in the laws of Azerbaijan Republic allow for warning and protection from contamination of water bodies, rivers, lakes, water reservoirs, canals especially while using them for household and drinking, cultural-household, as well as fishing activities.
Standard quantity of a harmful substance in a waste water is expressed as a density (concentration), characterising guantity of such substance in a unit volume.
Optimal distribution of discharged harmful substances among the water users, determines standards of Permissible Effluent Discharge Limits for each pollutant, subject to protection of water reservoir and Permissible Effluent Discharge Limits for discharged harmful1 substances.
While determining Permissible Effluent Discharge Limits, content and characteristics of effluent discharged into water body from the described facility, location of connection points, hydological regime characterising water body status specifying a harmful impact level of specific mixtures contained in waste water, availability of waste water outlets above water outlets, content and characteristics of water at this point, possibility of changing hydrological regime and factors such as mixture and deposition rate of water body and waste waters should be taken into consideration.
Once waste water (mostly treated through treatment plant, filtrates to be dischaged) from Balakhani landfill is designed to to be discharged into Boyuk Shor lake, cultural-household water requirements will be applied to calculate Permissible Discharge Limits.
As rainwater and waste water discharged from Balakhani landfill (mostly treated through treatment plant, filtrates to be dischaged) is designed to to be discharged into Boyuk Shor lake, cultural-household water requirements will be applied to calculate Permissible Discharge Limits.

A.1. Waste water standards.

While determining standards for waste waters from Balakhani landfill, it is expected that waste water will be discharged into Boyuk Shor lake. Requrements set out in "Basic rules of using water bodies for recreation and sports" confirmed by decree No. 216, of the Cabinet of Ministers of AR, dated from 22 Oktober 1998 and sanitary-hygienic standards,

SanPiN N 4630–88 adopted in 1998 will be used for waters with cultural-household category.

a. ***Hygienic requirements relating content and characteristics of running waters and water reservoirs used for recreation and sports.***

(A copy from "Background of rules of using water bodies for recreation and sports" confirmed by decree No. 216, of the Cabinet of Ministers of AR, dated from 22 Oktober 1998.)

Characteristics and content of water bodies

For water bodies within boundaries of public swimming areas, sports as well as residential areas

Suspending agents- Quantity of suspending substances should not exceed 0, 75 mg/l. Increase of suspending substances is allowed around 5 % in water bodies containing more than 30mg/l mineral substances in average level of water. If deposition rate exceeds 0,4 mm/sec in waters flows and 0,2 mm/sec in water reservoirs, it is forbidden to discharge suspending substances into water bodies.

Swimming mixtures (substances)

There should not be any suspending substances on the surface of water bodies (thin turbid layers, oil tracks or spots, various additions or other mixtures).

Odours, tastes

Alien odours or tastes in water should not exceed a level of 2 scores (level of human feeling). Alien tastes or odours should not pass to the meat of caught fishes.

Colour

Should be appeared in a 10sm water column.

Temperature

Temperature of discharged effluent in summer months should not be higher than 30C, average annual hottest temperature of water in the last 10 years.

Hydrogen indicator (pH)

Should not exceed 6,5—8,5.

Mineral content

Is normalized with "Tastes" indicator.

Dissolved oxygen

Should not be less than 4 mg/l in a sample taken until 12 a.m. at any period of a year.

Biochemical oxygen demand (BOD)

Should not exceed 6,0 mg/l at 200C of water temperature.

Chemical oxygen requirement (COR)

Should not exceed 30,0 mg/l.

Disease-producing factors

There should not be any disease-producing factors in water

Quantity of Coliphages
Should not exceed 100 in 1L.

Quantity of lactose bacteria relating colon bacillus
Should not exceed 5000 in 1L.

There should not be any living threadworms (teniasis, toxocarosis, fasiol), & living cysts of pathogenic colon bacillus

Chemical substances should not exceed
Permissible Concentration Limit(PCL) or Permissible Approximate Limits (PAL).

b. ***Sanitary-Hygienic Standards***

Table E2.1. Permissible Concentration Limits of harmful substances in household-drinking and cultural-household water bodies (water bodies, water canals, etc)

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
1.	Barium	PCL	s-t.*	0,1	2
2.	Benzpyrene	PCL	s-t.	0,000005	1
3.	Berillium	PCL	s-t.	0,0002	1
4.	Bora	PCL	s-t.	0,5[3]	2
5.	Brome	PCL	s-t.	0,2[3]	2
6.	Vanadium	PCL	s-t.	0,1-	3
7.	Bismuth	PCL	s-t.	0,1[3]	2
8.	Tungsten	PCL	s-t.	0,05[3]	2
9.	Dioxonium	PCL	s-t.	0,000035	1
10.	Ferrum (including ferrum chloride) calculated on Fe	PCL	Orq*** color	0,3[3]	3
11.	Cadmium	PCL	s-t.	0,001[3]	2
12.	Cobalt	PCL	s-t.	0,1[3]	2
13.	Silicium(as per Si)	PCL	s-t.	10,0	2
14.	Lithium	PCL	s-t.	0,03	2
15.	Manganese	PCL	Org.-color.	0,1[3]	3

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
16.	Copper	PCL	Org.-taste	1,0[3]	3
17.	Methane	PCL	s-t.	2,0	2
18.	Molybdenum	PCL	s-t.	0,25	2
19.	Natrium	PCL	s-t.	200,0	2
20.	Natrium chloride	PCL	Org.-taste.	20,0	3
21.	Oil-containing sulphur	PCL	Org.-foam.	0,1	4
22.	Other oil	PCL	Org.-foam.	0,3	4
23.	Nickel	PCL	s-t.	0,1[3]	3
24.	Niobium	PCL	s-t.	0,01[3]	2
25.	Nitrates (NO_3)	PCL	s-t.	45,0	3
26.	Nitrates (on NO_2)	PCL	s-t.	3,3	2
27.	Mercury	PCL	s-t.	0,0005[3]	1
28.	Lead	PCL	s-t.	0,03	2
29.	Selenium	PCL	s-t.	0,01[3]	2
30.	Bronze	PCL	s-t.	0,05[3]	2
31.	Hydrogen sulfide	PCL	Org.-odour.	1,0	4
32.	Sulphate (SO_4)	PCL	Org.-taste.	500,0	4
33.	Sulphate	PCL	Gen**.	Absence	3
34.	Antimony	PCL	s-t.	0,05[3]	2
35.	Thallium	PCL	s-t.	0,0001[3]	1
36.	Tellurium	PCL	s-t.	0,01[3]	2
37.	Phenol	PCL	Org.-odour.	0,001	4
38.	Elementary phosphorus	PCL	s-t.	0,0001	1
39.	Fluorine	PCL	s-t.	1,2	2
40.	Furan	PCL	s-t.	0,2	2
41.	Active Chlorine	PCL	Gen.	Absence[6]	3
42.	Chlorides ($C1^-$)	PCL	Org.-taste.	350,0	4
43.	Chromium (Cr^{3+})	PCL	s-t.	0,5	3
44.	Chromium (Cr^{6+})	PCL	s-t.	0,05	3

N	Description of substances	PCL or PAL	Hazard index	Permissible concentration limit mq/l	Danger class
45.	Cyanide	PCL	s-t.	$0,1^{7}$	2
46.	Zinc	PCL	s-t.	$1,0^{3}$	3

Source: SanPiN 4630–88 , 1988-ci il ; Normative documents on natural protection and efficient use of natural resources. State Ecological Committee. 1994

Abbreviation:

*- **s-t.** –sanitary-toxicological

** -Gen. – General sanitation

***-org. – **Characterises changes of organoleptic characteristics (odour, taste, color, bubble and surface layer) of organoleptic water.**

ANNEX 2B. REQUIREMENTS FOR DISCHARGED HARMFUL SUBSTANCES

Harmful substances discharged into air from enterprises and facilities are regulated, technical standards and their permissible levels are determined.

When determining a Permissible Emission Level of harmful substance, a surface density of harmful substance is calculated through a special program and a distribution chart of a harmful substance is developed, considering meteorological parameters specifying spreading of those substances in air, background data of contarnination area, sources of emission and emission parameters. Standards harmful substance discharge are determined on the basis of these calculations.

The document of PEL s include the following measures:

- Environmental impact, including air quality standards of concrete enterprises and facilities;
- possible spreading and accidental emissions;
- measures for emission reduction (temporarily agreed emission limits), in case of exceeding determined limit values;
- control of determined specified emission limits;
- atmospheric emission regulation in an unsuitable metereological conditions

Permissible Emission Level determine limit values of permits given to enterprises and organizations on harmful atmospheric emissions.

B.1. PCLs

Table E2.2. Permissible Concentration Limit standards for calculating Permissible Emission Level **for some substances emitted into atmosphere from landfill**

Pollutants	PCL o.m.	PCL a.d.	Danger class	
Methane	50 (ALEI)	-	2	
Nitrogen dioxides (NO2)	0.085	0.04	2	
Nitrogen oxides (NO)	0.40	0.06	3	
Sulphur oxide (SO2)	0.5	0.05	3	
Carbon oxide (CO)	5,0	3,0	4	
Hydrogen sulfide	0,008	—	2	
Hydrogen chloride	0,2	0,2	3	
Dioxonium (2, 3, 7, 8-terrachlorodibenzene-1,4-calculated on dioxonium)		$5*10^{-12}$ q/m3	1	
Benzpyrene (3,4-Benzpyrene)		0.000001	1	
Ammoniac	0.200	0.040	4	
Ammoniac	0.200	0.040	4	
Benzene	1.500	0.100	2	
Trichloromethane	-	0.030	2	
Carbon-4 chloride	4.00	0.700	2	
Chlorobenzene	0.100	0.100	-	
Vanadium (V) oxide	-	0,002	1	
Manganese and its compounds (calculated on manganese)	0,01	0,001	2	
Cadmium nitrate (calculated on cadmium)		0,0003	1	
Lead and its compounds (calculated on lead)	0,001	0,0003	1	
Metallic Mercury	—	0,0003	1	
Vanadium (V) oxide	-	0,002	1	
Ozone	0,16	0,03	1	
Soot	0.15	0.05	3	
Suspending agent (non-differentiable as per dust content)	0,5	0,15	3	
Florids (calculated on F)	0.2	0.03	2	
Hydrocarbons	1,2 (TTTS)		4	
Ozone	0,03		3	

Source: GOST 17.2.3.01-86. Atmosphere. Air quality control at populated areas. 1986, Normative documents on natural protection and efficient use of natural resources. State Ecological Committee. 1994

Legend: o.m.- one-time maximum,
a.d.- average daily
ALEI-approximate level of emission impact

B.2. AIR QUALITY STANDARDS FOR WORKING AREAS

Table E3 – PDLs of main harmful substances emitted into atmosphere from the landfill at the working area

Pollutants	PCLs o.m.
Methane	-
Nitrogen dioxide (NO2)	5.0
Sulphur oxide (SO2)	0.5
Carbon oxide (CO)	20
Hydrogen sulfide	10
Ammoniac	5.0
Benzene	1.500
Trichloromethane	-
Carbon-4 chloride	20.00
Chlorobenzene	100.0
Dust	4.0

Source: GOST 12.1.005-88. Labour safety standards system. General sanitary-hygienic requirements of working area. M. 1988

c. PERMISSIBLE DENSITY LIMITS OF SOME CHEMICAL SUBSTANCES CONTAINED IN SOIL AND PERMISSIBLE LEVELS DEPENDING ON THEIR DANGER INDEX

Table 2.3 Standards for soil contamination level assessment.

Substance	Form, composition	PCL, mg/kg, including background	Level of harmfulness (K_{max})				Danger index
			Translocation ,K1	Migration		General sanitary K4	
				Water K_2	Air K_3		
Copper	Moveable	3.0	3.5	72.0	-	3.0	2
Chromium	-"-	6.0	6.0	6.0	-	6.0	2
Nickel	-"-	4.0	6.7	14.0	-	4.0	2
Zinc	-"-	23.0	23.0	200.0	-	37.0	1
Cobalt	-"-	5.0	25.0	>1000.0	-	5.0	2
Fluorine	Water solubility	10.0	10.0	10.0	-	25.0	1
Arsen	Bulk content	4.5	4.5	4.5	-	50.0	2
Manganese	-"-	1500.0	3500.0	1500.0	-	1500.0	3
Vanadium	-"-	150.0	170.0	350.0		150.0	3
Manganese + Vanadium	-"-	1000.0 + 100.0	1500.0 + 150.0	2000.0 + 200.0	-	1000.0 + 100.0	3
Lead	-"-	30.0	35.0	260.0	-	30.0	1
Antomony	-"-	2.0	2.0	15.0	-	10.0	1
Mercury	-"-	2.1	2.1	33.0	2.5	5.0	1
Lead + Mercury	-"-	20.0 + 1.0	20.0 + 1.0	30.0 + 2.0	-	50.0 + 2.0	1
Potassium chlorine	-"-	560.0	1000.0	560.0	1000.0	5000.0	3
Nitrates	-"-	130.0	180.0	130.0	-	225.0	2
Benzpyrene	-"-	0.02	0.2	0.5	-	0.02	1
Isopropylbenzene	-"-	0.5	3.0	100.0	0.5	50.0	1
Styrene	-"-	0.1	0.3	100.0	0.1	1.0	2
Xylene	-"-	0.3	0.3	100.0	0.4	1.0	2
Sulphur compounds:							
Hydrogen-sulfide	-"-	0.4	60.0	140.0	0.4	160.0	3
Elemental sulfur	-"-	160.0	180.0	380.0		160.0	3
Sulphuric acid	-"-	160.0	180.0	380.0	-	160.0	1

Source: (Methods of assessing contamination of soil with chemical substances during determination of soil contamination level. M., Ministry of Health of USSR, 13 March 1987, No. 4266-87.)

D.1. REFERENCE DATA OF HARMFUL SUBSTANCES IN SOILS

Table E2.4. Reference data of harmful substances in soil as per forms of using soil (Refernce data)

(in compliance with standards of foreign countries)

Forms of using soil	Category	Quantity of elements (mg/kg)										
		As	Be	Cd	Cr	Cu	Hg	Ni	Pb	Se	Ti	Zn
Multipurpose	I	20	1	1	50	50	0.5	40	100	1	0.5	150
Playgrounds for children	II	20	1	1	50	50	0.5	40	200	5	0.5	300
	III	50	5	10	250	250	10	200	1000	20	10	2000
Vegetable garden - gardening	II	40	2	2	100	50	2	30	300	5	2	300
	III	80	5	5	350	200	20	200	1000	10	20	600
Sports and football stadiums	II	35	1	2	150	100	0.5	100	200	5	2	300
	III	90	2.5	3	350	300	10	250	1000	20	20	2000
Recreation parks and squares, soft squares with soft plant cover.	II	40	5	4	150	200	5	100	500	10	5	1000
	III	80	15	15	600	600	15	250	2000	50	30	3000
Industrial and storage sites not covered with waterproof surface	II	50	5	10	200	300	10	200	1000	15	10	1000
	III	150	20	20	800	1000	20	500	2000	70	30	3000
Industrial and storage sites covered with waterproof surface and plant cover	II	50	10	10	200	500	10	200	1000	15	10	1000
	III	200	20	20	300	2000	50	500	2000	70	30	3000
Non-agricultural ecosystems	II	40	10	5	200	50	10	100	1000	5	2	300
	III	60	20	10	500	200	50	200	2000	10	20	600

ANNEX 2C. ELECTROMAGNETIC RADIATION

Health impact of industrial frequency (50 Hz) is regulated on the basis of GOST 12.1.002-84 and SanPiN 2971-84.

Table E2.3. Permissible Levels of electric field (PL)

Location , area	Electric field voltage E, кW/м
Inside residential buildings	0.5
In residential areas	1
Outside residential buildinds and areas	5
At I-III category highway cross-sections of high voltage power lines	10
At non-residential areas, accessible for transport	15
Regions which are difficult of access	20

Note – Electric field voltage E, is determined at a 2 m height from ground surface. .

D. NOISE.

Levels of ordinary noise, infrasound va ultra-sound in residential areas and buildings are regulated with GOST 12.1.003-83, GOST 23337-78, GOST 20444-85 and sanitary rules (SNIP 3077-84 and SNIP 42-128-4948-89).

Level of noise equivalent in areas, directly close to residential areas, equals to 55 dBa. Equivalent and maximum level of noise generated by vehicles and equipment in the area, is measured by dBa and can be 10 dBa more than routine case ($A = + 10d_{Ba}^{in}$), so that permissible level of equivalent noise equals to 65dBa.

E. VIBRATION

Vibration levels in residential and working areas are regulated through vibration safety GOST 12.1.012-90, GOST 12.4.012-83 and sanitary standards (SNIP 3077-84 and SNIP 42-128-4948-89).

ANNEX 3

Main principles of the EIA prepared for temporary operation and cdvering of Balakhany landfill

According to the general guidelines of WB provided in Annex 4 and Azerbaijani legislation the EIA should be prepared on the basis of the followingequirements.

1. PROJECT DESCRIPTION

The project description should address activities and estimated periods of the following phases of the landfill project:

- site preparation and construction (construction phase)
- landfilling operation (operation phase)
- covering and post-covering care (post-covering phase)

1.1 Construction phase

It should specifically contain descriptions on the following activities or information:

Accurate definition of the active part of the landfill (where wastes are being placed and covered with soil)
Poliqonun aktiv sahasinin (tullantilar basdırılmış, ustu torpaqla ortulmüş sahalar da daxil olmaqla) dəqiqləşdirilməsi;

- learing, levelling, and/or excavating of the site
- construction/reinforcement of dikes/bunds
- construction/reinforcement of access and on-site roads
  construction/reinforcement of surface run-on and run-off drainage channels
  construction of leachate collection and retention systems
  construction of leachate re-circulation or treatment facilities
- construction of landfill gas ventilation/collection system
  setting up of monitoring facilities for ground/surface water, air and noise pollution
  construction/provision of fences, gate, office, weighbridge, water and power supplies,

1.2 Operation phase

- Identification of the contents and volumes of the existing wastes and estimation of the wastes that would be delivered to the existing landfill until the construction of the new wastes landfill is completed.

- projected volume and type of cover material

- operational plan or schedule for landfilling
- levelling, covering, and compacting of solid waste
  extension/construction of on-site roads
- on/near-site excavation/trenching of soil for cover material

1.3 Post-covering phase

- projected volume and type of final cover material including top soil
- facilities, setting up monitoring facilities for post-covering care, etc.
- projected final topography of the site
- post-covering monitoring, inspection and maintenance plan
- post-covering land use plan

1.4 General items applicable to all phases

- contingency plan for natural and human-caused emergencies;
- project site plans (e.g., 1:2,500 or 1:5,000) and design drawings showing the site and facilities, and maps (e.g., 5 km x 5 km area) showing the location of nearby human settlements and other land uses

2. DESCRIPTION OF EXISTING ENVIRONMENT

The items that must be included in this section are discussed below on the basis of categories. As much as possible, existing information should be collected and used. However, site-specific field surveys are usually required to supplement the existing information.

When conducting the field surveys, samples should be taken at all locations where the site
preparation, construction, landfilling operation, covering and post-covering care can affect
environmental quality. Sampling stations and selection criteria for these specific locations should be given. Analytical methods and dates of sampling should be stated. Analytical results should be presented with absolute levels of accuracy and precision. All data should be summarized textually and preferably be presented graphically

2.1 ***Terrain and land use***

- general and topographic map(s) (e.g., 1:50,000) showing the project site, the surrounding municipalities, Utility lines, water bodies, etc.;
- present land use;
- relevant color photographs of the project site

1.2 Operation phase

2.2 Geology

- surficial geology of the project site and the surrounding areas;

- soil characteristics of the project site (e.g., permeability, porosity, density, vertical profile, organic content, etc.);
- geological hazards, slope stability, past occurrence of earthquakes and landslides;
- seismological survey

2.3 Meteorology

- general climatological description of the project region;
- meteorological data (gathered at the project site or taken from the nearest meteorological station), including temperature (monthly averages);
- rainfall (monthly averages), intensity (24-hour duration), number of rainy days;
- wind (frequency distribution of strength and direction, presented in wind roses)
- occurrence of natural hazards such as storms

2.4 Hydrology and water resources

- surface hydrology of the project site and surroundings: natural drainage patterns, delineation of watershed and subwatersheds, stream flow rates at gauging stations, and estimates of discharges or flow rates at the project site, and seasonal changes in the flow rates;
- subsurface hydrology of the project site and surroundings: groundwatershed, groundwater table, and estimates of groundwater flow rates;
- water resources and uses in the watershed: drinking-water wells, reservoirs, irrigation, etc.

2.5 Flora and Fauna

- survey of wildlife and vegetation: apparent species of fauna and flora, relative abundance, etc.;
- utility or values (e.g., commercial or aesthetic), and indication whether it is rare or endangered

2.6 Water quality and aquatic ecology

- apparent aquatic organisms in the main water (Boyuk Shor lake) environment (e.g., phytoplankton, zooplankton, macrophytes, benthic organisms, fish, shellfish, and water fowl)
- ambient water quality measurements of fresh, Boyuk Shor lake and groundwater, for the following parameters
  - ✓ acidity (pH), color, salinity;
  - ✓ Organic matter Volatile Organic Carbon (VOC)
  - ✓ temperature, turbidity and suspended solids;
  - ✓ dissolved oxygen, biochemical oxygen demand (BOD), chemical oxygen demand (COD), and Cl levels;
  - ✓ chloride, sulphate, phosphate, ammonium, nitrate, nitrite
  - ✓ levels of metals, including heavy and trace metals (e.g., Si, Al, Fe, Ca, Ti, Mg, Na, K, Zn, Hg, Pb, Cu, Cr, As, Cd, Mn, and Se)

2.7 Air quality and noise

- ambient noise levels at and near the project site
- ambient levels of sulphur, karbon and nitrogen oxides and of particulates
- levels of odor at or near the project site

2.8 SOCIOECONOMIC ENVIRONMENT

The EIA should include a socioeconomic profile of the municipalities adjacent to the project site.
The information should include the following:

- administrative boundaries;
- population, its distribution, density, and characteristics (age, sex, ethnic groups, and education level);
- industries, employment and productivity statistics;
- transportation and traffic conditions;
- health status data including morbidity and mortality rates available (data from direct impact areas should gathered, otherwise data from the municipality can be used), and health care facilities;
- description about the community lifestyle(s), the present community needs and problems, the local peace, and other situations;
- number of households that will be directly affected by the project;
- perception study of the proposed project, based on interviews with the people who will be affected by the project activities (negative survey results will not necessarily result in project denial). A copy of the interview questionnaire should be appended.

3. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The environmental impacts of site preparation, construction (construction phase), landfilling
operation (operation phase), and covering and post-covering care (post-covering phase) of a
solid waste landfill project must be discussed quantitatively and qualitatively. The items that
should be particularly addressed are given below:

3.1 Geology and hydrology

a. Construction and operation phases

- erosion and sedimentation problems during and following site clearing and levelling, soil covering, etc.
- changes in drainage patterns which may affect water resources and wildlife habitat
- likelihood of flooding and landslides due to changes in geomorphology and
- slope stability

b. *Post-covering phase*

- Soil settlement due to decomposition of organic wastes

3.2 Water quality

a.Construction phase

- increase in turbidity of surface water due to surface soil erosion and airborne dust deposition

b.Operation phase

- increase in turbidity of surface water due to surface soil erosion and airborne dust deposition;
- increase in suspended solids, BOD, and other pollutants due to solid waste entering surface water bodies;
- surface water pollution due to leachates from the site;
- groundwater pollution due to leachates from the site;
- residual impacts on water quality when leachate collection and treatment facilities are provided;
- impacts on water quality due to structural failure, surface drainage and leachate collection and treatment facilities

c. *Post-covering phase*

- all the items as in construction and operation phases if final cover, surface drainage, and leachate collection and treatment facilities are not provided
- impacts on water quality due to structural failure of final cover, surface drainage, and leachate collection and treatment facilities

3.3 Air quality and noise

a.Construction phase

- dust and particulates during site clearing, levelling, excavating, etc., and access road construction;
- sulphur and nitrogen oxides, carbon monoxide, etc. from vehicle emission;
- noise due to traffic and heavy equipment works;

b.Operation phase

- all the items as in construction phase;
- airborne or windblown particulates of solid waste;
- odor and biogas due to biodegradation of organic waste;
- toxic gas from chemical waste;
- particulates and toxic gas due to open burning;

c. Post-coveringphase

- all the items as in operation phase if final cover and appropriate gas extraction and disposal systems are not provided

3.4 Flora and fauna

a.Construction and operation phases

- removal of vegetation and wildlife habitat due to site clearing, levelling, etc.
- general disturbance of wildlife in the surrounding areas due to increased traffic and heavy equipment works

b. Post-covering phase

- site rehabilitation works including revegetation;
- disturbance due to water quality degradation and gas emission

3.5 Visual impacts

a. Construction and operation phases

- loss of green due to removal of vegetation
- changes in landscape

b. Post-coveringphase

revegetation works; and

- final topography not well matched with the surrounding landscape

3.6 Socioeconomic and cultural impacts

a. Construction and operation phases

- impacts of enhanced traffic: dust, noise, and safety;
- potentially increased risk of open and subsurface fire;
- public health problems due to the breeding of flies and vermin;
- health and sanitation problems due to inadequate housing and sanitation structures of the laborers;
- compromised safety of workers due to inadequate provision of facilities and equipment;
- peace and order problems due to strong increase in the number of nonlocal laborers;

b.Post-covering phase

- post-covering land use and increase/decrease in land value
- residual fire hazards and toxic gas emission

4. MITIGATING MEASURES

The EIA should list and discuss all necessary mitigating measures to minimize the identified adverse impacts. As mentioned earlier, for a municipal solid waste landfill project, the structural and operational mitigation measures are normally incorporated in the design and operational management plan. Some commonly applied mitigation measures are given below:

4.1 Geology and hydrology

a.Construction and operation phases

- construction of dikeslbunds, drainage channel, and culverts to control hydrology
- vegetation cover, sediment traps, and planting of stripped areas to prevent erosion and siltation
- design consideration for the slope of landfill, and contingency planning for landslides and flooding;

b. Post-covering phase

Post-covering phase land use plan to prevent construction of heavy structures

4.2 Water quality

a.Construction and operation phases

- sediment traps and planting of stripped areas to prevent erosion and siltation
- construction of a drainage system to collect polluted surface run-off
- application of liners to intercept leachates
- construction of leachate collection systems
- construction of a wastewater/leachate treatment system to treat polluted surface run-off and/or leachates

b.Post-covering phase

- application of final cover to reduce surface water pollution
- design of final slope to reduce leachate production
- contingency planning for structural failure

4.3 Air quality and noise

a.Construction phase

- minimization of dust generation by sprinkling stockpiles of removed earth and dusty roads with water
- choose working hours and use larger vehicles to reduce noise and air pollution levels due to traffic

b.Operation phase

- all the items as in construction phase
- application of daily cover soil to prevent odor emission and airborne waste

- application of mobile fence to reduce windblown waste
- construction of biogas collection and disposal systems
- limiting the entry of hazardous/toxic waste

c . Post-covering phase

- application of final cover to prevent airborne waste;
- contingency planning for possible structure failure

4.4 Flora andfauna

a.Construction and operation phases

- construction of buffer zones by planting trees, etc.

b. Post-covering phase

- revegetation of the site

4.5 Visual impacts

a.Construction and operation phases

- construction of green buffer zones by planting trees, etc.

b. Post-coveringphase

- revegetation of the site
- design of final topography considering the surrounding landscape and future land use

4.6 Socioeconomic and cultural impacts

- compensation measures for affected or resettled people
- planning for information campaign and dialogue with the population affected by the proposed project
- improvement of working environment, including protection measures for employees such as the provision of training, and safety hats and glasses, respiratory and hearing protection devices, first aid kits, etc.
- contingency plan involving local communities and workers

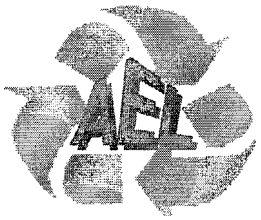
5. Monitoring

The EIA should contain an extensive monitoring program for parameters included in the baseline studies. The following guides could be used in the formulation of the monitoring program:

- Monitoring should be carried out through the entire project period including post-covering care.
- Sampling should be done at the same locations as in the baseline data survey and at effluent release points to check whether permit requirements are met.

- Samples should be collected and analyzed, using the norms and standard procedures for the monitoring of environtnental quality and emissions as far as available.
- Corrective measures should be specified when the monitoring indicates the levels of impacts are not permissible.

ANNEX 4



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Date: **23 January 2008**

CONTENT

TABLES

FIGURES

SAMPLES REGISTRATION

At 26.12. 2007 Azecolab had received below samples from customer for storage:

Table 1 Samples delivered to lab by customer

Matrix	Lab N	Filed label	SamOrig-Station	Cont	Quant	Unit
Soil	8346	Zibilxana Quyu №1	Baslangic 0.0 Son 0.3	Pl.paket	713	
Soil	8347	Zibilxana Quyu №1	Baslangic 1.5 Son 1.8	Pl.paket	705	g
Soil	8348	Zibilxana Quyu №1	Baslangic 3.5 Son 4.0	Pl.paket	1367	g
Soil	8349	Zibilxana Quyu №1	Baslangic 4.5 Son 5.0	Pl.paket	78	
Soil	8350	Zibilxana Quyu N22	Baslangic 0.3 Son 0.5	Pl.paket	1036	
Soil	8351	Zibilxana Quyu №2	Baslangic 1.0 Son 1.3	Pl.paket	800	g
Soil	8352	Zibilxana Quyu №2	Baslangic 2.8 Son 3.0	Pl.paket	990	
Soil	8353	Zibilxana Quyu №2	Baslangic 3.8 Son 4.0	Pl.paket	918	
Soil	8354	Zibilxana Quyu N22	Baslangic 5.3 Son 5.5	Pl.paket	897	
Soil	8355	Zibilxana Quyu №2	Baslangic 9.3 Son 9.5	Pl.paket	613	g
Soil	8356	Zibilxana Quyu №3	Baslangic 0.3 Son 0.5	Pl.paket	600	g
Soil	8357	Zibilxana Quyu №3	Baslangic 1.0 Son 1.2	Pl.paket	658	g
Soil	8358	Zibilxana Quyu №3	Baslangic 2.3 Son 2.5	Pl.paket	1088	
Soil	8359	Zibilxana Quyu №3	Baslangic 3.3 Son 3.6	Pl.paket	539	g
Soil	8360	Zibilxana Quyu №3	Baslangic 5.3 Son 5.5	Pl.paket	578	g
Soil	8361	Zibilxana Quyu N23	Baslangic 8.8 Son 9.0	Pl.paket	714	g
Soil	8362	Zibilxana Quyu №3	Baslangic 11.8 Son 12.0	Pl.paket	517	
Soil	8363	Zibilxana Quyu №4	Baslangic 0.0 Son 0.3	Pl.paket	860	g
Soil	8364	Zibilxana Quyu №4	Baslangic 1.3 Son 1.5	Pl.paket	913	
Soil	8365	Zibilxana Quyu N24	Baslangic 2.0 Son 2.5	Pl.paket	5811	g

Soil	8366	Zibilxana Quyu №4	Baslangic 3.3 Son 3.5	Pl.paket	546	
Soil	8367	Zibilxana Quyu №4	Baslangic 4.8 Son 5.0	Pl.paket	590	g
Soil	8368	Zibilxana Quyu №4	Baslangic 7.8 Son 8.0	Pl.paket	455	g

At 28 December of 2007 Azecolab expert had participated in sampling program:

Table 2 Sampling of soil, water and air samples

Matrix	Lab N	Filed label	N	E	SamOrig-Station	Cont	Quant	Unit
	8377	Gl.Bottle G071 + Pl.paket 43	40 26 52.1	49 53 44.4	st.№1 -10 sm	Gl.Bottle Pl.paket		g
Soil	8378	Gl.Bottle G024 + [illegible]	40.26.52.0	49 53 37.6	st.№2-10 sm	Gl.Bottle Pl.paket		g
	8379	Gl.Bottle G065 + Pl.paket 34	40 27 14.8	49 53 14.1	st.№3-10 sm	Gl.Bottle Pl.paket		g
Soil	8380	Gl.Bottle G011 + Pl.paket 35	40 27 56.1	49 53	st.№4-10 sm	Gl.Bottle Pl.paket		g
water	8381	Gl.Bottle G025 + Pl.bottle PB040	40 26 49.8	49 53 43.7	st.№1-15 sm	Gl.Bottle Pl.bottle	2000	ml
water	8382	Gl.Bottle G032 + Pl.bottle PB080	40 26 51.7	49 53 31.7	st.N.2-15 sm	Gl.Bottle Pl.bottle	2000	ml
water	8383	Gl.Bottle G084 + Pl.bottle PB019	40 27 16.	49 53 12.7	st.№3-15 sm	Gl.Bottle Pl.bottle	2000	ml
air	8388	132	40 27 09.7	49 53 37.0	st.1	Balon		
air	8389	136	40 27 14.8	49 53 14.1	st.2	Balon		

SAMPLING REPORT

4 soil, 3 water and 2 air samples were taken during 28 of December 2007 and delivered to lab.

SOIL SAMPLING POINT 1 (SP1)

Soil sample S1 was taken from point SP1 with coordinates N= 40^{0}26'52.1" and S=49^{0}53'44.4".

Fig. I Soil sampling from point SPI

SOIL SAMPLING POINT 2 (SP2)

Soil sample S2 was taken from point SP2 with coordinates N= $40^0$26'52.0" and S=$49^0$53'37.6".

Fig. 2 Soil sampling from point SP2

SOIL SAMPLING POINT 3 (SP3)

Soil sample S3 was taken from point SP3 with coordinates N= $40^0$27'14.8" and S=$49^0$53'14.1".

Fig. 3 Soil sampling from point SP3

SOIL SAMPLING POINT 4 (SP4)

Soil sample S4 was taken from point SP4 with coordinates N= $40^0$27'56.1" and S=$49^0$53'10.9".

Fig. 4 Soil sampling from point SP4

WATER SAMPLING POINT 1 (WP1)

Water sample W1 was taken from point WP1 with coordinates N= $40^0$26'49.8" and S=$49^0$53'43.7".

Fig.5 Water sampling from point WP1

WATER SAMPLING POINT 2 (WP2)

Water sample W2 was taken from point WP2 with coordinates N= $40^0$26’51.7'' and S=$49^0$53’31.7''.

Fig.6 Water sampling from point WP2

WATER SAMPLING POINT 3 (WP3)

Water sample W3 was taken from point WP3 with coordinates N= $40^0$27’16.1” and S=$49^0$53’12.7”.

Fig.7 Water sampling from point WP3

AIR SAMPLING POINT 1 (AP1)

Air sample A1 was taken from point AP1 with coordinates N= 40'27'09.7'' and S=$49^0$53’37.0”.

Fig.8 Air sampling from point AP1

AIR SAMPLING POINT 2 (AP1)

Air sample A2 was taken from point AP1 with coordinates N= $40^0$27'14.8" and S=$49^0$53'14.1".

Fig.9 Air sampling from point AP2

LAB ANALITICAL RESULTS

Soil samples from monitoring wells

Customer had asked to study of delivered soil samples testing according of below scheme:

Table 3 Monitoring wells- Heavy metals and organic fractions test results

Martix		soil	Soil	Soil	Soil	Soil	Soil
Well N		Q2	Q2	Q2	Q4	Q4	Q4
Depth		1.0-1.3 m	2.8-3.0 m	9.3-9.5 m	1.3-1.5 m	3.3-3.5 m	7.8-8.0 m
Lab N		8351	8352	8355	8364	8366	8368
Cd	mg/kg	0.52	0.22	0.25	0.093	0.063	0.11
Co	mg/kg	8.75	12.7		7.1	16.0	
Cr	mg/kg	53.06	53.7		42.3	107	
Cu	mg/kg	19.6	48.1		19.2	36.5	
Hg	mg/kg	<0.02	<0.02		<0.02	<0.02	
Ni	mg/kg	32.3	39.1		25.5	56.1	
Pb	mg/kg	7.5	12.1	13.3	9.0	21.3	19.7
Zn	mg/kg	56.1	65.2	83.5	40.4	101	105
TOC	%	<0.1			<0.1		
Total organics	mg/kg	18.2			16.7		

Table 4 Monitoring well samples- TPH/PAH fractions test results

Martix		soil	Soil	Soil	Soil	Soil	Soil	
Well N		Q2	Q2	Q2	Q4	Q4	Q4	
Depth		1.0-1.3 m	2.8-3.0 m	9.3-9.5 m	1.3-1.5 m	3.3-3.5 m	7.8-8.0 m	
Lab N		8351	8352	8355	8364	8366	8368	MDL
C8-C10	mg/kg	0.09	0.13	0.09	0.80	0.30	0.24	0.01
C10-C12	mg/kg	0.91	0.37	0.14	0.89	0.48	0.45	0.01
C12-C16	mg/kg	1.20	0.54	0.76	1.94	0.28	0.39	0.01
C16-C21	mg/kg	0.85	0.38	0.48	0.68	0.14	0.13	0.01
C22-C36	mg/kg	1.70	0.06	0.05	0.24	0.08	0.06	0.01
Naphthalene	mg/kg	3.6	<1.1	<1.1	2.4	<1.1	<1.1	1.1
Acenaphthene+Fluorene	mg/kg	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	0.6
Phenanthrene	mg/kg	1.9	<0.6	<0.6	7.6	<0.6	<0.6	0.6
Anthracene	mg/kg	0.8	<0.1	<0.1	0.46	<0.1	<0.1	0.1
Fluoranthene	mg/kg	1.73	<0.4	<0.4	0.95	<0.4	<0.4	0.4
Pyrene	mg/kg	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	0.6
Benzo(a)anthracene	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4
Chrysene	mg/kg	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9	0.9
Benzo(b)fluoranthene	mg/kg	0.82	<0.5	<0.5	0.94	<0.5	<0.5	0.5
Benzo(k)fluoranthene	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4

Benzo(a)pyrene	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
Dibenzo(a.h)anthracene	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
Benzo(ghi)perylene	mg/kg	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	0.6
Indeno(1.2.3-cd)pyrene	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	0.4

Table.5 Monitoring well samples- Pesticides/PCBs fractions test results (GC/MS full scan mode)

Martix		soil	Soil	Soil	Soil	Soil	Soil	
Well N		Q2	Q2	Q2	Q4	Q4	Q4	
Depth		1.0-1.3 m	2.8-3.0 m	9.3-9.5 m	1.3-1.5 m	3.3-3.5 m	7.8-8.0 m	
Lab N		8351	8352	8355	8364	8366	8368	MDL
Aldrin	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
a-BHC	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
b-BHC	mg/kg	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	0.7
d-BHC	mg/kg	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	0.6
g-BHC	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
p,p'-DDD	mg/kg	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.5
p,p'-DDE	mg/kg	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	1.1
p,p'-DDT	mg/kg	<2.7	<2.7	<2.7	<2.7	<2.7	<2.7	2.7
o,p'-DDD	mg/kg	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	1.5
Dieldrin	mg/kg	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	0.7
Endosulfan I	mg/kg	<1.1	<1.1	<1.1	<1.1	<1.1	<1.1	1.1
Endosulfan II	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0
Endosulfan sulfate	mg/kg	<1.8	<1.8	<1.8	<1.8	<1.8	<1.8	1.8
Endrin	mg/kg	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	0.7
Endrin aldehyde	mg/kg	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	2.5
PCB-18	mg/kg	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	0.7
PCB-31+28	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2
PCB-52	mg/kg	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	0.8
PCB-44	mg/kg	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	0.8
PCB-101	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5
PCB-149 + PCB-118	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
PCB-153	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
PCB-138	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
PCB-180	mg/kg	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.3
PCB-194	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1

Table 6 Monitoring well samples- volatile fractions (GC/MS head space)

Martix		soil	Soil	Soil	Soil	Soil	Soil	
Well N		Q2	Q2	Q2	Q4	Q4	Q4	
Depth		1.0-1.3 m	2.8-3.0 m	9.3-9.5 m	1.3-1.5 m	3.3-3.5 m	7.8-8.0 m	MDL
Methylene chloride	mg/kg	<30	<30	<30	<30	<30	<30	30
Benzene	mg/kg	<30	<30	<30	<30	<30	<30	30
Methane, bromodichloro-	mg/kg	<30	<30	<30	<30	<30	<30	30
Chloroform	mg/kg	<30	<30	<30	<30	<30	<30	30
Toluene	mg/kg	<40	<40	<40	<40	<40	<40	40
EthylBenzene	mg/kg	<30	<30	<30	<30	<30	<30	30
p-Xylene	mg/kg	<75	<75	<75	<75	<75	<75	75
m-Xylene	mg/kg	<25	<25	<25	<25	<25	<25	25
o-Xylene	mg/kg	<25	<25	<25	<25	<25	<25	25
Benzene, propyl-	mg/kg	<35	<35	<35	<35	<35	<35	35
Benzene,1,2,4-trimethyl-	mg/kg	<35	<35	<35	<35	<35	<35	35
Benzene,1,2,5-trimethyl-	mg/kg	<35	<35	<35	<35	<35	<35	35
Naphthalene	mg/kg	<60	<60	<60	<60	<60	<60	60
Ethene,1,2-dichloro-,(Z)-	mg/kg	<90	<90	<90	<90	<90	<90	90
Ethene,1,2-dichloro-,(E)-	mg/kg	<100	<100	<100	<100	<100	<100	100
Ethane,1,1-dichloro-	mg/kg	<40	<40	<40	<40	<40	<40	40
Ethene,1,1-dichloro-	mg/kg	<50	<50	<50	<50	<50	<50	50
Propane,2,2-dichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	12.5
Ethane,1,1,1-trichloro-	mg/kg	<65	<65	<65	<65	<65	<65	65
1-Propene,1,1-dichloro-	mg/kg	<125	<125	<125	<125	<125	<125	125
CarbonTetrachloride	mg/kg	<85	<85	<85	<85	<85	<85	85
Trichloroethylene	mg/kg	<50	<50	<50	<50	<50	<50	50
Propane,1,2-dichloro-	mg/kg	<50	<50	<50	<50	<50	<50	50
Methane,dibromo-	mg/kg	<100	<100	<100	<100	<100	<100	100
Methane,bromodichloro-	mg/kg	<25	<25	<25	<25	<25	<25	25
1-Propene,1,3-dichloro-,(Z)-	mg/kg	<60	<60	<60	<60	<60	<60	60
1-Propene,1,3-dichloro-,(E)-	mg/kg	<10	<10	<10	<10	<10	<10	10
Ethane,1,1,2-trichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	12.5
Propane,1,3-dichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	12.5
Methane,dibromochloro-	mg/kg	<30	<30	<30	<30	<30	<30	30
Tetrachloroethylene	mg/kg	<12.5	<12.5	<12.5	<12.5	<12.5	<12.5	12.5
Ethane,1,2-dibromo-	mg/kg	<50	<50	<50	<50	<50	<50	50
Benzene,chloro-	mg/kg	<10	<10	<10	<10	<10	<10	10
Ethane,1,1,1,2-tetrachloro-	mg/kg	<10	<10	<10	<10	<10	<10	10
Styrene	mg/kg	<30	<30	<30	<30	<30	<30	30
Methane,tribromo-	mg/kg	<15	<15	<15	<15	<15	<15	15
Isopropylbenzene	mg/kg	<7.5	<7.5	<7.5	<7.5	<7.5	<7.5	7.5
Ethane,1,1,2,2-tetrachloro-	mg/kg	<15	<15	<15	<15	<15	<15	15
Benzene,bromo-	mg/kg	<10	<10	<10	<10	<10	<10	10
2-Chlorotoluene	mg/kg	<10	<10	<10	<10	<10	<10	10
4-Chlorotoluene	mg/kg	<10	<10	<10	<10	<10	<10	10
Benzene,tert-butyl-	mg/kg	<30	<30	<30	<30	<30	<30	30

Benzene,1,4-dichloro-	mg/kg	<9	<9	<9	<9	<9	<9	9
sec-Butylbenzene	mg/kg	<30	<30	<30	<30	<30	<30	30
Benzene,1,2-dichloro-	mg/kg	<10	<10	<10	<10	<10	<10	10
p-Isopropyltoluene	mg/kg	<30	<30	<30	<30	<30	<30	30
Benzene,1,3-dichloro-	mg/kg	<10	<10	<10	<10	<10	<10	10
Benzene,butyl-	mg/kg	<250	<250	<250	<250	<250	<250	250
Propane,1,2-dibromo-3-chloro-	mg/kg	<45	<45	<45	<45	<45	<45	45
Benzene,1,2,4-trichloro-	mg/kg	<40	<40	<40	<40	<40	<40	40
Benzene,1,2,3-trichloro-	mg/kg	<35	<35	<35	<35	<35	<35	35
Hexachlorobutadiene	mg/kg	<35	<35	<35	<35	<35	<35	35

Tests results for Azecolab taken top soil samples

Table 7 Top soil samples- Heavy metals and organic fractions test results

Matrix		Soil	Soil	Soil	Soil
Point N		SP1	SP2	SP3	SP4
Lab N		8377	8378	8379	8380
Cd	mg/kg	0.17	0.21	0.13	0.041
Co	mg/kg	9.2	11.4	4.7	6.1
Cr	mg/kg	66.3	66.7	43.9	37.4
Cu	mg/kg	25.5	39.6	21.8	13.2
Hg	mg/kg	<0.02	<0.02	0.05	0.03
Ni	mg/kg	37.5	42.1	15.6	21.2
Pb	mg/kg	9.8	11.5	10.8	3.7
Zn	mg/kg	63.6	76.4	106	34.7
TOC	%	1.1	1.8	1.7	<0.1
Total dichloromethane extractable organics	mg/kg	158	218	184	24

Table 8 Top soil samples- TPH/PAH fractions test results

Matrix		Soil	Soil	Soil	Soil	
Point N		SP1	SP2	SP3	SP4	
Lab N	Unit	8377	8378	8379	8380	MDL
C8-C10	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01
C10-C12	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01
C12-C16	mg/kg	<0.01	<0.01	<0.01	<0.01	0.01
C16-C21	mg/kg	0.48	0.18	0.14	0.13	0.01
C22-C36	mg/kg	0.86	0.24	0.63	0.41	0.01
Naphthalene	mg/kg	2.4	<1.1	3.2	<1.1	1.1
Acenaphthene+Fluorene	mg/kg	<0.6	<0.6	<0.6	<0.6	0.6
Phenanthrene	mg/kg	3.4	1.4	<0.6	<0.6	0.6

Anthracene	mg/kg	0.1	<0.1	<0.1	<0.1	0.1
Fluoranthene	mg/kg	1.1	0.7	1.1	<0.4	0.4
Pyrene	mg/kg	3.1	<0.6	1.5	<0.6	0.6
Benzo(a)anthracene	mg/kg	1.5	<0.4	0.7	<0.4	0.4
Chrysene	mg/kg	4.9	<0.9	0.9	<0.9	0.9
Benzo(b)fluoranthene	mg/kg	2.0	1.0	2.4	<0.5	0.5
Benzo(k)fluoranthene	mg/kg	<0.4	<0.4	<0.4	<0.4	0.4
Benzo(a)pyrene	mg/kg	1.3	<0.3	0.6	<0.3	0.3
Dibenzo(a.h)anthracene	mg/kg	0.6	<0.3	<0.3	<0.3	0.3
Benzo(ghi)perylene	mg/kg	2.6	1.3	3.1	<0.6	0.6
Indeno(1.2.3-cd)pyrene	mg/kg	<0.4	0.9	2.1	<0.4	0.4

Table 9 Top soil samples- Pesticides/PCBs fractions test results (GC/MS full scan mode)

Matrix		Soil	Soil	Soil	Soil	
Point N		SP1	SP2	SP3	SP4	
Lab N	Unit	8377	8378	8379	8380	MDL
Aldrin	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5
a-BHC	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5
b-BHC	mg/kg	<0.7	<0.7	<0.7	<0.7	0.7
d-BHC	mg/kg	<0.6	<0.6	<0.6	<0.6	0.6
g-BHC	mg/kg	<0.5	<0.5	<0.5	<0.5	0.5
p,p'-DDD	mg/kg	<1.5	2.5	1.8	<1.5	1.5
p,p'-DDE	mg/kg	<1.1	1.9	1.3	<1.1	1.1
p,p'-DDT	mg/kg	<2.7	<2.7	<2.7	<2.7	2.7
o,p'-DDD	mg/kg	<1.5	<1.5	<1.5	<1.5	1.5
Dieldrin	mg/kg	<0.7	<0.7	<0.7	<0.7	0.7
Endosulfan I	mg/kg	<1.1	<1.1	<1.1	<1.1	1.1
Endosulfan II	mg/kg	1.1	1.8	2.3	<1.0	1.0
Endosulfan sulfate	mg/kg	<1.8	<1.8	<1.8	<1.8	1.8
Endrin	mg/kg	<0.7	<0.7	<0.7	<0.7	0.7
Endrin aldehyde	mg/kg	<2.5	<2.5	<2.5	<2.5	2.5
PCB-18	mg/kg	<0.7	<0.7	<0.7	<0.7	0.7
PCB-31+28	mg/kg	<0.2	<0.2	<0.2	<0.2	0.2
PCB-52	mg/kg	<0.8	<0.8	1.8	<0.8	0.8
PCB-44	mg/kg	<0.8	<0.8	1.8	<0.8	0.8
PCB-101	mg/kg	1.5	5.0	2.7	<0.5	0.5
PCB-149 + PCB-118	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3
PCB-153	mg/kg	1.1	0.5	1.2	<0.3	0.3
PCB-138	mg/kg	<0.3	0.3	0.5	<0.3	0.3
PCB-180	mg/kg	<0.3	<0.3	<0.3	<0.3	0.3
PCB-194	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1

Table 10 Top soil samples- volatile fractions (GC/MS head space)

Matrix		Soil	Soil	Soil	Soil	
Point N		SP1	SP2	SP3	SP4	
Lab N	Unit	8377	8378	8379	8380	MDL
Methylene chloride	mg/kg	<30	<30	<30	<30	30
Benzene	mg/kg	<30	<30	<30	<30	30
Methane, bromodichloro-	mg/kg	<30	<30	<30	<30	30
Chloroform	mg/kg	<30	<30	<30	<30	30
Toluene	mg/kg	<40	<40	<40	<40	40
EthylBenzene	mg/kg	<30	<30	<30	<30	30
p-Xylene	mg/kg	<75	<75	<75	<75	75
m-Xylene	mg/kg	<25	<25	<25	<25	25
o-Xylene	mg/kg	<25	<25	<25	<25	25
Benzene, propyl-	mg/kg	<35	<35	<35	<35	35
Benzene,1,2,4-trimethyl-	mg/kg	<35	<35	<35	<35	35
Benzene,1,2,5-trimethyl-	mg/kg	<35	<35	<35	<35	35
Naphthalene	mg/kg	<60	<60	<60	<60	60
Ethene,1,2-dichloro-,(Z)-	mg/kg	<90	<90	<90	<90	90
Ethene,1,2-dichloro-,(E)-	mg/kg	<100	<100	<100	<100	100
Ethane,1,1-dichloro-	mg/kg	<40	<40	<40	<40	40
Ethene,1,1-dichloro-	mg/kg	<50	<50	<50	<50	50
Propane,2,2-dichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	12.5
Ethane,1,1,1-trichloro-	mg/kg	<65	<65	<65	<65	65
1-Propene,1,1-dichloro-	mg/kg	<125	<125	<125	<125	125
CarbonTetrachloride	mg/kg	<85	<85	<85	<85	85
Trichloroethylene	mg/kg	<50	<50	<50	<50	50
Propane,1,2-dichloro-	mg/kg	<50	<50	<50	<50	50
Methane,dibromo-	mg/kg	<100	<100	<100	<100	100
Methane,bromodichloro-	mg/kg	<25	<25	<25	<25	25
1-Propene,1,3-dichloro-,(Z)-	mg/kg	<60	<60	<60	<60	60
1-Propene,1,3-dichloro-,(E)-	mg/kg	<10	<10	<10	<10	10
Ethane,1,1,2-trichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	12.5
Propane,1,3-dichloro-	mg/kg	<12.5	<12.5	<12.5	<12.5	12.5
Methane,dibromochloro-	mg/kg	<30	<30	<30	<30	30
Tetrachloroethylene	mg/kg	<12.5	<12.5	<12.5	<12.5	12.5
Ethane,1,2-dibromo-	mg/kg	<50	<50	<50	<50	50
Benzene,chloro-	mg/kg	<10	<10	<10	<10	10
Ethane,1,1,1,2-tetrachloro-	mg/kg	<10	<10	<10	<10	10
Styrene	mg/kg	<30	<30	<30	<30	30
Methane,tribromo-	mg/kg	<15	<15	<15	<15	15
Isopropylbenzene	mg/kg	<7.5	<7.5	<7.5	<7.5	7.5
Ethane,1,1,2,2-tetrachloro-	mg/kg	<15	<15	<15	<15	15
Benzene,bromo-	mg/kg	<10	<10	<10	<10	10
2-Chlorotoluene	mg/kg	<10	<10	<10	<10	10
4-Chlorotoluene	mg/kg	<10	<10	<10	<10	10
Benzene,tert-butyl-	mg/kg	<30	<30	<30	<30	30
Benzene,1,4-dichloro-	mg/kg	<9	<9	<9	<9	9

sec-Butylbenzene	mg/kg	<30	<30	<30	<30	30
Benzene,1,2-dichloro-	mg/kg	<10	<10	<10	<10	10
p-Isopropyltoluene	mg/kg	<30	<30	<30	<30	30
Benzene,1,3-dichloro-	mg/kg	<10	<10	<10	<10	10
Benzene,butyl-	mg/kg	<250	<250	<250	<250	250
Propane,1,2-dibromo-3-chloro-	mg/kg	<45	<45	<45	<45	45
Benzene,1,2,4-trichloro-	mg/kg	<40	<40	<40	<40	40
Benzene,1,2,3-trichloro-	mg/kg	<35	<35	<35	<35	35
Hexachlorobutadiene	mg/kg	<35	<35	<35	<35	35

Tests results for Azecolab taken water samples

Table 11 Water samples- common parameters test results

Matrix		water	water	water	
Point N		WP1	WP2	WP3	
Lab N	Unit	8381	8382	8383	MDL
pH		8.37	8.38	7.1	
Salinity	%	0.65	0.66	6.65	
COD	mg/l	171	169	2690	1.0
BOD	mg/l	5	8	50	1.0
TOC	mg/l	44	105	1620	10
Total organic	mg/l	91	132	1270	0.3

Table 12 Water samples- TPH/PAH fractions test results

Matrix		water	water	water	
Point N		WP1	WP2	WP3	
Lab N	Unit	8381	8382	8383	MDL
C8-C10	mg/L	130	265	4350	10
C10-C12	mg/L	95	183	7800	50
C12-C16	mg/L	310	540	16400	50
C16-C21	mg/L	210	470	9400	100
C22-C36	mg/L	<50	120	1670	50
Naphthalene	mg/L	5.1	6.3	24.2	0.011
Acenaphthene+Fluorene	mg/L	4.2	4.1	16.4	0.006
Phenanthrene	mg/L	204	156	126	0.006
Anthracene	mg/L	3.8	7.1	10.4	0.001
Fluoranthene	mg/L	7.5	18.3	62.0	0.004
Pyrene	mg/L	0.92	1.9	5.8	0.006
Benzo(a)anthracene	mg/L	2.8	0.7	28.1	0.004
Chrysene	mg/L	0.8	9.3	19.5	0.009
Benzo(b)fluoranthene	mg/L	4.1	7.5	19.2	0.005

Benzo(k)fluoranthene	mg/L	1.4	2.9	8.1	0,003
Benzo(a)pyrene	mg/L	038	0.61	0.94	0,003
Dibenzo(a.h)anthracene	mg/L	7.1	9.6	10.3	0,003
Benzo(ghi)perylene	mg/L	2.8	0.7	12.4	0,006
Indeno(1.2.3-cd)pyrene	mg/L	1.6	6.1	4.8	0,004

Table 13 Water samples- Pesticides/PCBs fractions test results (GC/MS full scan mode)

Matrix		water	water	water	
Point N		WP1	WP2	WP3	
Lab N	Unit	8381	8382	8383	MDL
Aldrin	mg/L	<0.1	<0.1	<0.1	0.1
a-BHC	mg/L	<0.03	<0.03	<0.03	0.03
b-BHC	mg/L	<0.03	<0.03	<0.03	0.03
d-BHC	mg/L	<0.03	<0.03	<0.03	0.03
g-BHC	mg/L	<0.03	<0.03	<0.03	0.03
p,p'-DDD	mg/L	<0.01	<0.01	<0.01	0.01
p,p'-DDE	mg/L	<0.01	<0.01	<0.01	0.01
p,p'-DDT	mg/L	<0.01	<0.01	<0.01	0.01
o,p'-DDD	mg/L	<0.05	<0.05	<0.05	0.05
Dieldrin	mg/L	<0.05	<0.05	<0.05	0.05
Endosulfan I	mg/L	<0.05	<0.05	<0.05	0.05
Endosulfan II	mg/L	<0.05	<0.05	<0.05	0.05
Endosulfan sulfate	mg/L	<0.05	<0.05	<0.05	0.05
Endrin	mg/L	<0.05	<0.05	<0.05	0.05
Endrin aldehyde	mg/L	<0.05	<0.05	<0.05	0.05
PCB-18	mg/L	<0.01	<0.01	<0.01	0.01
PCB-31+28	mg/L	<0.01	<0.01	<0.01	0.01
PCB-52	mg/L	<0.01	<0.01	<0.01	0.01
PCB-44	mg/L	<0.01	<0.01	<0.01	0.01
PCB-101	mg/L	<0.05	<0.05	<0.05	0.05
PCB-149 + PCB-118	mg/L	<0.05	<0.05	<0.05	0.05
PCB-153	mg/L	<0.05	<0.05	<0.05	0.05
PCB-138	mg/L	<0.05	<0.05	<0.05	0.05
PCB-180	mg/L	<0.05	<0.05	<0.05	0.05
PCB-194	mg/L	<0.05	<0.05	<0.05	0.05

Table 2 Water samples- volatile fractions (GC/MS head space)

Matrix		water	water	water	
Point N		WP1	WP2	WP3	
Lab N	Unit	8381	8382	8383	MDL
Methylene chloride	mg/L	36.7	138.7	513.5	6.0
Benzene	mg/L	6.8	33.5	10	7.0
Methane, bromodichloro-	mg/L	10.8	16.7	17.4	15.0
Chloroform	mg/L	<5.0	<5.0	<5.0	5.0
Toluene	mg/L	5.3	37.8	9.5	2.5
EthylBenzene	mg/L	<2.0	<2.0	<2.0	2.0
p-Xylene	mg/L	0	3.1	0	2.5
m-Xylene	mg/L	<2.5	<2.5	<2.5	2.5
o-Xylene	mg/L	0	8.9	0	2.5
Benzene, propyl-	mg/L	<1.5	<1.5	<1.5	1.5
Benzene,1,2,4-trimethyl-	mg/L	<2.0	<2.0	<2.0	2.0
Benzene,1,2,5-trimethyl-	mg/L	<2.0	<2.0	<2.0	2.0
Naphthalene	mg/L	<8.0	<8.0	<8.0	8.0
Ethene,1,2-dichloro-,(Z)-	mg/L	<6.0	<6.0	<6.0	6.0
Ethene,1,2-dichloro-,(E)-	mg/L	<6.0	<6.0	<6.0	6.0
Ethane,1,1-dichloro-	mg/L	<6.0	<6.0	<6.0	6.0
Ethene,1,1-dichloro-	mg/L	<8.0	<8.0	<8.0	8.0
Propane,2,2-dichloro-	mg/L	<6.0	<6.0	<6.0	6.0
Ethane,1,1,1-trichloro-	mg/L	<5.0	<5.0	<5.0	5.0
1-Propene,1,1-dichloro-	mg/L	<7.0	<7.0	<7.0	7.0
CarbonTetrachloride	mg/L	<7.0	<7.0	<7.0	(7.0
Trichloroethylene	mg/L	<12.0	<12.0	<12.0	12.0
Propane,1,2-dichloro-	mg/L	<18.0	<18.0	<18.0	18.0
Methane,dibromo-	mg/L	<20.0	<20.0	<20.0	20.0
Methane,bromodichloro-	mg/L	<8.0	<8.0	<8.0	8.0
1-Propene,1,3-dichloro-,(Z)-	mg/L	<10.0	<10.0	<10.0	10.0
1-Propene,1,3-dichloro-,(E)-	mg/L	<13.0	<13.0	<13.0	13.0
Ethane,1,1,2-trichloro-	mg/L	<25.0	<25.0	<25.0	25.0
Propane,1,3-dichloro-	mg/L	<17.0	<17.0	<17.0	17.0
Methane,dibromochloro-	mg/L	<10.0	<10.0	<10.0	10.0
Tetrachloroethylene	mg/L	<10.0	<10.0	<10.0	10.0
Ethane,1,2-dibromo-	mg/L	<20.0	<20.0	<20.0	20.0
Benzene,chloro-	mg/L	<5.0	<5.0	<5.0	5.0
Ethane,1,1,1,2-tetrachloro-	mg/L	<12.0	<12.0	<12.0	12.0
Styrene	mg/L	<6.0	<6.0	<6.0	6.0
Methane,tribromo-	mg/L	32.3	54.6	110.8	10.0
Isopropylbenzene	mg/L	<2.0	<2.0	<2.0	2.0
Ethane,1,1,2,2-tetrachloro-	mg/L	<2.0	<2.0	<2.0	2.0
Benzene,bromo-	mg/L	<6.0	<6.0	<6.0	6.0
2-Chlorotoluene	mg/L	<3.0	<3.0	<3.0	3.0
4-Chlorotoluene	mg/L	<3.0	<3.0	<3.0	3.0
Benzene,tert-butyl-	mg/L	<2.0	<2.0	<2.0	2.0

Benzene,1,4-dichloro-	mg/L	<6.0	<6.0	<6.0	6.0
sec-Butylbenzene	mg/L	<1.8	<1.8	<1.8	1.8
Benzene,1,2-dichloro-	mg/L	<6.0	<6.0	<6.0	6.0
p-Isopropyltoluene	mg/L	<2.0	<2.0	<2.0	2.0
Benzene,1,3-dichloro-	mg/L	<6.0	<6.0	<6.0	6.0
Benzene,butyl-	mg/L	<2.0	<2.0	<2.0	2.0
Propane,1,2-dibromo-3-chloro-	mg/L	<50.0	<50.0	<50.0	50.0
Benzene,1,2,4-trichloro-	mg/L	<9.0	<9.0	<9.0	9.0
Benzene,1,2,3-trichloro-	mg/L	<7.0	<7.0	<7.0	7.0
Hexachlorobutadiene	mg/L	<7.0	<7.0	<7.0	7.0

ANNEX 5

THE REPUBLIC OF AZERBAIJAN

CURRIE BROWN

CONTRACTOR DESIGN

THE AREA OF BALAKHANI TRASH DAMP

ENGINEERING-GEOLOGICAL AND HYDROGEOLOGICAL REPORT

BAKU - 2008

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I. Introduction

Engineering-geological and hydrogeological report is for the Contractor Design stage of ''The Area of Balakhani Trash Damp'' prepared by ''Currie Brown''.

Field-geological surveys were conducted aiming at engineering-geological and hydrogeological study of the hotel building area. These works cover drilling of prospecting boreholes by mechanical and core drilling and taking the rocks samples and monoliths.

The total volume of 4 prospecting boreholes is 80 m. The rocks samples and monoliths were analyzed under laboratory conditions in accordance with the adopt d general methods.

Field geological surveys were conducted in December 2007.

Engineering-geological and hydrogeological report is prepared basing on the above engineering and geological works results, fund materials and literature as well.

II. Physical and Geographical Condition of the Area

Orography and Landscape

The territory of investigated Balakhani trash damp is located in the central part of Absheron peninsula, south-east of Balakhani district, and north-east of Boyuk Shor Lake. Absolute value of Boyukshor lake which is located in the north of Baku is 12.6 m. Ground elevation absolute value gradually rises by moving away from the lake bank, this value reaches up to 25-30 m in the north of trash damp.

The studied area differs from other areas of Absheron peninsula by its landscape. Low series and hills with smooth surface are observed in the central anticlinal zone and hollows are observed in synclinal zones. Salty lakes are met in most of these places. It is possible to meet hollows in anticlinal folding. Closed hollows are one of the main geomorphological peculiarities of the central Absheron landscape.

Hydrography

Drainage network is weakly developed in the Absheron peninsula. There are no rivers in the peninsula if not to take into account Sumgayit River and dry Jeyrankechmez valley in north-east. On the contrary, there are many lakes here. Majority of Absheron lakes are located to the north of Baku plateau. The greatest lakes are Masazir and Boyukshor. The origin of lakes hollows to a great extent depends on wind activities. It is necessary to note that, composition of lake's water depend on salts that winds bring.

Climate

Features of the natural condition have been reflected in the Absheron climate. Variety of the physical-geographical condition in separate parts of peninsula causes for landscape variety.

Weak warm semi-desert climate with dry summer – dry field climate type prevails at the area of investigation. This climate type is formed by the influence of complex circulation processes in the atmosphere. Solar radiation affects to circulation processes a lot.

Air average annual temperature is 14.2°, the lowest perennial average monthly temperature is -1.9° C. Annual range of average monthly temperature is 22.1°C. The hottest month is August (+25,5°C), the coldest month is January (3,4°C).

ature in summer months is 46-47°C and sometimes reaches up to 65°C. The soil is swelling under warm condition and setting under cold condition (0.4-0.7 m).

North, north-western, south and south-western winds prevail in Baku. Wind velocity average annual value varies from 5,6 m/sec to 8,7 m/sec. Northern winds are characteristic for Baku city, velocity of which varies between 20-25 m/sec÷30-40 m/sec.

Air relative humidity is very high in Baku. Northern winds which prevail in Baku bring humidity from the sea. Average annual relative humidity reaches 80-85% in the morning and 60-70% in the afternoon correspondingly. Humidity deficit average annual value in the peninsula varies between 5.2÷9.2 mb.

Maximum humidity deficit is observed in July and August and minimum humidity deficit in January and February correspondingly.

Precipitation amount in Baku is not high and its distribution per area and time is very irregular. Annual precipitation amount in the city is 195 mm. 60-70% out of annual precipitation is mainly observed in the cold period of the year.

Evaporation is high and average perennial value is 1262 mm. The highest value is observed in summer months.

Earth Lining and Vegetative Cover

Earth lining consists of brown semi-desert soils. Shore along consists of mainly sandy, clay, in some places solonetzic soils.

In general, vegetative cover of Absheron differs for its peculiar. Warm summer, rainy autumn beginning late, damp warm winter creates conditions for distribution of semi-desert elements of main vegetative cover.

III. Area geology

Baku is situated in the northern branch of circular Baku mold in the area of Balakhani trash damp. Geological section of trash area is presented by Pliocene and Eopleystosene sedimentaries monoclinal dip is 20-40°. These rocks are covered by middle Pleistocene and Holocene subhorizantal sediments.

Pleistocene aged rocks are presented by clay and sand sediments interlace of balakhani, sabunchu and surakhani strata of productive layer (H_2^1 np).

Agchakil stage (H_2^2 ак) clay with volcanic ash layers are laying above these sediments. Black clays are met in Agchakil section top. Pleistocene aged sediments tlickness is approximately 1400 m. Eoplestosene sediments are lying over Pleistocene aged rocks. These rocks are presented by Absheron stage lower and middle semistage sediments. Low Absheron sediments consist of clays with limestone strata. Middle Absheron rocks are presented by limestone, sandy clay and sand layers.

Middle Pleistocene is presented by gravel, limestone, shell and loam of Xhazar stage ($Г_2ш_3$). These sediments are stretched along lake bank in a fine stripe (till 50-60 m) and go down towards its bottom under angle 1-4'. The sediments thickness is 1-5 m.

Delluvial-proluvial gravels, clays, clayish sands and loams are laying here and there over Pleosen Pleistocene sediments. These sediments refer to new Khazar stage. The youngest

sediments mostly spread in the area are elluvial-delluvial (едГыв) sediments of modern period. Lithologically these sediments consist of loam and sand loams. Here Quaternary period sediments thickness is about 5.0 m. Geomorphologically, this flat area is formed under influence of abrasive accumulative processes. This area is complicated due to eroded products of sea terrace sediments at the result of numerous transgressions in the Caspian Sea.

As per seismicity, the studied area is included into 8 balls earthquake zone due to letter No. HH-0213-1611191 dated 17.09.1991 from the State Committee on Construction and Architecture of the Republic of Azerbaijan and SNiP 11-7-81 (Annex 1, Table 1).

IV. Hydrogeological Condition

C) Surface Water

Surface water of Balakhani trash damp is presented by Boyukshor lake – a freat salt pond of Absheron Peninsula. In the past, this lake was mainly fed by precipitation and highly salted pressure water of productive layer. White salt was extracted from this lake till mid XX century; only in 1926 24 thousand ton white salt was extracted from this lake.

Development of petroleum production around the lake, and as well as Baku city expansion and its economy progress, simultaneously weak management of industry caused afterwards to intensive pollution of the lake. Several physical and chemical index of the lake is presented below:

Area of water surface -9,9 km^2
Average length – 7,0 km
Average width – 1,04 km
Maximum depth – 5-7 m
Water analysis – $CISO_4$, Na-Mg
Salinity – till 50 gr/l
Water clarity – 0,3 m

Water pollution –very high (A category)

Radiation phon in water surface level – 8-12 mkp/hour

In the soils around lake radiation phone is 15-24 mkp/hour which exceeds the average index (9 mkplhour) for several times in Baku.

D) Underground Water

From weak up to high salted ground water is met at the territory of Balakhani trash damp in Absheron peninsula.

Ground water in Absheron peninsula is divided into two zones as per depth of occurrence: the first zone covers areas where ground water depth of occurrence is from 0.2 m up to 2.0-10.0 m (ground water depth of occurrence equals to 0.2 m in Novkhani resident). The areas where ground water depth of occurrence is over 10 m are included into the second zone. Balakhani trash damp area is included into second zone.

The area to the north from Balakhani trash damp is considered to be a waterless zone (arid zone). Water retaining rocks participate in the geology of trash damp area but ground water has not been formed in this strata.

Ground water depth is 10-15 m, there salt load is approximately was determined 15 gr/l according to prospecting wells previously drilled at 3 km to the east (between residents Balakhani and Sabunchu) from Balankhani trash damp. Nearby Boyukshor lake ground water is uploading. Approximately 2.5-3.0 km to the north-west from Balakhani trash damp in Mehdiabad resident ground water depth of occurrence is 15-20 m as per prospecting wells drilled previously. Water salt load in this area varies within 1.2-2.0 gr/l. uploading zone of this water is in western direction towards Masazir lake.

Precipitation infiltration and slightly condensation processes caused to ground water formation. Ground water in some areas (oil deposits) is fed by oil waste water. Water pipelines and effluent disposal lines are feeding source for ground water in residential massive (Balakhani village).

V. Engineering-Geological and Hydrogeological Condition of the Bridges Location Area

Engineering-geological and hydrogeological condition of the location area is studied by mechanical and core drilling of prospecting boreholes. 2 boreholes (with each one's depth 30 m) and 2 boreholes (with each one's depth 10 m) were drilled with this purpose (prospecting boreholes total volume is 80 m).

With the purpose of the studying the rocks physical-mechanical and compression properties the samples from disturbed structures (monolith) and undisturbed structures are analyzed in laboratory condition.

Lithological sections for boreholes were prepared basing on drilling works .

With the purpose of the studying the rocks physical-mechanical and compression properties 10 samples are analyzed in laboratory condition. Average values of the rocks physical-mechanical and compression properties are as follows:

Clays:

Clays physical-mechanical and compression properties indexes are given basing on 6 samples.

No	Physical and mechanical properties	Unit	Maximum value	Minimum value	Average value
1	Granulometrical composition: a) sand fraction (2-0,05 mm) b) dust fraction (0,05-0,005 mm) c) clay fraction (<0,005 mrn)	Y_o Y_o %	11,5 53,2 52,0	4,2 38,9 42,7	6,4 43,8 47,8
2	Plasticity	%	25,37	19,74	22,61
3	Humidity under liquid limit	%	51,92	41,01	46,25
4	Humidity under plastic limit	Y_o	26,55	21,27	23,64
5	Natural humidity	Y_o	1,95	1,88	1,91
6	Bulk density under natural humidity	g/sm^3	1,64	1,48	1,58
7	Bulk density under dry state	g/sm^3	2,74	2,74	2,74
8	Specific weight	g/sm^3	26,99	17,12	21,13
9	Porosity	%	46,0	40,1	42,3

10	Porosity index		0,851	0,671	0,732
11	Wet degree		0,87	0,67	0,75
12	Absorption capacity	%	31,0	25,6	27,3
13	Consistency		0,16	<0	
14	Internal friction factor		0,300	0,250	0,275
15	Angle of internal friction	degree	16°30′	14°	15°15′
16	Cohesion	kgf/sm^2	0,60	0,60	0,60

Compression tests of the clays without water and under water are conducted by steps 0,0; 0,5; 1.0; 1,5; 2,0 kg/cm^2 under load till 2.0 kg/cm^2. The clays relative compression is 0,013 under 0,5 kgf/cm^2 load, 0,023 under 1,0 kgf/cm^2 load, under 1,5 kgf/cm^2 load, 0,029 under 2,0 kgf/cm^2 load, 0,036 under 2,0 kgf/cm^2 load i.e. settling module corresponding to the loads is 13 mm/m, 23 mm/m, 29 mm/m, 36 mm/m. Thus, clays under load till 2.0 kgf/cm^2 as per compression and settling module is referred to strongly compressed (III category) type.

Compression tests under water showed the clays swelling ability while wetted.

Average value of the clays compression coefficient (a) under load 1,0÷2,0 kgf/cm^2 is equal to 0,021 under natural density and 0,016 in saturated water. Deformation module (E) average value is correspondingly 59,24 and 49,51.

Loams

Loams physical-mechanical and compression properties indexes are given basing on 4 samples.

No	Physical and mechanical properties	Unit	Maximum value	Minimum value	Average value
1	Granulometrical composition: a) sand fraction (2-0,05 mm) b) dust fraction (0,05-0,005 mm) c) clay fraction (<0,005 mm)	 % % %	 34,2 61,2 19,4	 21,2 51,2 15,8	 26,7 56,2 17,1
2	Plasticity	%			1063
3	Humidity under liquid limit	%	34,26	29,11	32,25
4	Humidity under plastic limit	%	23,40	20,14	21,60
5	Natural humidity	%	1,84	1,82	1,83
6	Bulk density under natural humidity	g/sm^3	1,55	1,54	1,55
7	Bulk density under dry state	g/sm^3	2,71	2,71	2,71
8	Specific weight	g/sm^3	19,45	13,92	17,16

9	Porosity	%	43,4	43,2	43,3
10	Porosity index		0,768	0,760	0,764
11	Wet degree		0,86	0,69	0,78
12	Absorption capacity	%	28,0	21,0	24,5
13	Consistency		<0	<0	<0
14	Internal friction factor				
15	Angle of internal friction	degree	-	-	
16	Cohesion	kgf/sm^2		-	

Rocks are found in the all boreholes in the course of drilling works.

The soils are average salted as per water extract, thus, dry residual maximum value equals to 1,76 per cent, minimum value 0,64 per cent, and average value 0,93 per cent.

According to difficulty of exploitation the soils in the bridges location area are referred to the following groups of ERER (collection "Common unit region cost, 1982")

Clay – 8 r

Loams – 33 6

The loads given to the rocks are as follows as per SNIP 2.02.01-83:

For clays – 3,0 kgf/cm^2

For loams – 2,5 kgf/cm^2

The rocks slopes inclination is accepted as following during drilling works as per SNIP 2.06.03-85 (till 5 m depth):

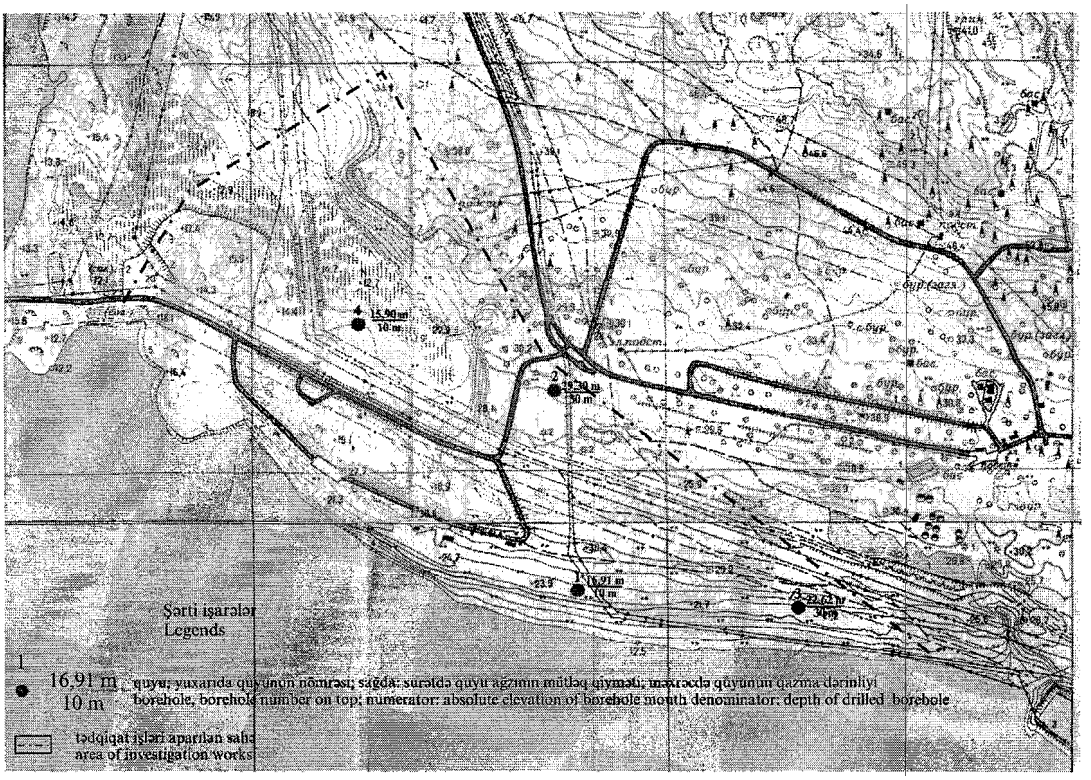
- Clays and loams:

Over water 1:1

Under water 1:1,5

Layout of drilled boreholes in the studied area

Annex № 1



Bore - hole No. 1

Annex 2

Scale 1:200	No. of strata	Depth, m		Thickness of layer, m	Litological section	Rock classification	GWL m
		from	to				
1	1	0.0	0.3	0.3		Filling ground	
2	2	0.3	10.0	9.7		Domestic waste (trash)	
3							
4							
5							
6							
7							
8							
9							
10							

Bore - hole No. 2

Annex 3

Scale 1:200	No. of strata	Depth, m from	Depth, m to	Thickness of layer, m	Litological section	Rock classification	GWL m
2	1	0.0	1.5	1.5		Loam with gravel mixture	
	2	1.5	2.0	0.5		Limestone	
4							
6	3	2.0	6.0	4.0		Greyish clay	
8							
10							
12						Greyish blue stiff clays	
14							
16	4	6.0	16.0	10.0			
18							
20	5	16.0	19.0	3.0		Greyish blue stiff loam	
22							
24							
26						Greyish blue stiff clays	
28							
30	6	19.0	30.0	11.0			

Bore - hole No. 3

Annex 4

Scale 1:200	No. of strata	Depth, m from	Depth, m to	Thickness of layer, m	Litological section	Rock classification	GWL m
2	1	0.0	0.8	0.8		Loam with gravel	
	2	0.8	1.5	0.7		Limestone	
4	3	1.5	4.8	3.3		Yellowish grey loams with sand loam	
6							
8	4	4.8	9.6	4.8		Greyish blue loam	
10							
12	5	9.6	30.0	20.4		Greyish blue stiff clays;	
14							
16							
18							
20							
22							
24							
26							
28							
30							

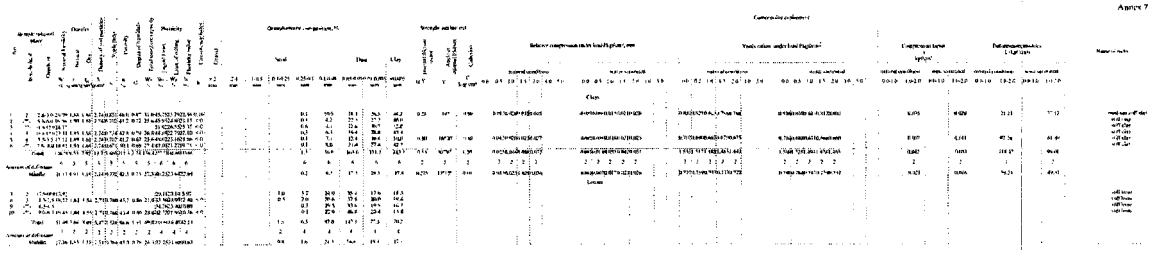
Bore - hole No. 4

Annex 5

Sale 1:200	No. of sta ta	Depth, m		Thickness of yer, m	Litological section	Rock classification	GWL
		from	to				
1	1	0.0	0.8	0.8		Light loam	
2							
3	2	0.8	2.5	1.7		Yellowish grey sand l a m	
4							
5	3	2.1	4.5	2.0		Yellowish grey loam	
6	4	4.5	6.0	15		Greyish day	
7							
8							
9						Greyish blue days	
10	5	6.0	10.0	4.0			

Table of physical-mechanical and compression features of soil

Annex 7



Analysis of Water Extracts from Soil Samples taken from Exploration Drill Holes

Annex No.8

No	Borehole number	Depth, m	GRAMS									NATIONAL EQUIVALENT							
			CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	Sum of ions	Dry residual at 105°	CO_3^{--}	HCO_3^-	Cl^-	SO_4^{--}	Ca^{++}	Mg^{++}	Na^+	Sum of ions	$Ca^{++} + Mg^{++}$
1	2	2.8-3.0		0.043	0.206	0.154	0.010	0.006	0.200	0.619	0.660		0.70	5.80	3.20	0.50	0.50	8.70	9.70	1.00
2	—"—	5.8-6.0		0.061	0.177	0.182	0.010	0.003	0.208	0.641	0.675		1.00	5.00	3.80	0.50	0.25	9.05	9.80	0.75
3	—"—	11.8-12.0		0.049	0.202	0.187	0.010	0.003	0.222	0.673	0.685		0.80	5.70	3.90	0.50	0.25	9.65	10.40	0.75
4	—"—	17.8-18.0		0.043	0.185	0.178	0.010	0.006	0.198	0.620	0.640		0.70	5.20	3.70	0.50	0.50	8.60	9.60	1.00
5	3	4.3-4.5		0.018	0.220	0.389	0.010	0.021	0.261	0.939	1.030		0.30	6.20	8.10	1.50	1.75	11.35	14.60	3.25
6	—"—	9.0-9.3		0.043	0.206	0.345	0.010	0.003	0.298	0.905	0.905		0.70	5.80	7.20	0.50	0.25	12.95	13.70	0.75
7	—"—	16.8-17.0		0.049	0.341	0.139	0.010	0.003	0.298	0.831	0.825		0.80	9.60	2.90	0.50	0.25	12.55	13.30	0.75
8	4	3.3-3.5		0.018	0.554	0.197	0.025	0.012	0.408	1.214	1.220		0.30	15.60	4.10	1.25	1.00	17.75	20.00	2.25
9	—"—	7.8-8.0		0.018	0.838	0.202	0.040	0.027	0.548	1.673	1.755		0.30	23.60	4.20	2.00	2.25	23.85	28.10	4.25
				0.342	2.929	1.973	0.155	0.084	2.632	8.115	8.395		5.60	82.50	41.10	7.75	7.00	114.45	129.20	14.76
Sum:				9	9	9	9	9	9	9	9		9	9	9	9	9	9	9	9
Number of tests:				0.038	0.325	0.219	0.017	0.009	0.292	0.902	0.933		0.62	9.17	4.57	0.86	0.78	12.72	14.36	1.64
Average:																				

Annexes 6

Protocols of the public discussions

ABSHERON REHABILITATION PROGRAM
Minutes of Public Consultations
First Round
December 19,2007
Baku, Azerbaijan

The first round of public consultations was held on December 19, 2007 for three projects of the Absheron Rehabilitation Program:

- Decontamination of Former Iodine Production Sites and Development of Low Radioactive Waste Decontamination Strategy for oil production sites – by the Ministry of Emergency Situations (MES)
- Municipal Solid Waste Management Project – by the Ministry of Economic Development (MED)
- Development of Capacity and Procedures for Large-scale Cleaning of Oil-polluted Soil – by the State Oil Company (SOCAR)

Mr. Yusif Zamanov, head of department of MES, opened the meeting, welcomed the participants and provided brief introduction of the project being prepared by MES. Then he invited his colleagues to describe project in more details. The floor was given to Mr. Ilkin Kangarli who talked about the problem with radioactive wastes, and explained how the project will be dealing with this problem. He also informed the audience on preparation studies currently undertaken by the MES: feasibility study, environmental assessment and social assessment. Mr. Kangarli introduced consultants contracted by MES to carry out these assignments. Each of the consultants reported on the progress achieved so far: Ms. Yulia Adilova - on social assessment, Mr. Islam Mammadov - on environmental assessment, and Mr. Talat Kangarli – on feasibility study. All presentations were accompanied with illustrative materials such as diagrams, site photos, charts, etc.

Then the floor was given to the team of the Ministry of Economic Development. Mr. Fuad Ahmedov informed participants on the project design, and on the work carried out to prepare the project. He introduced his colleagues Mr. Parviz Yusifov and Mr. Rauf Muradov, consultants, who provided more detailed information on feasibility and safeguard studies currently underway. The MED's presentation was also illustrated by site photos and supported by relevant data available up to date.

Then SOCAR's team represented by Mr. Soltan Aliyev, head of environmental department, and Anar Guseynov, specialist of the environmental department, presented the project to be implemented by SOCAR. Mr. Aliyev talked about overall environmental

policy of SOCAR which is partially supported by the WB credit. He described the project design and informed the participants on current studies which SOCAR contracted consultants for, and the anticipated time-table.

After all projects had been presented, a "Questions and Answers" session was held. The following questions were raised and answers given:

Q: Ramiz Mammadov, Institute of Geography: How were consultants selected for these studies?

A: Yusif Zamanov, MES: Since the amount of the assignments is below 50,000 AZN, the quotation method was used for selection of consultants.

Q: Ramiz Mammadov, Institute of Geography: Where have satellite images been obtained?

A: Islam Mammadov: Satellite images have been provided by MES.

Q: Telman Zeynalov, Natioanl NGO Forum: NGOs have to be informed about and involved in such studies.

A: Soltan Aliyev, SOCAR: The purpose of this meeting is to inform NGOs on these studies.

A: Ilkin Kangarli, MES: There will be also the 2nd round of public consultations. The studies are conducted by independent consultants.

Q: Farida Huseynova, NGO Green Movement: The EIA has to be publicly available 1 month prior to consultations.

A: Ilkin Kangarli, MES: EIA will be publicly available prior to the 2nd round of public consultations.

Q: Farida Huseynova, NGO Greem Movement: Was Academy of Sciences involved in radiometric tests?

A: Yusif Zamanov, MES: Specialists of "Isotope" carried out radiometric tests

Q: Farida Huseynova, NGO Green Movement: Which oil clean up technologies will be applied?

A: Soltan Aliyev, SOCAR: Feasibility study will identify most suitable technologies to be applied.

Q: Farida Huseynova, NGO Greem Movement: Is EIA for SW project taking into account such aspects as biogas?

A: Rauf Muradov, Currie Brown: EIA will take into account all possible aspects, including biogas.

Q: Gakhraman Hasanov, Academy of Sciences: There is soil clean up research done by the AS. Can SOCAR support such research instead of doing clean up itself?

A: Soltan Aliyev, SOCAR: It is not SOCAR's mandate to finance scientific research but SOCAR can purchase clean up equipment and carry out clean up operations.

Q: Ramiz Mammadov, Institute of Geography: Why did WB decide to allocate funds to the agencies which are not primarily involved in this environmental work?

A: Yusif Zamanov, MES: According to the Charter of MES, ensuring radiological safety is one of the primary functions of the MES, thus, the responsibility for the project has been assigned relevantly.

A: Bakhtiyar Karimov, WB: WB provides funds to the Government of Azerbaijan, and it is the Government of Azerbaijan not the WB which decides on specific responsibilities for projects.

A: Soltan Aliyev, SOCAR: Such decision is made by the Government based on the practical experience of the agencies.

A: Parviz Yusifov, MED: The MED was assigned by the Government to coordinate work under construction of the Waste Incineration Plant. In the same time the Government understands that the Waste Incineration Plant is a part of SW management system, therefore this task was also attached to the Plant assignment. With assistance of SWM project funded by the Bank, MED is planning improve whole the system of SWM

As there were no more questions, Mr. Zamanov closed the meeting with thanking everybody for participation and invited them to participate in the 2nd round upon additional notification.

List of Participants

Academy of Sciences

1. Ramiz Mammadov, Institute of Geography, Deputy Director
2. Gaxraman Hasanov, Institute of Chemistry

NGOs

3. Islam Mustafayev, Ruzgar
4. Kamal Yagubov, Ruzgar

5. Muslim Gurbanov, EcoOil
6. Elchin Sardarov, Saniya
7. Farida Huseynova, Green Movement
8. Telman Zeynalov, National NGO Forum
9. Arif Islam-zade, Sumgayit Center for Environmental Rehabilitation
10. Fuad Akhund-zade, National NGO Forum
11. Fuad Mirkishiyev, Synergetics

Ministry of Emergency Situations

12. Yusif Zarnanov
13. Ilkin Kangarli
14. Sahib Garayev
15. Fikret Aslanov
16. Vugar Huseynov (Isotope)
17. Talat Kangarli (Consultant)
18. Islam Mammadov (Consultant)
19. Yulia Adilova (Consultant)

Ministry of Economic Development

20. Fuad Akhmedov
21. Parviz Yusifov (Consultant for the Department for Foreign Investments and Coordination of Technical Assistance, GTZ)
22. Rauf Muradov (Consultant, Currie Brown)

SOCAR

23. Soltan Aliyev
24. Anar Guseynov

MENR

25. Rafiga Mir-Movsumova, Ecological Expertise Department

Local Governments / Local Communities

Sabunchu District

26. Abbas Malikyeganov, Sabunchu Executive Committee
27. Khanlar Lhanlarov, Ramana Municipality
28. Akbar huseynov, Balakhani Municipality
29. Ramiz Rahimov, Amirjan Municipality

Mashtaga District

30. Ilgar Gurbanov, Mashtaga Municipality

Suraxani District

31. Nargiz Talibova, Hovsan Municipality
32. Agasaf Rahimov, Suraxani Municipality
33. Avaz Mirzayev, Garachuxur Municipality
34. Mubariz Novruzov, Zig Municipality

World Bank Team

35. Anirudha Dasgupta
36. Frank van Woerden
37. Wolfhart Pohl
38. Gulana Hajiyeva
39. Bakhtiyar Karimov
40. Vusala Asadova

Protocol of the public discussions of the draft projects on
"Comprehensive management of solid household wastes in Apsheron peninsula"
"Environmental impact assesment"
"Ressetlement policy framework"

Bakı city, **20 February**
2008-ci il

Participants:

1. Mr. Fuad Ahmadov – Chief of the sector on foreign investment contracts and investment projects of the DFICTA (Division on Foreign Investments and Coordination of Technical Assistance)
2. Mrs. Konul Aliyeva – Chief consultant of the sector on foreign investment contracts and investment projects of the DFICTA
3. Mr. Hamlet İsmayılov – Lead specialist of the sector on foreign investment contracts and investment projects of the DFICTA
4. Mr.Perviz Yusifov – DFICTA assistnace GTZ project cosnultant;

5. Mrs. Saida Bagirova – Representative of the World Bank
6. Mr. Bahram Hasanov – Representative of the National Academy of Sciences of Azerbaijan
7. Mr. Elbey Abdullayev – Representative of UP international company
8. Mr. Rauf Muradov -Currie & Brown company, project manger
9. Mr. Fuad Mirkishiyev – Sinergetiks company, Director
10. Mrs. Yuliya Adilova – Sinergetiks company, sociologist
11. Mr. Tofig Hasanov – Ekoteks company representative
12. Mr. Abbas Melik-Yeganov – Representative of Sabunchi region executive authority
13. Mr. Javanshir Mammadov – Representative of the Balakhani municipality
14. Mr. Farhad Gurbanov – Balakhani settlement representative
15. Mr. Yuriy Veliyev – NGO
16. Mr. Fuad Akhundzade - National NGO forum
17. Mrs. Chimnaz Shabanova – Ekoskope NGO
18. Mrs. Elvina Alishina – Fineko/abc.az (correspondent)

Mr. Fuad Ahmadov – Chief of the sector on foreign investment contracts and investment projects of the DFICTA (Division on Foreign Investments and Coordination of Technical Assistance) opened the session with an openning remarks and gave a brief information about the project documents to be discussed and state programs and decrees these projects were based on. Then the floor was passed to Mr.Perviz Yusifov, DFICTA assistnace GTZ project cosnultant.

Mr.P.Yusifov has demonstrated to participants a presentation reflecting the current situation related with the process of collection, transportation and placement of solid houseold wastes. The slides on current condition of the Balakhani range where the household wastes of 10 regions of Baku are

transported, as well as the ways of solution of this problem were brought to attention of participants. At the end of the presentation an information was presented on "Unite system of management of household wastes in Apsheron peninsula" to be implemented within the framework of the World Bank's "Program on Ecological Restoration of Apsheron".

Mr.P.Yusifov who spoke about the cooperation with Currie & Brown company that was contracted as a consultant company in the area of solid household wastes management passed a floor to the reporter of Currie&Brown company Mr. R.Muradov.

R.Muradov brought the "Environmental impact assesment framework" to the attention of participants, he also clarified the results of the analyisis and studies made. He noted, that in order to conduct the ecological analysis of the current condition of the Balakhani range a samples were taken from air, subsoil waters and from the Boyuk Shor Lake situated nearby and such samples were analysed later on, and the results of each analysis had indicated that the presence of the harmful substances is higher than the norm. As the most optimal way of solution of the problem Mr. R.Muradov mentioned the gradual covering of the surface of the range, and later digging of wells and collection of the accumulated metane gas.

Mr.R.Muradov mentioned about the Call for Proposals presented to the contractor companies and noted that the Call for Proposals fully reflects the requirements put by the Ministry of Ecology and Natural Resources.

Then the floor was passed to Mrs. Yuliya Adilova, representative of Sinergetiks NGO. Mrs. Yuliya Adilova presented the draft of the "Ressetlement policy framework". Mrs. Adilova mentioned about the analysis made on the current socio-ecological condition of the range employees and of the families settled nearby. It was noted, that during the conduct of a socio-economic assesment 6 families living in nearby areas of range and 51 range employees had participated in such survey.

After the presentations of the projects was over the floor was passed to the representatives of the public.

Firstly, a speech was made by Mr. T. Hasanov, representative of Ekoteks company. He supported the idea of covering the surface of Balakhanı range and collection of the metane gas from there. Mr. T.Hasanov asked some questions related with the envisioned construction of the waste burning plant. Speaking about the previous waste burning plants he underlined their negative experience. He informed that 30% ashes will be accumulated in the result of burning of wastes, and its placement will be problematic. As an answer Mr. Muradov mentioned, that in the result of burning of wastes with modem technology the volume of the ashes made 7% in total.

Later, the representative of Ekoskope organization Mrs. Ch.Shabanova expressed her views regarding the waste burning plant. She mentioned about the ecological impact of the waste burning and noted that, the refining equipment envisoned for the plants mentioned are more expensive than the plant itself, and therefore, the classification and re-procerssing of the wastes would be the much better option. Mr. P. Yusifov noted as a reply, that the projects discussed cover only the wastes accumulated in the Balakhani range only and that it would be inexpedient to include into today's discussion the issues related with the activity of the waste burning plant.

Mr. F.Qurbanov representative of the Balakhani settlement asked questions related with the benefit of these projects to the population of the settlement, on what kind of assistance would be provided by health care institutions to the population, as well as about the assistance to be provided to the local population related with their employment. He also noted, that future conduct of these activities there will lead to the increase of the traffic, noise and subsequent pollution of the roads. He also asked whether the government considers to undertake any actions in this regard.

F. Ahmadov noted that, the biggest benefit for the population would be the ecological benefit, regulation of the management of the range and its closure is a very factor directly impacting the health of population of the settlement. Besides, employment of the local people will be envisioned in projects during the period of construction of the plant and also during the

works at the range. We can also consider your proposals and come back to these issues as there are also discussions being held currently.

Mrs. S. Bagirova, representative of the World Bank informed the participants, that a negotiations will start in the mid of April with the government of Azerbaijan with respect to a project worth of approximately USD47 mln. Approval of this project by the Board of Directors is expected to take place on July. The purpose of the discussions held currently is to reveal the issues that were missed in the report and to consider such missed issues when preparing the assesment documents.

Later the representative of UP international company E.Abdullayev expressed his objection to two issues related with the project. First, he noted that, the number and structure of the employees involved in waste issues is not reflected correctly in the report. Second, no information was given in the report regarding the oil (Baku-Novorossiysk) and gas pipelines passing through the territory of the range. At the same time E.Abdullayev noted, that when preparing the Feasibility Study the reference should be made to the correct information and one should not think bad about the persons involved in the sphere of waste issues..

Mr. Ahmadov expressed his views with respect to this matter and noted, that our main problem at present is statistical figures. There is no accurate source from where an information about the population of Baku can be taken, and in connection with this it is not possible to see the volume of wastes. The volume of wastes coming to Balakhanı range reflects the volume of waste formally transported.

By this, Mr. Ahmadov informed participants that the public discussions held in the regime of exchange of opinions are over.