JULY 2012

GKP KOKTEM

AKTAU WASTE MANAGEMENT PROJECT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
ENVIRONMENTAL AND SOCIAL ACTION PLAN
ENVIRONMENTAL AND SOCIAL MONITORING PLAN

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List of abbreviations

ACRP	Accident containment and response plan
BAT	Best available technology
BOD	Biological oxygen demand
CHP	Combined heat-power plant
COD	Chemical oxygen demand
GKP	State municipal enterprise
ESAP	Environmental and social action plan
ESMP	Environmental and social monitoring plan
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EHS	Environmental and occupational health and safety
EIA	Environmental impact assessment
EU	European Union
FS	Feasibility Study
GHG	Greenhouse gases
GOST	State standard
KPI	Key performance indicator
MAC	Maximum allowable concentration

MBT	Mechanical – biological treatment plant
MPE	Maximum permissible emission
MSW	Municipal solid wastes
OHS	Occupational health and safety
OVOS	National environmental impact assessment
PE	Project Engineer
PIU	Project implementation unit
PMC	Project management consultant
POPs	Persistent organic pollutants
PPM	Personal protection means
ppm	Parts per million
PR	Project requirement
PIU	Project implementation unit
Q	Quarter
RK	Republic of Kazakhstan
SanPiN	Sanitary norms
SEP	Stakeholders engagement plan
SNiP	Construction codes
SWM	Solid waste management
ToR	Terms of Reference
TPH	Total petroleum hydrocarbons
WWTP	Wastewater treatment plant

1 Introduction

Authorities of the Oblast have intent to establish a modern waste management facility in Aktau. In order to assess possible technical scenarios of the Project, in 2009 the Oblast mobilised a Consultant funded by the European Commission. The Consultant recommended establishing an integrated waste management facility which will combine waste separation and recycling with generation of green energy (the "Facilities"). It is expected that modern technologies will be used and the Facilities will fully process the waste with the least or zero residual left. When established, the Facilities would allow Aktau to depart from the current ineffective and costly practices that have resulted in the accumulation of environmentally hazardous and unsafe waste disposal sites. Additionally, the Facilities will help to decrease CO_2 and methane emissions and preserve renewable and non-renewable resources. The Facilities in Aktau shall include waste separation, recycling, anaerobic digestion and generation of electricity. The Aktau Waste Management Project shall be a pilot project of the kind in Kazakhstan.

The Oblast has requested the European Bank for Reconstruction and Development ("the EBRD" or the "Bank") to provide financing for the Aktau Waste Management Project.

Upon the Bank's request, in 2009 the Oblast established the Project Management and Coordination Centre (the "PMCC"), a local PIU, with the purpose to prepare and implement the EBRD-funded and other municipal infrastructure projects in the region. EBRD has been cooperating with the PMCC to initiate and develop a framework for the proper development and implementation of infrastructure projects in the region. The PIU will co-ordinate all activities and communications between the Company and its Contractors under the Project, and will be the overall project manager as well.

This report includes a summary of the findings of an environmental analysis carried out as a part of the Feasibility Study for the Aktau Waste Management Project. The main objective of the analysis is to assess environmental impacts of the Project and propose mitigating measures to be included in the Project. Such assessment will ensure that the Project is in compliance with applicable EBRD and relevant national standards and regulations including those on health and safety. In order to fulfil this objective, the following tasks shall be completed:

- Assess the existing environmental conditions and SWM system (baseline situation), and identify "hot spots" and improvement opportunities;
- Assess proposed technical solutions, including potential location of the new landfill, and options for the existing landfill upgrade/closure;
- Describe procedures associated with obtaining environmental permits;
- Make an Environmental and Social Impact Assessment ("ESIA") for the proposed investment Project in compliance with the PRs 1 to 10 and national requirements and disclose its results to the stakeholders including general public by means of a non-technical summary and public hearings;
- Recommend measures which would mitigate potential adverse impacts on the environment, health and safety of the population associated with the PIP implementation, and find ways to enhance environmental benefits expected from the PIP implementation.

Though the key objective of the investment programme is to improve performance of public services systems and to enhance services quality, it is expected to have positive long-term environmental effects as well.

2 Approaches, Methodology and Scope of Study

This Report was prepared with the focus on the current situation in the waste management system in the Aktau Oblast, and in particular on the activities observed in the Koktem landfill which is used for MSW disposal from Aktau City and Munalinsky Rayon. Methodology used to make this ESIA included a review of the information provided by the Oblast and waste collection companies, published in the Internet, collected during site visits in Kazakhstan, meetings and telecommunication with responsible persons of the Oblast and waste management companies, as well as a review of technical, environmental, health, safety and stakeholder management information provided by waste collection and wastewater treatment companies upon the Consultant's requests.

This chapter describes the main approaches used during Environmental and Social Impact Assessment.

The assessment process consisted of the following main tasks:

- Scoping;
- Collecting of baseline data;
- Impact assessment, assessment of cumulative impacts;
- Development of mitigation measures;
- Development of the Environmental and Social Monitoring Plan, Environmental and Social Action Plan, Stakeholder Engagement Plan.

At the scoping stage an overall assessment of potential impacts was carried out to establish which aspects of the environment might be significantly affected by the proposed Project. They were considered with respect to both the type and scale of the proposed development to derive a potential list of environmental aspects which should be covered in the Report.

Environmental and social baseline conditions were identified by collecting information about recipients and biophysical/social resources that occupy both the site and the surrounding area and thus might be affected by the development proposals. In addition to the data provided by the Company, baseline data were also gathered from the public information sources, during field surveys and consultations with key stakeholders.

Having outlined the baseline conditions, the Consultant identified potential impacts from each project component and assessed their acceptability in terms of environmental and social effects. Key impacts were identified and the likely scale of each potential impact was determined as a predicted change from the baseline conditions during various development stages. The impacts were assessed for the long term and short term periods to see potential changes at different stages of the Project.

The assessment of significance of impacts was based on the assessment of their duration, their extent, value of the natural component which is acting as recipient for the impact. The impact was considered insignificant when at least two of these parameters were of low value and the third was not significant (for example: short emission of pollutant in low quantities in the air), on the other hand the impact was considered significant when one of the parameters had significant value and two others were considerate moderate. Planned success of the proposed mitigation measures were also taken into account to provide the final assessment of the impact.

The overall impacts from all components were assessed by means of an analysis of the interaction of different impacts from each project component. An assessment of cumulative impacts as well as of impact interactions was an iterative process in which potentials of such impacts were re-examined through all stages of the Project. However it was mostly based upon assumptions and predictions due to many uncertainties met. It should be mentioned that construction effects in general will tend to be temporary in nature. Operational effects of the new Facilities might be either permanent (visual impacts), or temporary (e.g., transient odorous loads, implications of accidental spillages, etc.).

The impacts were combined in two groups: short-term impacts and long-term impacts for every natural component (e.g. air quality, water, groundwater, soil, etc.). The main method used was analogue modelling, i.e. comparing potential impacts of the proposed Project with the impacts of a similar existing project. Predictions are necessary when forecasting future impacts, particularly regarding noise, air quality and traffic levels.

Mitigation measures were developed for all impacts which were considered significant. Mitigation measures can be implemented at the following stages of the Project:

- During the design stage of the entire Project life cycle to avoid or minimise the magnitude of adverse impacts at source, and promote positive effects where possible;

- During construction (mitigation and environmental enhancement measures); and

- During operation of the Facilities applying best operational practices.

All mitigation measures described or proposed shall be supported by the operator of the proposed Facilities so that significance of residual effects could be predicted and necessary monitoring/management strategies identified. Mitigation measures will be elaborated for every project stage using the "avoid - minimize - compensate" hierarchy.

For certain criteria, where significant environmental impacts are either certain or else likely without mitigation, it is important to ensure that progress of mitigation measures is monitored. For this purpose an Environmental and Social Monitoring Plan was developed. Within each project component measures are proposed to monitor each environmental aspect (air, water, soil, wildlife, radioactivity, sanitary conditions) which is likely to be affected. It is worth noting, that this also includes monitoring of working conditions and living conditions in the Project Area. This structure of the monitoring plan allows its implementation within any organizational structure which might emerge in the city after the elements of the waste management system are transferred to the competitive environment.

Another measure to increase flexibility of the current Plan in case of any institutional changes in future is to develop recommendations on E&S monitoring for the implementation and operation stages of the Project separately. This Plan accounts for these differences and allows maximum possible control and mitigation of impacts. It is also designed to achieve best environmental results from the PIP implementation.

A distinctive feature of the Project is that it involves a multi-stakeholder structure. Moreover, the currently existing structure will be changed based on the world's best available practices and recommendations developed in the course of this Study. Therefore, during environmental and social assessment significant attention will be given to the institutional aspect (in addition to the institutional part of the current study) of the social and environmental responsibility. Further on, the Consultant will give recommendations on EHS and OHS management for future operators and sum them up in the Environmental and Social Action Plan, rather than assess the existing SWM system operator's activities.

In addition to this Study, a special Environmental Impact Assessment document (i.e. OVOS) was prepared as required by the Kazakh legislation to be submitted to the State Expertise for approval. The approval was granted on 20 April 2012.

Wide public and stakeholders consultations are a required part of the Project ranked A according to the EBRD Rules and Procedures.

3 Baseline Situation in the Project Area

3.1 Background Environmental Situation

3.1.1 General Information and Location

The City of Aktau is the centre of the Mangistau Oblast (Region) in the West Kazakhstan. It is situated close to the Caspian seashore.

The Mangistau Oblast is located in the southwest of Kazakhstan and borders on the Caspian Sea in the west, Uzbekistan and Turkmenistan in the south and southeast and two other Kazakh provinces – Atyrau Oblast and Aktobe Oblast in the north and northeast.

The total area of the Mangistau Oblast is 165,600 square kilometres with the total population of about 410,000 people. There are three cities, four rural districts and 26 auls (settlements) at the territory of the Mangistau Oblast. Urban and rural population accounts to 76% and 24% respectively. About 40% of the population of the Mangistau Oblast lives in Aktau City.

Aktau City (literally means "white mountain" in Kazakh) which was named after the cliffs overlooking the sea is of a strategic importance for Kazakhstan. Such importance is attributed not only to gas and oil extraction but also to the fact that the city is the main seaport on the Caspian Sea and the free economic zone crossed by the Aktau-Zhetybay-Uzen oil pipeline.

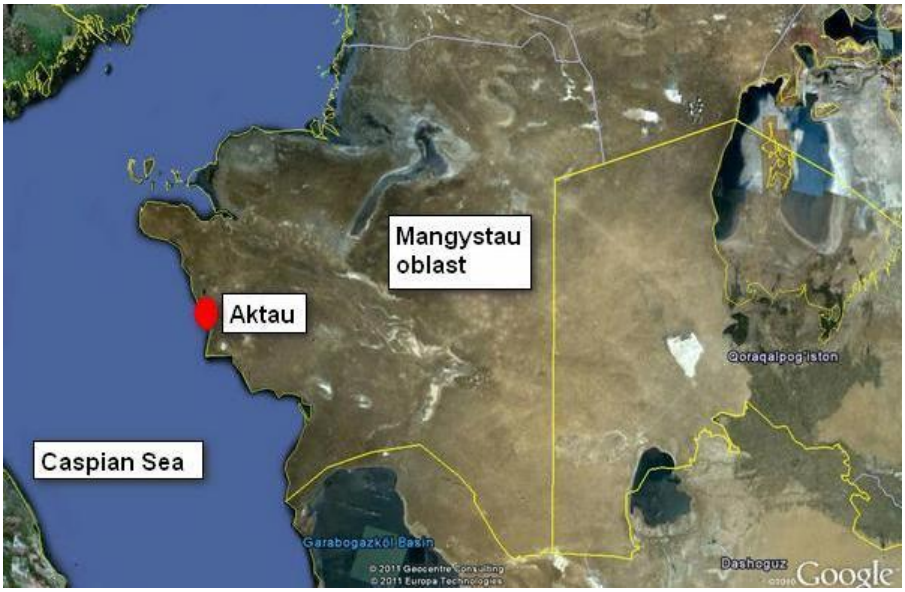

Figure 1. Location of the Project Area

Climate and Air Quality

Climate

Due to its vast territory, the Mangistau Oblast has a wide variety of climate conditions. In general, the climate here is continental with cold winters and hot summers. The climate of the Mangistau Oblast is formed under the influence of the Arctic, Iranian and Turanian air masses. During cold seasons masses from the west wedge of the Siberian anticyclone dominate, in warm seasons they are replaced by the continental Turanian and Iranian air masses. The extreme continental climate influencing the entire complex of meteorological parameters is formed under the influence of these air masses.

According to SNiP RK 04-01-2001 "Construction climatology", the territory of Aktau belongs to IV-G climatic sub-area.

Design parameters for the territory of Aktau are as follows:

- Climatic area (SNiP RK 2.04-0-2001) IV-G
- Area by snow cover weight 1 (so =50 kgs/m^2)
- Area by wind pressure IV (wo = 48 kgs/m^2)
- Calculated winter outdoor temperature of the coldest five days, reliability 0,92 (SNiP RK 2.04-0-2001) -15 ºC
- Normative soil freezing depth 0,61 m
- Maximum soil freezing depth 1,00 m
- Average annual wind velocity 35 m/s

› Seismic activity rate 6

The winter is cold with the unstable snow cover and deep soil freezing. The summer is hot and long with frequent dust storms. The climate is dry due to prevailing clear and sunny days as well as a small amount of precipitation. Relative humidity up to 30% is observed during 56 days per year, up to 80 % – during 100 days per year. Relative humidity reaches its maximum value of 75 – 90% in cold seasons. In summer low values of relative humidity (less than 30 %) are observed during daytime.

A typical feature of the extreme continental climate is the contrast between winter and summer, day and night temperatures. The warm season in Aktau City (average daily temperature is above 0°C) lasts for about 280 days. Transition of the average daily temperature over 0ºC in spring takes place in March, and hot clear weather sets from May till September. The average temperature is 18 – 23°C. The warmest weather is registered in July – August, the daytime temperature reaches 28-30 °C. The absolute temperature maximum registered is +42ºC (1965).

The weather in winter is unsteady, with frequent thaws. The cold season (with average daily temperature below 0°C) starts usually in the middle of December and lasts till the beginning of March. Moderately low temperatures with a higher humidity are typical for the winter season. The lowest temperatures are registered in January. The average monthly temperature in January is – 2.9 °C, the absolute temperature minimum registered is -28ºC (1969).

East, south-east, and west winds are most frequently observed during the year. West and northwest winds are prevailing in the summertime. 30 – 50 % of east and southeast winds are observed in winter. It is attributed not only to the baric but also to the local temperature environment. The tendency of the transfer of cold air masses from the desert to the sea increases in winter due to the fact that the Caspian waters in winter are warmer than the deserts at the shore.

The average monthly wind velocity is 4–5 m/s in winter, in the summertime it is lower – 3 m/s. The average annual wind velocity is 3.5 m/s. South-east and northwest winds have the highest velocity. Strong winds (over 15 m/sec) in the dry summer season provoke dust storms which can be a challenge due to the Koshkar-Ata tailing pond. However west winds are prevailing in the summertime, and Koshkar-Ata is located to the north-east from Aktau, i.e. dust is blown to the desert.

As per the moisture regime, the area belongs to the desert zone. Annual precipitation averages to 176 mm. Distribution of precipitations within a year is irregular. The major part of the annual precipitation occurs in the winter season. Summer precipitation falls in the form of short storm rains, winter precipitations falls as snow. Snow cover is unstable; its density is up to 5–10 cm.

Table 1. Average annual and monthly precipitation in the Project Area, based on the "Eraliev" Meteo-Station data.

Meteo station	Monthly average												Annual average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Eraliev	20	24	20	16	11	8	6	6	6	8	21	20	176.0

Air quality

The main criteria of the air quality are the values of pollutant concentrations as compared to the maximum permissible emissions (MPE) of main pollutants in the air of populated areas. The MPE set forth in the RK are presented in the table below.

Table 2. MPE values for some pollutants in the air for residential areas of the Kazakhstan Republic

Pollutant	Air pollutant in Aktau[1], mg/m^3		MPE values (national norms), mg/m^3		Class of hazard	EU standard
	Single registered concentration	Daily average concentration	Single registered concentration	Daily average concentration		
Carbon oxide	1.0	0.03	5.0	3	4	10
Nitrogen dioxide	0.05	0.01	0.085	0.04	2	0.2 – hourly average 0.04 – yearly average
Suspended solids	0.6	0.24	0.5	0.15	3	-
Ammonia	0.06	0.017	0.2	0.04	4	-
Sulphur dioxide	0.02	0.005	0.5	0.05	3	0.35 – hourly average 0.125 – daily average
Sulphuric acid	0.04	0.02	0.1	0.3	2	-
Hydrocarbons	1.2	0.75	1.0	-	4	-

[1] Source: Information Report on the Environmental Situation in the Aktau Seaport for the first half of the year 2011

Industrial activities are one of the main air pollution sources in the Mangistau Oblast and Aktau City. However, despite of numerous pollution sources their impact on the local air quality is limited due to the location of the city at the seashore and advantageous wind conditions. Aktau takes only the 14th place of the 20 cities of Kazakhstan by the level of air pollution. However the MPE values of the RK are exceeded from time to time. It refers first to suspended solids and nitrogen dioxide.

The air pollution level is lower than the average for the country. The worst average concentration of suspended solids was 2.1 MPE, while concentrations of carbon monoxide, sulphur dioxide, nitrogen dioxide, ammonia and sulphuric acid were within the permissible norms. Maximum of the single concentration of suspended solids came up to 1.8 MPC, nitrogen dioxide – to 2.0 MPC.

According to a monitoring analysis made at the Koktem landfill in the second quarter 2011, the radiation level was 0.08 – 0.12 micro-Sv/hour, while the national norm is 0.30 – 0.33 micro-Sv/hour. The radiation level in residential areas does not exceed normal natural levels: the average level is 0.1 micro-Sv/hour, the maximum registered level is 0.13 micro-Sv/hour. According to the ICRP recommendations, the maximum acceptable for people dose emitted from any man-made facility is 1 mSv/year, which is 0.1 micro-Sv/hour above the natural baseline level. The norms are calculated based on the natural baseline level of the baseline figures which can differ considerably, for example: the average individual background radiation dose: 0.17 microSv/h for Australians, and 0.34 microSv/h for Americans.

3.1.3 Geological and Geomorphologic Structure and Groundwater

The Project Area is located within the eastern part of the Caspian lowland, at the Caspian seashore on the Novokaspyskaya (New Caspian) coastal plain. The Novokaspyskaya coastal plain is formed by lake and sea deposits (silt-based clay, fine and river sand, clay with shells), which were accumulated and repeatedly resorted due to alluvial activities during the recession period of the Khvalynskiy and Pozdne-Khvalynskiy seas.

Quaternary and tertiary deposits determine the geological structure of the Project Area. The quaternary deposits are represented by sands covered with a thin layer of aeolian-diluvium clay loam. At 16 to 19 m marly clays are deposited.

Groundwater in the area is heavily mineralized water of the calcium chloride type, with the total mineralization of 89-120 g/l, sulphates concentration – 7,400-13,900 mg/l, and the concentration of hydrocarbons more than 6 mg-eq/l. Groundwater does not occur at the technological depth, and it was reported that groundwater at the Project Area occurs at a depth of more than 20 meters.

Groundwater in the area of Aktau cannot be used for potable or technical water supply. The closest deposit of brackish waters called Kuyulus –Melovoe is located at the distance of 43 km to the north-east from Aktau City.

The geologic structure with a significant layer of watertight rocks and absence of groundwater at depths of at least 15 – 20 m create proper conditions for safe storage of hazardous materials. This was the main reason to choose this area for the construction of a radioactive waste storage (Koshkar-Ata). Details on the Koshkar-Ata tailing dumpsite are provided further in this Report.

3.1.4 Hydrological Network

The Project Area is located within the borders of the Caspian Sea drainage basin and is characterized by the absence of a river network, and poverty of surface water resources. Surface waters of this region are represented by the Caspian Sea, which is the water supply source for Aktau City.

The Caspian Sea is the largest inland drainless water body at the planet. The sea has the area of about 436,000 km^2. The Caspian Sea is divided into three distinct physical regions: the Northern, Middle, and Southern Caspian. The northern part is shallow with the average depth of 6 meters. The average depth of the middle part is 190 meters, and the maximum depth of the deep Southern part is up to 1,025 meters.

The Caspian Sea belongs to water reservoirs of the first fishery category. The seashore is low and monotonous, the seashore line changes slightly depending on the wind-induced coastal forms. The sea is rather shallow up to several kilometres from the coast.

The average water salinity is 12.7 – 12.8 $^{o}/_{oo}$. The salt composition of the Caspian Sea is characterized by high concentrations of sulphates, calcium carbonate, magnesium chloride, which is determined by the morphological, geological and climatic conditions, as well as the water composition of the rivers flowing into the sea.

A water protection zone for the Caspian seashore was created based on a Decree of the Mangistau Oblast Akimat. Within this zone a special regime of economic activity was established to prevent pollution and depletion of water resources. The width of the water protection zone is 2.0 km, with the Caspian Sea level being at the elevation of 26.62 meters.

Due to the lack of permanent water sources in the Mangistau Oblast, the Caspian Sea is the only source of surface water in the region. The local surface-water flow is formed in the basins of small temporary streams and accumulates in local depressions, lake valleys and is then evaporated, taken by the plants and infiltrated to the groundwater.

Also the Project Area is located in the vicinity of the Koshkar-Ata artificial lake. Starting from 1965, the “Koshkar-Ata” blind drainage depression has been used as a tailing dump for a chemical ore mining and smelting plant and a vitriol plant. In the southern part of the depression radioactive wastes were disposed without any landfill design till 1994.

The area occupied by the tailing pond is 77 km^2 and is the largest in the world.

The estimated amount of toxic and radioactive waste disposed in the tailing dump is 105 million tons. The wastes include nitrates, nitrites, ammonium, iron, phosphates, fluoride, strontium, zinc, copper, chromium, molybdenum, manganese, lead, uranium, radium, and thorium.

A design for the reconstruction and rehabilitation of the Koshkar Ata tailing dump was developed in 2006 based on a detailed site investigation.

Starting from December 2007, cultivation works were carried out over the area of 24 ha (covering of the area with a 1 meter thick earth fill layer). Disposal grounds for radioactive waste were covered with a 25 cm thick reinforced-concrete layer over the area of 20,300 m^2. The rehabilitation project was completed in August 2009, covering the total area of 55 ha, and local authorities have officially announced that the tailings damp does not pose any radiation hazard any longer.

The remaining issues are dust from non-rehabilitated beaches of the Koshkar Ata tailing pond and theoretically possible infiltration of radioactive elements with groundwater into the Caspian Sea. The latest issue is considered minor as no groundwater was observed at the depth of 50 meters.

Soils

The desert type of landscape prevails in the Project Area.

Most of the area is covered with sagebrush-saltwort desert with areas of brown soils. The surface is partially covered with saltwort, alkali soils, and sands with rare vegetation.

Physical and mechanical properties of soils are as follows: light brown hard sand clay, collapsible, with inclusions of limestone broken rocks up to 10 %. Deposit thickness is 0.6 – 1.5 meters.

Soil density is 1.45–1.49 g/cm^3; porosity ratio – 0.85–0.99; specific cohesion – 18 kPa; internal friction angle – 26^o; modulus of deformation – 13 MPa (in natural condition), 4.8 MPa (in water-saturated conditions); the soil is collapsible, type 1, initial collapsing pressure of 0.01 MPa, index of liquidity is < 0.

Limestone-shell rock is from yellow to rusty-brown colour, of low strength, ferruginous, eroded in the top, softening in water; with layers of marlstone of very low strength. Deposit thickness varies from 6.6 – 7.4 meters.

Soil density is 1.20–183 g/cm^3; strength limit for the linear compression is 1.3 MPa (in natural conditions) and 0.8 MPa (in water-saturated conditions); softening factor – 0.1–0.87; water absorption capacity – 6.6–23; initial collapsing pressure 0.02 MPa.

There is no exact data on a permeability coefficient. However it is generally known that clay and marlstone are watertight layers and can be also used as natural insulation. Detailed design works always involve respective surveys to reveal details of geologic structure (including permeability coefficients) of particular land plots designated for new construction; therefore precise data on the locations designated for the PIP facilities will be available as soon as the design works are completed.

Due to chloride concentrations (up to the 1595 mg/kg), the soils are slightly aggressive to concrete structures, and highly aggressive to carbon steel. Due to sulphate concentration (up to the 2180 mg/kg), the soils are strongly aggressive to Portland cement concretes and non-aggressive to sulphate-resistant concretes. According to ST RK 25100 – 2002 the soils are non-saline, and the total concentration of freely soluble salts is 0.511%.

As for potential flooding, the area is non-flooded. The normative depths of seasonal freezing of soils (as reported by the Aktau Meteo-Station) are: 0.67 m for sand clay, 0.8 m – for soil with larger grains. The maximal depth of 0□C penetration in the soil is 1 meter.

3.1.6 Vegetation, Fauna and Landscapes

Aktau City is situated in the desert zone, northern desert subzone. The land cover of the described region is exposed to an anthropogenic influence and differs from its natural state.

The vegetation of the Mangistau Oblast develops in harsh environmental conditions: climate aridity, large temperature amplitude, low humidity with a broad dispersion of salinized soil-forming bed-rocks.

According to the last phyto-geographical zoning this region belongs to moderate deserts on brown soils and is part of the Turanian province of the West Turanian subprovince (Botanical geography of Kazakhstan, 2003, Kazakhstan vegetation map, 1995). On the unoccupied area sagebrush-weed vegetation grows, formed by gray sagebrush (Artemisia terrae-albae), with additions of termophyrum and other weed complexes. Ranker soils are grey-brown with saline areas.

More than 50 species of mammals, 350 species of birds, 130 species of fishes live, and more than 120 species of plants grow on the territory of the Mangistau Oblast. The fauna of the Mangistau Oblast includes many species of birds and animals, like caracal lynx (Felis caracal), manul cat (Felis manul), dune cat (Felis margarita), hoofed mammals from the Red Book and other. More than 20 species of animals and around 20 species of plants are included in the Red Book.

The area intended for the construction of the MBT facility and the new landfill is located in the vicinity of the Koshkar-Ata tailing dump with transformed/disturbed landscapes. They do not make any significant contribution to the biodiversity on the level of species or landscapes. The planned facilities (MBT and landfill) will be built in the northern part of the City of Aktau, at a distance of more than 1000 m

from the developed districts of Aktau City, between the road to the Aktau City Airport and the Koshkar-Ata tailing pond. The landscape of the area is a desert plain, with a considerable impact from human activities (roads, wastes and etc.).

Figure 2. Location of the Project Area

3.1.7 Cultural Heritage

There are no objects of cultural heritage in the vicinity of the Project Area. No cultural heritage will be affected by the Project implementation.

3.1.8 Environmental Protection Activities of Local Authorities

The major part of environmental issues in the Mangistau Oblast is directly or indirectly related to the exploration of uranium and oil and gas deposits.

One of the most serious environmental issues is related to the Koshkar-Ata tailing pond, which is a former uranium waste dump and is situated at the distance of 4 kilometres away from Aktau City in the vicinity of the site designated for the construction of the proposed waste processing facilities.

To improve the environmental situation in the area around the Koshkar-Ola tailing pond the following measures are undertaken under the regional budget funding:

- Permanent monitoring of the radiation level;
- Groundwater monitoring, including monitoring of its presence (no presence registered so far) and a Laboratory Testing Programme developed and ready for implementation if groundwater is discovered;
- 8.5 mln. m^3 of water is pumped over to the tailing pond in order to maintain an adequate water level in the artificial lake and to reduce dusting.

In 2007 – 2008 of two areas of the radiation hazard were recultivated, 55 ha in total, in the southern part of the tailing pond. Also in 2009 21.0 mln. Tenge were allocated by the Oblast Akimat for the development of a design for the total

rehabilitation of the bared part of the Koshkar-Ata tailing pond. The design was developed by LLP «Caspian Contractors Trust». The rehabilitation program will last till 2030.

With the purpose of proper coordination of environment related projects an Environmental Program was adopted by the Oblast authorities. This Program lists the following issues of the highest importance:

- Prevention of air and water pollution;
- Elimination of the historical contamination, minimization of the current contamination and minimization of the related risks;
- Conservation of biodiversity, prevention of land degradation and desertification;
- Environmental improvement of settlements through the implementation of green construction and establishment of green areas;
- Development of the local protected areas network;
- Reproduction of forests, forest planting and increase of the forested areas;
- Improvement of the forest protection situation, consolidation of the material and technical base of the forestry management facilities
- Development of an environmental monitoring system;
- Scientific and technical provision of environmental activities;
- Development of environmental passports for towns, cities and regional centres;
- Environmental zoning of the Oblast area;
- Enhancement of the existing environmental education system.

An action plan was developed for the Program implementation. Activities for the phased implementation of the Program are described in the action plan.

These activities will be funded not only from the Oblast budget but also by large industrial companies of the region.

Protected Areas

The largest protected area in the Mangistau Oblast is the Ustyurt National Biosphere Reserve, which covers the area of 70,000 hectares.

The Reserve was established to protect 261 species of plants, 27 animal species and 111 species of birds. Reptiles are quite widespread, including 27 species. The desert monitor is under protection of the Red Book. The Ustyurt munflon, long-

needled hedgehog, Persian gazelle, karakal lynx, golden eagle, short-toed eagle, Egyptian vulture, saker falcon are nearly just as rare.

Other protected areas are (some of the territories are in few regions of Kazakhstan):

- Aktau-Buzachinsky State Zoological Preserve (170,000 ha);
- Karagiye-Karakolsky State Zoological Preserve (137,500 ha);
- Kendyrli-Kayasanskoye State Reserve Zone (1,231,300 ha);
- Aktau Botanical Garden (39 ha);

However, none of the above mentioned protection areas have any direct relation to the Project Area.

3.2 Background Social Situation

3.2.1 Population and Households

Aktau City is the biggest settlement of the Mangistau Oblast in Kazakhstan with the total population of 158,500 people. This is almost all of the urban population of the Oblast, which has the population of 425,600 (2009). The ethnic composition of the population in Aktau is varied and diverse, about 90 nationalities and small nations live there including Ukrainians, Tatars, Germans and others. Being the original population of the Mangistau Oblast, Kazakhs make up 74%, and Russians account to 17% of the population. The urban population makes up to 283,200 people or 75.9 % of the total population in the Oblast (see Table 3 below).

Table 3. Development of urban and rural population in 1998-2010, Mangistau Oblast, Aktau City and Munailinsky Rayon [Source: National Statistical Department.[http://www.mangystau.stat.kz and Statistical Yearbook of the Mangistau Oblast, 2010]]

	Population in the Mangistau Oblast, Aktau city and Munailinsky Rayon, thousands									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mangistau Oblast	323.7	328.2	338.5	349.7	361.7	374.4	390.5	407.4	425.7	446.2
Aktau City	*163.9*	*162.9*	*168.3*	*174.4*	*180.6*	*187.6*	*194.6*	*147.4*	*154.5*	*158.5*
Urban	162.9	162.3	167.7	173.9	180	165.9	167.5	147.4	152.4	156.4
Rural	1	0.6	0.6	0.5	0.6	21.7	27.1	2	2.1	2.1
Munailinsky Rayon	-	-	-	-	-	-	-	53.4	59.6	68.3

The population density is 2.2 persons per 1 square km, whereas for the entire Republic this index is 6 persons per square km on average.

Table 4 below presents data on the availability of urban and rural housing in Aktau City and Munailinsky Rayon which together build up the Project Area.

Table 4. Urban and rural housing in Aktau and Munailinsky Rayon 2002-2009. [Source: Statistical Yearbook of the Mangistau Oblast, 2010]

	Urban and rural housing, thousands, sq. m							
	2002	2003	2004	2005	2006	2007	2008	2009
Aktau City	2454	2580	2695	2857	2875	2838	3020	3082
Munailinsky Rayon	-	-	-	-	-	182.6	36.1	236.2

Immigration to Kazakhstan is observed from the neighbouring countries – Turkmenistan, Uzbekistan, Azerbaijan and Moldova. The majority of all immigrants are from CIS countries. Immigration flows to the Mangistau Oblast consist of 84.8 % Kazakhs, 9.1 % Russians and 1.2 % Azerbaijanis. People move to the Mangistau Oblast because of a possibility to settle by the national and state formations.

Differentiation by gender and age is given in table below.

Table 5. Differentiation by gender and age

	Total			By different age groups								
				0 – 15			16 – 62 (57)[2]			63 (58) +		
	total	men	women	total	men	women	total	men	women	total	men	women
Aktau City	158540	77461	81079	48624	24990	23634	102977	51879	51098	6939	592	6347
Mangistau Oblast	446265	220666	225599	145493	74746	70747	275530	139415	136115	25242	6505	18737

As we can see the majority of people is between the age of 16 and 62 (57). This means that the majority of the population is able-bodied. The number of men and women is very similar because of different life expectancy. This results in a huge difference between men and women population in the next age group.

[2] Different life age of expectancy of men and women.

3.2.2 Health

According to statistics, the birth rate in the Mangistau Oblast was 16.78 and the death rate was 10.56, with the difference between them of 6.22. That means that the population is growing – more people are born than die. Almost one third of the population (27 %) is young people of the age under 15. The majority of people are between 15 and 64 years old, which makes 65 %. In its turn this means that there are many people who can work and create or improve the country's economy.

The death rate in the Mangistau Oblast is higher for men than for women due to the risk behaviour of men, higher risk of stress and cardiovascular diseases. The men/women death rate is 63 % (see Table 6).

Table 6. Death rates of different origins for 2005-2010 per 100,000 people. [Source: Statistical Yearbook of the Mangistau Oblast, 2009]

Mangistau Oblast	2005	2006	2007	2008	2009
All diseases	75,148.10	76,031.30	62,061.40	64,076.10	63,463.80
Psychological disorder	116.4	114.8	96.2	97.2	97.2
Digestive apparatus diseases	7,337.20	8,344.80	6,626.00	6,609.40	6,521.60
Blood-forming organ/blood diseases	3,920.50	4,686.30	4,260.20	4,825.20	4,431.00
Eye diseases	5,375.30	5,622.10	4,793.50	4,796.90	4,280.00
Skin diseases	5,862.50	5,579.60	4,860.20	4,636.20	4,406.00
Injuries and toxications	5,167.90	5,614.60	4,197.10	3,871.90	3,461.50
Neoplasm, including cancer	351.6	592.6	107.2	285.7	225
Congenital anomaly and chromosomal disorders	288.5	293.6	221.9	203.8	247.9
Urogenital system diseases	3,489.30	3,890.50	2,756.10	2,757.70	3,354.60
Nervous system diseases	2,869.30	3,208.60	2,289.40	2,491.90	2,481.90
Ear diseases	3,425.30	4,053.40	2,647.40	2,464.60	2,261.00
Musculoskeletal system and conjunctive tissue diseases	2,458.00	2,508.50	2,124.70	2,424.70	2,041.50
Infectious and parasitogenic diseases	3,641.70	3,418.20	2,222.60	2,182.70	2,501.10

Respiratory system diseases	23,047.20	20,308.00	17,657.20	17,492.50	17,502.70
Pregnancy, puerperium and prenatal complication	2,199.30	5,429.40	2,873	11,942.90	12,018.20
Blood circulatory system diseases	2,664.80	3,436.90	1,711.70	1,712.70	2,082.80
Endocrine system diseases	1,716.00	1,668.50	1,000.70	1,309.30	1,082.10

The health situation in Aktau is mostly typical for Kazakhstan. No health issues related to possible radiation are reported in the region.

Waste management does not show any gender related issues within households. Based on the available data, there is no any gender discrimination in the households related to waste management. Waste collection facilities are available at every house. In block houses this is represented by waste chutes; in private house quarters waste containers are available. The waste management system is used by both genders equally without any problems or gender related conflicts.

These issues will be further addressed during the SEP implementation.

3.2.3 Waste Management Tariffs and Tariff Affordability

Current domestic waste management tariffs for the population residing in apartment blocks is 62 KZT/person/month (0.45 USD/person/month). For households residing in the private housing sector the waste collection and transportation tariff is calculated per individual housing and amounted to 426 KZT/house/month (3.10 USD house/month) in 2010.

On the basis of estimated operating costs, required revenues (and respective required tariff adjustment profiles) have been analysed. Key components of such analysis are presented below:

- The Facility which is assumed to be fully functional starting from 2015, shall generate a substantial amount of marketable products in the form of recyclables and energy;
- Sale of such recyclables and energy on the Kazakh market (at prices as investigated by the Consultant, with 50% conservative discount applied) will contribute to the overall revenue generation capacity of the operating company, and, in fact, constitute a significant part of such revenues;
- Such revenues will significantly ease the burden on households in terms of tariff increase required to ensure the proper operation, and maintenance of the new Facility and landfill, and loan repayment ;

- A gate fee shall be payable at the entrance to the Facility. Depending on the resulting institutional arrangement of the facility operation, the gate fee will be just an internal payment to pass through (if the Facility and new landfill are to be operated by Koktem), or will be a formal payment from Koktem and other collection companies (cost) to the Operator (revenue) (if the Facility and landfill are to be operated by an external PPP operator selected through public tendering).

- Tariff increase, in addition to the existing rates, will be required only to cover a part of the total costs of the system which has not been recovered so far through the sales of marketable products, in order to make sure that the Company is able to operate in a financially sustainable manner and to meet all the financial covenants as to be undertaken under the Loan Agreement (primarily in relation to DSCR and Current Ratio);

- As such, the required tariff increase shall be moderate, since a significant part of the revenues for the Facility and entire system will be attributed to the sales of recyclables and produced green energy;

- Tariffs are assumed to increase automatically each year taking inflation rates into account (minimum automatic adjustment of Base Case macro scenario), and an additional possibility for discrete step increase shall be provided to ensure tariff growth where necessary;

- The affordability assessment carried out for the entire profile of the resulting tariff for population, shows that even increased tariffs will be well below any affordability threshold and should not be of major concern (an internationally accepted level of affordability limit for waste management services lies within the range of 1,0-1,5% of the household income, and such threshold range was applied during the assessment);

- At all time, tariff adjustment shall ensure that the operating company has sufficient cash available to cover its own financial needs – financially sustainable operations (it shall be mentioned here that the entire waste management system is included into analysis, hence not only the new Facility and landfill were reviewed during the financial sustainability assessment, but also all other services included in the complex of waste management services provided by Koktem);

- As a result of tariff increase, DSCR covenants shall be fulfilled. For the current Project, the DSCR requirement is above the minimum required throughout the period of the loan repayment, i.e. the operating company has to generate a sufficient annual free cash flow to cover debt service payments (with a safety margin) after all other expenditures have been covered. The minimum DSCR achieved will be 1.77 in 2015.

It is also important to note that tariff cross-subsidies exist by customer groups. It was assumed that the existing cross-subside practice will not be removed so far since it is a political issue and needs to be tackled gradually over time. Covenants associated with the eliminations of cross-subsidies, however, will be introduced to

encourage the City and the Company to take actions in that direction. The elimination of cross-subsidies over time should not be an issue as tariff affordability is well within the acceptable limits.

The resulting tariffs in nominal terms are shown in the following table (taking into account that the entire waste management system of Koktem needs to be financially balanced).

Table 7. Required tariff increase and resulting tariff rates (w/o VAT)

Customer group	Unit	2010	2011	2012	2013	2014	2015
Households, apartment buildings	KZT/person/month	62	66	97	140	203	293
Households, houses	KZT/house/month	426	460	669	971	1,405	2,029
Required tariff increase for households	% in real terms	-	-	35%	35%	35%	35%
Commerce and Industries, collection	KZT/m^3	962	1,037	1,510	2,191	3,170	4,580
Commerce and Industries, disposal	KZT/m^3	356	384	558	810	1,172	1,693
Budget, collection	KZT/m^3	533	574	836	1,213	1,755	2,535
Budget, disposal	KZT/m^3	356	384	558	810	1,172	1,693

The dynamics of affordability development suggests that no significant problem shall be expected as related to tariff adjustments. Moreover, further tariff increases above normal inflation rate seem to be possible, if necessary.

Table 8. Tariffs for households and affordability assessment (with VAT)[Source: Consultant's calculations]

Affordability	2011	2012	2013	2014	2015
Tariff for households in mulstorey buildings, KZT/person/month	74	108	157	227	329
Tariff for households in private houses, KZT/household/month	515	749	1,087	1,574	2,273
Average affordability for a household in a mulstorey building	0.09%	0.11%	0.15%	0.20%	0.26%
Average affordability for a household in a private house	0.14%	0.18%	0.24%	0.32%	0.42%

Low-income household affordability	0.48%	0.63%	0.82%	1.09%	1.44%

4 Legal Framework

The environmental assessment of the Company's activities is based on the Kazakhstan legislation, including framework and industry-specific national laws, as well as other regulations and norms, such as state standards (GOSTs), sanitary norms (SanPiNs), and construction norms (SNiPs). In addition to the nation-wide laws and regulations, the Consultant included specific assessment criteria in the legal framework of this study. The full list of laws and regulations with a breakdown by activities and environmental impacts is provided in 9.2Appendix A.

It is recommended to the Company to elaborate a system for identification of laws and regulations relevant to EHS management in the Company. All corporate guidelines are provided with references to respective laws and regulations. The Company has a library of legal documents containing occupational and environmental safety regulations inter alia.

4.1 National and Local Laws

Waste collection and disposal is regulated by the following legal documents:

Environmental Code of the Republic of Kazakhstan;

Sanitary and Epidemiologic Rules and Norms, "Sanitary and Epidemiologic Requirements for Maintenance of Populated Areas";

Sanitary Rules, "Arrangement and Maintenance of MSW Landfills", No.3.01.016.97;

Rules on maintenance and improvement of territories, city infrastructure objects and facilities, and street cleaning in the City of Aktau and suburban settlements, approved by Decision of the Aktau City Maslikhat Session, No.26/239 dated 15.10.2002; and other rules;

Order of the Minister of MEP No.100-p dated 5.04.2007 "On approval of document templates related to the establishment and implementation of the state environmental control".

In accordance with the Environmental Code of the RK landfill owners shall meet the following requirements:

- Implement measures to reduce methane emissions by means of reduced acceptance of biodegradable waste and introduction of the system for landfill gas monitoring and recovery;
- Introduce unified waste acceptance procedures based on the waste classification;
- Establish specific abandonment funds for land recultivation and after-care;
- Keep records of amounts of wastes accepted at landfills;
- Report on annual basis to environmental authorities on the types and amounts of delivered wastes and results of planned inspections;
- Report on any identified adverse impact on the environment;
- Adhere to the waste acceptance procedure established in Article 304;
- Provide written confirmation on every consignment of the accepted waste and keep the issued documents during 5 years;
- Perform closure, after-care and monitoring activities.

Results of an E&S audit performed at GKP Koktem show that the existing waste disposal practice is not completely corresponding to the above mentioned requirements, viz.:

- There is no gas collection system;
- There is no abandonment fund established;
- Monitoring activities and corresponding reporting are not performed.
- The following non-compliances are observed in health and safety aspects:
- Access of strangers to the landfill site area;
- Partial fencing of the landfill site area;
- Waste separation after the entrance to the landfill;
- Manual compaction of wastes while re-loading from containers to trucks;
- Lack of personal protection equipment at all stages of waste handling.

Sanitary and Epidemiologic Rules and Norms, “Sanitary and Epidemiologic Requirements for Maintenance of Populated Areas” set forth rather detailed

requirements to the installation of sites for waste receptacles at specified distances from dwellings and public places with the requirement for vehicle access. The Rules also set forth sanitary-epidemiological requirements to MSW landfills, their operation and conservation. However, they do not name the persons to be responsible for the implementation of these requirements. The requirements seem to be similar to those provided in the Sanitary Rules for Arrangement and Maintenance of MSW Landfills. In addition, the Rules set forth sanitary-epidemiological requirements to the waste used for recultivation of quarries, to monitoring of landfill operation, to maintenance of sewers in houses which are not connected to the public sewage system, as well as sanitary-epidemiological requirements to the operational staff.

Sanitary Rules for Arrangement and Maintenance of MSW Landfills were adopted in 1997 with the purpose of replacing dumpsites with landfills as more advanced installations of harmless handling of waste from both, environmental and sanitary viewpoints. The Rules also set forth requirements to arrangement of landfills on the allocated plots of land, landfill operation and conservation, acceptance requirements and lists of industrial waste, requirements to process control and sanitary monitoring.

The EIA process is described in the Environmental Code of the RK followed by the guidelines for execution of preplanning, planning, pre-design and design documentation under the environmental impact assessment of planned activities, introduced by the Order of the Minister of Environment of the RK No.204-p dated 28 June 2007.

The full list of applicable national laws is given in 9.2Appendix A, an overview of the national legislation on disclosure of environmental information is given in the SEP.

4.2 Applicable EU Standards

This chapter provides a review of the relevant EU legislation regulating waste management activities. It is explained why this legislation shall be deemed applicable to the existing SWM system in Aktau and to the proposed Project.

EU Directive 97/11/EC: The Directive on Environmental Impact Assessment.

The purpose of this Directive is to secure execution of EIA under the Projects, both in public and private sectors, which are likely to produce a significant environmental impact. Environmental impact assessment of the utility is carried out with due regard to the following EU legislative documents.

In general, requirements of the Directive comply with the RK regulations that are to be followed when preparing materials on the planned activities for the State Environmental Expertise.

Approvals by the State Environmental Expertise and by stakeholders upon public hearings are an integral part of the current assignment.

The same requirement is applicable for the Detailed Design Documents to be developed at the implementation stage of the PIP. This is ensured by the national legislation and the SEP prepared by the Consultant.

Directive 2008/98/EC, 19/11/2008, (Waste Frame-work Directive) primarily makes reference to Directive 2006/12/EC on waste, 05/04/ 2006, which "establishes the legislative framework for the handling of waste in the Community. It defines key concepts such as waste, recovery and disposal and puts in place the essential requirements for the management of waste, notably an obligation for an establishment or undertaking carrying out waste management operations to have a permit or to be registered and an obligation for the Member States to draw up waste management plans. It also establishes major principles such as an obligation to handle waste in a way that does not have a negative impact on the environment or human health, an encouragement to apply the waste hierarchy and, in accordance with the polluter-pays principle, a requirement that the costs of disposing of waste must be borne by the holder of waste, by previous holders or by the producers of the product from which the waste came".

The WFD explicitly consolidates the principle of waste hierarchy stating that appropriate measures on the state level shall be taken to encourage:

1 Prevention;

2 Preparing for re-use;

3 Recycling;

4 Other recovery, e.g. energy recovery;

5 Disposal.

For the purpose of implementing re-use, recycling and recovery, waste shall be collected separately, if technically, environmentally and economically practicable and shall not be mixed with other waste or other material with different properties.

The Directive highlights the same issues as the Environmental Code of the RK (Articles 42-44 dealing with waste management systems and their components, such as landfills etc.).

In regard to the current Project and the Company, the Directive can be used as a general guideline for strategic development of the solid waste management system in Aktau. The main party which might make use of this Directive is the City and the Oblast Akimat to ensure that development of the local SWM sector is in line with the best international practice.

The current Project contributes to the development of the Aktau SWM system to achieve compliance with the Directive since it introduces waste separation and MBT facility into the SWM system providing for recovery of valuable materials and energy from the waste stream.

The Commission Decision 2000/532/EC establishes a list of waste types. Different types of waste in the list are fully defined by a six-digit code for the waste and a respective two-digit and four-digit chapter headings. All in all, 20 chapters are dedicated to 20 different types of waste.

The last Chapter 20 of the list names "municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions".

In the Kazakh law there are two main documents regulating waste classification. The Waste Classifier adopted by the Order № 169-p of the Ministry of Environment of the RK establishes a code for every type of waste, and Order № 331-p establishes rules for determining the hazardous class of the waste. A municipal landfill is not allowed to accept hazardous wastes for disposal. The Kazakh Waste Cadastre uses the same 20 main types of wastes as the Decision, with an elaborated system of classes. It is therefore obvious that the national and local systems of waste classification are in compliance with the EU practice. The only improvement needed is a better enforcement and awareness raising for owners of hazardous wastes in order to prevent mixing of MSW and other types of wastes and proper registration and passportisation of all wastes (for details see chapter on hazardous waste handling in Aktau).

Directive 1999/31/EC on the Landfill of Waste

The Directive 1999/31/EC of 26/04/1999 on the landfill of waste provides for the measures, protection and guidance aimed at prevention or reduction as far as possible of negative effects on the environment and risks to human health resulting from landfilling of waste. The Directive sets standards for landfill construction, operation, etc., and includes criteria for the acceptance of waste. The Directive distinguishes landfills for hazardous waste, non-hazardous waste and inert waste.

The Directive requires a phased reduction in the total quantity of biodegradable municipal waste directed to landfills (reduction to 75 % of 1993 levels by 2002, to 50% by 2005, and to 25% by 2010). Methane from both new and existing landfills shall be collected and used, or flared; leachate shall be collected and treated. Pre-treatment of waste, such as composting, sorting, incineration, etc. is required before landfill disposal. Co-disposal (the mixing of hazardous waste with municipal waste in the same landfill) shall be phased out. Prices for landfill disposal shall include the costs of closure and after-care.

In general the core provisions of the Directive are met since there are two different landfills for municipal and hazardous wastes, the landfill design includes measures for due isolation of the waste mass from environment. However at the moment the SWM system in Aktau only partially meets the described requirements. The non-compliances are associated with the lack of enforcement instruments for the requirement to a separate collection and disposal of hazardous wastes, absence of biogas collection system.

The proposed concept of the SWM system modernization in Aktau provides for a significant reduction in the total quantity of biodegradable municipal waste directed to landfills. Methane from the new landfill will be collected and used for energy (including electricity) production; leachate from the existing landfill is monitored visually and will be monitored by laboratory tests starting from 3Q

2011, leachate from the new landfill will be collected and treated. Pre-treatment of waste, such as composting, sorting, incineration, etc. is required prior to landfill disposal. Co-disposal (mixing of hazardous waste with municipal waste in the same landfill) shall be phased out.

Directive 91/698/EEC on Hazardous Waste

The Directive 91/698/EEC on Hazardous Waste, 12/12/1991, sets out additional strict requirements deriving from the hazardous nature of waste. The record keeping system shall cover the full life cycle of hazardous wastes from generation up to final disposal. The mixing of hazardous and non-hazardous wastes or of different categories of hazardous wastes is prohibited, with the exception of specific circumstances. Mixed hazardous wastes must be separated. Provisions are made for packaging and labelling of HW during transportation. A consignment note should accompany the vehicle. HW Management Plans must be drawn up and made available to the public.

Under the Kazakhstan legislation, disposal of hazardous wastes at MSW landfills is prohibited. At the landfill gate a monitoring system should be established to prevent hazardous waste disposal. A procedure to handle identified hazardous waste will be elaborated.

In case of due implementation of the PIP, the ESAP and the SEP compliance will be achieved.

Directive 75/439/EEC on the Disposal of Waste Oils

The Directive 75/439/EEC of 16/06/1975 on the disposal of waste oils applies to any mineral-based lubrication or industrial oils which have become unfit for their originally intended use. Member States must ensure that waste oils are collected and disposed of (by processing, destruction, storage or tipping above or under the ground). Priority is given to regeneration, i.e. refining of waste oils, then to combustion under conditions defined in the Directive, and finally to their controlled storage or disposal.

The Directive prohibits any discharge of waste oils to waters and drainage systems, deposits or discharges harmful to soil, uncontrolled discharges of residues from waste oil processing, and any waste oil processing that causes air pollution exceeding levels prescribed by existing law. Companies disposing waste oil must obtain permits, while companies collecting waste oils must be registered and adequately supervised. The Directive sets a maximum limit (50 ppm) for PCBs/PCTs in regenerated oils or oils used as fuel.

Member States are allowed to indemnify companies for the un-recovered costs of collecting and disposing waste oils; this may be funded by the imposition of a charge on new or regenerated oils. Such indemnities must be in accordance with the polluter pays principle and must not cause any significant distortion of competition or artificial patterns of trade in waste oil products.

Waste oils are classified as hazardous waste by the RK legislation. Separate collection and disposal requirements apply. In case of occurrence in the municipal waste stream, waste oils will be removed at the stage of gate control. It will be further sent for safe disposal by companies authorised to handle and dispose of hazardous wastes. Koktem produces some waste oil which is transferred to

accredited companies for further processing or safe disposal. So the current practice is in compliance with the Directive, no actions for improvement are required. The sorting of waste will prevent the waste oils to enter the bioreactor and landfill.

BREF on Waste Treatment Industries

The BAT (Best Available Techniques) Reference Document (BREF) titled "Waste Treatment Industries" reflects an information exchange carried out under Article 16(2) of Council Directive 96/61/EC (IPPC Directive). It contains a brief technical description of the activities and processes found in the sector and is complemented by the actual emissions and consumptions found in the installations. The document also identifies the key environmental issues for the waste treatment sector. These are related to air emissions, emission to water, waste and soil contamination.

The document includes those treatment methods that can make a waste re-usable or recoverable.

However the document does not include any re-use or recovery options that go directly from one industrial sector to another without treatment (e.g. re-use of foundries sand or some compatible catalysts as a raw material in cement kilns, re-use of waste metals in non-ferrous metal processing).

As mentioned above, no techniques related to landfills are included in this document. The only issues covered are those related to the treatment of waste to make it more suitable for landfilling.

The new Facilities will be designed in accordance with the best available techniques.

5 Results of Environmental Audit

5.1 Existing Facilities and SWM System Setup

This Section presents brief summary information on the existing facilities, involved in the SWM system. The full information on the SWM system in the Project Area is provided in the Feasibility Study Report.

5.1.1 Solid Waste Generation

Primary sources of municipal solid waste are private households, administrative facilities, commerce, industry and public administration, kindergartens, schools, hospitals, small enterprises, agriculture, market places and other generation points covered by the municipal waste collection system. The amount of waste generated is considered equal to the amount of waste delivered for landfill disposal.

The total generated quantity of domestic solid waste in Aktau city and Munailinsky rayon is reported to be 106,806 ton, which accounts for 471 kg/person/year.

The morphologic structure of waste stream in Aktau is favourable for the introduction of recycling activities. The largest fraction of MSW in Aktau City is plastic waste, comprising 30%. Biodegradable waste comprises a somewhat smaller amount of 20 %, while waste paper and glass make 15% and 12% respectively. Other elements are textile (8%), metals (7%), food residue (5%) and other waste fractions (3%). However in 2008–2010, almost 99 % of MSW was disposed at the local landfill. The rest, making less than 1 %, was recycled in a non-transparent way with the use of illegal waste separation methods (by marginal population groups at the landfill in unsafe labour conditions).

Some inaccuracies may occur in the data on waste generation, which is a consequence of non-existing registration system of collected and landfilled domestic solid waste. No accurate data exists, since assessment of waste generation rates is based on the volume (registration of incoming trucks number at the landfill gate).

It is the experience from municipalities in Lithuania and in other East European Countries that the reported tonnage decreases considerably (by 25 % – 35 %) after a weighbridge is installed and accurate waste registration is made.

Due to the forecasted increase of the population of Aktau and welfare of the population, an increase in the amount of generated waste can be anticipated in the following years. A waste generation forecast is presented in the Main Report. It is one of the key figures which are used for waste treatment facility design.

5.1.2 Solid Waste Collection

GKP Koktem (a state utility enterprise) has the leading position in MSW collection and disposal in Aktau and Munailinsky Rayon, with the service coverage of 86 %. The Company is in charge of collection of MSW from the population, covering all districts of the city, except for some private cottage areas, and provides services on MSW disposal to 674 enterprises and organizations and 1,012 private businesses.

There are several smaller private enterprises which also render waste collection and transportation services. These individual enterprises are small and most of them are owned by a single owner. Altogether the private enterprises have 30 employees and operate 10 collection trucks with the operational time-span of 7–8 years and 350 containers. Some containers are provided by condominiums. Each of the enterprises covers a separate service area of the city. They are in charge of collection of solid waste from enterprises and residential areas. The amounts collected are about 4000 m3 waste per month from enterprises and about 2000 m3 waste per month from residential areas mainly from cottages of new construction.

Standard 0.75m3 metal containers are used (plastic containers are very rare) for solid waste collection. Containers are placed near apartment houses or blocks of houses based on the number of residents and anticipated daily waste generation. In Aktau the total number of containers is around 2000 units (Koktem – 1636 unit, other enterprises – 350 units) Additional 30 emergency containers may be provided when necessary.

There are about 29 vehicles in GKP Koktem. The majority of vehicles have the operational time-span of about 2–5 years.

According to the Sanitary Rules (“Sanitary and Epidemiologic Requirements for Maintenance of Populated Areas”) domestic solid waste must be removed once per day.

Collected amounts of waste are presented in Table 9 below.

Table 9. Collected Waste in 2008-2010

	2008		2009		2010	
Type of waste	m^3	t	m^3	t	m^3	t

Household waste	212,258	53,065	235,860	58,965	188,673	47,168
Commercial waste	144,194	36,048	116,170	29,042	92,929	23,232
Waste from landscaping activities[3]	5,119	1,380	6,285	1,697	6,588	1,779
Collected by GKP Koktem	361,571	90,493	358,315	89,704	288,190	72,179
Collected by other enterprises	95,435	23,859	103,439	25,860	145,611	36,403
Total waste received at the landfill	451,887	112,972	455,469	113,867	427,213	106,803

There are no containers for recyclable waste collection in Aktau city. Recycling is practiced by the informal sector "waste pickers" or by the solid waste management staff themselves for extra income. However, recyclables are separated by way of sorting in the Aktau landfill. Such work is done in a very labour-intensive and unsafe way, and for very low incomes. Safety risks while performing this function include moving vehicles, unstable slopes, sanitary risks due to contact to waste. Moreover, this activity is illegal since all types of MSW processing should take place before wastes enter the landfill gate.

There is no data on the number of waste pickers (these data was requested from the City as well as the local largest NGO). Reportedly they are mostly men of active working age, no children and very few women are involved. No data on their income is available either, since this business is very far from being transparent and is run informally. There are no formal obstacles (they are citizens of Kazakhstan, they have education) for those people to find a formal job with due observation of their rights and safety. In the interviews they state that they realize this option and will most probably use it in case if the landfill location changes.

In 2008 – 2010, almost 99 % of municipal solid waste was disposed at the local landfill. The rest of less than 1 % was recycled.

Recovered and recyclable products then enter a chain of dealers, or processing before they are finally sold to manufacturing enterprises. The main recyclables are soft and hard plastics, glass, paper and cardboard.

The main problems identified in the waste collection system are the following:

[3] not disposed at the landfill

- A lot of animal corpses are disposed at the landfill in breach of safety and sanitary norms of Kazakhstan;
- Due to violations of safety norms related to landfilling and due to the aridity of the climate, fires occur at the landfill. Additional hazard is posed by the presence of third persons without any H&S training received at the landfill;
- Reportedly there are issues of the unsafe waste collection in the cases of broken truck presses. Waste were pressed manually, which should not be done;
- Small containers do not allow for any optimization of waste collection traffic routes;
- Containers without covers are mainly used; this creates problems as strong winds spread light fractions around the containers;
- Lack of container covers also results in the penetration of rain water into the container decreasing the quality of paper and cardboard (which can be recycled), boosting rottening of organics and leachate formation;
- The latter two processes result in odour and sanitary risks for population;
- Low awareness of the consumers resulting in disposal of hazardous wastes (batteries, animal corpses, etc.) in MSW containers.

5.1.3 Solid Waste Disposal

In the Mangistau Oblast solid waste management is carried out according to the "city – landfill" scheme without any waste transfer and sorting stations.

The landfill for disposal of MSW collected from the Project Area is located at the southern side of the Koshkar-Ata pond and managed by Koktem. The landfill was designed with the capacity of 2,062,500 m3 and started working in 2006. Relatively new machinery (< 2–5 years old) is used at the landfill.

This is an engineering landfill, with the design approved by the State Environmental Expertise (Positive Opinion No.15-313/05 issued on 28 September 2005). The design criteria are: an adequate size sufficient for the mentioned number of years of operation, a proper insulation from groundwater (in this case a natural insulation layer is considered to be sufficient), and a sustainable system of leachate monitoring (observation wells) and management.

According to the EU Landfill Directive 1999/31/EC the landfill base and sides shall consist of a mineral layer which satisfies permeability and thickness requirements with a combined effect in terms of protection of soil, groundwater and surface water at least equivalent to the one resulting from the following requirements:

- landfill for hazardous waste: K ≤ 1,0 × 10- 9 m/s; thickness ≥ 5 m;
- landfill for non-hazardous waste: K ≤ 1,0 × 10- 9 m/s; thickness ≥ 1 m;
- landfill for inert waste: K ≤ 1,0 × 10- 7 m/s; thickness ≥ 1 m.

The existing landfill has an insulation layer constructed from mineral clay with the permeability no more than K=1,16 × 10- 8 m/s of thickness 0,5 – 0,7 m, which does not comply with the EU standard.

There is no leachate collection system at the landfill. There is only a system for collection and removal of rain water. According to the EU Landfill Directive 1999/31/EC if an assessment based on consideration of the landfill location and the waste type to be accepted shows that the landfill poses no potential hazard to the environment, the competent authority may decide that this provision does not apply. Due to the aridity of the climate no leachate collection system is required under the Kazakhstan laws; however no full assessment for the existing landfill was provided.

As it was decided to close the existing landfill, further investigation of the issue does not seem feasible. Design for the new landfill will be prepared according to the international practices. To avoid any future environmental liabilities, the new landfill will be equipped with a leachate collection and monitoring system according to the best international practices. The existing landfill has a leachate monitoring system though, presented only by 4 monitoring wells. No leachate was observed there in the course of the landfill operation. It can not be however excluded that leachate is formed but does not properly migrate to the observation wells so far. This issue, including a possibility of additional surveys (drilling through the landfill body) will be included in the closure design which shall be duly approved by the regulatory authorities.

The existing landfill does not have a gas collection system, hence does not comply with the national requirement and the EU requirement with that respect.

Table 10. Information on the Koktem landfill (Aktau City)

Total landfill area (ha)	12.5
The beginning of waste disposal in the landfill (year)	2006
The end of waste disposal in the landfill (year)	2011
The volume of waste disposed per day (tons/day)	244
Distance from a waste collection point to the landfill (km)	10-15

Audit of the existing landfill supplemented by a review of relevant documents showed that the gate monitoring at the landfill is not efficient (to prevent disposal of hazardous waste at the MSW landfill), there is no groundwater and air quality monitoring by the Company at the landfill and in the adjacent areas, viz.:

- The gate monitoring involves only radiologic control of the incoming trucks. Moreover, there is no emergency action plan for the case when a high radiation level is registered;
- There is no visual inspection of the incoming waste in order to prevent hazardous wastes entering the landfill;
- There is no weight control;
- There is no monitoring/control of air emissions from the landfill, no system for methane collection is anticipated;
- The groundwater monitoring is carried out in the form of visual inspections of monitoring wells located along the landfill perimeter; no water or other liquid was observed in them so far. Therefore no laboratory testing of leachate is required.

Recommendations on monitoring arrangements will be given in the form of an Environmental and Social Monitoring Plan (ESMP).

Upon an official prescription from the local office of the Environmental Authority (Zhaiyk-Caspiy Department of the Ministry of Environmental), the Company has started to taking activities to solve this issue by contracting a certified company. The contract conditions read that this company has to develop a monitoring programme including groundwater quality, air emissions, etc. However, Koktem's staff involvement in the process is insufficient, and the development of the monitoring programme is solely under the responsibility of the contracted company.

According to the contract conditions, the monitoring company carries out monitoring activities and reports directly to the supervisory authority.

Measurements are made once in a quarter. According to the monitoring report, there were no non-compliances with the national MPE of pollutants registered during the first two quarters of 2011. Groundwater analyses were not made due to the lack of groundwater in monitoring wells.

An additional radiological analysis was made in QII 2011. The monitoring result was 0.08-0.12 mkSv/hour while the local norm is 0.30-0.33 mkSv/hour.

Other observations on environmental, health and safety aspects of the landfill operation made in the course of the ESDD are as follows:

- The landfill area is partially fenced, there is a checkpoint at the gate; however some non-staff people are present inside the landfill area. These are mainly

squatters from the nearby illegal settlement picking plastic bottles to be further sold for recycling (see Figure 2). The company or individual entrepreneurs buying this material are not known. This overall activity is not authorised by the management of the landfill because of the following:

  - Only staff is allowed inside the landfill area; people present on the site are to be registered and have to undergo a safety training course before;
  - Any kind of waste processing shall take place before entering the landfill gate.

- Disinfection of the truck wheels is not arranged at the landfill exit;
- The waste mass has an extensive open surface available for birds (particularly seagulls which are abundant in the area due to the neighbourhood with the sea);
- Strong winds spread light fractions of wastes around the landfill area;
- Some safety requirements are neglected, including those related to the use of protective clothing and shoes during waste handling and unloading operations, routes (if any) for vehicles are not marked;
- The noise and odour levels are acceptable.

The existing landfill site is at the final stage of operation now. 2011-2012 are the last years of operation. By the end of these years, the landfill area will be completely filled up. Another reason for the urgent closure is illegal squatter settlement emerged within the sanitary protection zone of the existing landfill, with mainly marginal population groups. It was decided to support the squatters and ensure proper living and environmental conditions in the area.

By the time of this study, no closure design has been developed. Closure is an ongoing process between the times, when a site is ‘closed’, i.e. it has ceased accepting waste for disposal, and the ‘definite closure’, i.e. when it is agreed that the site may enter the after-care phase. The Akimat is responsible for all closure procedures including implementation of the Closure and After-care Management Plan (according to the EU Landfill Directive, Article 13), preparation of closure design and after-care monitoring of the closed landfill.

According to the current practice, the closure design will include covering of the landfill charts with soil, planting of vegetation after the landfill body is stabilized. It is not likely that the landfill gas collection system will be installed at the old Koktem landfill, because of the thin waste layer (less than 6 m) and poor biogas yield (discharged waste contains only about 25% of biodegradable material, it is a low bioactivity landfill due to the lack of water) in the body of the Koktem landfill. However, the after-care monitoring of the landfill (that also should include wells for groundwater monitoring) should eliminate even the lowest potential risk of possible adverse environmental impact.

Recommendations are provided below for the Closure and After-care Management Plan (see Table 11)

Table 11. Closure and After-care Management Plan

1	The closure design should minimise risks during decommissioning. Designs for parts of the installation outside the landfill area should ensure that: underground tanks and pipework are avoided where possible (unless protected by secondary containment or a suitable monitoring programme); there is a requirement to empty and clean vessels and pipework prior to dismantling; insulation is provided which can be readily dismantled without dust or hazard; materials used are recyclable (associated with operational or other environmental objectives).
2	The site closure plan for parts of the installation outside the landfill area should include: either removing or flushing out of pipelines and vessels where appropriate and their complete emptying of any potentially harmful contents; plans of all underground pipes and vessels; methods and resources necessary for the clearing of any lagoons; removal of asbestos or other potentially harmful materials other than those from the landfill, unless agreed that it is reasonable to leave such liabilities to future owners; methods of dismantling buildings and other structures; testing of soil to verify the degree of any pollution caused by activities and the need for any remedial actions to return the site to a satisfactory state.
3	The site closure plan should be reviewed at least once every four years. Other triggers for reviewing the site closure plan include any proposed changes to the phasing of the landfill. The plan should be updated as material changes occur.

In order to facilitate consideration of the existing landfill closure, this measure was included into the ESAP.

5.1.4 Hazardous Waste Disposal

According to the Environmental Code of the RK, wastes are classified hazardous if they contain one or more of the following substances:

1 Explosive substances;

2 Inflammable liquids;

3 Inflammable solids;

4 Self- inflammable substances;

5 Oxidized substances;

6 Organic peroxides;

7 Poisons;

8 Toxic substances causing chronic or long-lasting diseases;

9 Infectious substances;

10 Corrosive substances;

11 Environmentally toxic substances;

12 Substances or wastes emitting inflammable gases when in contact with water;

13 Substances or wastes emitting toxic gases when in contact with water or air;

14 Substances or wastes which might generate the above mentioned substances.

Every type of hazardous wastes generated by a company or a person shall have a hazardous waste passport. Hazardous wastes are collected and disposed separately from MSW by specialized companies certified to perform such activity.

The landfill for hazardous wastes is owned by LLP "Landfill". It is located near the Bayandy settlement of the Munailinsky Rayon. The landfill area is 27 ha. It operates from February 2006 and has the capacity of 460 000 m3.

There is a demercurisation plant for mercury-containing wastes in the Mangistau Oblast. This plant is owned by LLP "MAEK-Kazatoprom" and has the capacity sufficient to treat 120,000 items of mercury-containing lamps per year. In 2010 – 53,202 items were treated, and in 2009 – 24,108 items. Since the beginning of 2007 also a medical waste treatment plant has been operating in the region.

The main issue related to hazardous waste treatment in the region is the lack of gate monitoring practices to prevent disposal of hazardous waste at MSW landfills. Hence, hazardous wastes finding its way to the MSW stream, are not registered, have no passports and may affect environment and health (mainly of the MSW landfill and collection system operators). This issue is to be solved at the MBT facility through the establishment of an adequate incoming control at the facility gate.

5.1.5 Location of Facilities and Surrounding Environment

The main source of environmental risks and impacts among the SWM facilities in Aktau is the municipal landfill. The existing landfill of the GKP "Koktem" is located to the south from the Koshkar-Ata tailing dump (see Figure 1 and Figure 2.)

Koshkar-Ata is a unique facility which requires a closer attention. Starting from 1965 the Koshkar-Ata drainless depression was used as a tailing dump for a chemical ore mining and smelting plant and a vitriol plant. In the southern part of

the depression radioactive wastes were disposed without any landfill design till 1994.

The area occupied by the tailing pond is 77 km2 and is the largest in the world.

The estimated amount of toxic and radioactive waste disposed in the tailing dump is 105 million tons. The wastes include nitrates, nitrites, ammonium, iron, phosphates, fluoride, strontium, zinc, copper, chromium, molybdenum, manganese, lead, uranium, radium, and thorium.

A design for reconstruction and rehabilitation of the Koshkar Ata tailing dump was developed in 2006 based on a detailed site investigation.

Starting from December 2007 recultivation works were carried out over the area of 24 ha (covering of the area with 1 meter thick earth layer). The plots of radioactive waste disposal were covered with 25 cm thick reinforced-concrete layer over the area of 20,300 m2. The rehabilitation project was completed in August 2009, covering the area of 55 ha (dried part of the Koshkar-Ata tailing pond), and local authorities have officially announced that the tailings damp does not pose radiation hazards any longer.

This official data has been confirmed by the state monitoring data as well as by independent international surveys. Moreover, radiation survey is a part of any engineering survey at the detailed design stage (as per national norms). Additional information for the particular location of the MBT facility will be obtained during the facility detailed design well before the construction actually starts. Disclosure of these data is included into ESAP.

The remaining issues are dust from the unrehabilitated beaches of the Koshkar Ata tailing pond and theoretically possible infiltration of radioactive elements with the groundwater into the Caspian Sea. The latter is considered to be a minor issue as no groundwater was discovered at the depth up to 20 meters.

The dust from the unrehabilitated beaches is still an issue. Reportedly, a new rehabilitation plan is now developed for the remaining areas of the Koshkar Ata tailing pond.

Also plans exist of the local authorities to build a new district, the so-called “Aktau City”, to the north from the existing Aktau. This district is planned to be a modern city area with a well-developed infrastructure. The distance from the planned area of the “Aktau City” to the existing landfill is approximately 4 km, to the designed landfill – 8.5 km. The shore of the Koshkar Ata tailing pond is 3 km away from the planned district. No health problems were reported in connection with the radiation level (see also “Social baseline”). As mentioned above, the radiation level is not higher, than the natural radiation level in this area (and lower, than the natural background in Scandinavia, for example).

The construction of the existing landfill with the area of 12.5 ha was initiated in 2005 because of the closure of the old landfill near WWTP-2. At that time, the landfill was located at the distance of 2 km from the residential area. The sanitary

protection zone was established, covering 1 km around the landfill. The operation time for the landfill was established for 6 years, i.e. till 2010.

In the recent years a squatter settlement appeared near the south-west borders of the landfill. Now the distance between the landfill and the residential area is about 200 meters in breach of the national legislation. This issue was discussed by the local authorities and a decision was made to support the squatters' right to live there and their right for favourable living conditions. Thus, there will be no resettlement of the squatters. As the distance from the residential area to the landfill border is too short, an order to close the existing landfill in November 2011 was issued by the authorities; though there is still some spare capacity (less than 20%) remaining.

It is unlikely that the new landfill will face the same problem. The settlement appeared in the vicinity of the existing landfill because of the convenient location, not because of the landfill. However in order to prevent similar problems in future the Akimat of the Munailinsky Rayon shall disclose requirements to the location of residential houses as well as to monitor actual situation in the sanitary protection zone.

The SPZ for the new landfill will be established at later stages of the Project implementation. The SPZ for this type of facilities shall be 1 km wide or can be reduced under the approval of the environmental authorities based on calculations in the detailed design to ensure that none of the pollutants emitted to the air exceed 0.5 of the maximum allowed concentration for the residential areas or the natural background.

5.2 Consumption of Natural Resources and Environmental Impacts

5.2.1 Air emissions

The main sources of impact to the air quality from the current operations of the Company are exhaust gases emitted by waste trucks, emissions deriving from repair works including welding as well as emissions caused by chemical processes taking place at the landfill (including occasional fires). Reportedly the Company is not implementing any measures to reduce the mentioned emissions. There is also no gas collection or flaring at the existing landfill in breach of the national and EU standards.

Allowable volumes and compositions of emissions are estimated and approved by the Ministry of Environment in the form of environmental permits with the maximum permissible emissions (MPE) values attached. The Company has submitted to the Consultant a copy of the permit for environmental emissions W№0055653 which specifies the allowed air emissions as described below. These figures only account for mobile sources (vehicles). The permit is valid till 31.12.2010. No new permit was presented.

The allowed emission volumes for the Enterprise are set at the level of design parameters (see the table below).

Table 12. Maximum permissible emissions for the year 2010

Pollutant	MPE[4]	
	t/year	g/second
Iron oxide	0.0784	0.0368
Manganese, total	0.0012	0.0006
NO2	0.175642	0.0266
Carbon oxide	7.213348	0.4732
Inorganic fluorides	0.00007	0.00006
Non-organic dust with SiO2 content 20 – 70 %	0.00006	0.00007
Hydrofluoride	$5.58*10^{-5}$	0.00006
Toluene	0.0007	0.0003
Butyl alcohols	0.0025	0.0027
Ethanol	0.0007	0.0003
Mineral oil	$5*10^{-9}$	0.000022
Solvent	0,049	0,0076
Total emission	7.477588	0.5483

The preset emission volumes are not exceeded according to the official statistical report for the year 2010. No environmental permit was presented to the Consultant for the year 2011.

[4] Maximum permitted emission

It shall be noted, that emissions from the landfill are not accounted for. In particular, there is no air quality monitoring established at the existing landfill, in breach of the Kazakhstan law. Reportedly, the Company has made an agreement with a specialized company (LLC Analytika) for provision of monitoring services. The monitoring activities started in 2011 and take place once per quarter. The monitoring programme involves air pollution control, including content analysis of soot, particles, ferrous oxides, copper oxides, manganese oxides, Vn oxides, white spirit, paraffins C12-C15, benzopyrene, xylene, formaldehyde, benzene, mineral oil, sulphuric oxides, nitrogen oxides, carbon oxide, fluorides and dust. In 2011 these tests were performed twice. Concentrations of all the mentioned pollutants were within the norms set forth for the Company.

The most significant amount of air pollutants at the moment comes from the landfill gas which consists mainly of CO_2 and CH_4. This emission is not monitored at all. Amounts of the landfill gas emission will be significantly reduced upon the Project implementation.

5.2.2 Greenhouse Gases Emissions

The enterprise does not measure greenhouse gases emissions because it is not required by the current national environmental law. But it should be noticed that greenhouse gases make up 99 % of the landfill gas emissions.

Based on the existing information it was estimated GHG emissions from the current operations in the waste management sector amount to about 38,000 tons CO_2-eq per year. This figure is based on the expert assessment using the Consultant's experience in similar projects in CIS countries.

The amount of methane generated per year is calculated based on recommendations and factors as per the latest version of the Tool to determine methane emissions from disposal of waste at a solid waste disposal site (official methodology approved by IPCC which can be found at http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v5.1.0.pdf). A default value of 0.265 tCH_4/tCOD was used. The following additional coefficients were used to estimate GHG emissions from the current operations:

- Total amount of disposed MSW – 85,938. TPY;
- Organic carbon rate, which can be decomposed (COD) – 0.18;
- Actually decomposing COD rate, – 0.77;
- Carbon rate released as CH_4, - 0.5;
- Carbon rate released as CO_2 – 0.5;
- Conversion ratio for CH_4 16/12;

› Conversion ratio for CO_2 44/12.

5.2.3 Water Management

The main office of GKP "Koketm" uses water for domestic needs and for washing/ cleaning, including vehicles and office areas. The building is connected to the water supply and sewerage systems. This environmental aspect can be therefore ranked as minor.

Water is also used for washing of waste containers. Though requested, the procedure of this activity was not disclosed. It is recommended to develop clear instructions on safe execution of this activity and on relevant water saving measures.

Due to the small amounts of water needed at the landfill, water is imported. The wastewater is collected in a septic tank.

Data on leachate management at the landfill is presented above in the section on waste disposal. The leachate formation rate is less than its vaporization rate, due to the arid climate and relatively low organics content in the waste stream. No leachate is registered at the landfill, thus no leachate collection system is required by the Kazakhstan construction norms. The leachate monitoring system consists of four monitoring wells located along the landfill perimeter to show leachate formation, if any. Observations are made at the quarterly basis, checked by the local environmental supervisory authorities. No leachate was registered during the operational lifetime of the existing landfill. This situation does not contradict to the Kazakhstan landfill arrangement regulations.

Water from a wheel washing station contains pollutants and should be treated before discharge. The local treatment facilities consist of a horizontal flow sedimentation tank (clarifier), oil trap and oil collection tank. After such treatment water is considered clear and is discharged to the current operational chart for vaporization or is discharged onto terrain.

According to the feasibility environmental report, with the landfill near the Bayandy settlement, treated wastewater can not be used in the water supply system due to a high risk of radioactive pollution.

Rainstorm (surface) runoff from the landfill is the same as natural. As under normal operation all runoff from the operational chart is collected as leachate. All other landfill territory (filled charts) is covered with a rainproof layer, preventing waste from any contact with rain water. Therefore there is no need to install treatment facilities for surface runoff water.

The administrative part of the landfill should be paved; rainstorm from this area should be duly treated.

5.2.4 Management of Hazardous Materials

There is no any reliable information on handling of hazardous materials. According to types of activities performed by the Company, the list of hazardous substances used shall include at least the following:

- Fuels, oils and lubricants for vehicles;
- Surfactants and disinfectants;
- Mercury contained in lamps.

It is therefore recommended to identify hazardous materials used, assess their weights, locations, moving patterns, staff involved in handling, and develop clear instructions on safe execution of these actions. The procedure shall include identification of relevant norms and rules, established by the state or by suppliers of those materials. Clear instructions on handling of materials with expired dates and disposal rules shall be also identified. It is also recommended to develop a purchase schedule in order to prevent the presence of excessive amounts of such materials onsite.

5.2.5 Waste Management

According to the environmental permit for the years 2008–2010 the Company could landfill 164,369 tons of waste of the hazard class V in 2010. In 2008–2009 the reported amount was 135,098 tons. It is however likely that the actual amount was below this figure due to deficiencies of the monitoring and registration system described in the Main Report. For the year 2011 no emission permit was presented to the Consultant.

Domestic waste from the landfill operation process is disposed at the landfill. Hazardous wastes generated are, reportedly, stored separately and passed for disposing to the LLC “Landfill”.

No documents were presented to the Consultant to support this information.

5.2.6 Impacts on Soil, Surface and Groundwater

The main source of impact on soil and groundwater from the existing waste management system in general and landfills in particular is the risk of leachate penetration beyond the actual landfill area as well as precipitation of pollutants from air (e.g. exhaust gases from vehicles and machinery).

The main instrument used to mitigate this risk management is the duly arranged monitoring system. At the existing landfill operated by GKP “Koktem” monitoring activities are limited to visual registration of the presence of water/liquids in monitoring wells located along the landfill perimeter (4 in total). Inspection results are filed as monitoring reports. In the course of the landfill operation no cases of liquids presence in the wells were registered.

5.2.7 Environmental Monitoring System

Lack of monitoring was identified as one of the most important gaps of the EHS management system existing in the Company. This includes the absence of gate control at the landfill (to prevent disposal of hazardous waste at the MSW landfill), groundwater monitoring and air quality monitoring at the landfill site and in the adjacent areas.

The gate control now involves only the radiologic control of incoming trucks. Moreover, there is no procedure including mitigation measures to be taken in case a high radiation level is registered.

The main type of instrumental measurements of environmental impacts is the initial environmental assessment at the start-up stage of the facilities operation (for air emissions – Permissible Emissions Design). Some calculations of impacts (air emissions, waste generation) are also made to calculate environmental charges. They are however based on theoretical figures and assumptions.

This non-compliance was brought to the Company's attention by the local supervisory authorities. Upon the official instruction, the Company has started taking actions to solve this issue by contracting a specialized certified company (LLC Analytika). The contract conditions read that this company has to develop a monitoring programme for groundwater quality, air emissions, etc. The monitoring activities started in 2011, and no noncompliances with the approved limits were registered so far.

Groundwater monitoring actions are included in the Plan of bringing the landfill operations into compliance with requirements of the Environmental Code of the RK.

In addition to above, experts of the EHS Department perform visual (qualitative) monitoring of the environmental and safety performance of different production sites of the Company. Those inspections are performed approximately once per quarter at each site. There is no fixed schedule for the inspections. In case an incompliance is identified, official instructions are issued. Corrective actions are checked in the course of the following inspection.

Recommended measures which aim is to bring the Company's monitoring activities to the acceptable level are included into the ESAP. Recommendations on the arrangement of an environmental and social monitoring system for the facilities included in the PIP and for the new landfill for the stages of construction and operation are presented in the form of the Environmental and Social Monitoring Plan (ESMP). Those include institutional and organizational changes as well as procurement of services and new equipment.

5.2.8 Environmental Charges and Company's Environmental Expenditures

Amount and structure of environmental charges paid by a company generally reflect types and scales of environmental impacts of the company's activities.

According to the data available from the Koktem's statistical report, the Company made the following environmental payments in 2010 (see Table 13).

Table 13. Environmental charges of GKP "Koktem", in thousand Tenge

Impact type	charged	paid
Air pollution	212,142	212,142
Waste disposal	30,000,000	28,183,514
Total	30,212,142	28,395,656

GKP Koktem was charged to the total amount of 21,195 thousand KZT for violations of the environmental law.

A fine was charged for the absence of an obligatory environmental insurance policy for 2010, absence of an Action Plan which aim is to bring the landfill in compliance with the Kazakhstan environmental requirements, absence of a monitoring report for QIII 2010.

5.2.9 Public Health and Safety

Waste collection system

The SWM system is one of the basic life-supporting systems in the city. At the moment it provides services meeting the needs in waste removal and maintenance of proper sanitary conditions in the city.

The main part of the whole solid waste management process which has an impact on the population is waste collection since it is performed in residential areas. There are no critical observations on the waste collection system which might result in significant risks to public health and safety. However there are several areas for improvement which can be achieved if the following problems are solved:

- Possible odour or leachate which can result from rottening of organics boosted by rain water in open containers;
- Overfilling of containers;
- Littering of residential areas in windy weather;
- Fires in containers as a result of burning cigarettes disposal, other actions of residents;
- Disposal of wastes at non-designated sites.

It can be concluded that some risks emerge as a result of low awareness of people on how to correctly handle the waste collection facilities. This can be solved through awareness raising campaign coordinated by the Akimat.

Other problems are addressed in the proposed PIP, e. g installation of larger containers with proper covers.

Emissions from collection trucks affect the air quality in residential areas. This impact is however non-significant and does not exceed impacts from ordinary vehicles of the same size. However purchase of new modern trucks will also help reduce this impact to a lower level.

There are complaints with regards to the wastewater discharge channel at Koshkar-Ata near the existing landfill. However this channel has nothing to do with the landfill. Odours and dirt from this cannel are caused by the industrial plant discharges, not the wastes. This issue, though posing inconvenience to residents, is out of the scope of the Waste Management Project.

Landfill

The existing landfill is situated well outside the city area and residential areas. The key impact is caused by emissions of methane, which is not considered a toxic substance, to the air from the wastes disposed. It however might pose risks to the safety of waste pickers as methane is inflammable and explosive gas. In the course of the landfill operation no explosions were registered. It can be concluded that the risk of explosion is not high and the potentially explosive landfill gas is mainly vented in the air. Other impacts on human health may include noise from vehicles, odour and pests. The sanitary protection zone of the landfill is 1 km wide, which is far enough to protect people from the listed nuisances. No housing is allowed in this area. However recently (after the existing landfill was put in operation) an illegal settlement of immigrants emerged within the sanitary zone. The settlement is called Baskudyk, the actual number of inhabitants is not known.

The currently operated landfill is not properly fenced and guarded. This results in the penetration of marginal Baskudyk dwellers to the landfill. They do some waste picking (mainly plastic bottles) to be further sold to companies (or individuals) which are unidentifiable. It is possible that their business is not properly registered. The picking takes place in unsafe conditions, including working in the vicinity of moving vehicles, slopes, direct contact with waste without any protection. As it was already mentioned, this activity is also illegal because any types of waste processing after the landfill gate are prohibited and non-staff persons shall not have access to the landfill site. Though the opening of the new landfill will result in the loss of income for the waste pickers it is considered less crucial than the current risks to their health and safety. This conclusion is also based on the information that reportedly only small share of the Baskudyk dwellers is engaged in the waste picking activities. At the same time negative impacts from the landfill affect all the dwellers. Furthermore, as it was already mentioned, there are no formal obstacles for those people to find legal workplace. The waste picking job was relatively attractive since it is located close to their place of residence. Measures on involvement of current waste pickers into future MBT facility operation are included into the ESAP.

Figure 3. Photo of the existing landfill, taken from Lada newspaper (internet publication)

Upon consultations, a decision was made by the local authorities to keep the settlement in this place and not to force the inhabitants to move to a place which is intended for residential use. In order to prevent risks to the health of those people an instruction was issued to close the existing landfill before November 2011, which was duly communicated to GKP "Koktem". The process of the new landfill establishment was started in 2008. However it is still at the stage of the Feasibility Study approved by the State Environmental Expertise and State Technical Expertise. At an open meeting with the Akim of the Mangistau Region it was decided to facilitate financing of the landfill design.

As it was already mentioned, the SWM system provides life-supporting services to the population. Functioning of all its components are an absolute must for support of favourable living conditions in the city. It is therefore decided that in case of necessity, operational time of the existing landfill can be extended till the new one is ready to accept waste. Extension of the landfill lifetime will not pose any additional risks since the design lifetime of the landfill is still not over.

After the landfill is closed and reclaimed, the Baskudyk dwellers will live in the safe area without major pollution sources. At the new landfill proper technical (due fencing and guarding) and organizational (keeping logbooks on access to production sites) measures will be taken to prevent access of non-staff persons to the site.

It shall be noted, that the Baskudyk dwellers have access to the employment system. The main barriers for them to work is low education level and absence of willingness to work which was revealed by means of interviews conducted by the local mass media with the Baskudyk representatives. Since some of these people have experience of waste sorting, it is recommended that the future MBT operator spreads information on vacant jobs at sorting line in this settlement.

5.2.10 Occupational Health and Safety

Main Documents

It shall be noted that the national legislation in this area is well elaborated and corresponds to main international standards. Due implementation of the legislative provisions is ensured by the State Labour Inspectorate.

The main document regulating the Company's occupational health and safety activities is called "Regulations on Occupational Safety Department of GTK Koktem". According to the Regulations, a health and safety department was established in the Company in February 2009. Objectives of the H&S department include:

- Development and implementation of measures to improve general health and safety situation in the Company;
- Supervision of the employees' provision with milk, soap, PPE etc.;
- Development of internal health and safety regulations for the Company;
- Organisation, coordination and supervision of health and safety activities in the Company's departments;
- Supervision over the Transport Shop to be compliant with the Kazakhstan road regulations;
- Supervision over the Fire Safety rules implementation in the Company.

This documents is however quite simple and does not define any measurable goals in OHS, does not contain any objectives for other departments of the Company, does not provide for continuous improvement.

Identification of applicable laws has not been performed. The main supporting documents developed by the Company to ensure functioning of the occupational health and safety system include: a list of professions employed in the Company and a list of operations, a list of safety instructions for those professions and operations, a training and induction plan, a list of workplaces associated with risks and hazardous factors, an recording system for accidents, plans of procurement and distribution of individual protection equipment.

OHS audit results

The health and safety department is responsible for prevention, registration and investigation of accidents, as well as for provision of PPE to the Company's employees.

Jobs and workplaces that are considered to involve risks and negative impacts with regards to occupational health and safety include:

- Landscaper;
- Driver;

- Tractor driver;
- Electric and gas welder;
- Locksmith;
- Carpenter;
- Electrician;
- Dog catcher;
- Vulcanizer operator;
- Compressor operator;
- Bulldozer operator;
- Pumping unit operator.

Specific training programmes are developed for each of the above mentioned profession based on the standard industry-specific guidelines.

Works involving risky and hazardous operations or conditions are compensated by increased salaries, donation of milk (0.3 l/day).

During the EHS audit, some gaps were also identified. Deficiencies related to management and recording practices are listed in the next chapter. Other problems related to occupational health and safety are of the local nature and are as follows:

- Lack of protection equipment and protective clothing, including boots, helmets, breathing masks due to limited financing;
- Not all employees have duty instructions;
- No information was provided about registration of employment injuries. Reportedly there were some injuries in the last several years, but no additional information was submitted;
- Reportedly there were fires caused by animal corpses disposed at the landfill in breach of the existing Kazakhstan safety and sanitary norms;
- Reportedly there were cases of unsafe waste treatment. Wastes were pressed manually in the tracks in the cases of broken truck presses;
- Due to the absence of gate control at the landfill aimed to prevent hazardous wastes, landfill operators might have contacts with hazardous substances without proper protective means.

5.2.11 Occupational Health and Safety Monitoring System

There is no systematic health and safety monitoring in the Company. The health and safety department of GKP "Koktem" undertake irregular internal inspections of workplaces within complex inspections of the EHS department. Non-compliances are fixed through written prescriptions. Adequacy of corrective actions is checked in the course of the following inspection.

There is no schedule of inspections. They are performed when the EHS department specialists have time for such inspections.

Reportedly, no one examined the actual working conditions (workplaces attestation) in the Company. This could be a useful instrument to make reasonable decisions on OHS management and is therefore recommended to the Company.

Occupational health and safety monitoring is also performed by supervisory authorities. It is done on the basis of periodic statistics submitted by the Company (including statistics on staff number, accidents, working conditions) and inspections. These inspections are performed by the EHS department expert which has relevant qualification and due authority to adequately assess the status of (in) compliance and require some corrective actions. Normally such inspections are carried out once per 2 or 3 months in each workshop (structural unit). Observations are documented in the form of reports signed by the inspector and the responsible person of the workshop. The main type of observations and prescriptions made relate to small incompliances in housekeeping practices. Adequacy of corrective actions is checked in the course of the following inspection.

5.2.12 Emergency Response and Contingency Plan

Development of an Accident Prevention and Response Plan (APRP) to tackle risks associated with hazardous production facilities and processes is a standard procedure for enterprises of all types. GKP "Koktem" reported that such practice is not introduced in the Company's operations. This can be considered a significant gap in emergency preparedness and risks assessment. It is therefore recommended to complete the following tasks:

1 Develop a procedure for risks identification (including possible accidents and emergency situations), allocate responsibilities and determine deadlines. The procedure has to contain at least a description of all existing environmental, safety and technical risks and ranking of risks, identification of major risks and possible scenarios for contingency situations. Communicate this procedure to responsible persons, and implement this procedure.

2 Develop measures to mitigate significant risks and prevent possible accidents arising from those risks. Communicate this procedure to responsible and involved persons, allocate budget and implement this procedure.

3 Develop clear instructions on measures to be taken in case of an accident, assess sufficiency of onsite accidents prevention infrastructure/means, allocate budget and purchase the relevant equipment if necessary.

4 Develop procedures for accident investigation and follow-up, including correction to the above mentioned procedures.

5 The APRP is to be revised at least once in 5 years and updated if there are any changes in technologies, equipment, metrological support of technological processes, or after an accident. Changes and amendments incorporated into the APRP are to be reviewed by managers, specialists and operational staff of the workshop, members of the emergency rescue service.

Staff awareness and training based on developed standards and knowledge assessment shall be carried out in accordance with the established procedures.

This requirement will be applied to both GKP "Koktem" and the future operator of the waste sorting and waste-to-energy facilities (if different).

5.2.13 Personnel Training

The Company's management gives due consideration to official requirements to occupational health and safety training. Employees undergo an attestation procedure in occupational health and safety on regular basis, including training if needed. No initiatives are taken to train the employees beyond the level of compliance. The training level is assessed as adequate and able to provide due level of safety for workers.

5.2.14 Other OHS Issues: Child Labour, Forced Labour, Discrimination Practices

Noncompliances are not revealed in such areas as child labour, forced labour, discrimination practices. The Company made up a list of hard and harmful occupations where female and under-age employees are not allowed.

5.3 The Company's EHS Management System

As it was mentioned earlier in the Approach section, this chapter will rather focus on development of recommendations and guidelines for companies which will possibly enter this market upon the completion of the current re-structuring process. These recommendations are based on the following:

1 national legislation applicable to the companies providing services to public, waste management systems operators, etc.;

2 observations made during the audit of GKP "Koktem" and interviews with representatives of smaller commercial companies acting on this market and identified areas for improvement;

3 international best practice, including relevant general and industry-specific guidelines on labour, occupational health and safety, environmental management, etc.

5.3.1 EHS Management

The Company has elaborated and is currently using a unified environmental, occupational health and safety (EHS) management system. All these issues are under supervision of the Department for occupational health, safety and environment (referred to as EHS Department). At the same time the Company's day-to-day practice has only some elements of the EHS management system as described in ISO 14001.

A due diligence of the Company's operations (GKP "Koktem" is currently operating the main part of the SWM system, including collection and disposal) identified significant gaps in the existing solid waste management system, particularly in monitoring practices, communication with the consumers, EHS management, consumer behaviour and institutional setup of the Company. If compared with the EHS management system described by ISO 14001, the baseline situation in the Company is as follows:

- The Company does not have any policy in the area of environmental, health and safety management;
- Objectives of the EHS Department are reflected in the document "Statute on the EHS Department", which is only available from the HR manager;
- EHS risks (aspects) resulting from the Company operations are not identified in any internal documents. They are only clear from the environmental and safety permits issued by the supervisory authorities and obligatory fees/charges paid by the Company;
- There is no system for identification of relevant legislation and other requirements; legal documents are kept in a non-systematic and scattered manner in hard copies; there is no roster which would identify relevant official documents neither at the company nor at the department level;
- EHS activities are elaborated in the form of early plans (Environmental Action Plan and OHS Action Plan are developed as separate documents). However those plans do not include organisational or recurrent activities. They mostly focus on measures which need capital investments. There is no practice to compile implementation reports after the planning period is over. According to the environmental protection plan of the GKP Koktem for the years 2008 – 2010, all planed actions are for the year 2008, including the actions which should be undertaken repeatedly. A separate plan is developed in response to the requirement of the environmental supervisory authorities to bring the existing landfill in compliance with the national legislation requirements. No reports on implementation of the planned activities were presented to the Consultant. This observations indicate the lack of follow-up activities upon the plans implementation and the absence of the PDCA (plan-do-check-act) approach;
- Objectives, responsibilities, roles, and duty instructions for each employee of the department are listed in the individual job descriptions;

- The Company's personnel is trained to the level prescribed by the national legislation for the employees working with waste and engaged in waste management; no willingness was demonstrated to educate the employees above those compliance standards;

- The Company ensures disclosure of environmental information through procedures prescribed by the national legislation. Since GKP "Koktem" is a municipal enterprise subordinate to the Akimat, it is subject to stricter requirements in this respect. More information about disclosure procedures and practices is available from the Stakeholders Engagement Plan;

- There is no clear system of documents and records management and keeping. Only some documents are available in electronic format which makes many procedures very time-consuming; opportunities for analysis (e.g. of statistic data, follow-ups, work efficiency) are also limited when data is only available in hard copy and the localization of those hard copies is not clearly defined;

- Significant lack of monitoring was identified as one of the most important gaps of the EHS management system of the Company. This includes the absence of gate control at the landfill (to prevent disposal of hazardous waste at the MSW landfill), groundwater monitoring and air quality monitoring at the landfill site and in the adjacent areas. This non-compliance was brought to attention of the Company's management by local supervisory authorities. Upon the official instruction, the Company has started activities to solve this issue by contracting a certified specialized company. The contract conditions read that this company has to develop a monitoring programme for groundwater quality, air emissions, etc. However in the opinion of the Consultant, this approach shall be modified in order to take more pro-active position and actively participate in the monitoring process as the Employer.

- Further, there is only radiation gate control for waste coming to the landfill. Normally there should be also visual (preferably double) control to prevent hazardous and construction waste from the municipal landfill and weight registration. Moreover, there is no procedure to determine the designation of waste portion if excessive radiation is registered. To solve this issue complex measures are needed, including purchase of equipment, training, re-direction procedures development, contracting of authorized companies to receive radioactive and hazardous waste detected in the MSW stream. The proposed solutions will be reflect in the Monitoring Plan developed by the Consultant as a part of this study in close cooperation with the company and based on the best worldwide practice in landfills operation and solid waste management.

- Compliance assessment is mainly executed by the supervisory authorities (see SEP for the list). Non-compliances identified are communicated to the Company as prescriptions. Corrective actions are checked in the form of periodic or urgent inspections. Fees and penalties are applied in accordance with the Administrative Code of the RK.

- Internal audits are not performed. However there are periodic inspections of workplaces made jointly by the health and safety engineer and environmental

engineer. Non-compliances identified are communicated to the heads of workshops and individual employers in the form of official prescriptions with responsibility and corrective actions dates identified. Corrective actions are checked while the following inspection.

- As for preventive actions, there is no clear procedure in that respect. Mainly trainings and safety drills (as prescribed by the national legislation) fall under this category.

- The Company does not perform annual reporting on EHS issues. Till 2009 there was a practice of internal reports on occupational health and safety performance (descriptive, without any KPIs). This report was issued in the Kazakh language for management review. In 2010 this practice was abandoned. If the Company receives the EBRD loan, it will have to perform annual reporting as prescribed by the 2008 Environmental and Social Policy and standard terms of a Loan Agreement.

- The Company has not provided any emergency response plans upon the Consultant's request.

Considering the Company's current financial situation combined with restructuring activities and overall lack of qualified workforce, it is not feasible to aim at the establishment of a certified EHS management system in the coming 3 years. However some gaps are obvious and need to be bridged as soon as possible.

The list of corrective actions proposed to the Company and recommendations to the future SWM system operator will be included into the ESAP.

5.3.2 EHS Management System Setup

The Company has developed an integrated environmental, occupational health and safety management system which falls under the Director's general supervision.

Though this approach can be estimated as progressive, the mentioned functions are not completely integrated yet. For instance, environmental protection activities planning is separated from the occupational health and safety planning, although there are numerous opportunities for monitoring and control activities integration and providing potential for saving of human and financial resources.

Occupational health and safety at GKP "Koktem" is under responsibility of the Chief Engineer. Besides, the following specialists are involved in the EHS management process.

Table 14. Specialists responsible for EHS management at GKP "Koktem"

Position	Functions

Chief Engineer	Ensure adequate technical condition of process equipment, safe operation of loading cranes, fire safety at production facilities
Specialists of Chief Power Engineer	Ensure adequate condition and safe operation of power equipment
Head of EHS Department	Ensure compliance with national and corporate occupational health, safety and environmental standards in the Company
Head of Production and Engineering Section	Ensure regulatory and engineering provisions for planned and emergency repairs at production facilities
Occupational Health and Safety Engineer	Ensure in-process operational control of safe operation of hazardous production facilities
Heating Engineer	Ensure adequate technical condition and safe operation of heat and power equipment
Environmental engineer – 1 person	Ensure environmentally sound performance of the utility and compliance with the relevant standards

Environmental activities are planned annually for the coming year, including necessary financial resources and statement of purpose, mainly based on the current legal requirements or contractual obligations of the Company.

6 Environmental and Social Assessment of Proposed SWM System

6.1 General Approach

Further in this section main environmental and social aspects of the PIP implementation will be described including identification of positive environmental and social outcomes of the projects, associated risks and measures to achieve best results, minimise or eliminate risks and to achieve overall compliance with the relevant national regulations, EBRD requirements and introduce best practice related to SWM sector modernisation where feasible.

Construction managers will be responsible for implementation of mitigation measures during construction and installation works. Contracts will include HSE requirements and penalty schemes in case of poor performance of the contractual obligations. The Employer‘s representative (Project Management Consultant / Project Engineer) will supervise the implementation of EHS measures and arrange for the timely reporting to the EBRD.

6.2 Analysis of Alternatives

Analysis of alternatives is an important part of each project. It allows to assess different options to achieve the same objectives. The analysis includes a comparison of different options for the SWM system upgrade as well as a review of different locations to be chosen for the facilities.

Alternative Technologies

Concept technical solutions for waste management include the following:

- Source separation and collection of recyclables;
- Construction of Civil Amenity stations;
- Sorting of collected wastes (manual or mechanical);

- Recycling of recovered fractions into market product;
- Thermal treatment (Incineration, pyrolysis, gasification, etc);
- Composting;
- Digestion with biogas recovery and its processing (aerobic / anaerobic, wet / dry);
- Landfilling of "tails".

In practice, combinations of the above mentioned solutions are normally used. A decision on the use of particular approaches is done on the case-by-case basis taking into account the volume and morphologic structure of waste, seasonal changes, climatic conditions, geographic features of the region, national and local legislation and traditions etc. One of the important criteria while making decision on the waste management system upgrade is the affordability of waste management services to all customers.

The most efficient waste management systems are to be based on the "3R" principle which stands for "reduce", "reuse", "recycle" outlining the hierarchy of approaches to be considered while making decisions on the SWM systems upgrade. In addition to economic benefits (utlisation of valuable fractions and energy contained in the waste stream) and social advantages (better living conditions, new jobs), this approach is a key to mitigation of various global changes such as ozone depletion, POPs accumulation, climate change, deterioration of resources.

The "3R" approach incurs a reduction of amounts of generated wastes as the first and most sustainable component of waste management. This requires a systematic work with FMCG producers, consumers etc. It shall be noted that this process requires a basic change in the production and consumption patterns meaning serious mindset change, which is always a very time-consuming process. In waste management this approach is also very widely associated with source separation of wastes which allows a significant decrease of amounts of wastes sent to the landfill. Valuable fractions are considered secondary resources rather than waste.

For Aktau City introduction of the full-scale source separation at this stage does not seen to be feasible. Though this allows receiving of secondary resources of better quality than in after-collection sorting, the process of the commercially reliable source separation system introduction is very time consuming and incurs many risks at the initial stages. It took 20 to 40 years in different EU member states. However we agree that this approach is the most progressive and needs to be introduced, but gradually and with due precautions and risk management measures.

Taking into account the absence of source separation traditions in Kazakhstan, it is planned to purchase and install a limited number of section containers (1 per 1000 dwellers). Further this number will gradually increase as public awareness rises. No doubt that consumers' awareness is among the main factors needed for the introduction of an efficient source separation system.

In the Project the waste reduction will be achieved through re-active measures, namely sorting of the whole waste stream, separation of valuable fractions and sending them for recycling. This also allows separation and further use of a significant part of valuable fractions such as paper, glass, plastics, metals, organic waste. The morphologic structure of the waste stream in Aktau favours this approach: it has a high share of valuable fractions and average content of biodegradable waste consisting mainly of food waste. These waste characteristics together with the results of financial and economic analysis were the two main criteria to propose a concept design of the waste management system consisting of an improved collection stage, manual and automatic sorting, anaerobic digester, CHP facility, composting and the improved landfill operating in combination with WWTP-2.

It is important to remember, that wastes besides valuable materials also contain energy potential. One of the most widespread ways to recover this energy is waste incineration. This method is rather expensive, incurs environmental and operational risks and in most cases is negatively accepted by public. Due to these factors it is prohibited in the RK and is not further considered in this analysis of alternatives. The only available method of energy recovery from waste in Aktau is therefore extraction of biogas and generation of energy based on this fuel. The most efficient way of fuel use is co-generation which was used in the proposed concept design. Therefore the only alternative to biogas CHP is the zero scenario with no energy recovery which would result in GHG emissions, loss of green energy potential and is therefore considered far less favourable.

To ensure complete utilization of nutrients potential of organic wastes, a composting stage is introduced. It allows diversion of organic waste residues from the landfill, overall decrease of the waste volume disposed, and production of fertilizers for agriculture, city landscaping and re-cultivation activities. Again, the only alternative regarding residue organics handling is landfilling which is less favourable from the environmental and economic points of view. Different options for composting and substantiation of technology choice will be provided in the chapter on composting stage, E&S assessment below.

Finally, landfilling is an inevitable part of any waste management system since it is not possible to avoid generation of some fraction of wastes which can not be further used and shall be disposed of in a safe manner.

Considering needs and features of the Aktau City as well as national and local legislation, the following scenarios are possible of future development of the SWM system in Aktau.

Table 15. Scenarios of the SWM system development in Aktau for the coming 15-20 years

№	Scenario, name and description	Pros and Cons
1	Business-as-usual scenario Situation as it is currently observed, all waste is collected in 0.75 m^3 containers and disposed at the	Significant and increasing volume of waste sent to the landfill, non-optimal working conditions for waste collectors and landfill staff, dumping of valuable waste components, energy potential not used, high production

	landfill complying with minimum national requirements. After the new landfill is constructed, the waste stream will be switched to the Bayandy landfill.	of leachate, odour and air emissions, low control due to insufficient monitoring, solution of the problem regarding ensuring proper living conditions for the Baskudyk dwellers incurring however some economic displacement due to restricted access to income from PET bottles selling with no new low-qualification jobs generated. No capital investments needed. Not in compliance with the national environmental and energy policy. Low operation and maintenance costs. No changes in operation cost, staff, no need for additional training.
2	Collection system upgrade, waste disposal at the landfill	Significant and increasing volume of waste sent to the landfill, optimal working conditions for waste collectors, non-optimal –for landfill staff, dumping of valuable waste components, energy potential not used, high production of leachate, odour and air emissions, low control due to insufficient monitoring, solution of the problem regarding ensuring proper living conditions for the Baskudyk dwellers incurring however some economic displacement due to restricted access to income from PET bottles selling with no new low-qualification jobs generated. Improvement of the living conditions. Low capital investments needed. Low operation and maintenance costs. Not in compliance with the national environmental and energy policy. No changes in operation cost, staff, no need for additional training. Time for introduction - < 1 year
3	Collection system upgrade, sorting facility, processing facilities for valuable fractions (processing facilities on-site), tails disposal at the landfill	Decreased volumes of waste disposed at the landfill, near-inert nature of tails, utilization of valuable fractions, energy potential not used, decreased air emissions, risks associated with the recycled materials market, new jobs. High capital investments needed. Needs of qualified staff, additional training Higher operation and maintenance cost In compliance with the national environmental policy, not in compliance with energy policy. Time for introduction – 2-3 years
4	"Maximum scenario" Source separation, re-use (bottles, paper) and recycling (including processing of PET and other plastic, green energy, composting), very small amount of tails sent to the landfill	Significantly decreased volumes of waste disposed at the landfill, inert nature of tails, high level of valuable fractions utilization, energy potential used, minimum air emissions, safety for Baskudyk dwellers ensured, economic displacement not mitigated, risks associated with the recycled materials market and the consumers behaviour, conditions for maximum de-fragmentation of the SWM system, new jobs. Average to high capital investments needed. Needs of qualified staff, additional training

		Higher operation and maintenance cost In compliance with the national environmental policy and energy policy. Time for introduction – about 10 to 20 years (to achieve commercially viable parameters and sorting depth) which outside the planning time for this project
5	"Gradual improvement scenario" Pilot areas with source separation, collection system upgrade, MBT involving sorting, baling of recovered valuable fractions, digestion of organic wastes and WWTP sludge, CHP facility, landfill	Significantly decreased volumes of waste disposed at the landfill, inert nature of tails, high level of valuable fractions utilization, energy potential used, minimum air emissions, safety for Baskudyk dwellers ensured, economic displacement mitigated, due management of risks associated with the recycled materials market and the consumers behaviour, new jobs. Average capital investments needed. Needs of qualified staff, additional training Higher operation and maintenance cost will be reduced by selling of green energy In compliance with the national environmental policy and energy policy. Time for introduction – about 2-3 years Opportunities to reach the "maximum scenario" in 10-15 years due to high flexibility of the system.

As can be seen from the table above that maximum environmental benefits result from implementation of the "Maximum scenario". However the introduction of a full-scale source separation system with commercially viable parameters of the separation depth and secondary material quality is possible within the timeframe of not less than 10 years. The concept chosen is designed to gradually move forward this system but to get positive social, environmental and economic results significantly earlier.

Therefore the concept including replacement of containers and vehicles, introduction of a sorting line, a biogas recovery system, a CHP facility, composting stage and a modern landfill with the gradual introduction of source separation and adjustment to the waste volume and composition change was ranked first by all stakeholders to meet the aims and objectives of the SWM system in Aktau in the coming 15–20 years.

The scenario chosen is a "medium" option compliant with the "3R" principle through a significant decrease of wastes amounts dumped, conditions for recycling and reuse of valuable fractions, and energy recovery in the way allowed by the national legislation. It is also in complete compliance with the national strategies for environmental management and energy saving because it provides effective diversion of the biodegradable wastes from the landfill, biogas recovery and use, green energy production. The problem is also solved of the safe utilization of the WWTP sludge. One of the main features of the system proposed will be a high degree of flexibility including options for technology adjustment to waste volume and composition which is vitally important in the situation of the growing population and well-being and when the reliability of the initial data is quite low.

Technologies to be employed, exact location and capacity as well as the concept design are identified and prepared as a result of this FS and extensive consultations with the Company, Akimat, and the Client.

6.2.2 Alternative Locations

At the moment two site alternatives for the mentioned facilities are considered. According to the existing plans of the City Administration, the new landfill is to be located in the Munaylinsky Region. However there is an alternative site close to the future WWTP-2 which is suitable for this purpose. The second option provides significant opportunities for industrial symbiosis, including common digestion of waste and WWTP sludge with higher energy output. The two options are compared by the Consultant in cooperation with the local authorities. The final decision on the best location is to be made after the state expertise approval is received and public hearings on the Project are held. Advantages and disadvantages of the alternative locations of MSW facilities are summarized in Table 16 below.

Table 16. Comparison of Location Alternatives

	MBT adjacent to WWTP-2, landfill in Bayandy	MBT and landfill in Bayandy	MBT and landfill adjacent to WWTP-2
Air emissions	Collection of methane from organic waste for CHP; collection at the landfill is possible but use for energy production is not feasible Additional emissions from vehicles, transport "tails" to the landfill	Complete collection (from organic waste and from landfill), used at the CHP Additional emissions from vehicles, transport wastes collected to MBT since it is farther from the city than the WWTP site	Complete collection (from organic waste and from landfill), used at the CHP Minimum emissions from transportation (only for transportation from the city to the facility)
Water use	Water will be used for employees, water supply for drinking and sanitation, at wheels washing point – 1 point at each facility	Decreased water consumption due to optimisation of the workers number, use of the common wheels washing point as compared to option 1	Decreased water consumption due to optimisation of the workers number, use of the common wheels washing point as compared to option 1
Wastewater management	Leachate from the landfill shall be treated onsite; currently it is planned to be pumped in the chart or to the ground, municipal wastewater is to be treated in the same	Leachate from the landfill and wastewater from MBT shall be treated onsite; currently it is planned to be pumped in the chart, or to the ground, municipal wastewater is to be	Leachate from the landfill and wastewater from MBT can be transferred to the WWTP and treated with other wastewater to required standards WWTP sludge

	MBT adjacent to WWTP-2, landfill in Bayandy	MBT and landfill in Bayandy	MBT and landfill adjacent to WWTP-2
	way WWTP sludge treated together with organic wastes in digester Need for two local treatment facilities for the wheels washing point station	treated in the same way Need for only 1 local treatment facility for the wheels washing point station	treated together with organic wastes in a digester Need for only 1 local treatment facility for the wheels washing point station
Impact on soil and groundwater	Risks and uncertainties which might arise from transportation of tails over the Koshkar-Ata surface (re-cultivated part)	Risks associated with increased transportation distance of unsorted wastes	There will still be transport of wastes but the risks will be less
Impact on vegetation and fauna	Low MBT and landfill construction at the new site in the desert	Low Landfill construction at the new site in the desert	Very low Project implementation in the industrial area
Waste management	Waste from the MBT facilities is disposed at the landfill. No additional transportation	Additional transportation of waste generated at the MBT facilities to the landfill for disposal	Waste from the MBT facilities is disposed at the landfill. No additional transportation
Public health and safety	No settlements in the vicinity of the site May cause economical displacement for the illegal waste pickers, but can provide opportunity for the legal job for them	No settlements in the vicinity of the site May cause economical displacement for the illegal waste pickers, but can provide opportunity for the legal job for them	No settlements in the vicinity of the site May cause economical displacement for the illegal waste pickers, but can provide opportunity for the legal job for them
Occupational health and safety	No additional risks	Additional risks due to the need of additional waste transportation	No additional risks
Energy saving (green energy)	From biogas of sludge and organic	From biogas of organic waste and	From biogas of sludge and organic

	MBT adjacent to WWTP-2, landfill in Bayandy	MBT and landfill in Bayandy	MBT and landfill adjacent to WWTP-2
	waste – medium capacity	landfill gas – low capacity	waste and landfill gas – high capacity
Land Use	Reduced land use due to the joint sanitary protection zone of the MBT and the WWTP-2, separate protection zone of the landfill covering about 3 sq.km	Additional land use due to the need of separate arrangement of the sanitary protection zones SPZ for the WWTP around 3 sq km and the MBT+ landfill around 3 sq km	Reduced land use due to the joint sanitary protection zone Efficient land use – partial overlap of the sanitary zones of the WWTP-2 and the MBT+ landfill, around 4.5 sq km in total

A more detailed assessment shall be carried out at the design stage of the Project and included in the OVOS/national EIA. This will include a detailed comparison of the environmental and social impacts and risks at both construction and operation stages, as well as E&S benefits involving a simple ranking model to choose the best option. Additionally, the Project opportunities will be discussed with stakeholders during the public consultations and final public hearings (as provided in SEP). Results of project ranking and the final decision on the location shall be approved by the local supervisory authorities.

Project description and context

In general the proposed Project aims at an improvement of the environmental situation and living conditions in the City of Aktau. The Priority Investment Programme ("PIP") includes the following components:

- Collection system update;
- Waste management system improvement;
- Institutional development;
- Construction of a waste sorting facility;
- Energy recovery facilities (anaerobic digestion and CHP facility);
- Construction of a new landfill,
- Closure of existing landfill, which is currently out of scope of the PIP, is included in this ESIA to reflect the complete MSW management system and update options;

The waste sorting facility and the anaerobic digestion facility together are referred to as a mechanical – biological treatment (MBT) facility.

Subsequent section will provide more detailed information about:

- the Project components;
- potential E&S impacts that might be associated with the construction, operation and decommissioning of the Project components;
- proposed mitigation measures to minimize such impacts;
- cumulative impacts of all Project components;
- Cumulative impacts of the Project and other facilities located close to the Project Area (WWTP-2, Koshkar-Ata).

In addition to economic benefits and possibilities to meet the needs of the growing city in high quality municipal services, the recommended projects have a notable potential for improvement of the environmental situation in the city and the surrounding territories as well as for mitigation of existing occupational and public safety risks. The detailed description of cumulative environmental benefits is given in this Chapter. Detailed description of environmental and social effects as well as measures to maximize benefits and mitigate risks for each PIP component are provided in Chapter Environmental and Social Impacts of the PIP Components.

6.3 Environmental and Social Assumptions in the Design

According to the RK legislation and regulations, the whole range of issues related to health, safety and environment (HSE) management for the Project components is to be addressed at the design stage. Design documents should include a description of the institutional setup of the HSE management system. Minimum required contents of this volume are determined by the SNiP RK 1.02-01-2007.

The Project shall be implemented in accordance with the national environmental legislation, legislation of the Mangistau Region, national standards and other documents issued by the regulatory authorities at the national, regional and local level as well as EBRD PRs and FIDIC rules. The laws and regulations provide for the obligatory incorporation of environmental assumptions in the design of the Project components.

Environmental assumptions will be reflected in design documents in a special section called "Environmental Protection", which will be prepared by a licensed designer in line with the applicable regulations and available guidelines approved by the national construction and environmental authorities. Emergency response and occupational health and safety assumptions are also an obligatory part of the design documentation. Each of them will be presented in the design as a separate volume subject to approval by the supervisory authorities.

Design documents approved by the authorities provide a basis for environmental permits for operation of the facilities constructed or upgraded according to the design.

Design documentation is also to be in compliance with the Technical Specifications which are part of the Tender Documents. They are to be developed by the Project Management Consultant and have to be implemented by the contractors. Environmental and safety issues are to be considered there with due details and scope, especially where they go beyond the compliance with the national rules. Design documents are to be approved by the respective regional and local authorities and ministerial establishments.

6.4 Environmental and Social Impacts of the PIP Components

Environmental impacts and benefits in this chapter are assessed by PIP components. This approach was chosen as the best one to show the contribution of each technical solution in both environmental / social benefits and impacts and to better spot proposed preventive or mitigation measures. This might also be useful in case of multi-operator structure when the elements of the SWM system are under responsibility of different companies. It is also very important how different impacts play together. Sometimes the cumulative effect of different impacts can be smaller then separate impacts. But sometimes the cumulative effect of different impacts can be larger then separate impacts (when different effects "help" each other to do harm). For example leachate of waste become very poisonous as amount of different waste compounds get more varied. Other example is that rotting of biodegradable waste and acid leachate together increase the cumulative effect, because acid leachate intensifies the rotting process and increases the total amount of leachate.

6.5 Upgrade of Waste Collection System

Although the Waste Collection System is not PIP Component, it is however a major element of overall Waste Management System in Aktau. Below is a description of this component together with environmental and social assessment as a result of upgrade of waste collection system and, hence, improvement of MSW management.

6.5.1 Description of the Component

Analysis of the existing waste collection system revealed that the main problematic issues are: use of the inefficient waste collection trucks and waste containers of small volume (0.75 m^3) without covers. This results in increased operational costs and causes environmental problems including littering while windy weather, penetration of rain water into containers, generation of leachate in residential areas and subsequent risks to sanitary situation and odour spread. Uncovered containers also provide for penetration of rain water into containers decreasing quality of paper and cardboard (which can be recycled), boosting rotting of organics and leachate formation.

Low efficiency trucks use more fuel per km which results in higher relative emissions in residential areas. Breakdowns of the compaction system on trucks

prevent use of the complete space of trucks and cause delays in consumers servicing. They also cause necessity for waste trucks operators to provide compaction by other available means, including compaction with own weight by legs. This causes risks to the operators' health since no protective clothes is supplied to them.

A gradual replacement of all existing 0.75 m^3 waste containers with 1.1 m^3 covered containers is proposed for the improvement of the MSW collection system. The total demand of a number of MSW containers under the same collection frequency of 7 times a week is 2,500 waste containers as estimated for the first year of the system improvement.

In view of the waste collection trucks and the age and technical characteristics of the trucks, replacement of 7 pieces of 10-year old waste collection vehicles with 7 new ones 25 m^3 in volume is suggested.

The increasing number of population and the related generation of the MSW will lead to the increased demand for containers and waste trucks.

For the purpose of conformity with the valid Sanitary Rules ("Sanitary and Epidemiologic Requirements for Maintenance of Populated Areas"), the upgrade of waste collection system should include the rehabilitation of approx. 250 waste container sites.

6.5.2 Environmental and Social Benefits

- Optimisation of the waste collection system, including shorter distance per ton of waste, lower relative emissions, optimal volume of containers;
- In future – complete source separation of wastes, further enhancement of the SWM system;
- Replacement of containers – prevention of littering of residential areas and lower attraction for birds and pests;
- Prevention of rain water penetration to containers;
- Prevention of organics rottening in containers;
- Decreased leachate formation in containers;
- Improved visual effects of containers;
- Overall improvement of sanitary conditions in residential areas;
- Overall improvement of air quality due to lower emissions from waste collection trucks (as a result of better vehicles use, routes optimization and fewer trips needed upon the installation of larger containers);

- Improved working conditions for the personnel of waste collection utilities.
- Less impact for ground water.
- Less impact of living area neighbourhood.

6.5.3 Environmental and Social Impacts and Mitigation Measures

This component is characterized by the absence of adverse impacts at the implementation stage, and no construction or installation works are required. To ensure the best possible effect of the component it is necessary to clearly specify technical and other requirements to the equipment to be purchased and to fix those requirements in the technical specifications of Tender Documents.

It is also necessary to plan measures on safe utilization/disposal of the replaced containers and vehicles. The best way to do it is to develop a disposal programme and find options for re-use of the replaced equipment, for example in other regions of Kazakhstan where it can be further used.

There will be no major social impact from this project component as daily life of the consumers will not change as compared to the existing level. However some benefits for the population could be brought out.

It is also required to develop a consumer awareness programme (including individual consumers and condominiums) to ensure the duly usage of the new system (including separate collection containers) and a proper understanding of the relation between the service quality and the tariff rate. The program implementation will contribute to an increase of the population well-being, enhance the sanitary situation in the City.

Good care of the waste management system also decreases the risk of disease sources spreading in the environment. It prevents viruses and bacteria spreading around the City or in the areas close to the landfill. But it is also required to ensure that diseases never “run out” from the landfill, especially to groundwater, cared out by rodents or birds, etc.

The fact that many of pollutants will be kept in the landfill will guarantee a better health situation in the City.

For the moment no change is to be expected at the household level as waste separation will be exercised at a specialised facility. However a better management will lead to a better visual and sanitary condition of the territories around residential houses, improve the odour situation near container grounds.

Introduction of the new waste management system at the moment will not provide for additional employment opportunities, however it will provide for a considerable improvement of the working conditions for the existing personnel.

It is necessary to arrange training courses for the staff of the waste collection system after the new equipment is purchased. When purchasing waste trucks, specific requirements to personnel training are to be included into the conditions of the procurement contract. The training is to cover measures on safe and efficient operation of the vehicles, possible emergencies and repairs. The contract conditions shall also provide for a supply of spare parts to perform planned replacements and ensure proper performance efficiency.

It is recommended to introduce a system for identification of occupational risks. The personnel of waste collection company shall take active part in such risk identification activities. The system shall be formalized by a document listing and ranking the existing risks and outlining risk management and mitigation measures, including identification of the need for protective means and clothing. The training programme should be based on this document.

The above mentioned measures are to be implemented in any institutional setup which can be established as a result of the transfer of some waste management functions to the competitive environment.

6.6 Waste Sorting Facility

6.6.1 Description of the Project Component

It is planned to establish a waste sorting facility with manual and automatic sorting and facilities to prepare organic fraction for further anaerobic digestion. taking into account the composition of the waste stream in Aktau, the following technology is proposed:

- Initial visual control of the incoming waste, removal of bulky wastes, unloading of the wastes to the conveyor belt with the loading grapple;
- Bag opener;
- Separation of the waste stream to three fractions (below 80 mm, 80 to 300 mm and more than 300 mm);
- Transportation of the “smaller” fraction to the digester;
- Transportation of the “medium” fraction to the manual sorting through air classifiers or suction devices for removal of film plastics and non-ferrous metals removal;
- Transportation of the “medium” fraction to the manual sorting;
- Magnetic removal of ferrous metals;

- Manual sorting and recuperation of recoverable materials (plastics, glass bottles, cardboard, wood and etc.) from the mid and large sized fractions at the finger screen;
- Baling of products like plastic film, paper & cardboard, plastic bottles;
- Transportation of "tails" to the landfill for disposal.

The products of this process include:

Recyclable Fractions:

- Organic Material (for Anaerobic Digestion);
- Paper & card board;
- white PET bottles;
- coloured PET bottles;
- Glass bottles;
- Ferrous;
- Non-Ferrous;
- Tetra Bricks;
- Light plastics (PE films etc.);
- Wood (non – contaminated with e.g. paint);
- Tails.

It is estimated that from 55% to 60% of MSW can be recycled.

6.6.2 Environmental and Social Benefits

Environmental benefits:

- Decreased volume of wastes sent to the landfill;
- Removal of wastes which is prohibited for disposal at the MSW landfills;
- Waste sorting with recovery of valuable fractions for further utilization;
- Separation of organic fraction and its diversion from the landfill disposal;
- Preparation of organic fraction for anaerobic digestions;
- Better sanitary situation in the city.

Social benefits:

- New jobs for different social groups, including low-income groups and women. The new MBT will need 51 workers, 4 administration personnel;
- More inert wastes sent for landfilling will result in a better health condition in the city due to reduced pollutant emissions.

6.6.3 Design Assumptions

One of the main issues to be considered at the design stage is the capacity of the facility. In 2010 the total amount of MSW collected was 85,350 tons. The facility has the output capacity of 100,000 tons of MSW per year. However the technical solution chosen provides for an extensive flexibility. This is especially important in the situation where no reliable data is available even on the current waste flow parameters. Further, some uncertainties about the future MSW generation exist including changing consumption patterns, changing packaging technologies, increasing well-being level, coupled with the growing attention to environmental issues, results of the source separation experiments which are difficult to predict at the moment.

Therefore the recommended technology involves the following mechanisms for a capacity adaptation and fine-tuning depending on changes in the morphological composition of waste:

- Currently the facility will be operated by 2 shifts of personnel. This number can be increased to 3 shifts without any capital investments, increasing the facility's capacity by 50%;
- All stages of the process are relatively independent, any one of them can be extended without the necessity to introduce major changes in other stages of the sorting process (which is important in case of significant changes in the morphologic structure of waste in 10 – 15 years or if the source separation will progress rapidly);
- There will be enough space to install additional equipment to double the capacity of all stages.

These measures will guarantee that the facility meets the needs of Aktau City in SWM services in the coming 20 – 25 years.

Other environmental, OHS and social assumptions are listed below which shall be taken into consideration at all stages of the component implementation starting from the preparation of technical specifications and design development (including detailed design development) to the facility operation.

6.6.4 Environmental and Social Impacts and Mitigation Measures

It shall be noted that the sorting line is a new facility in the waste management system of Aktau. Therefore environmental and social impacts and effects will be assessed in comparison with the "Zero scenario". Of course this new facility will interact with the environment. As it relates to the sorting line, its impact is assessed as low especially taking into account its location in the vicinity of the WWTP-2 production site and the Koshkar-Ata tailing dump.

The cumulative effect of all those facilities will be measured as soon as details of the design are known. These will be included in the OVOS (national EIA)

documents (which is part of the current study as required by the State Expertise, which will be completed later, after the finalization of the technical documentation; results of those are to be disclosed to general public) and detailed design (to be developed at the implementation stage) for approval by the environmental supervision authorities taking into account the background environment features and impacts (existing or forecasted) from the adjacent facilities. The main prerequisite for the current preliminary design development and for the future detailed design is that the cumulative impact of the two facilities (MBT and WWTP-2) at the border of the sanitary protection zone is not significant meaning that none of the pollutants emitted to the air exceed 0.5 of the maximum allowed concentration for the residential areas or the natural background. It is possible to meet this requirement, considering that the SPZ radius will be not less than 500 m and not more than 1000 m (the exact figure for the SPZ needed for the facilities will be determined based on calculations in the detailed design).

Air quality

Long-term effects

The proposed sorting line will be situated in a hangar-type building equipped with a ventilation system. Preliminary estimated emissions from the sorting process will be as shown in Table 17.

Table 17. Waste sorting line. Air emissions at full capacity operation

Pollutants	Emissions	
	T / year	G / sec
Suspended solids	1.9120	0.060629
Dust (wood, plastics)	1.4543	0.046116
Cotton dust	0.2237	0.007093
Non-organic dust	0.1954	0.006196
Metal dust	0.037	0.001174
Carbon acids	0.1374	0.004357
NH3	0.05	0.001585
Spirits	0.02735	0.000867
H2S	0.0004	0.000014

The main source of emissions is the sorting process itself. Besides emissions from equipment and vehicles are included in the assessment.

The main measure to mitigate this impact is to install air treatment equipment in the exhaust ducts of the ventilation system.

While choosing vehicles for the in-workshop operations the preference shall be given to electric vehicles. The following recommendations shall be also taken into account:

- Purchase vehicles compliant with the EURO 3 and 4 requirements;
- In dry weather the production site and the transport moving routes shall be watered;
- In case of adverse weather conditions additional measures shall be applied, viz.:
- Air tightness control in gas removal systems, places for loading and unloading of loose materials;
- Improved control of measuring devices and automated process control systems;
- Cleaning and air flushing of the piping and equipment shall be prohibited;
- Repair works causing air emissions (e.g. painting, welding, use of lubricants and oils, open fire) shall be prohibited;
- Enhanced operational control and monitoring of modes of operation;
- Accelerated regimes shall be prohibited;
- Possible dispersion of the operational time of different devices which are not employed in one technological process;
- Enhanced operational control of gas cleaning systems and equipment;
- Repair works in gas cleaning systems and equipment shall be prohibited;
- Use of the periods of adverse weather conditions for scheduled equipment checks and repair if those are planned in the nearest future;
- Check composition of exhaust gases from vehicles.

Short-term impact

The short-term impact is the environmental or social impact taking place solely at the construction or installation stage.

Emission of pollutants is the main type of impacts during construction. The main sources of air emissions are:

- Transport (main pollutants: CO, NOx, soot, kerosene, gasoline, SOx);
- Construction equipment;

› Welding equipment (main pollutants: ferrous and manganese oxides and fluorides).

Those emissions are localized on the construction sites. Standard measures shall be used to mitigate this impact, including:

› Planning of works and scheduling of equipment operation;

› Idle operation shall be prohibited;

› Only certified equipment shall be used;

› Open fire shall be prohibited, including burning of waste oils and construction wastes.

Air pollution can be also caused by dust from the storage grounds of excavated soil. Those storage places shall be equipped with covers to preserve soil, prevent dust pollution and improve working conditions on the construction site.

Detailed calculations of air emissions and dissipation patterns will be made at the detailed design stage (Volume "Environmental Protection") based on the approved methodology. The calculations are to be approved by the supervisory authorities and will be a basis for the construction company to receive environmental permits for emissions and to calculate environmental charges.

Surface water bodies and soil cover

Long-term impacts

There are no surface water bodies in the Project Area. Therefore only risks and impacts related to soil cover will be considered.

The main source of soil pollution risks are industrial and municipal waste water. The technology proposed for waste sorting is not associated with t hgeneration of industrial wastewater. However if the decision on tails compaction is made in future, this might become an issue. This decision is deemed to be possible in case of a significant increase of the waste stream amounts and strict limitation on the landfill area.

Municipal wastewater, according to the preliminary design, will be discharged to the inlet of WWTP-2. Therefore this impact can be ranked as non-significant, there are no direct impacts. The treatment performance of WWTP-2 will be in compliance with the national norms and with the EU requirements to urban wastewater treatment.

Storm runoff from the production site (administrative and production parts) is formed by the rain water and depends on the runoff factor associated with the site planning. The Project Area is situated in the arid zone with low precipitation. However the storm drainage system is foreseen as a part of the site environmental infrastructure. It will consist of collection pits, trays, side screens, and a main collector. The key pollutants contained in the storm runoff are suspended solids

(because of the soil erosion process), household wastes, road pavement components, hydrocarbons generated by vehicles and machinery.

The storm runoff is transported to the local wastewater treatment facility located in the lowest point of the site. The required level of treatment will be determined at the detailed design stage. It can be either complete cleaning to achieve the fishery norms (which are much stricter than the EU standards) or basic treatment to achieve the concentrations acceptable for discharge into WWTP-2. WWTP-2 is capable to achieve EU standards for wastewater treatment and has enough capacity to treat additional wastewater amounts from the waste sorting facility. The exact data for treatment quality (if the option with discharge to WWTP will be chosen) will be determined after the alignment of the WWTP design (currently WWTP-2 is at the stage of obtaining the detailed design approval and preparation of the construction site) and requirements to the MBT detailed design – see ESAP.

Therefore the key measures on soil and groundwater protection at the production site including production and administrative areas are:

- Construction of a collection and treatment system for the storm runoff;
- Arrangement of the site landscape, rain water collection system, especially in the areas of active machinery operation;
- Collection of household wastewater in a septic tank with further removal to WWTP-2 or local wastewater collection system taped into the sewage collector at WWTP-2;
- Washing of vehicle wheels at the exit to the facility and treatment of the generated wastewater at local treatment facilities of the block type;
- Scheduled checks of the wastewater (industrial, household and storm) removal systems and timely maintenance;
- Monitoring as per the ESMP.

Another important source of possible soil pollution on the territory of the waste processing facilities is precipitation of air pollutants which results from:

- Emission of aerosols and suspended solids with further precipitation on the soil surface on the production site and in its vicinity (not exceeding the sanitary zone size).

Significant involvement of machinery and vehicles into the processing process causes increased content of exhaust gases components in the lower layer of ambient air; its further precipitation results in the formation of the typical “transport” pollution pattern along the main traffic routes and roads; the typical list of pollutants in such cases involves lead, zinc, nickel, TPH. These impacts can be mitigated by the further measures recommended by the IFC Environmental, Health, and Safety Guidelines for Waste Management Facilities:

- Select vehicles and containers that minimize air emissions during waste loading and unloading;
- Design drop-off points to minimize queuing of vehicles;
- Sweep waste management areas and roads frequently including watering for dust control where necessary.

Potential pollution radius is limited to 100 – 250 m. To manage this risk measures for dust suppression shall be implemented; specific operation modes (including limitation for loading-unloading works) shall be developed for windy and adverse meteorological conditions.

Further mitigation is achieved through planting of greenery on the site and in the sanitary zone as well as other measures included in the "Operation regime" of the facility, including cleaning, sanitation, use of electrically-driven vehicles, step-by-step equipping of the municipal services of the city and the facility itself with waste transportation vehicles complying with high environmental standards (especially for emissions).

Further, measures included into the monitoring plan and environmental action plan shall be duly implemented.

Short-term impacts

Standard mitigation measures are to be employed in any civil construction of localized facilities as prescribed by regulatory documentation. Household wastewater is to be collected and disposed to the municipal wastewater collection system. No additional pollution of storm water is anticipated if properly functioning machinery is used and lubricants are handled according to the established rules.

Arrangement of storage places for construction materials, fuel, solvents, etc. will prevent spillages or deflations, preferably on solid basement; stocks of fuel, paints and solvents shall be limited to a 3 days demand.

In reconstruction projects vehicles and machinery might cause soil disturbance if the traffic is not arranged properly. Transportation and vehicles moving schedule on the construction and production site shall be outlined in the detailed design documents.

Vehicles parking shall be arranged on the designated plot with a solid cover. Repairs of machinery and vehicles during construction shall be arranged in the specially designated workshops (equipped with permanent solid cover and surface runoff collection system) outside the site.

Only certified vehicles which underwent technical checkup shall be allowed to the site and to works; regular visual checks of the fuel system functioning and leaks detection shall be performed by operators.

Further, littering of soil with construction waste is also a risk at all construction sites. This risk has to be mitigated by proper implementation of waste management procedures described in the relevant chapter.

Landscaping of the production site, planting of greenery shall be a part of the detailed design and an inherent part of the Contractor's works.

Construction and household waste

Waste formation is an environmental issue at both construction and operation stages. Waste streams for both stages are to be estimated in the design documentation (Volume "Environmental Protection") for each PIP component (designed separately). Based on these calculations, the Contractor and the Company (operator of the facilities) have to get permits for waste generation. It needs to be checked that the Contractor and the Facility Operator are authorized to handle wastes. Standard construction waste stream is expected. No outstanding types or quantities of wastes will result from this construction.

Construction and industrial waste require a special infrastructure to be temporarily stored at the site and then transported for recycling or safe disposal. For the best result, these processes are to be arranged into waste management system. No significant types or quantities of wastes are expected.

The waste management system shall include procedures for permits re-issue, information on waste amounts and hazardousness, registration of wastes formation, storage and transportation, removal schedule, agreements with companies licensed for waste disposal and recycling, responsibility allocation, necessary material and organizational resources, trainings and explanatory work for all workers on procedures for waste handling onsite, including visual information such as signs, markers for containers, short instructions. Wastes classification should be carried out based on the national Waste Classifier.

Based on those calculations, the Company shall also obtain an environmental permit for emissions (which includes data on waste formation) and calculate the amount of environmental charges to be paid quarterly.

Waste management adequacy shall be subject to periodic internal inspections by the responsible person within the EHS Department of the Company. It is also subject to control by the local supervisory authorities.

Where wastes are to be temporarily stored at the construction/production site, storage places are to be arranged as prescribed by sanitary norms established for production and construction sites.

Long-term impacts

During the facilities operation, the main stream of waste will come from the process line. These wastes (their types and volumes) are to be accounted for in the waste generation assessment and relevant permits from environmental authorities as well as environmental charges paid by the company. The main waste types include:

- Compacted waste tails;
- Organic waste conditioning waste;
- Waste from cleaning activities;
- Municipal solid waste (source – 40–45 persons of staff);
- Sludge of the local storm water treatment plant.

Total amount of the wastes generated in the process shall be about 40 000 TPY.

Hazardous wastes generated by the facilities will include:

- Mercury lamps;
- Lead-containing accumulators;
- Waste motor oil;
- Wipers contaminated with oil;
- Sludge from the local storm water treatment plant if containing high TPH.

Short-term impacts

At the construction stage waste management will be within the Contractor's responsibility and should involve standard procedures described above and in the normative documents.

Main types of waste include:

- Machinery servicing waste (excavators, bulldozers, cranes, cement pumps);
- Construction waste (concrete works, insulation);
- Municipal solid waste;
- Sewage residues.

Waste management plan with the components described above shall be developed by the Contractor for the construction period and approved by the local supervisory authority.

Adequacy of the procedures and results of these cativities will be checked by the PMC. It is also subject to control by the local supervisory authorities.

Wildlife

The area intended for establishment of the MBT facility and the new landfill is located in the vicinity of the Koshkar-Ata tailing dump with the transformed

landscapes. They do not make any significant contribution to the biodiversity on the level of species or landscapes.

Therefore the impact on wildlife will be determined by the overall effect on the surrounding landscapes and overall state of the environmental components. Specific measures on wildlife protection are not needed.

Additional measures include:

- Landscaping and greenery planting at the facility production site;
- Arrangement of grass covers;
- Greenery care during operation.

Details on the landscaping activities are to be included in the detailed design.

Social conditions

Long-term impacts

The waste sorting facility is the main labour-intensive stage of waste management in the future MBT. It creates workplaces for workers with different education and experience including possible employment of the marginal dwellers of the Baskudyk who were previously engaged in waste picking at the landfill.

Other social impacts are mainly of the secondary nature and result from environmental impacts of the facility. Since the facility is to be located in an industrial area at a distance from the routes where citizens move and due to generally low environmental impact, the public health and safety situation will not be deteriorated as result of the facility operation.

Upon the implementation of the new MSW collection system it will be possible to reduce the number of vehicles from 29 to 19 trucks, reduce the traffic to the landfill, resulting in a decreased amount of pollutants released in the air. There will be no significant changes in the traffic routes. The waste collection schedule will be developed to avoid peak hours, so excessive emissions from traffic jams will be avoided. The location of the Project Area in the industrial area will also provide for the low traffic impact. There are no communities on the way of the waste collection trucks between the city border and the future facility. Also due to the compact design of the proposed facilities and location of the project in the industrial area there will be no major visual impact. Under the normal operation the highest negative visual impact will be from the landfill, which will be mitigated by the operational measures, e.g. daily soil cover and can be further mitigated by the tree planting in the SPZ zone – see relevant chapter. These issues will be determined at the design stage.

The renewal of vehicle fleet will minimize respective environmental impacts. Less fuel will be needed for less vehicles. This means less amounts of exhaust gas, less brakedowns of vehicle parts. Less spare parts required for vehicles will have effect in many fields, including environmental aspects: consumption of raw materials, manufacture of spare parts, and all benefits related to the whole way of the product

from the manufacturer to the consumer (marketing, transportation, selling and etc.). Of course these effects are very small if we compare them to global ones, but still it could make some changes at the local level. The renewal of vehicles will minimize the road accidence rates. Less vehicles mean smaller scuff of roads. This results in another wide and complex effect on environment (from the comsumption rates of raw materials to road construction).

Specific assumptions are to be made due to the planned construction of a new city district, the so-called "Aktau City", at the seashore at the approximate distance of 1-2 km from the planned waste processing facility. Nevertheless, a 1 km wide Sanitary Protection Zone will be established to prevent any adverse impacts. The cumulative effect of WWTP-2, Koskar-Ata and the MBT facility will be calculated during the preparation of the national EIA (OVOS) for the project design. The scope of the preliminary assessment of all environmental impacts will meet the requirements established by the RK legislation. The overall cumulative effect from the close location of these objects will provide for a reduced land demand for the establishment of a sanitary protection zone, decrease of the air pollution due to accumulation of the gas from organic waste, wastewater sludge and landfill (pollutant concentrations at the SPZ border will not exceed 0,28 of the MAC level for the residential zone), energy savings due to the use of this gas for energy and heat production (42.2 % for energy production and 43.2 for heat production), decrease of the traffic distances for wastes and optimisation of the wastewater treatment for the MBT facility.

Short-term impacts

Some inconveniences can be caused by the increased traffic to the citizens during the construction period. Noise and vibration levels outside the fenced areas of production sites are not expected to be disturbing for dwellers, due to the fact that the construction site is well outside the residential areas. Therefore no nuisance to public will be caused by the works. However some risks might occur if non-staff persons accidentally enters the construction sites. In order to prevent accidental access by dwellers to the construction sites, they shall be fenced and properly lighted. Information boards are to be installed with the dates of commencement and completion of works, name of the Contractor and general data on the Project. Information about the works location and duration shall be disclosed to population at least two weeks prior to their commencement. Warning signs are to be installed at the approaches to construction sites. Details on stakeholders' communication including mechanisms for notification of local dwellers and grievance mechanisms are provided in the Stakeholders Engagement Plan (SEP).

Main OHS aspects and mitigation measures

Long-term impacts

The long-term effect of the PIP implementation is the establishment of the new MBT facility. Necessary measures to ensure comfortable working conditions are to be included into the design, including light, insulation of hot surfaces, temperature contrast, ventilation, control devices, availability of manuals, signboards, fire safety, safety during maintenance works, personal and group protection equipment identification and purchase. A full HS management system as specified in the tender documents shall be developed by the facility operator. Certification of workplaces upon the completion of the Project's components will not be required.

All employees working at the sorting line shall receive introductory training on the proper handling of the new equipment before it is put into operation. It is better if this training is performed by representatives of the equipment suppliers. Besides, general trainings on fire safety, loading and unloading operations, working with hazardous materials, use of the PPE, etc. shall be arranged for relevant workers according to the training schedule. Workers involved in activities incurring specific risks, shall undergo periodic trainings in the accredited educational centres issuing individual certificates. This will ensure safety and efficient exploitation of the newly installed equipment.

Emergency response and containment plans shall be developed and approved before the facility starts its operation.

Grievance procedure is to be established for workers in compliance with the national legislation and the SEP provisions.

Short-term impacts, OHS during construction

The issues related to occupational health and safety (OHS) management during construction will be included in the project design (Works arrangement plan) according to the RK regulations and best practice available in the sector considering design detailed parameters, site arrangement and works schedule. The Project Engineer will ensure that the OHS issues are addressed not only in the documents, but in the actual operations of contractors and operators. The OHS arrangements will include the management of noise, dust, smoke, odour, light, hindrances on floors, cables and installations, insulation of hot surfaces, temperature contrast, ventilation, hard physical work, availability of manuals, signboards, fire safety, construction waste handling. This document will also specify the list of working force needed and equipment to be used. Based on this lists, work and safety instructions are to be provided and necessary trainings for workers are to be arranged prior to the works commencement.

As for amenities, it is necessary to arrange a laundry room with a washing machine for dirty clothes, room for dedusting of working clothes with cabinets for outerwear and footwear. Cloak-rooms must be provided with individual cabinets for clothes and private things of the workers, the rooms for meals must have sanitary areas for dish washing and cooking.

6.7 Anaerobic Digestion and Biogas CHP Plant

6.7.1 Description of the Project Component

The Project component includes organic waste handling, anaerobic digestion, mechanical treatment, odour treatment, wastewater treatment and, automation and instrumentation, etc.

The key features of the wet anaerobic organic waste treatment technology are:

› High gas yield;

- High loading capacity;
- Low sludge production;
- Simple and stable operation;
- High performance stone & dirt removal.

Fully automatic process control program to keep track of all important process data.

The facility will be fenced to prevent occasional access of people. The proposed facility will be of the type presented on the figure below, with a digester, 15 m in diameter and 30 m in height.

6.7.2 Environmental and Social Benefits

Prevention of air emissions (Collection of biogas which would be emitted to the atmosphere);

Use of biogas for "green energy" production at CHP plant (about 2MW), prevention of negative environmental and subsequent social impacts which are associated with production of the equal amount of electrical and heat energy by conditional power plants;

Reduction of waste amounts sent to the landfill by up to 30 – 35 % owing to the removal of biodegradable fraction;

Dramatic decrease in amounts of biodegradable waste disposed at the landfill.

This benefits will, in their turn, result in a number of secondary benefits including:

- Environmental:
  - Decreased risks of leachate formation at the landfill meaning significantly lower risks for soil and underground water pollution;
  - In general the waste disposed at the landfill will be of a more inert nature than previously;
  - Elimination of environmental impacts and risks associated with the WWTP sludge including risks of soil pollution, odour, bacterial contamination, non-productive use of land;
  - Reduction of GHG emissions;
  - Compost for landscaping / agriculture;

- Significantly lower risk of fires at the landfill will help to avoid pollution of smokes, fine particulars and other toxic fire products.

- Social:
  - Better sanitary situation at the landfill and improved working conditions;
  - Elimination of odour in the landfill vicinity which is a nuisance for locals;
  - Elimination of landfill attractiveness for birds which are a nuisance for locals and a part of the negative visual impact of the landfill;
  - Significantly lower risk of fires at the landfill which means improved safety for workers, mitigation of nuisance for population and mitigation of excessive air emissions risks;
  - Use of energy potential containing in WWTP sludge for green electricity / heat generation;
  - Better energy supply to the dwellers since there will be no additional load to the grid from the WWTP and the MBT;
  - Improvement of working conditions of staff involved in collection of waste and landfilling;
  - New workplaces with no gender limitations;
  - Significantly lower risk of fires at the landfill, improving environmental conditions for the population, better health situation;
  - Learning effect of the pilot project.

6.7.3 Environmental and Social Impacts and Mitigation Measures

It shall be noted that the anaerobic digester is a new facility in the waste management system of Aktau. Therefore the environmental and social impacts and effects will be assessed in comparison with the “Zero scenario”. Of course this new facility will interact with the environment. In the case of the sorting line the impact is assessed as low especially taking into account its location in the vicinity of the WWTP-2 production site and the Koshkar-Ata tailing dump.

The cumulative effect of all those facilities will be measured duping the preparation of OVOS (national EIA) documents and detailed design for approval by the environmental supervision authorities taking into account the background environment features and impacts (existing or forecasted) from the adjacent facilities. The overall cumulative effect from the close location of these objects will provide for a reduced land demand for the establishment of a sanitary protection

zone, reduced air pollution owing to the accumulation of the gas from the organic waste, wastewater sludge and landfill, energy savings owing to the use of this gas for energy and heat production, decrease of the traffic distances for wastes and optimisation of the wastewater treatment for the MBT facility.

Air quality

Long-term impacts

In the long term the facility helps to reduce emissions of landfill gas into the atmosphere owing to the removal methane generated by biodegradable waste which would be otherwise emitted into the atmosphere. Methane is a greenhouse gas contributing significantly to the global warming processes.

The CHP facility will be the new source of emissions similar to the CHP facility of the same capacity fuelled by natural gas. The types of emissions related to combustion of biogas are:

- NOx - oxides of nitrogen can contribute to smog, ground level ozone, acid rain and greenhouse gas emissions;
- CO2 - Carbon dioxide is a significant greenhouse gas. Progressively reducing CO2 is an essential element of a global response to the risks of global warming and climate change;
- Benzo(a)pyrene (3,4) – is accumulated in soil and water. Benzo(a)pyrene is a typical carcinogenic agent.

All CHP units shall meet various EU emission standards. The only directive applicable directly to the CHP is the Council Directive 88/609/EEC of 24 November 1988 on the limitation of emissions of certain pollutants into the air from large combustion plants. This Directive is however not applicable in the case of the Aktau MBT since the planned capacity is far below the Directive's threshold of 50 MWt.

However the emissions standards set in the Directive will be met, viz.:

- SO_2 – not more than 35 mg/Nm^3;
- NOx – not more than 300 mg / Nm^3;
- Particles – not more than 10 mg / Nm^3.

Mitigation measures related to pollutant emission by combustion units will include measures aimed at the optimisation of the combustion process. The set of technical and managerial measures will address the following aspects:

- automatic or manual adjustment of the combustion process according to fuel quality and the weather conditions;
- regular maintenance of equipment;

› keeping records of the combustion and cleaning system operation.

Since the CHP is of a comparatively low capacity and situated well outside of the residential areas, emissions levels are rather low and additional specific mitigation measures are not required. The EU air quality standards (see Table 2 in Paragraph 3.1.2) will be met by the facility.

Specific requirements relate to smoke stacks parameters since they determine pollutants dissipation patterns:

› Gas flue and stack connection points must exclude heating of soil at stack basements and foundations;

› Smoke stack is to be made of metal or non-combustible materials;

› Smoke stack must have outside heat insulation. The renderer is to confirm that at any normal operation modes of boiler house there will be no condensate on the inside surface of flue-pipe. A drainage condensation device is to be installed in the bottom part of the smoke stack.

› The height of smoke stacks must be subject to calculations accounting for necessary dissipation.

Stacks parameters are calculated for each case based on the intensity of gases emission, gas composition, and background air pollution. These parameters are subject to state expertise by environmental supervisory authorities for every tender package. The sanitary protective zone around boiler houses must be established and landscaped. Its presence ensures that the necessary air quality is met at points where citizens have free access to. In the case of the Project, emissions level does not require any extension of the protective zone above the existing size.

Short-term impacts

Construction works will be accompanied by a short-term increase of air emissions. The main sources of air emissions are:

› Construction machinery and vehicles;

› Welding and cutting equipment;

› Volatile substances.

Those emissions cannot be avoided. However a number of measures allow minimising air pollution including use of modern vehicles, works scheduling, accounting for meteorological situation etc. Standard mitigation measures are to be employed as for any civil construction of localised objects as prescribed by normative documentation.

Calculations of emissions at the construction stage and standard mitigation measures are to be included into the Project design documentation and are subject for approval by environmental authorities and to environmental fees.

Surface water bodies and Soil cover

There are no surface water bodies in the Project Area. Therefore only risks and impacts related to soil cover will be considered.

Long-term impacts

Every facility interacts with the soil cover and geological basement at the operation stage. This interaction is not considered for the digestion facility at the operation stage among significant environmental aspects. Therefore the main task is to control proper handling of leachate.

Part of the liquid fraction of the digestate cannot be recycled in the process and has to be treated. The nearby WWT facility is not designed to take this wastewater and treat it together with the municipal wastewater. The liquid fraction of the digestate still contains a large amount of COD (20.000 mg/l) and nutrients such as N, P and K.

Therefore the liquid fraction of the digestate has to undergo a pretreatment prior to sending it to the municipal WWTP. A nitrification/denitrification stage will remove most of the nitrogen and COD from the water. This ensures the COD value of < 2.000.

Currently WWTP-2 is at the detailed design approval stage and construction site preparation. It is therefore decided at an official meeting that the two designs are to be aligned before the construction activities start. The parties involved are informed on this measure, resources are allocated, and the consultations involve best COWI experts on wastewater treatment as well as representatives of the local partner. This measure is also included into ESAP to make it a binding obligation. Based on the analysis of the existing design, the Consultant concluded that WWTP-2 is capable to achieve national and EU standards for wastewater treatment and has enough capacity to treat the additional wastewater from the facility. The exact data for treatment quality (if the option with discharge to WWTP will be chosen) will be decided after alignment of the WWTP design (currently WWTP-2 is at the detailed design approval stage and construction site preparation) and requirements to the MBT detailed design – see the ESAP.

To control the impacts that could potentially result from the releases of contaminated surface water, run-off generated within each facility's receiving, processing, and curing areas should be collected and managed as leachate.

Working surfaces in these areas should be constructed to withstand the expected wear and tear from site equipment and customer vehicles, and should be underlain by an impermeable layer to prevent downward and lateral migration of leachate into groundwater.

Wheels of waste trucks are to be washed when leaving the production site.

Short-term impacts

Soil disturbance at the construction stage will be mainly associated with construction of basements for the bio-reactor and the CHP plant. This soil is to be estimated on applicability for landscaping works and properly stored till these works start or disposed as prescribed by the norms.

Vehicles and machinery might cause soil disturbance if the traffic is not arranged properly. Asphalt roads are to be used for this purpose to the extent possible.

Further, littering of soil with construction waste is also a risk at all construction sites. This risk has to be mitigated by proper implementation of waste management procedures described in the relevant chapter.

Besides these risks, as was already mentioned, bioreactor reconstruction is not expected to produce any significant impacts on soil cover.

Standard precautionary measures should be implemented to avoid leakage and spillage of fuels, paints, solvents. Other measures include storm runoff collection and treatment system which was described above and will service the whole production site including bio-reactor and the CHP plant.

Standard mitigation measures are to be employed in any civil construction of localized facilities as prescribed by normative documentation. Those measures are to be included in the Detailed Design Documents (Volume "Environmental Protection" and "Construction works arrangement"). Household wastewater is to be collected and disposed to the municipal wastewater collection system. No additional pollution of storm water is anticipated if properly functioning machinery is used and lubricants are handled according to the rules (national standards or passports of the chemicals).

Construction and household waste

Waste formation is an environmental issue at both construction and operation stages. Waste streams for both stages are to be estimated in design documentation (Volume "Environmental Protection"). Based on these calculations, the Contractor and the Company (for facilities operation) have to obtain permits for waste disposal.

The waste management system shall include information on waste amounts and hazardousness, registration of wastes formation, storage and transportation, agreements with companies licensed for waste disposal and recycling, trainings and explanatory work for all workers on procedures for waste handling onsite, including visual information such as signs, markers for containers, short instructions. Wastes classification should be carried out based on the National Waste Classifier.

Construction and industrial waste require special infrastructure to be temporarily stored at the site and then transported for recycling or safe disposal. To achieve the best result, this process are to be arranged into waste management system.

Where wastes are to be temporarily stored at the construction/production site, storage grounds are to be arranged as prescribed by national norms.

Long-term effects

In the long term the main types of waste from the anaerobic digestion and energy generation stage include sludge from bioreactor (not 100% of residues from the bioreactor are suitable for composting) and wastes of consumption (MSW). The

sludge needs to be examined to assign the hazardousness class and classification number. All requirements to Waste management plans (see above) apply further.

The main volume of residues is considered the be a raw material for composting which is the next stage of the technology.

Short-term effects

At the construction stage waste management will be within the Contractor's responsibility and should involve standard procedures described in national and local normative documents as well as the contract conditions and design documents.

Main sources of wastes during the construction of pipelines are the following:

- Earth works and associated earth masses moved;
- Cutting and welding works;
- Dismantled temporary constructions;
- Household wastes.

Main mitigation measures include separate collection of wastes which can be further recycled, proper storage, timely pick-up and safe storage by authorized companies on contract basis.

Where wastes are to be temporarily stored at the construction site, storage grounds are to be arranged as prescribed by SanPiN 2.1.7.1322-03 "Hygenic requirements to disposal and detoxication of production and consumption waste". Based on these norms, sites for temporary waste storage should have a solid cover, be equipped with properly marked containers, have access ways for waste pick-up arranged. Wastes of paints and solvents should be stored in closed containers. Scrap metal should be stored separately on the plot with solid cover together with waste electrodes and should be handed over for recycling to authorized company. Wood waste where possible should be also reused or recycled. Removal of wastes should be carried out in parallel with main construction works. Burning of waste shall be prohibited.

Wildlife

The area intended for establishment of the MBT facility and the new landfill is located in the vicinity of the Koshkar-Ata tailing dump with the transformed landscapes. They do not make any significant contribution to the biodiversity on the level of species or landscapes.

Therefore the impact on wildlife will be determined by the overall effect on the surrounding landscapes and overall state of the environmental components. Specific measures on wildlife protection are not needed.

Additional measures include landscaping and greenery planting on the facility production site.

Social conditions

Long-term impacts

Bioreactor is the new facility which needs staff to operate, though its number is lower than for the sorting line owing to a wide introduction of automation means and remote controls. It creates four workplaces for workers with different education and experience level.

Other social impacts are mainly of the secondary nature and result from environmental impacts of the facility. Since the facility is to be located in an industrial area out of the routs where citizens move and due to generally low environmental impact, the public health and safety situation will not deteriorate as result of the facility operation.

Specific considerations are to be made due to the planned construction of the new city district called “Aktau City” at the seashore at the distance of 1-2 km from the planned waste processing facility. The cumulative effect of WWTP-2, Koshkar-Ata and the MBT facility will be calculated during the preparation of the national EIA (OVOS) in the framework of this Feasibility Study.

Short-term impacts

Some nuisance to local dwellers during construction can be caused by increased traffic. Noise and vibration levels outside fenced areas of production sites are not expected to be disturbing for dwellers.

The construction site is well outside the residential areas. Therefore no nuisance to public will be caused by the works. However some risks might occur if non-staff persons accidentally enter the construction sites. In order to prevent access by dwellers to the construction sites, they are to be fenced and properly lighted. Information boards are to be installed with the dates of commencement and completion of works, name of the Contractor and general data on the Project. Information about the works location and duration shall be disclosed to population at least two weeks prior to their commencement. Warning signs are to be installed at the approaches to construction sites. Details on stakeholders’ communication including mechanisms for notification of local dwellers and grievance mechanisms are provided in the Stakeholders Engagement Plan (SEP).

Main OHS aspects and mitigation measures

Long-term

There is no experience of a bioreactor and CHP plant operation in Aktau or elsewhere in Kazakhstan. Moreover, the technological process involves methane (which is inflammable) storage (up to 500 m3) and handling including pressure vessels, boilers, high temperature surfaces. It is therefore absolutely necessary to develop emergency prevention and containment plans, pay specific attention to fire safety and operational parameters at the detailed design stage. While selecting equipment it is recommended that preference is given to equipment with verified reliability and equipped with reliable system of self-adjustment in case of operators’ failures. Detailed instructions on equipment operation in Kazakh or Russian should be supplied together with the equipment. Initial staff training shall be done by representatives of the equipment supplier.

The amount of methane at the site is too small to trigger SEVESO II Directive, however it should be noted that the national requirements for the hazardous facilities are quite strict and can be compared with SEVESO requirements.

The hazardous facilities are to be registered by the local technical supervision authority. They are to be periodically checked by inspectors of these authorities. Measuring equipment is to be calibrated and checked at least once a year by accredited companies.

At the design stage standard requirements to workplaces shall be considered including due lighting, ventilation, safety, sanitary facilities, cloakrooms etc. The need for personal protection equipment (PPE) in terms of types, quality and quantity shall to be assessed prior to the launch of the facility.

A system shall be introduced to identify occupational risks. This requires an active involvement of the Company‘s staff. The system shall be formalized by a document listing and ranking existing risks and outlining the risk management and mitigation measures, including identification of need for protective means and clothing. The training programme should be based on this document. Protection means and clothes are to purchased based on this assessment.

All workplaces are to undergo attestation in the course of 1 year after the facility startup.

Short-term (construction stage)

The issues related to OHS management during construction will be included in the project design (Works arrangement plan) according to the RK regulations. The Project Engineer will ensure that the OHS issues are addressed not only in the documents, but in the actual operations of contractors and operators. The OHS arrangements will include the management of noise, dust, smoke, odour, light, hindrances on floors, cables and installations, insulation of hot surfaces, temperature contrast, ventilation, hard physical work, availability of manuals, signboards, fire safety, precautions for operations during demolition, construction waste handling. This document will also specify the list of working force needed and equipment to be used. Based on this lists, work and safety instructions are to be provided and necessary trainings for workers are to be arranged prior to works commencement.

Specific attention shall be given to testing of the new equipment to ensure proper operational parameters and overall safety as well as understanding of those rules and procedures by the staff involved.

As for amenities, it is necessary to arrange a laundry room with a washing machine for dirty clothes, room for dedusting of working clothes with cabinets for outerwear and footwear.

Cloak-rooms must be provided with individual cabinets for clothes and private things of the workers, the rooms for meals must have sanitary areas for dish washing and cooking.

6.8 Composting

6.8.1 Description of the Project Component

The digestate, after dehydration, is to be composted. Since we introduced an elaborate pre-treatment of the organic fraction to remove the bulk of contaminants, we expect to have the digestate of an excellent quality.

The composting area is designed to compost 15.000 TPY of Solid Digestate. The digestate is mixed with organic material of a certain structure to allow oxygen into the compost. This can be garden waste (shredded branches), wood chips and bark.

It is proposed to use windrow composting.

Advantages:

- It can handle feedstock with lower C:N ratios or porosity than static piles;
- Relatively-low capital costs and low technology requirements (windrow turners, front-end loaders or farm equipment will be sufficient);
- Relatively low operating costs;
- No electric power needed.

Disadvantages:

- Large area required;
- Labour-intensive technology, particularly for feedstock with low C:N ratio or porosity;
- No odour control which may require larger buffer area between site and neighbours;
- Exposure to rain, wind and cold.

For the composting facility, an area of 75 m x 275 m is needed. The largest part of the hardened surface is used to harbour the windrows. The remainder is used for curing of the compost, storage of compost, garden waste, shredding and sieving.

6.8.2 Environmental and Social Benefits

Environmental:

- The product can be used as a fertilizer;
- Decreased volume of wastes sent to the landfill;

- Decreased leachate volume;
- Decreased attractiveness of the landfill for birds and pests and subsequently – improved visual effect of the landfill;
- Re-use of the nutrients from the organic fraction of wastes.

Social:

- This fertilizer will be available for local farmers at favourable prices;
- Elimination of odour which is a nuisance for people;
- Improved working conditions for the landfill staff;
- New jobs, no gender discrimination. 2 new operators will be required in this waste management system.

6.8.3 Environmental and Social Impacts and Mitigation Measures

Air quality

Long-term impacts

Air emissions is one of the main impacts of the composting process on the environment. It is necessary to highlight that in case of the "business-as-usual scenario" emissions from rottening organics would be emitted from the landfill in an uncontrolled manner. Therefore the emissions described below are anyway lower than the "zero" scenario emissions.

Use of windrow turning equipment is designed to minimize air emissions, as opposed to wheeled loaders or conveyor loaders that drop wastes into piles.

Table 18. Estimated levels of air emissions from the composting facilities

Pollutant	Relative emission (kg / t of waste)	Emission from the composting facilities	
		g / sec	t / year
Toluene	0.088	0.04	1.3
Xylene	0.088	0.04	1.3
CH	0.066	0.032 1	1.02
Benzol	0.035	0.017	0.5
Acetone	0.132	0.065	2.06
CO	0.0044	0.002	0.07

Suspended solids	0.0013	0.0006	0.02

Accordingly, GHG emissions are expected at the level of 23-25 t CO2-eq per year.

Actual emission level is verified at the detailed design development stage accounting for the technical solutions and equipment chosen. The emission standards to be achieved will be based on the national and EU norms for air of residential areas to be achieved at the borders of the sanitary zone, considering cumulative effect of all facilities located in the vicinity.

Mitigation measures include installation of gas cleaning equipment such as scrubbers and bio-filters.

Compost conditioning line shall be equipped with de-dusting equipment at the stage of the pneumatic removal of light fraction.

Short-term impacts

Construction works will be accompanied by a short-term increase of air emissions. The main sources of air emissions are:

- Construction machinery and vehicles;
- Welding and cutting equipment;
- Volatile substances.

Those emissions cannot be avoided. However a number of measures allow minimising air pollution including use of modern vehicles, works scheduling, accounting for meteorological situation, etc. Standard mitigation measures are to be employed inany civil construction of localised facilities as prescribed by normative documentation.

Calculations of emissions at the construction stage and standard mitigation measures are to be included into the project design documentation and are subject for approval by environmental authorities and to environmental fees.

Natural Water and Soil Cover

There are no surface water bodies in the Project Area, therefore only impacts on soil and underground water will be considered.

Long-term impacts

The composting facilities are significant in terms of the area covered. They also pose some risks of soil contamination since leachate is produced during composting progresses. To avoid contact between soil and leachate, insulation system from artificial materials is to be installed and maintained duly.

The composting ground will be designed to fully prevent compostable organic material and all leachate which may be generated from escaping the designated area. The containment system will be impermeable, the surface of which will be constructed of concrete or asphalt. All drainage from the composting area will be collected for treatment or for return to the process. This is in compliance with IFC

Environmental, Health, and Safety Guidelines for Waste Management Facilities which states that the material processing or storage areas of the facility should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics, as well as systems for collecting and treating leachate.

Also a leachate management system will be designed which consists of an infrastructure and monitoring systems to collect, monitor, control, and treat leachate prior to being discharged into the surrounding environment. The extent of surface and groundwater monitoring at the facility will be based on the requirements of the local authorities.

Measures to minimize the amount of water added to compost (e.g., by covering compost material) to avoid anaerobic conditions that can cause hydrogen sulphide odours if the compost mixture contains sulphur-containing materials. The leachate production will be assessed at the design stage. The leachate production will be quite low due to the prior dehydration of the organic materials and arid climate of the territory.

Products of composting can be used in agriculture, landscaping of city area or for recultivation of damaged lands and therefore contribute to increased soil fertility. Justification of this opportunity has to be done based on detailed chemical analysis of the composting product and its comparison with existing standards for fertilizers.

The main national regulation of the RK for the use of WWTP sludge and waste processing products as fertilizers is the Technical Regulation “Requirements to Safety of Fertilizers” approved by the Order no.491 of Government of RK on 28 May 2010 and entered into force on 28 May 2011. This document sets a principal possibility to use sludge from WWTP and organic fraction of municipal waste for production of fertilizers. It also sets some framework principles for safe use of those. These recommendations are however very general, shall be applied on the case-by-case basis and do not refer to any figures.In such situation it is required to take EU Council Directive 86/278/EEC of 12 June 1986 “on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture” as reference. Reference data is provided below. This way it will be in compliance with both RK legislation and follow the EU requirements as best practice.

Table 19. Dry sludge properties as compared to normative requirements to WWTP sludge used as fertilizers

Component	86/278/EEC
Solid residual	
Lead	750-1200
Cadmium	20-40

Nickel	300-400
Chromium	
Zinc	2500-4000
Copper	1000-1750
Mercury	16-25

National standards for compost from European countries or commercial data from compost producers can be also used (as BATs).

Application methods should be described in technological guidelines accompanying every portion of compost sold which are to be developed by a specialized company based on local soil conditions, including soil composition and hydrologic regime, crops to be cultivated, crop rotation methods, concentration of individual substances in soil and in sludge such as total and mineral nitrogen, phosphorus, potassium, pollutants etc. The rules of sludge application for soil fertilization shall include but are not limited to the following (based on the recommendations of the abovementioned documents, including national, Russian and EU norms):

1 Application of compost containing heavy metals is prohibited if it can cause increase in concentration of metals in soil up to 0.7 – 0.8 of MAC (maximum allowed concentration);

2 It is not allowed to apply more than 10t/ha of compost (dry weight), pure or in mixtures; minimum period between applications should be specified;

3 Higher norms of sludge input (up to 30 t/ha, dry weight) may be applied for recultivation as well as for areas designated for tree and bush planting, nursery gardens, parks, longstanding graze lands and hayfields if their soils are not contaminated with heavy metals;

4 Application of sludge to the soils with pH below 5.5 shall be only allowed with preliminary liming if calcium concentration in sludge does not provide pH maintenance at the level of 5.5 or above;

5 Machinery designed specifically for compost of for solid organic fertilizers application can be used for compost application;

6 Application of compost can be complemented by use of other types of organic and mineral fertilizers based on calculations of total input of different elements into soil.

Short-term impacts

In new construction projects vehicles and machinery might cause soil disturbance if the traffic is not arranged properly. Since all the facilities intended for

reconstruction are situated within the city borders, asphalt roads are to be used for this purpose.

Further, littering of soil with construction waste is also a risk at all construction sites. This risk has to be mitigated by proper implementation of waste management procedures described in the relevant chapter below.

Waste management

Long-term impacts

Standard procedures for waste management as described above shall apply.

Depending on the detailed design solutions and calculation of the compost parameters, it may undergo conditioning / sieving before sending to the customers. Only in this case some waste may result from this stage. It needs to be sent for safe disposal at landfill.

Short-term impacts

At the construction stage the waste management system shall include standard procedures described for other components of the Project.

Wildlife

The area intended for establishment of the MBT facility and the new landfill is located in the vicinity of the Koshkar-Ata tailing dump with the transformed landscapes. They do not make any significant contribution to the biodiversity on the level of species or landscapes.

Improvements in the waste collection system and removal of organics from the landfilled fraction and good housekeeping will prevent establishment of pests population at the landfill and the facility.

Social conditions

Long-term impacts

In the long term the introduction of the composting facility will result in a reduced operation time of the landfill and therefore a delayed need for a new landfill and associated land allocation issues.

The generated valuable product (compost) can be used in city landscaping and in agriculture. This is especially important taking into account the poor soils of the Project Area which are not favourable for agriculture.

Short-term impacts

The construction site is well outside the residential areas. Therefore no nuisance to public will be caused by the works. However some risks might occur if non-staff persons accidentally enters the construction sites. In order to prevent accidental access the construction sites by dwellers, they are to be fenced and properly lighted. Information boards are to be installed with the dates of commencement and completion of works, name of the Contractor and general data on the Project. Information about the works location and duration shall be disclosed to population at least two weeks prior to their commencement. Warning signs are to be installed at the approaches to construction sites. Details on stakeholders' communication including mechanisms for notification of local dwellers and grievance mechanisms are provided in the Stakeholders Engagement Plan (SEP).

6.9 Landfill

6.9.1 Description of the Project Component and Design Assumptions

The waste disposal system is one of the main life-supporting infrastructures in cities, it is therefore absolutely necessary to maintain continuous operation of all parts of the SWM system. Thus in 2008, a decision of the Akim of the Munailinsky Rayon No.46 dated 05.12.2008 approved a land plot with the area of 25 ha for the construction of a new landfill (referred to as Bayandy landfill since the nearest settlement is called Bayandy).

The anticipated results of the Construction Project will be the following:

› Construction of municipal solid waste landfill;

› Installation of an animal cemetery.

The Consultant has obtained and reviewed the materials of the Feasibility study (prepared according to the RK norms) developed by a local design institute for the proposed option of the Bayandy landfill. Based on the review the following conclusions were made:

› In comparison with the existing landfill several improvements are foreseen, including;

› Disinfection of truck wheels at the landfill exit;

› New local wastewater treatment facilities for wheel washing point;

› Sanitary protection zone is free of any residential areas, the nearest settlement is Bayandy located at the distance of about 7 km; this will also help to solve the problem of illegal presence of non-staff persons within the landfill area;

› Provisions for weight control of incoming waste;

› Provisions for closure of the landfill.

However the following deficiencies are revealed:

› The technical aspects described in the FS represent a typical approach to the construction of landfills in RK which is still far below the BATs;

› Moreover, several requirements of the national legislations are omitted, including biogas collection and control system;

› There are no provisions for the construction of a checkpoint and an administrative building (building for daily living needs), and for any fencing;

› No recommendations on air and waste monitoring are included;

› Water from the disinfection point after treatment is discharged onto the land.

As described in the chapter on existing SWM facilities, the land for the new landfill was allocated in the Munailinski Rayon not far from the Bayandy settlement. However after the review of the existing FS on this landfill, a conclusion was made that it was proposed to use outdated technologies. Therefore it was decided to abandon this option. It is now proposed to apply the "industrial symbiosis" approach and locate the MBT facility, WWTP-2 and the new modern landfill at the same production site to achieve a most efficient use of land, biogas, and to improve logistics.

The new landfill will be used for disposal of waste tails amounting to ca. 40 000 TPY upon the commissioning of the MBT facility. This waste will be of semi-inert nature owing to a better gate control and removal of biodegradable waste. The technical characteristics of the landfill needed are summarized in Table 20below.

Table 20. Proposed landfill parameters

Landfill type (as per RK legislation)	Capacity needed for 20 years	
	Ton	Area, ha
MSW	1,500,000	29

Recommendations on the new landfill design parameters are included into the chapter on PIP environmental and social analysis, on monitoring, in the ESMP and the ESAP further in this Report.

To ensure compliance with the EU Directive, a leachate collection and treatment system is included in the current concept design of the landfill. To comply with the EU Landfill Directive 1999/31/EC according to the concept design the new landfill will be equipped with:

› Installation of 2 layers of HDPE liner, T = 2 mm^3);

› Installation of gravel drainage layer, t = 0.4 m;

› Conditions for daily cover of wastes;

› Landfill gas collection system;

› Landfill gas registration system;

› Early provisions for closure and after-use life;

› Options for compaction of waste onsite or for bailed waste acceptance;

- Leachate monitoring, collection and treatment system. Proper guarding of the territory;
- Groundwater monitoring wells (depth 10 m);
- Surface water monitoring points.

Gas production potential and leachate production rate and quality will be studied during the detailed design of the landfill and necessary adjustments will be made in the design. Because the waste to be disposed in the landfill will have almost no organic material, gas collection may not be a viable option. Similarly, if the water balance for the site indicates that there will be no leachate generation, leachate treatment might not be necessary.

Closure of the existing landfill and after-care

The existing dumpsite has exhausted its capacities, and its operation should be discontinued in 2013. Thus, the local authorities have been seeking for an appropriate waste disposal solution. At the meeting summoned by the Akim of the Mangystau Oblast, on 7 June 2011, a decision was made about the allocation of 15 million Tenge from the regional budget for the financing of design works required for the construction of a temporary landfill.

However, the construction of the temporary landfill is not deemed feasible due to the following reasons:

The implementation of the above-described MBT Facility/Landfill project will provide a long-term waste disposal solution for the Project Area, and the new landfill will be available for waste disposal in June 2014;

The construction of a temporary landfill would create an additional pollution source, which will have to be handled accordingly: closed and monitored according to environmental requirements thus adding extra cost to the SWM system operation;

Technically, the operation of the existing dumpsite may continue, if a special approval is obtained from environmental authorities.

Therefore, it is recommended to seek an approval and continue the operation of the existing dumpsite until the new landfill disposal capacities are available.

As soon as the new landfill is constructed, the presently operated dumpsite situated to the south from the Koskar-Ata pond will be closed to avoid its further environmental impact.

Closure and after-care planning activities should include the following:

- Development of a closure plan which specifies the necessary environmental objectives and controls (including technical specifications), future land use (as

defined in consultation with local communities and government agencies), closure schedule, financial resources, and monitoring arrangements;

- Evaluation, selection, and application of closure methods consistent with the after-care use which should include the placement of a final cover to prevent further impacts to human health and environment;
- Application of final cover components that are consistent with the after-care use and local climatic conditions. The final cover should provide a long-term environmental protection by preventing direct or indirect contact of living organisms with the waste materials and their constituents; minimize infiltration of precipitation into the waste and the subsequent generation of leachate; control landfill gas migration; and minimize long term maintenance needs.
- Financial instruments in place to cover the costs of closure, after-care and monitoring. Landfill design will consider the time needed to stabilise the waste in the landfill; after-care period will be determined based on this assessment.

These requirements are reflected in the ESAP.

6.9.2 Environmental and Social Benefits

- Elimination of air emissions;
- No need for transportation of waste tails to the landfill and elimination of emissions of exhaust gases;
- Increased green energy production;
- Leachate control;
- Monitoring system;
- Increased workers safety;
- Lower attractiveness for birds and pests;
- Lower littering of the surrounding area.

All effects are given in comparison with the “business-as-usual scenario” which involves the permanent use of the Bayandy landfill.

6.9.3 Environmental and Social Impacts and Mitigation Measures

The main impacts of the landfills are air emissions of methane, possible formation of leachate which needs to be isolated from soil and natural water bodies, dust and

litter. This chapter focuses on technical and organizational solutions to be employed at the new landfill which can eliminate or mitigate these impacts. The residual impacts are assessed, environmental benefits of the integrated solution are listed.

Air quality

Long-term impacts

MSW contains significant portions of organic materials that produce a variety of gaseous products when dumped, compacted, and covered in landfills. Oxygen in a landfill is quickly depleted, resulting in anaerobic bacteria decomposition of the organic materials and the production of primarily carbon dioxide and methane. Carbon dioxide is soluble in water and tends to dissolve in the leachate. Methane, which is less soluble in water and lighter than air, tends to migrate out of the landfill, resulting in landfill gas that is typically about 60 percent methane and 40 percent CO_2, with trace amounts of other gases such as NH_4, H_2S and other.

The proposed MSW landfill is designed to maximize anaerobic degradation and production of landfill gas, which can be burned for energy. Further, landfill gas is not generated, or in lesser quantities, if the waste material is primarily inert, such as glass. This will be the case after introduction of the sorting stage into the waste management system because most organic waste will be removed at the sieving stage and sent for anaerobic digestion and further to composting.

Additional installations for landfill gas collection and its use at CHP facility will be installed at the landfill which will result in complete elimination of this impact.

To eliminate wind impact (increasing dust and particles content in air) perimeter planting, landscaping, or fences to reduce wind are to be provided. This measure will also improve working conditions at the landfill.

In order to reduce air emissions from vehicles and transport, specific requirements shall apply to the vehicles purchased they shall be certified, preference shall be given to EURO 3 and 4 vehicles; yearly technical checkups (including emissions control) confirmed by the ticket from the authorized service / state authority shall be always present, timely maintenance and daily checks for due operation shall be performed and registered in the designated log.

Short-term impacts

Construction works will be accompanied by a short-term increase of air emissions. The main sources of air emissions are:

- Earth works;
- Insulation works;
- Construction machinery and vehicles;
- Welding and cutting equipment;
- Volatile substances;

› Dust from excavated soil.

Those emissions cannot be avoided. However a number of measures allows to minimise air pollution including the use of modern vehicles, works scheduling, accounting for meteorological situation, etc. Standard mitigation measures are to be employed in any civil construction of localised facilities as prescribed by normative documentation.

Calculations of emissions at construction phase and standard mitigation measures are to be included into the project design documentation and are subject for approval by environmental authorities and to environmental fees.

Surface water bodies and soil cover

There are no surface water bodies in the project area, therefore only soil and underground water impacts will be considered.

Long-term impacts

The landfill is a source of leachate formation which is generated as a result of rain penetration into the waste mass and degradation of the organic waste. Leachate is a dark liquid with malodour. Leachate composition varies depending on waste types disposed and landfill "age". Leachate production rate depends mainly of the precipitation and open area of the operation chart of the landfill. It is recommended that only one chart needed for disposal of a daily waste volume shall be open at the new landfill. The other charts are to be covered with intermediate coverage. Surface runoff from the covered areas is considered "clean" and can be accumulated within the landfill body or can be discharged onto the ground.

The main measure to manage risks deriving from leachate formation includes establishment of the monitoring system (monitoring wells around the landfill perimeter) and construction of the leachate collection system. As it can be concluded from the previous experience of MSW landfill operation in the region, almost no leachate is formed due to hot arid climate of Aktau. Decreased leachate formation is also expected due to removal of biodegradable waste from landfill disposal. In case leachate is detected in the monitoring wells, it is to be either pumped out and transported to WWTP-2 or diverted to the open chart of the landfill for moisturizing and dust formation prevention. The final decision on this issue as well as the water balance for the landfill aare to be made at the detailed design phase after adjustment of the WWTP-2 design.

There are 2 sources of water generation in a bioreactor landfill, one being rainwater the other one originating from the waste itself during the degradation process. The latter is known as the biological water potential, which expresses the amount of water physically and chemically bound to the waste that is released as the organic matter is converted into CH4. Basing on the model this represents about 6,800 m^3 of leachate per year, depending on the amount of waste and open cells.

Other technical solutions on soil protection include:

› Arrangement of the site landscape, rain water collection system, especially in the areas of active machinery operation;

- Local storm runoff water treatment to achieve fishery norms;
- Collection of household wastewater in a septic tank with further removal to WWTP-2 or local wastewater collection system taped into the wastewater collector at WWTP-2;
- Waterproofing of basements, protective soil embankments around the landfill perimeter, leachet collection and pre-treatment system, localization of the leachate within the landfill area, leachate monitoring system;
- Washing of vehicles wheels at the facility exit;
- Scheduled checks of the wastewater (industrial, household and storm) removal systems;
- Monitoring as per the ESMP.

If the landfill is situated at the production site together with the MBT facility in the vicinity of WWTP-2, all types of wastewater can be directed to the inlet of WWTP, directly or upon pre-treatment at the local wastewater treatment plant. Therefore if operated properly, the risks and impacts from generated waste water are eliminated.

Another risk of the soil pollution may derive from machinery operation and dust precipitation. The main polluting substances are: hydrocarbons, heavy metals and their derivatives. The risks are limited to the close surrounding of the production site and along the vehicles moving routes. Minimisation of the pollution is achieved through accurate control of the waste disposal technology outlined in this report and described in detail in the design documentation.

After the closure of the landfill and upon re-cultivation activities, the natural landscape and relief of the area will be inevitably changed. Planting of trees on the landfill body is possible in 8 – 10 years after the closure.

Short-term impacts

The main impact on soil cover will result from earth works.

The main types of impact are:

- Moving of significant amounts of soil while excavation of trenches, mixing of the soil horizons;
- Local change of the surface runoff patterns;
- Soil compaction as a result of the machinery operation and in the places of temporary storage of construction materials;
- Risks of pollution by construction wastes;
- For mitigation of negative impacts and risks the following measures are recommended;

- Removal and storage of fertile soil layer for backfilling and landscaping at commissioning stage;
- Waste management procedures as described below;
- Arrangement of storage grounds for construction materials, fuel, solvents, etc. preventing spillage or deflation, preferably on solid basement; limit stocks of fuel, paints and solvents to 3 days demand;
- Cleanup and landscaping of the construction site after works closure including complete removal of all temporary facilities, restoration of surface incline, runoff pattern etc. with restoration of soil compaction to natural state by adding 20 cm of fertile soil suitable for local plants on the damaged surfaces (local or transported soil can be used).

After development of the production site plan and landscaping plan as well as after assessment of the soil quality and applicability for green areas and re-cultivation, the decision of excavated soil management will be made. This soil can be used for future landscaping of the production site area, temporary coverage at the non-operational charts or greenery areas in the city. In any case the excavated soil shall be stored in conditions preventing dust formation and dispersion (under cover).

Standard precautionary measures to avoid leakage and spillage of fuels, paints, solvents should be implemented. Other measures include storm runoff collection and treatment system which was described above and will serve the whole production site. Those measures are to be included in the detailed design documents (Volume “Environmental Protection” and “Construction works arrangement”). Household wastewater is to be collected and disposed to the municipal wastewater collection system. No additional pollution of storm water is anticipated if properly functioning machinery is used and lubricants are handled according to the rules (national standards or passports of the chemicals).

In new construction projects vehicles and machinery might cause soil disturbance if the traffic is not arranged properly. Since all the facilities intended for reconstruction are situated within the city borders, asphalt roads are to be used for this purpose.

Further, littering of soil with construction waste is also a risk at all construction sites. This risk has to be mitigated by proper implementation of waste management procedures described in the relevant chapter below.

Household wastewater shall be collected and disposed of by transfer to the WWTP-2 inlet.

Vehicles parking shall be arranged on the plots with solid basement; repairs of machinery shall be organised in the specially designated workshops equipped with the solid cover and storm runoff collection facilities.

If the operation of vehicles and machinery is duly arranged, the risk of soil pollution is estimated as low. Storage of oils and lubricants shall be arranged in

compliance with the effectual norms and safety instructions. The stock of the oils and fuels is to be limited to the 3 days demand.

Waste management

Long-term impacts

In general, waste management issues to be employed are the same as for other facilities and were already described. Specific issues relate to waste stored at the landfill. Considering the local climate, specific concern is possible littering of the production site and surrounding area due to strong winds. In order to prevent this impact the following measures are to be employed:

- Provide perimeter planting, landscaping, or fences to reduce wind;
- Pin waste by dozers and landfill compactors immediately after discharge from the vehicles delivering the waste;
- Use soil or artificial cover materials so that deposited waste is held in place. More frequent application of cover may be required during high winds or in exposed areas;
- Install strategically placed mobile catch fences in extreme weather conditions;
- Temporarily close the facility to specific or all waste or vehicle types when weather conditions are particularly adverse.

The landfill operator needs to get permits for waste handling and disposal specifying amount of waste and their types which is to be re-approved at periodic basis. Staff involved into waste handling shall be trained and attested by designated professional training centres.

Short-term impacts

Standard procedures for waste management will be applied during construction.

Wildlife

The area intended for establishment of the MBT facility and the new landfill is located in the vicinity of the Koshkar-Ata tailing dump with the transformed landscapes. They do not make any significant contribution to the biodiversity on the level of species or landscapes.

Improvements in the waste collection system and removal of organics from the landfilled fraction and good housekeeping will prevent establishment of pests population at the landfill and the facility.

Social conditions

The main social impact of the new landfill construction is safe disposal of municipal waste and moving of the landfill away from settlements, prevention littering around the facility. At the construction stage there will be no significant impacts since all works are localized at the site. Due measures to prevent unauthorized access the construction site shall be taken as described for other components.

Occupational health and safety issues

Long-term impacts

The main sources of OHS risks at the production site are:

- Machinery;
- Waste itself;
- Slopes within the landfill;
- Emergencies described below.

To mitigate this risk standard safety procedures are to be followed. Before the facility start-up, it is necessary to carry out an assessment of the need for protective means, need for personnel trainings, develop relevant plans, allocate time and budget and implement those plans. This measure is included into the ESAP.

Each new employee shall undergo introductory training courses on safety (general and specific relevant to particular function). Visitors are also to be instructed on safety issues, they are to be guided by the company representative and provided with protection means such as helmets, etc.

Noise

The preliminary assessment results indicated that this noise level is significantly below the maximum allowed levels. Therefore additional measures on noise monitoring and control are not needed. However this conclusion is to be confirmed while detailed design development after the detailed list of equipment is defined – for details see chapter Monitoring below.

Emergencies

Inflammation of waste is the most common emergency at landfills. The main causes of inflammation include violation of waste disposal rules, acceptance of smouldering waste batches. As a result the landfill body may be unstable, sharply increasing emissions of pollutants and inflammation of products. Removal of biodegradable waste from the waste stream sent to the landfill, and methane collection system are the main measures which are expected to significantly reduce this risk. However some additional measures are recommended, including:

- Gate control as described in the ESMP below;
- Regular compaction of wastes and temporary coverage with soil;
- Gas drainage installation;
- Watering of waste in dry hot periods (can be done with leachate);
- Machinery and vehicles shall be equipped with spark guards;
- Prevention of non-staff persons' access to the production site.

These recommendations are to be accounted for at the design stage and implemented during the operation of the facility.

Short-term impacts

To mitigate OHS risks during construction, standard safety procedures are to be followed by the Contractor and monitored by the Project Engineer. This involves precautionary measures to be taken during general civil works, execution of works

in trenches, loading, unloading, lifting mechanisms, excavators and bulldozers, earth works, use of fuels and other chemicals.

Before the works commencement, it is necessary to carry out an assessment of the need for protective means, need for personnel trainings, develop relevant plans, allocate time and budget and implement those plans. Each new employee shall take an introductory training course on safety (general and specific relevant to particular function). Visitors are also to be instructed on safety issues, they are to be guided by the company representative and provided with protection means such as helmets, etc., relevant record shall be made in the registration log.

This measure is included into the ESAP.

6.10 Cumulative Environmental and Social Impacts

The aim of this section is to assess the potential cumulative impacts that might result from the proposed development. The assessment will consider both the overall cumulative impacts resulting from interactions between different components of the SWM project which have been described in previous sections and interactions between the SWM project and other existing activities/facilities in the vicinity of the project area. Appropriate criteria were used in the technical chapters and respective appendices of the Baseline Study to assess the potential impact of the proposed development on the site and the surrounding area.

Existing activities near the proposed Aktau MBT facility and the new landfill include the existing MSW landfill and the municipal wastewater treatment plant (WWTP).

Existing landfill located to the southwest from the planed Aktau MBT plant will run until the new landfill is commissioned. The WWTP operations are currently permitted until 2020. The main change that would be experienced by the existing and surrounding developments, as a result of the proposed development, would be the permanent addition of an MBT facility and new landfill site. Other changes as a result of the MBT plant being in place would be treatment of wastewater sludge generated in WWTP at MBT plant, which would be beneficial and sustainable on a cumulative level. Integration of the waste management facility with WWTP-2 allows elimination of environmental impacts and risks associated with the WWTP sludge which is one of the main impact sources in the wastewater treatment process. Those impacts and risks involve soil contamination, odour, bacterial contamination, non-productive use of land. 40 000 TPY of sludge will be isolated from environment through the transfer to the bioreactor. The sludge energy potential will be utilised for green electricity.

For each technical issue (air quality, landscape, traffic, noise, hydrology, environment, cultural heritage and planning) possible effects from the proposed development and the cumulative effects were identified. The potential cumulative impact from the proposed solutions is outlined below.

6.11 Environmental impacts

Increased efficiency of resources use

Introduction of the waste sorting facility into the solid waste management system will allow an extensive recovery of valuable fractions from the municipal solid waste stream which was previously sent to the landfill. At the same time the volume of waste sent for final disposal will decrease by 50 – 55%. This measure is the basic step towards an enhanced waste management system in the city and can be elaborated further as consumer's awareness increases.

Reduction of waste amounts sent to the landfill

Amounts of waste sent for final disposal will decrease by 50 – 55%. This is in line with the national legislation (Environmental code) and the EU Waste Management Framework Directive.

Significantly decreased amounts of biodegradable waste disposed at the landfill

The major part of biodegradable waste fraction will now be sent to anaerobic digestion. This benefit will, in its turn, result in a number of secondary benefits, including:

- Decreased risks of leachate formation at the landfill meaning significantly lower risks for soil and underground water pollution;
- Better sanitary situation at the landfill and improved working conditions;
- Significantly lower risk of fires at the landfill which means improved safety for workers, mitigation of nuisance for population and mitigation of excessive air emissions risks;
- In general the waste disposed at the landfill will be of a more inert nature than previously. Stabilisation and therefore the aftercare period will be reduced by pre-treatment.

Green energy

Further, one of the essential environmental benefits is energy recovery from the organic waste stream and generation of green electricity and heat energy from biogas. This energy will be used for technological processes at the waste management complex; it is therefore close to self-supporting system with minimum consumption of resources from the outside. Collection and utilization of biogas will also result in reduction of uncontrolled air emissions of the so called "landfill gas" (mixture of carbon dioxide and methane) by 90 – 95 %.

Air quality

Overall effects of the proposed development on air quality are considered to be negligible and no cumulative impacts have been identified.

Baseline air quality monitoring results and information have been collected in respect of the Aktau MBT facility and new landfill site which take into account existing traffic and operations associated with the existing landfill site and WWTP. The predicted long-term contributions from the proposed MBT and new landfill owing to the encapsulated type of waste and WWTP sludge treatment will result in reduction of emissions compared to the existing situation.

Vehicles coming to and leaving the facility during the construction period can cause an insignificant change of the air quality at the existing site and surrounding

area. Whilst during the operation stage there would be no significant cumulative air quality impact from the surrounding road network. Dust surpressing measures will be included in the environmental protection section of the detiled design documentation.

Provided that good operational practices are implemented, the potential increase in dust, litter, odours and bio-aerosols will be minimal which subsequently equates to little or no change on the cumulative impact of an operational MBT, landfill and WWTP on site.

After a thorough assessment of potential emissions produced by the development it was concluded that with dully implementation of the mitigation measures defined in the ESIA and OVOS there would be no significant adverse air quality effects for both human and environmental receptors which cumulatively would not hinder the site or the surrounding area and the residual impact will be insignificant.

Landscape

The area for the proposed facilities is considered as “disturbed” and has a very low visual and environmental value. No long-term cumulative effects are anticipated, although the existing landfill to the south of the Project Area has some visual impact already.

However, as the operation time of the existing landfill is limited and the area will be recultivated after its closure, these effects would be restricted to the short to medium term and would in some cases assist in screening the proposed development from certain viewpoints. The new landfill is planned partially below the land surface, so it will not have such negative visual impact.

All buildings will be constructed in the same area with the landfill. From far away it will look like part of industrial suburb with low buildings. So they will not affect very much the landscape and visual impact of the area. Besides, there are no any important cultural or architectural objects or residential areas in the Project Area which could be negatively affected.

Furthermore the site benefits from being at a substantial distance away from significant surrounding buildings and landscape features, the cumulative impact is considered to be minimal.

Noise

All the process lines and equipment of the proposed Project will be designed and built according to EU noise regulations for operators inside the plant and for neighbours. Incoming and outgoing transport vehicles are the main source of noise around and inside the plants. Other noise sources include handling machines such as mechanical shovels, loaders, hydraulic shovels, screeners, shredders, grinders, pumps, agitators, motors used for the ventilation network, and VOC treatment units. The noise levels from the on-site noise sources will be reduced by using appropriate noise reduction measures defined in the ESIA.

The on-site operations would not have any significant effect on the receptors and as such it is concluded that there would be no cumulative impact with regard to noise on site.

Geology Hydrology and Hydrogeology	It is considered that there will be no additional ground water impacts as a result of the proposed development with all potential issues mitigatd through the measures defined in the ESIA. In respect of surface water the proposed design of the surface water attenuation features provides adequate capacity for both the landfill and the proposed MBT facility.With due implementation of the mitigation measures definrd in the ESIA and OVOS the residual impacts will be insignificant. It is therefore considered that there are no significant cumulative impacts associated with the proposed development.
Cultural Heritage	As the Project Area is located close to the existing operating landfill there will be no direct impacts on cultural heritage. There are no nearby buildings of historic interest in the area, therefore no cumulative impacts have been identified.
Climate Change	A review of alternative technologies demonstrates that the MBT technology is the one of the most beneficial waste management methods in terms of reduction of GHG emissions. The proposed MBT plant with an anaerobic digestion facility would therefore be beneficial in providing a permanent source of energy recovery which would reduce dependence on fossil fuels. Reduction of GHG emissions is achieved through biodegradable waste separation and anaerobic digestion with collection and further use of the total volume of recoverable biogas. If the landfill is be situated in the same production site, biogas produced by the waste disposed will be also collected and used in CHP for energy production to prevent emission of the pollutants in the air. This means that all emissions of the landfill gases (consisting of CO2 and methane which are both GHG gases) are diverted from the atmosphere to the energy production cycle. GHG emissions for the WWTP sludge will be also avoided. Calculation of the GHG emission reduction indicated that annual GHG emissions avoided as a result of the PIP implementation will be around 60 000 t CO2-eq per year after the facility starts to operate at full capacity (Including the indirect savings due to the energy savings from the green energy generation calculated through the average for the RK power grid. Direct saving of the GHG phisically emitted from the waste management will be around 13 000 -15000 tons CO2-eq per year). According to many studies, the Caspian region is now in its “wet” stage which corresponds to higher precipitation levels. Very few climate models show the increase of precipitations in the area, no considerable changes are expected in the climate model with respect to temperature and precipitation levels (according to data from http://www.climatewizard.org/). Options for closed cycle of water use at the waste processing facility. Closed loop water systems (with the use of wastewater after-treatment) are prohibited in this area due to possible presence of radioactive contamination which might accumulate. However discharges of waste water will be avoided since it can be directed to the nearby WWTP (after pre-treatment or directly).
Improved monitoring system	The extensive monitoring of waste management activities and related environmental and social impacts as recommended in the ESMP (see below) will be a part of the Project implementation and future facilities operation.

6.12 Socio-economic impacts

The proposed development would increase direct employment (Due to the construction of the MBT facility) and provide permanent employment and investment opportunities to the local economy which would be beneficial. During the construction period 5 new operators will be required, and 73 new work places will be created upon the works completion. The degree of separation from sensitive receptors and the lack of impact from the existing waste management operations support the view that additional waste management development at this location would not have a significant effect on the local economy and population.

Improvement of working conditions of staff involved in collection of waste and landfilling

Purchase of new waste containers will improve the sanitary situation for workers. Old containers usually had been contaminated with different type of waste. In the mixture of municipal wastes it is possible to find old paints, polish, batteries, etc. It is bad that all these things come to landfill, but it is crucial if all these waste are in an open box or container. They spill in the container and contaminate it. Later they slowly evaporate. Contacting with other materials in containers they become even more dangerous. Many of these pollutants are impossible to clean. Another reason to have new containers is that usually they are lighter and have wheels. They are more convenient to handle for workers.

Purchase of new machinery will improve working conditions because they will do the work which has been done manually before. It will make physical work easier and/or minimize it. New vehicles also will help to reduce the contact between workers and waste. It will improve the sanitary situation for workers. Owing to changes in work conditions (less manual work), less pollutants will carried away with shoes and clothes of workers.

During the design works for the new facilities (MBT facility, new landfill) the best practice will be implemented with regard to the arrangement of workplaces and OHS measures.

Better living conditions in the city

Overall enhancement of the living conditions in the City of Aktau will be mainly attributed to the improvement of the waste collection system. This includes prevention of the city area littering, lower emissions from waste trucks, timely collection of waste, and better awareness of people of waste disposal rules.

Improved public awareness

As it was already mentioned, consumers' awareness is among the main factors required for the introduction of a source separation system as well as for the due use of any waste collection facilities. This Project involves wide-scale public consultations starting from the early stages of works. NGOs, representatives of smaller and medium businesses, authorities involved in SWM, numerous mass media are informed on the main ideas and technical solutions best appropriate for Aktau. They disclose this information further to general public. To the large extent this activity is guided by the SEP developed for this Project. The purpose of the public awareness programme is to achieve common understanding of the new waste management system setup and rules of its use, prepare consumers and authorities to the forthcoming changes, explain the ways and milestones of services improvement, explain future tariffs and importance of payments for sanitary

situation and living conditions in Aktau, avoid risks for collection system staff and population.

New workplaces for different social groups

Upon the Project completion the new SWM system will provide about 40 new workplaces at the MBT facility for workers of different educational level, for both men and women. This includes employment opportunities for marginal population groups including those of the Baskudyk settlement who already have obtained some experience in waste sorting at the landfill which is under closure now. This will include additional provision of information about the legal work possibilities to them (see theESAP). These new jobs will be safe, regularly paid and will provide all guarantees in accordance with all national labour norms.

All new workers will be employed in accordance with all requirements set forth by the Kazakhstan law, without gender or age discrimination. Employment procedure will comply with the applicable legal requirements. There will be announcements made about the new workplaces, and then everybody could file his/her application. Additional measures to inform the dwellers from the old landfill about these opportunities will be taken and to fill at least 50% of relevant workplaces with them if they do apply. If it is necessary a competitive selection could be arranged. The best of all applicants will obtain the new jobs.

Learning effect of the pilot Project

This is the pilot Project in waste sorting and green energy recovery in Kazakhstan. At the same time the national environmental legislation requires wide introduction of practices which aim at waste minimisation and recycling, biogas recovery and green energy. It is therefore expected to have significant learning effect for future modernisation of waste management practices all over Kazakhstan. Due monitoring and registration of milestones is therefore a vitally important part of the Project.

It is therefore obvious, that the PIP will have a positive environmental impact from the viewpoint of optimal use of resources, energy, higher efficiency solid wastes collection, occupational health and safety. However due implementation of the Project shall involve careful planning, environmental assessment and precautionary measures as well as an extensive dialog with the stakeholders. This includes elaborated permitting procedures which are a necessary part of the environmentally and socially important projects which may imply potential risks if not properly managed.

Anyway, at the design and implementation stages of the Project special attention should be paid to foreseeing/assessment and mitigation of certain adverse impacts and risks which may arise from the construction works.

Summary of environmental and social impacts and risks resulting from the PIP

Construction works will be located at the new facility production site which is well remote from the residential areas and places of public presence. They will be therefore of short-term and localized nature. Most of those impacts will be similar to the short-term adverse impacts typical for any kind of civil construction and earth works. These impacts could include minor traffic disturbances, pollution of air with dust and emissions from vehicles, soil run-off and sedimentation, noise, odour and light nuisance, additional waste generation. However due precautions to

ensure safety of workers as well as measures to prevent unauthorized access of the construction site by dwellers shall be foreseen.

At the operation stage only minor impacts are expected: the new facilities will need electricity (less than the CHP will generate), will produce some air emissions and wastewater. If compared to the baseline scenario, those impacts will be well offset by the environmental benefits. In order to ensure expected results of the facility operation, the physical components of the Project shall be designed, installed, operated and maintained in strict conformity with relevant health and safety laws and regulations (national, EBRD and FIDIC as well as those outlined by the current FS in technical and E&S parts).

In terms of social impact, closure of the existing landfill (which will not result from this Project but is a part of the baseline scenario) may cause economical displacement for the illegal waste pickers, but Project implementation can provide legal job opportunities for them.

Mitigation measures will be proposed taking into account the relevant local laws and regulations, as well as the best national and international expertise. Participation of international consultants during the design, tendering and construction supervision will facilitate successful implementation of the Project in line with the best international practice. All significant negative impacts will be mitigated through the mitigation measures defined in the ESIA and OVOS and the residual negative impact from the project implementation will be insignificant.

A summary of mitigation measures and additional protection and preventive activities will be provided in the form of the Environmental and Social Action Plan (ESAP) in Chapter 5 of this Report.

Monitoring is one of the core functions within environmental and social management. The Environmental and Social Action Plan (ESMP) is also developed for the future Project to ensure a proper basis for the facility operation, public communication and environmental protection. The Project monitoring and reporting system will include measures ensuring transparency of the Project progress and environmental improvements, enabling involved companies to meet the local regulatory requirements and operate the facilities following the best international environmental management practices. The longer-term investments can be planned on this basis.

It is assumed that the PIU will consist of experts which have already obtained experience of EBRD-funded projects implementation. This team is also involved in the implementation of the Aktau Water Project including the city water and wastewater facilities reconstruction. This setup ensures that the Project implementation and related knowledge will be duly transferred to the employees of the Company.

7 PRs Compliance Status

Environmental and social audit and analysis of the Company (GKP "Koktem") as well as of the city's SWM system in general were carried out by the Consultant based on the 2008 Environmental and Social Policy EBRD project requirements in order to determine the Company's performance and the Project's compliance with the relevant EBRD PRs.

Environmental and social audit and analysis involved visits to the Company's facilities, revision of documents and reports, interviews of the key specialists in waste management and other processes, meetings with top managers of the Company and representatives of the relevant health, safety and environmental supervision authorities. Results of the audit and analysis are presented in the following sections of Table 21.

Table 21. Assessment of Project Requirements Compliance

PR 1 – Environmental & Social Appraisal & Management
E&S assessment of the baseline situation and the Company
The Consultant found that the Company's EHS management system has significant gaps, including monitoring system, records and other documents keeping and analysis, communication patterns. They are summarized in the body of the E&S audit and assessment report. Considering the current financial situation of the Company coupled with restructuring and the overall lack of qualified workforce, in the opinion of the Consultant, it is not feasible to aim at establishment of a certified management system in the coming 3 years. However some working EHS management system needs to be put in place. It will be established during the introduction of the new waste management system.
The list of corrective actions proposed to the Company and recommendations to the future SWM system operator is included into the ESAP.
E&S assessment of the potential Project impacts
In accordance with the national legal requirements, Environmental Impact Assessment is an integral part of the Feasibility Study and shall be approved by the state environmental expertise at the early stage (FS stage).
The E&S assessment in accordance with the EBRD rules is prepared by the Consultant and presented in the current report for each PIP component. Its results will be disclosed to public on the EBRD web site and to the local public and other stakeholders during the presentation of the different stages' results and during the final public hearings in Aktau.
An Environmental and Social Action Plan, Environmental and Social Monitoring Plan and a Stakeholder Engagement Plan were prepared for the Project. These will guide the Company

to full compliance with the national environmental and social legislation, information disclosure requirements of the Aarhus Convention (Kazakhstan has adopted it), EBRD PRs 1-8 and 10 as well as EU and best practice examples where feasible.

PR 2 – Labour & Working Conditions

Activities of the Company comply with the relevant national labour, public safety and OHS laws. The Company arranges training courses on health and safety issues, assesses working conditions, compensates working in dangerous conditions with salary premiums, free milk and additional leave days, arranges medical examinations, provides individual and group protection means; and reports on those issues to the supervisory authorities as prescribed by the effective legislation. For better compliance with international standards the Company in cases where national legislation does not fully provide for sufficient requirements (non-discrimination, retrenchment and workers' accommodation, as well as problems with risks of non-recognition of freedom of association) will elaborate a policy to render its activities in accordance with EBRD PR 2, as described in ESAP.

Several problems identified (e.g. unsafe work implementation, lack of the PPE use, poor documentation, etc) are of localized nature and can be solved through the enhancement of the OHS management system and SWM system upon the PIP implementation.

Compliance at the Project implementation stage (including Contractor's compliance) will be ensured by means of tender documentation (specific requirements chapter), development of recommendations for design developers, and inclusion of relevant measures into the ESAP. Specific attention shall be given to methane utilization facilities if included into the Project scope since they fall in the category of dangerous industrial facilities.

Additional requirements will be developed for the future operator of the newly constructed facilities. Specific attention will be paid to the level of the employee's qualification, safety records (if applicable) and quality of the occupational health and safety management system. This requirement will be formalized as recommendations in the tender documents for sorting and energy recovery facilities operators.

The Company tries to apply better labour conditions then respective requirements are introduced in the existing legislative system of Kazakhstan. It commits to follow PR2 requirements even if they are stricter then the national law.

PR 3 – Pollution Prevention & Abatement

ESDD was carried out with a focus on waste disposal (utilisation) options and a review of the collection practices.

The "hot spots" identified involve the lack of environmental information due to deficiencies in the monitoring system, unsatisfactory maintenance of the existing landfill, littering of the city area. A proper environmental monitoring system is required for pollution prevention and abatement.

Pollution prevention and abatement measures will apply to the updated SWM collection system and to the MBT facility which is to be introduced into the solid waste management system as a result of the investment Project implementation. Relevant recommendations are developed as a part of this study to be further included in the detailed design, technical specifications and Employer's requirements of the tender documents.

Normally those facilities do not produce significant environmental impacts except for those associated with the use of energy and water in production processes. The proposed facility will operate using the green energy generated by CHP unit driven by biogas. Therefore this impact is also mitigated by the proposed concept design.

Mitigation measures will include treatment of generated leachate, introduction of closed loop water systems (where feasible), monitoring of emissions and gas cleaning equipment (if needed), proper design of the landfill with reliable insulation suitable for particular geological conditions. Measures will be also proposed to prevent littering during MSW collection.

Environmental benefits will include a significant decrease of wastes amounts to be landfilled,

materials recovery and energy recovery, reduction of CO_2 emissions.

PR 4 – Community Health, Safety & Security

In general the Project is aimed at the improvement of waste management services in the city of Aktau and to the enhancement of the living conditions.

Although it is anticipated that the Project will have a long-term positive impact on the community, a due environmental and social assessment has to be carried out to ensure that: i) the cumulative effect of the established facilities and other industrial facilities will be within the sanitary norms; ii) proper safety measures will be applied in case of the methane recovery facility establishment; iii) requirements to the operators of the dangerous facilities are completely met.

The first requirement will be met at the FS stage and at the design stage; the last two are included into the ESAP to be met at the implementation stage.

The last two requirements will be met through proper arrangement of the tender process, adequate EHS management system as well as the local supervisory authorities, as recommended in the ESAP.

Negative impacts at the construction stage are likely to be localized at the construction site which is outside the city area. Therefore no health and safety risks for the population are identified. The only risk can be posed by unauthorized access the construction site which is to be prevented by proper arrangement of the construction site, including information shields, fencing, lighting and guarding. The Contractor will be requested to develop the EHS management plan for the whole construction period. These and other key recommendations on works arrangement will be included into ESAP.

PR 5 – Involuntary Resettlement & Displacement

Physical resettlement is not identified as relevant to the Project because all work will be carried out at the land plot specially designated for industrial purpose (currently two options are considered: the first one at the production site adjacent to WWTP-2 or at the land plot in the Munailinsky Rayon. Both land plots are situated well outside the city area and are state owned. No local dwellers will be affected. The dwellers that might be economically displaced due to the closure of the old landfill will have new job opportunities at the new MBT facility, which is included in the ESAP.

PR 6 – Biodiversity Conservation & Sustainable Natural Resource Management

PR6 is not identified as relevant to the Project because all work will be carried out at the land plot specially designated for industrial purpose with very low biodiversity potential.

PR 8 – Cultural Heritage

Not identified as relevant.

PR 10 – Information Disclosure & Stakeholder Engagement

The Project is classified A under the 2008 Environmental Policy since it involves municipal solid waste management and processing facilities. Therefore special procedures for the Projects A regarding ESIA and information disclosure are followed to ensure due transparency and common understanding of the proposed investment Project, including social and environmental benefits as well as risks.

Commensurate with A level Projects, a Stakeholder Engagement Plan (SEP) is developed - see below. It i) identifies potential stakeholders, ii) the Company's approach to and legislative requirement for public information disclosure and/or communication with its workforce; and iii) outlines an external and internal grievance mechanism; and iv) can be used as a guideline to access to environmental information by any person or legal entity.

8 Environmental and Social Monitoring Plan

8.1 General Approach

Operational environmental monitoring is a complex of control measures for main environmental components, including air, surface and underground water, soil, sanitary situation and radiation around the industrial facility. The main aim of the monitoring is to fix behaviour of the key parameters of the environmental components quality (from the point of view of landscapes and quality of life), indication of impact sources, creation of a basis for mitigation measures, development and overall environmental performance improvement in the Company and within the Project Area.

The key assessment criteria are data of the instrumental measurements and laboratory tests as well as qualitative data and observations, operational parameters of the facilities (such as fuel and electricity consumption, etc). The main principle of the environmental monitoring is continuous and periodic nature of observations, compatibility of results, comparison with the threshold figures and tracking of changes and trends.

This chapter includes a guidance on the approach to arrange environmental monitoring for every Project component (including some general observation at the future production site and within its sanitary protection zone). Measures are proposed for each Project component to monitor each environmental parameter (air, water, soil, wildlife, radioactivity, sanitary conditions) which is likely to be affected. It shall be noted that this also means monitoring of working conditions and living conditions in the vicinity of the production site. This structure of the monitoring plan allows for its implementation in any organizational setup which might emerge in the city after the elements of the waste management system are transferred to the competitive environment. Responsibility for communication of this monitoring plan will be with the Client (NK SPK Kaspij).

Another measure to increase flexibility of the current Plan in case of future institutional changes is to develop recommendations on E&S monitoring for the

implementation and operation stages separately. They differ in terms of the monitoring methods, institutional arrangements, etc. Those two stages also differ significantly in terms of impact scale and sources as indicated in the chapter above. This Plan accounts for those differences and allows maximum possible control and mitigation of the mentioned impacts. It is also designed to achieve best environmental results from the PIP implementation.

Another aim met through due monitoring arrangement is the formation of a database for informed decision-making on the Company's environmental performance improvement and increased awareness of population on the improvement of the waste management system and rules of its use. This issue is specifically important since this is a pilot Project for Kazakhstan and will be most probably serve as an important case study for further introduction of waste recycling facilities in the country and other CIS regions. It is therefore very important to have clear performance indicators of the Project.

8.2 Environmental and Social Monitoring Concept

8.2.1 Waste Collection System

Although the Waste Collection System is not PIP Component, it is however a major element of overall Waste Management System in Aktau. The recommendations for environmental and social monitoring are outlined below.

The main instrument for environmental and social monitoring of the waste collection system is consumers' service agreements fixing amounts of generated waste, collection time, containers' location and type, etc. Fulfilment of the collection company's obligation under these agreements shall be fixed in daily logbooks. It is recommended to not only fix address and amount of waste collected by the truck, but also to make comments in free format which can be used to enhance collection services, customers' communication or working conditions.

The daily reports are to be collected, analysed and filed in the collecting company in the systematic way.

8.2.2 MBT Facility

Most of the following monitoring measures are to be performed for the waste processing facility (including MBT facility, administrative building, supporting technological facilities, and the landfill) as a whole.

Gate control

Wastes are accepted at the MBT gate checkpoint. Gate control involves checking of the waste passports and the waste collection log, visual inspection of the MSW batch delivered, weighting of the truck and entering these data to the unified data system. Radiation control (of gamma-rays) is also performed at this stage.

In case if the gate control reveals any deviations from the normative parameters (increased radiation, presence of wastes of 1 – 3 class etc), the MSW batch is not

allowed to enter the facility. Otherwise the truck proceeds to the reception chamber.

When the truck leaves the facility, it is weighed again to precisely measure the amount of waste delivered.

Air

Air emissions sampling is to be performed quarterly. Samples are to be taken in the working area of the facility and at the border of the 1 km sanitary protection zone established around the MBT facilities and landfill. A set of parameters to be measured is determined by the specific nature of the facility and includes NH4 in line with such standard parameters as CO, NOx, dust, particles, SO2. The list of the substances to be identified and the threshold concentrations are to be adjusted at the stage of detailed design development with regard to the existing background concentrations provided by the local meteorological service and in compliance with EU emissions standards described in section 0. This list is to be approved by the local supervisory authorities. The environmental charges are calculated on the basis of these approved tests as prescribed by the Tax Code.

The air quality monitoring system shall also include measures to receive weather forecasts, especially to receive warnings on the coming adverse weather conditions (AWC) including dust storms. The AWC warning shall be a signal to start executing additional air protection and health and safety measures.

Waste water and groundwater monitoring

If leachate is detected in monitoring wells, its chemical analysis shall be performed. Theoretical calculations of the leachate compositions are to be included in the detailed design. Measures on the leachate management are to be developed upon consultations with the WWTP-2 designers.

The wastewater from the waste management facilities will be pre-treated prior to discharge to WWTP-2. The main point for wastewater monitoring shall be the inlet and the outlet of the local wastewater treatment plant. Tests are recommended every month and in case of disturbances of the operational mode. Surface runoff shall be tested for content of TPH, suspended solids surfactants, BOD, COD, heavy metals and N-containing substances (N total). Treatment can aim at the fishery norms (which are much stricter than the EU standards) or at the concentrations acceptable for discharge into WWTP-2. The WWTP-2 is capable to achieve EU standards for wastewater treatment and has enough capacity to treat the additional wastewater from the facility. The exact data for treatment quality (if the option with discharge to WWTP is be chosen) will be determined upon the alignment of the WWTP design (currently WWTP-2 is at the detailed design approval stage and construction site preparation) and requirements to the MBT detailed design, see the ESAP. The list of the substances to be identified and the threshold concentrations are to be adjusted at the detailed design stage. This list is to be approved by the local supervisory authorities. The tests are to be performed by an accredited laboratory, and test results shall be submitted to the local supervisory authorities. Environmental charges are calculated on the basis of these approved tests as prescribed by the Tax Code.

Soil

Assessment of the soil pollution is done based on the soil sampling. Geochemical survey of soils is done based on plots of 5x5 or 10x10 meters at the production site and within the sanitary zone. % samples are to be taken each time.

Specific soil monitoring measures are to be applied at the landfill and at the composting facilities. The assessment of the baseline conditions will be done during the EIA, the Monitoring Plan will be the same, as for landfill – see Landfill section below.

Separate process shall be arranged for compost quality monitoring. This is a part of the operational / quality monitoring which is however closely connected with the environmental monitoring and shall be arranged properly. In particular, detailed laboratory testing of compost shall be arranged at early stages of the facility operation which shall result in the proper certification of the facility product. Further, rules for the compost application shall be developed and communicated to the compost consumers (agriculture and landscaping companies). Further periodic quality control of compost shall be arranged, at least once per quarter and in case of operational changes. The monitoring parameters should include heavy metals content, sanitary safety, nutrient potential. The limit standards to be applied are given in Section 6.8.3.

Noise

Noise levels assessment will be performed for the working area and at the border of the sanitary protection zone. Preliminary assessment is to be performed at the detailed design stage. The noise level, which was generated by machinery, transport and other operations, during peak loads, will be assessed. The preliminary assessment indicated that this noise level is significantly below the maximum allowed levels. Therefore additional measures on noise monitoring and control are not needed. However this observation is to be confirmed during the development of the detailed design after the detailed list of equipment is defined.

Radiation

Radiation monitoring at the planned facility will consist of the gate control as described above and regular measurements of radiation in the air and in air dust which will be performed quarterly.

Sanitary and hygienic monitoring

Sanitary and hygienic monitoring at the waste recycling facilities involves specific air, soil and water surveys. The survey includes testing to reveal main parameters of biologic contamination (pathogenic micro organisms, tapeworms, coliform organism) and genetic toxicology (mutations as compared to the average). If needed, assessment of the pests population is performed.

Decision on the necessity of this monitoring type is made by the local sanitary authorities. Data collected is the main basis for determination of the sanitary status of the facility. If any deviations are identified, corrective actions are to be taken immediately.

Hygienic parameters of the workplaces

Workplaces at the new facilities shall undergo the attestation process. This procedure is to check and confirm compliance of the working conditions with the national norms. The attestation procedure involves survey of the workplaces parameters (physical and chemical) using measurement devices which is to be performed by the authorized company. The survey is to be carried out after the

facility starts its operation at its full capacity. The survey shall be better performed at peak operation hours (accounting for daily and seasonal fluctuations). If any non-compliance is revealed, a corrective actions plan shall be developed and implemented.

8.2.3 Landfill

Monitoring plays a vital part in determining the landfill performance efficiency against the assumptions made. The monitoring should consider the progress made towards the initial criteria, including the following factors:

- quality and quantity of leachate;
- generation, flow and concentration of gas;
- trace composition of the gas;
- potential for leachate or gas to be generated in future;
- physical stability of the waste and associated structures;
- presence of particular wastes which could pose a risk in the future.

Another trigger for reviewing the surrender criteria would be where the annual review of monitoring data against the assumptions in the risk assessment indicates a significant deviation from the expected performance of the landfill.

Considering details of the physical location of the planned facilities as well as geologic structure, the focus of the monitoring shall be soil cover and underground (temporary) water. The level of underground water is to be monitored as well as their chemical composition to identify possible contamination. While geologic survey no underground water was revealed on the site till the depth of around 15 – 19 m. However the temporary groundwater might occur on the site occasionally. It is therefore still necessary to perform this type of monitoring. For this purpose a system of monitoring wells is to be established at the perimeter of the landfill. Their depth is to be around 1.2 – 1.5 depth of the landfill basement. Detailed parameters of those wells are to be decided on the stage of the detailed design development. Visual control of the wells is to be carried out once per month and after intensive rains. This can be done by the landfill staff. In case of the liquids presence the representative of the environmental service of the company is to proceed. Even if the wells are dry, it shall be fixed in a report signed by the authorized person.

If any liquids are discovered in the wells, the liquid sampling and chemical analysis are to be carried out. In case of permanent or prolonged presence of liquids in the wells sampling shall be carried out at least once per quarter. The standard chemical analysis is to be carried out (including mineralization, BOD, ionic composition) with additional test for TPH, aluminum, cadmium, manganese, copper, lead, chromium, zinc. Besides specific bacteriologic and vermin tests may be carried out

if requested by the sanitary authorities. The exact list of the parameters to be controlled and sampling methods are to be developed and approved at the detailed design stage and further in the Monitoring programme and annual plan (see next chapter). The tests are to be performed by an accredited laboratory sending results to the Company with subsequent submission to the relevant authorities and any stakeholder interested in the results (upon request as indicated in SEP).

The samples are to be tested for heavy metals content – Pb, Zn, Cu, Cr, Ni, Hg, Cd and As. This is to be done at least once per year.

8.3 Organisational Issues

These recommendations are to be revised at the detailed design stage and adjusted to the design solutions if needed. Further, they are to be formalized in the form of a monitoring programme outlining measures and activities to be made, responsibility allocation, distribution list, data format and analysis methods, corrective actions procedure in case of any non-compliances revealed.

For the purpose of the monitoring programme implementation it is recommended to develop annual monitoring plans setting dates and deadlines, responsible persons for the activities included in the Monitoring programme. This will promote a better time management and budget allocation and will ensure that the monitoring programme is linked to real resources. The plan shall provide space for notes and "done" marks. Procedure of the plan development and implementation monitoring shall be included in the monitoring programme. It shall also allow some flexibility and procedures for annual revision and update of the programme.

The annual monitoring plan and proposals for environmental and social protection measures are to be compiled in the standard format and approved by the supervisory authorities and shall be accessible for stakeholders.

8.4 E&S Monitoring During Construction

Monitoring of HSE is mainly under responsibility of the PIU. The PIU functions are performed by NK SPK Kaspij JSC. It is to be supported by the Project Engineer. PE prepares monthly reports reflecting the project progress and any problems arising with duly and timely Project implementation including HSE issues. Special reports on HSE issues are to be prepared annually. Those reports are based on ad-hoc reports of Contractors, logbooks analysis, etc. Urgent issues are also discussed at internal weekly meetings with the Client and PIU representatives. Compliance with the national EHS rules is also monitored by national and regional authorities. The Project Engineer assists is also in contact with those authorities to resolve any arising issues timely and in most efficient way.

Preliminary assessment of the construction stage impacts is to be included in the detailed design. The detailed design shall contain the following information on environmental impacts of the construction stage:

Air emissions:

- Construction machinery emissions;

› Dust from earth works;

› Emissions during insulation works;

› Emissions of transport exhaust gases (based on the per km emissions for transport means delivering construction materials an equipment and removing waste; normative emissions are used);

› Cumulative effect of all air emissions sources;

› Calculation of dispersion patterns taking into account background concentrations of pollutants.

Noise

› Assessment of the threshold noise levels with the reference to the following norms (according to the 2007 IFC Guidelines "Noise management" :

Areas		One hour L, decibel
Areas adjacent to the residential areas, recreational facilities	7^{00} – 23^{00}	55
	23^{00} – 7^{00}	45
Industrial areas	7^{00} – 22^{00}	70
	23^{00} – 7^{00}	70

› Identification of noise sources and their characteristics;

› Determination of the expected noise levels in the reference point in the working area and at the borders of the sanitary protection zone.

Waste

› Identification of waste sources, determination of the expected waste flow and their characteristics;

› Removal and disposal planning.

In order to improve monitoring efficiency, the sample EHS compliance checklist was developed by the Consultant as a guideline for the PIU. It is attached to the Report as 9.2Appendix B. The checklist is designated for monitoring of every Project component implementation. The checklist shall be adjusted to match the nature of the Project component. The detailed design should be the basis for adjustments of checklists.

9 Environmental and Social Action Plan

9.1 General Approach

As it was demonstrated above the PIP implementation is associated with a number of environmental aspects of both short-term and long-term nature. Therefore the Consultant has developed the action plan for abatement of possible adverse environmental impact at the construction sites and for provision of maximum positive effect upon completion of the planned projects.

The full list of activities to be undertaken within each group of projects is given below. The time of implementation of these activities was determined taking into account the following circumstances:

- Time required for preparation of tender documents and tendering;
- Rough estimation of the time required for purchase of different equipment and implementation of works relevant to the specific project;
- Limitations for works to be implemented in open air during different seasons;
- Priorities and existent commitments of the Company;
- Existing organizational chart for the EHS management;
- Practical experience of similar projects implementation.

In order to achieve the best possible results those measures are designed for the following stages of the PIP implementation:

- Implementation (design/construction/installation) stage;
- Operation stage.

Responsibility for execution of environmental and occupational health and safety requirements at the implementation stage rests with the contractors. Supervision of

the works implementation and observance of all regulative and additional requirements at this phase will be under responsibility of the PIU. In order to ensure efficient environmental, occupational health and safety management, it is recommended to set up a separate dedicated team within the PIU with the relevant functions. This process should involve specialists of the Project Company for their professional upgrading, acquaintance with the best environmental protection practices and elimination of hazards for employees and population.

The Environmental Action Plan also includes activities to be implemented at the operation phase aimed at safe (for environment and human) and efficient operation of the facilities by the Project Company. The planned activities to be implemented at the operation phase deal with the technical, managerial and informational aspects of the project implementation. A set of recommended activities is based on the outputs of the technical, economic and environmental assessments of the Project Company and takes into account the experience of the Project Company and the specialists involved in PIP projects management. Implementation of the mentioned activities is under responsibility of the Project Company.

A balanced implementation of the proposed activities will allow to maximize the expected environmental, financial and economic benefits of the PIP implementation as well as to improve the overall environmental performance of the waste management system in Aktau.

9.2 Environmental and Social Action Plan

Environmental and Social Action Plan is given in Table 22 below.

Table 22. Environmental and Social Action Plan

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
1	Stakeholders engagement	1.1 Implementation of SEP and all party-specific obligations, properly functioning grievance procedures and public communication methods at all stages of the project implementation	Transparency and stakeholders engagement	EBRD PR 10	Properly functioning grievance procedures, meetings, publications, explanatory programmes, opinion polls	Mangistau Oblast, Akimat, Aktau Akimat, the Client	Throughout the project lifetime	Pre-design stage Design stage Construction stage Operation stage	
		1.2 Public hearings on detailed design	Transparency and stakeholders communication	Laws "On State Expertise" and "On Public Hearings", Environmental Code, EBRD PR10	Announcement in the media, invitations sent at least 1 week prior to the hearings, minutes of hearings	PIU	Invitations sent at least 1 week prior to the hearings Hearings upon approval of the detailed design by the parties	Design stage	3 md
		1.3 Advertisement about the new jobs available in the Baskudyk settlement, ensuring that at least 50% of sorting operators vacancies will go to those people if they apply	Economic displacement mitigation	SEP, EBRD PR 5, PR 10	Advertisement, job offers	Operator	1 month prior to actual start of operation	Construction phase	
2	Activities needed to ensure continuous functioning of the SWM system and preparation	2.1 Adjustment of the WWTP-2 design with the MBT detailed design and compliance with national and EU wastewater treatment	Compliance with the Project Concept	Decision of the multilateral meeting of 07 June	WWTP-2 design structured to comply with EU discharge standards	NK SPK Kaspij	Before starting the detailed designing process for the PIP facilities	ca.	ca.

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
	to the Project implementation	norms							
		2.2 Proper fencing of the existing landfill. Gate control of wastes entering the landfill. Compliance with ESH requirements (including monitoring) are followed properly.	Legislative compliance, safe operation of the landfill	National norms	Gate control log. ESH reports	Client	4Q 2014 Before the PIP implementation (prior to conceptual design stage of PIP)	Pre-design stage	
		2.3 Detailed laboratory study of the waste amount and composition	More reliable baseline data for detailed design	Best practice	Study report with the detailed data on waste amount and composition	Contractor	2012	Pre-design stage	ca. KZT 500 000
3	Employer's requirements to the detailed design	3.1 Elaboration of EHS requirements to be included into the tender documentation during the preparation of the tender packages to achieve compliance with the national and EU norms 3.2 Evaluation of bids for compliance with EHS requirements	Compliance with environmental and occupational health and safety requirements during the Project implementation	National norms (SNiP, SanPiN, GOST), sectoral guidelines, EBRD operation policies	Tender documents – specific requirements (Environment, H&S)	Project Management Consultant (PMC), PIU	Prior to start of tendering process	Pre-design stage	About 10 man-days (md)
4	Public Impact and Safety and access	4.1 Liaison with the Contractor on fencing and guarding of construction sites	Prevention of impacts on public	State safety norms (SNiP) EBRD PR 4	Evidence at construction site, Plan for construction works arrangement (design volume)	Project Engineer	Prior to the construction works commencement	Construction phase	

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
	Risk of accidents and injuries from unauthorized access to construction sites;								
		4.2 Provide access to the project site for stakeholders representatives with due regard to safety issues	Transparency	SEP, EBRD PR 10	Access procedure in place (approved)	PIU / Contractor	Throughout and after the construction period	Construction phase	
5	Territory planning	5.1 Landscaping of the production site, trees and grass planting marking of traffic routes	Favorable working conditions, mitigation of impacts on soil and air.	National norms, best practice	Landscaping design, works completed	Contractor, design and actual works to be checked and approved by PE	Before the construction works completion	Construction phase	
6	Institutional arrangements	6.1 Require the facilities operator to develop and implement a Human Resources policy and procedures to ensure that its operation is carried out in accordance with PR 2 standards (including a prohibition against child labour , women discrimination other forms of discrimination	Ensure proper operation of the MSW system	PR2	Tender documents, invitation to tender, tender evaluation reports, contract / service agreement signed HR policy and procedures in place	PIU / Mangistau oblast Akimat	Prior to start of operations HR plan and procedures in place 6 months after assignment of operator	Operation stage	40 – 50 md

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
		,a need for a human resource policy and etc).							
7	Permitting and licensing	7.1 Development of the environmental documentation, including Permissible Emissions Designs, Permissible Discharges Designs, waste generation limits; state expertise approval; obtaining of Permit for Environmental Emissions	Proper operation of the facility and compliance with the national norms	Environmental Code, national norms	Permit for emissions	Operator	Prior to commencement of operation	Operation stage	Around KZT 1 500 000
		7.2 Obligatory Environmental insurance	Compliance with the national norms	Polluter pays principle, Law of the RK "On obligatory environmental insurance"	Insurance policy	Operator	Prior to commencement of operation	Operation stage	TBD
		7.3 Registration of all dangerous facilities in the local supervisory authority (elaboration of Declaration of Industrial Safety for hazardous facilities)	Ensure compliance with the national norms	Law of the RK No.314 of 18.04.2002	Registration Certificate	Operator	Prior to commencement of operation	Operation stage	
8	Health and Safety and	8.1 Check the design documentation's	Compliance with the environmental and	National norms (SNiP, SanPiN,	Design volumes, official	PIU, Technical experts of the	Upon submission of the detailed design by the	Design stage	20 md

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
	labour conditions – all types of impacts	content and completeness for inclusion of the EHS requirements of the ESIA and assumptions (Volumes: Environmental Protection, Occupational Health, Safety, Fire Safety, Emergency Response) as recommended in the Checklist attached, in case of non-compliance – require upgrade; Works shall not be commenced until the State expertise approval is obtained	occupational health and safety requirements during the Project implementation and communication of those requirements to the Contractor	GOST), sectoral guidelines, EBRD operation policies and PRs 1-4 and 7	approval by the Company	Company, the PMC / PE where needed	Contractor Prior to commencement of construction works		
		8.2 Check the Safety Plan of the Contractor, require upgrade if necessary	Ensure the Contractor chosen is aware of risks and is duly prepared to them	Voluntary best practice (to be included into the tender documents)	Approval by the Company	PIU / PE	Prior to construction works commencement	Design stage Construction stage	About 10 md for each component
	Risk: Introduction of the new production cycle involving methane treatment	8.3 Develop, approve and implement rules for works associated with the risks associated with physical properties of methane, including fire and explosion safety and health risks,	Rules are developed and implemented	National safety norms (SNiP, PB) Specific rules for equipment operation	Approved rules	Development – Contractor, Implementation - Industrial safety dept. of the Company To be checked by	Prior to putting the biogas plant into operation	Construction phase	

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
		provide necessary trainings				PIU / PE			
	Possible risks: - neglected safety rules - careless handling of machinery and equipment	8.4 Based on the assessment of potential OHS risks, develop standard operating procedures in compliance with the best available international practices in OHS to be monitored while works are performed (including contractors) see Checklist Develop and implement procedures to ensure that personnel without necessary training evidence are not allowed to perform any works at the Company's facilities	Minimization of risks to and impacts on health and safety of workers Compliance with the existing national codes and rules	National norms (SNiP, SanPiN, GOST), sectoral guidelines, EBRD operation policies	EBRD PR 3, Safety plan	Project Engineer	Prior to works commencement under each contract	Design stage Construction phase Operation stage	10 – 15 md for each component
		8.5 Development of job descriptions for new personnel needed, communication of them through mass media and other ways, ensure that this information have reached the dwellers near the old	Ensure new qualified personnel is hired in shortest possible terms	EBRD PR 3, SEP RK Law#314 of 18.04.2002	Job descriptions, Job announcements	Operator	Prior to commencement of operation	Operation stage	Around 50 – 70 md

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
		landfill Hire personnel with the required qualification, identification							
		8.6 Workplaces attestation	Ensure personnel safety, comfortable working conditions and legislation compliance	EBRD PR 3, national labour legislation	Attestation data, approved by authorities	Operator through the authorized company	1 year after upon the launch of facilities	Operation stage	Around ca. KZT 1, 500, 000
		8.7 Development and communication of emergency response plans for construction and operation. Communicate to personnel, assign responsibilities for implementation	Ensure personnel and public safety	EBRD PR 3, 4, Law of the RK No.314 of 18.04.2002	Safety plans approved by authorities, signatures of the relevant personnel, job descriptions / orders on responsibility allocation	Operator	Prior to construction works commencement	Construction phase Operation stage	
9	Negative environmental impacts during the construction and operating of new facilities	9.1 Detailed design of new waste treatment Facilities in Aktau to comply with relevant EU environmental requirements as well as with applicable national law, Construct and operate the Facilities in accordance with these laws and requirements.	Compliance with national and EU environmental requirements	EBRD PR 3; Environmental legislation of the RK ; National norms (SNiP, SanPiN, GOST), European Best Available Techniques Reference Document (BREF) for Waste Treatment	Prepared and approved Technical Project and Plan for construction works arrangement (design volume); Tender documents, invitation to tender, tender evaluation reports, contract / service agreement signed	PIU, Technical experts of the Company, the PMC / PE where needed, Operator	Prior to commencement of construction works and operation, respectively	Design stage Construction phase Operation stage	TBD
	Risk: technical characteristics	9.2 Include abatement measures in the design	Ensure the high level environmental		Prepared and approved	PIU, Technical experts of the	Prior to construction	Design stage	Depending on the

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
	and abatement measures of the new facilities are not sufficient for local conditions	that are based on the best available techniques taking into consideration the technical characteristics of the installation concerned, its geographical location and local environmental conditions so as to ensure a high level of protection for the environment as a whole.	protection		Technical Project	Company, the PMC / PE where needed,	works commencement		system design
10	Pollution prevention, resource conservation and energy efficiency	10.1 Include the mitigation measures defined in ESIA and OVOS in the tender documents for construction.	Minimize of adverse impacts on human health and the environment	EBRD PR 3; Environmental legislation of the RK; BREF for Waste Treatment	Prepared and approved Technical Project, Approved operation permit regarding to BAT,IPPC and legal requirements	PIU, Technical experts of the Company, the PMC / PE where needed, Operator	Prior to start of tendering process	Pre-construction stage and implementation of the requirements throughout the project	TBD
	Risk: release of pollutants to the environment form new waste treatment Facilities	10.2 Develop and implement operational procedures to avoid the release of any pollutants into environment (including greenhouse gas (GHG) emissions) or, when avoidance is not feasible, minimise or control their release. In	Ensure consistence with the principles of cleaner production.	EBRD PR 3; Environmental legislation of the RK; BREF for Waste Treatment	Approved operation permit regarding to BAT,IPPC and legal requirements Regular internal and external audits	Operator, PMC, External Consultant	Upon putting the constructed facilities into operation	Operation stage	TBD

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
		addition, examine and incorporate in the operations of new Facilities energy efficiency measures and measures to conserve water and other resources.							
11	Monitoring All types of impacts revealed	11.1 Ensure that the requirements of the monitoring programme (including radiation survey) is adequately reflected in the detailed design as in the ESMP, require upgrade if needed	Ensure adequate information on the facility operation	EBRD PR 1	Chapter in the design volume "Environmental protection"	PIU, involvement of the PMC / PE where needed	After submission of detailed design by the Contractor, Prior to commencement of construction works and operation, respectively	Design stage	5 – 10 md
12	Contractor's monitoring	12.1 Develop and implement a Monitoring Programme to ensure compliance of Contractors with the requirements developed at designing and construction stages (including complex inspection visits on each construction site twice a month	Control over the Contractor's compliance with the legislative requirements while performing works Legislative compliance assessment and risks prevention	National norms (SNiP, SanPiN, GOST), sectoral guidelines, EBRD operation policies	Monitoring records, instructions to the Contractor, corrective action plans and reports if needed, records in the progress reports	Project Engineer	2 times per month Upon construction works commencement	Construction phase	40 – 50 md per year
		12.2 Reporting on the inspections' results	Prompt correction of non-compliances	EBRD PRs 2,3	Monitoring reports	Project Engineer	Dates are to be determined in the	Construction phase	40 – 50 md per year

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
							Inspection plan		
		12.3 Issue of instructions/ recommendations to the Contractor in cases of non-compliance	Filing of the EHS information on the Project	PDCA approach (set in ISO 14001)	Instructions to the Contractor, reports on follow-up measures	Project Engineer	According to the Inspection Plan	Construction phase	40 – 50 md per year
		12.4 Establishment of a monitoring programme of the facilities operation as described in the Environmental and Social Monitoring Plan (ESMP)	Ensure PBSA terms compliance and continuous improvement More reliable data acquisition Due transparency	PBSA terms Best practice PDCA approach (ISO 14000) National norms	Forms and monitoring data, minutes of meetings on revision and review, corrective actions plans	Operator under supervision of authorities	Before the facilities operation commencement	Operation stage	TBD
13	EHS management while project implementation	13.1 Development and approval of the reporting formats for the contractors on EHS compliance at construction sites based on the Checklists attached	efficient management, due reporting and transparency	Best practice	Approved reporting formats	PIU, possibly with support of PMC / PE	Before the construction commencement	Pre-design stage	10 md
14	Environmental and OHS management systems upgrade	14.1 Development of an EHS management system covering policy and procedures development (revision) based on the notes and recommendations of this report and based on the SMART approach (**S**pecific, **M**easurable,	Increased EHS management effectiveness, informed decision-making, transparency	ISO 14001, best practice, EBRD PR1	Policy and procedures in place ISO 14001 and OHSAS 18001 accreditation	Operator (obligatory) and All companies involved into the MSW system (recommended); possibly with involvement of qualified consultant, initial	One year after start of operation		

#	Impact, environmental factor	Mitigation measures	Objectives	Legislative requirement/ Best practice	Success criteria	Responsibility / resources	Deadlines	Project stages	Inputs/ resources (estimate)
		Achievable, **R**esults driven and **T**ime-bound)				communication from PIU;			
		14.2 Design and implementation of the integrated electronic EHS data system, including primary, secondary, and external information	Better data management, improved EHS management efficiency	Best practice	The operational system, equipment in place, use procedure	Operator	One year after start of operation		Depending on the system design

Appendix A List of applicable Kazakhstan and international regulations and standards

1 Pollution Prevention and Abatement Handbook – General Environmental Guidelines. World Bank Group, July 1998

2 Environmental and Social Guidelines for Occupational Health & Safety. IFC, June 2003

3 EBRD Environmental Policy. EBRD, July 2003

4 EBRD's sub-sectoral environmental guidelines - Building and construction activities.

5 Law "On radiation safety of population " of 23.04.1998 No.219-1 (as amended of 20.12.2004 No.13-III)

6 Law " On the order of consideration of physical and legal persons requests" of 12.01.2007 No.221

7 Resolution of the Plenum of the Supreme Court of Kazakhstan of 22.12.2000, No.16 "On the practice of courts regarding implementation of the environmental legislation"

8 Decision of the Supreme Court of the Republic of Kazakhstan of 18.06.2001 No.1 "On the application of penalties for certain environmental crimes in the court practice"

9 Law "On Sanitary - Epidemiological Welfare"of 4.12.2001 No.361

10 Environmental Code of the RK as amended of 12.10.2008

11 Law "On protection of citizens' health" of 7.07.2006 No.170

12 Law "On the emergency situations of natural and man-made nature" of 5.07.1996 No.19

13 Order of the Minister of Environment of 5.04.2007 No.100-p "On Approving the forms of documents relating to the establishment and enforcement of the state environmental control"

14 The order "On distribution of authorities between the Ministry of Environment and the regional (city) territorial departments for environmental protection"

15 Order of the Minister for Emergency Situations of Kazakhstan of 08.02.2006 No.35 "On approval of rules of fire safety in the Republic of Kazakhstan"

16 Labour Code of the RK as amended on 7.12.2009

17 Criminal Code of the RK as amended on 11.12.2009

18 The concept of environmental safety of the Republic of Kazakhstan for 2004 - 2015 (Approved by the Presidential Decree of 03.12.2003 No.1241)

19 Governmental Resolution of 10.07.2007 No.591 "On Approval of Regulations for the formation of abandonment funds for waste disposal landfills"

20 Order of the Minister of Health of 08.07.2005 No.334 "On approval of the sanitary-epidemiological rules and norms "Sanitary-epidemiological requirements to the design of production facilities"

21 Water Code of the RK as amended on 7.17.2009

22 Code of Kazakhstan "On Taxes and other obligatory payments to the budget" (Tax Code), as amended on 16.11.2009

23 Law "On Mandatory Environmental Insurance," as amended on 26.05.2008.

24 SNiP RK 1.04.-14-2003 "Landfills for the disposal and dumping of toxic industrial waste. Key requirements to the design"

25 SN RK 1.04.-15-2002 "Landfills for municipal solid waste"

26 Guidelines for the assessment of technical conditions and safety of storage of industrial waste and sewage enterprises of chemical industry.

27 Instruction of the Committee for Construction “On the order of development and approval of the design documentation and their contents as related to construction of buildings and facilities” as of 17.05.2001 No.109

28 Guidelines for the assessment of environmental impacts of the planned activities for the preplanning, planning, predesign and design documentation. Introducted by the Order of the Minister of Environment of the RK No.204-p dated 28 June 2007

29 Technical Regulation “Requirements to safety of fertilizers” approved by the Governmental Order No.491 of 28 May 2010

Appendix B Checklist for monitoring of EHS performance at the project implementation stage (guideline for the project Engineer)

Project HSE Checklist

Contract [insert title]

Project Engineer –

Reporting period
(from to)

Date of Inspection
___ _____201__

Engineer's HSE inspector:

Contract component ()

Requirement	Reference to document setting the requirement	Status			Comments
		n/a	done	on-going	
Contract *- General*					
The Contractor assigned a representative responsible for compliance with HSE requirements	To be included in the Contract				
Development of Safety plan	To be included in the Contract				
Other procedures on health and safety are developed	National norms and Contract terms				
Design development*- general*					
Development of part "Environmental Protection", "Fire safety", and "Labour protection" of the Engineering Design					
The abovementioned design documents are approved by state expertise					
Lists of the materials and chemicals to be used are duly composed					
Lists of the equipment and machinery to be used are duly composed					
Make sure that all health and safety requirements under Contract are properly addressed in the design					
Check if the work programme and Construction organisation plan comply with the design considerations and the Contract details in the area of environment, health and safety					

Check the abovementioned information for adequacy and sufficiency of measures

If any inadequacies are identified, require inclusion of the missing considerations into safety Plan

Design stage – *safety and occupational health*

Provide the list of professions involved into construction, and the list of personnel allowed to enter the construction site
Identify any hazardous substances which will be used on site. For each one ensure that the health effects of its use are assessed , and controled accordingly, i.e. provide information to users, provide appropriate Personal Protective Equipment (PPE), provide suitable storage for materials, ensure first-aid facilities are available and appropriate (e.g. eye wash bottles), etc.
Provide adequate sanitary working conditions including WCs, washing rooms, dining rooms, clothes keeping and washing places.
Develop and implement accident prevention program including identification of potential hazards, written operating procedures, training, maintenance, and accident investigation procedures
Implement confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards
Implement measures for population safety including organization of temporary bypass roads and crossings, installation of warning signs

Design stage - *Environment*

General requirements

Identify environmental aspects and nature's components affected

Air pollution

Identification of sources and estimation of emissions at implementation and operation phases.
Assessment of compliance with the existing norms of air in the working area and adjacent territories at implementation and operation phases
Assessment of pollutants concentration in the air at the borders of sanitary protection zones.
Measures to control risks and mitigate negative impacts

Waste management

Estimation of solid wastes generation volumes and types/ hazard classes.

Preparation of the schedule of working area cleaning, storage and disposal of wastes.

Conclusion of agreements for solid wastes removal and utilization.

Measures to control risks and mitigate negative impacts

Noise impact

Assessment of noise impacts in the working area and at adjacent territories against the effectual norms

Preparation of proposals on noise control at the construction site and the adjacent area

Soil and underground water

Assessment of risks and scale of negative impact on surface water

Measures to control risks and mitigate negative impacts

Development of schedule for vehicles and machinery

Construction phase

Site Safety Arrangements *- General*

Check availability and maintenance of the of the OH&S log-book on site

To be included in the Contract

Check availability of approved safety instructions and respective training of the Contractor's staff.

Make sure that measures and precautions on safety of the Engineer's staff on site are implemented

Check warning signs, fencing, lighting on site

Appoint the person responsible for EHS issues at each construction site and develop safety plan for each project component

Check that cases of significant environmental pollution or OHS norms non-compliance are properly reported and registered; and communicated to the Company

Site Safety Arrangements *- Fire & Emergency Arrangements*

An evacuation procedure must be established for action in the event of a fire or other emergency in the site office. This will include alarm signals, action to take on hearing it, and where to muster. A notice giving the details of the procedure must be placed on the notice board including phone numbers which may be useful in an emergency, the location and route to the nearest accident and emergency department, the names of first-aiders and the location of first-aid facilities

Any fire alarm system must be sounded at least once a week to make sure it works, and tested & maintained according to the manufacturer's instructions or the Fire

Certificate, if there is one.

There must be extinguishers of suitable type and in sufficient numbers. All extinguishers must be serviced annually.

Site Safety Arrangements - Electrical Appliances and Equipment

Ensure that the electrical installation to the site accommodation has been installed by a competent person and is re-inspected regularly. Certificates of inspection should be available.
All portable electrical appliances must be confirmed to be safe. They must be visually inspected before first use (check plugs, cables and casings for obvious signs of damage). Where electrical equipment has been supplied by the Contractor, ensure that they have tested it as necessary, as described above, and carry out a visual inspection in any case.
Whereas high voltage equipment is used on site it must be provided with respective warning signs and access to it be restricted except for its operators.

Site Safety Arrangements - Training

All staff must be given an induction talk when they come on to the site for the first time, to include the site rules and principal hazards of the project. Ensure that all sign to confirm that they have received induction training.
Assess the need for additional specific training which is required for the project, such as confined space entry, working with asbestos or manual handling. Make sure that the relevant staff has received the necessary training.

Inter-sector guidelines for labour protection

Site Safety Arrangements - Hazardous Substances

Check availability of Personal protection equipment and first aid kits, conditions of materials storage.
Ensure that spaces where fuel is stored and welding is performed are properly ventilated

Site Safety Arrangements – Office/Accommodation/Shelter Conditions

Ensure that the office/accommodation/shelter is free from hazards such as trip hazards, trailing leads, dangerously positioned kettles, unsound or overloaded shelving etc. Offices must be adequately lit, heated and ventilated. Outside lighting may also be necessary to ensure safe access. Heating appliances must be stable and must not present a fire hazard. Gas fires are not generally acceptable.
Ensure that sufficient welfare facilities are available, i.e. washing, eating, toilets, and that these are kept clean.

Safety at construction site – Hazardous works

Install railings around all trenches, require use of a life line when workers are within railing, ensure rescue buoys and throw bags are readily available
Ensure appropriate lighting on construction sites
Maintain sufficient work spaces

Use proper techniques for trenching and shoring

First Aid

Ensure that the first aid provisions provided for the site are sufficient.
Ensure that trained first aiders or appointed persons are provided in sufficient numbers to enable first-aid to be administered without delay.
Ensure that first aid arrangements are displayed on the notice board and understood by all staff.

Personal protective Equipment (PPE)

Ensure that personal protective equipment (PPE) requirements for the project have been fully identified, via the Risk Assessment process, and that sufficient appropriate equipment is obtained and supplied to the appropriate staff.
Ensure that the appropriate staff has been trained and instructed in the use, care and maintenance of the equipment, and are fully aware of the hazards against which the equipment is to be used, and the limitations of the equipment.
Ensure that the PPE selected is compatible with the environmental factors (e.g. heat, humidity, period of use), and also with the user (e.g. presence of facial hair on those who are to use respiratory protection).
Ensure that a stock of personal protective equipment is also be available for visitors.

Environmental protection

General issues

Adequacy of environmental protection measures implementation in accordance with the design documentation
Make photographic evidence of cases involving pollution, violation of HSE regulations, accidents, casualties etc., make proper notes, file all non-compliance cases and communicate them to the Company

Air pollution

Prohibit the use of non-certified vehicles and construction machinery;
Prohibit idle operation

Limit speed of vehicles on construction site to 5 km/h;
Use water suppression (in dry weather at least once a day) for access ways and temporary roads, moisture and/or cover excavated soil

Soil & Ground Water Contamination

Storage of construction materials and lubricants in roofed areas and on the solid basement
Limit construction activities during heavy rains and snow fall;
Limit stocks of oil products on site to the amount necessary for three days operation;
Use only parking places with hard surface and drainage system for vehicles and construction machinery
Collect and dispose of heavily contaminated soil in case of oil spills, make arrangements with the municipal landfill management or companies dealing with contaminated soil treatment
Prohibit movement of vehicles and machinery outside asphalt roads and designated routs, arrangement of access roads at the water intake, if necessary
Remove and preserve fertile soil layer for construction period, arrange rain and wind protection (protection cover)

Waste management

Appointment of persons responsible for wastes management at each site;
Elaboration of wastes collection and disposal schedule;
Make arrangements with municipal authorities for waste pick-up and disposal
Arrangement of temporary wastes storages at temporary construction sites; Ensure availability of properly marked wastes containers and garbage bins;
Cleanup of sites upon completion of construction;
Ensure that waste produced during construction is properly handled
Signature
Date