Initial Environmental Examination

Project Number: 42408-033
September 2011

Republic of Azerbaijan: Water Supply and Sanitation Investment Program – Nakhchivan City Wastewater Treatment Plant Project (Tranche 2)

Appendix 4

CURRENCY EQUIVALENTS
(as of 8 September 2011)
Currency Unit – Manat (AZN)
AZN 1.00 = $0.7865
$1.00 = AZN 1.2714

ACRONYMS

ADB : Asian Development Bank
AR : Autonomous Republic
EC : European Council
ECO : Environmental Control Official
EIA : Environmental Impact Assessment
EMP : Environmental Management Plan
EMU : Environmental Management Unit
EPA : Environmental Protection Act
GRP : Glass Reinforced Plastic
IEE : Initial Environmental Examination
Km : Kilometer
m³ : Cubic meter
MBR : Membrane Bioreactor
Mg/L : milligrams per liter
Mld : Million liter per day
MENR : Ministry of Ecology and Natural Resources

M&E : Monitoring and Evaluation
NAR : Nakhchivan Autonomous Republic
PHS : Public Household Survey
PIU : Project Implementation Unit
PMF : Project Management Facility
PMO : Project Management Office
Project : Nakhchivan City Water Treatment Plant
SAWMC : State Amelioration and Water Management Committee
SEE : The State Ecological Expertise
SNIP : Construction Norms and Regulations of Azerbaijan
ToR : Terms of Reference
WWTP : Wastewater Treatment Plant
WHO : World Health Organization

This initial environmental examination is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.
I. EXECUTIVE SUMMARY

1. The Asian Development Bank (ADB) funded Azerbaijan Water Supply and Sanitation Investment Program is intended to optimize social and economic development in selected secondary towns through improved water and sanitation (WSS) services. This Investment Program is in continuation to the ADB assistance in WSS Sector (Loan 2119 and 2120 - Azerbaijan Water and Sanitation Improvement Project), and will cover: (i) WSS infrastructure development in the towns of Agdash, Goychay, Nakhchivan, Aghjabedi, Beylagan, Balakan and other developing urban centers, and the peripheral areas of Baku; (ii) Management Improvement and Capacity Development of WSS agencies; and (iii) a Program Management Facility (PMF) that will oversee the Program development, implementation and management. This will be implemented through multi-tranche financing facility of ADB over a period of 8 years (2010-2018). The State Amelioration and Water Management Committee (SAWMC) of Nakhcivan AR is the Executing Agency for Nakhcivan subprojects. PMF, created at SAWMC, is responsible for project implementation, and is supported by international and national consultants. At the field level, a Project Implementation Review Committee will review progress and ensure timely resolution of operational issues.

2. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for Environmental Assessment are described in ADB's Safeguard Policy Statement (2009). This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans. Accordingly, this Initial Environmental Examination (IEE) Report has been prepared for Nakhcivan City Waste Water Treatment Plant Works, to be implemented in Tranche 2. The Works will involve construction of a membrane bioreactor type waste water treatment plant where the treated effluent will be used for irrigation purposes. Subproject is currently in preliminary design stage. Construction is likely to start in II. Quarter of 2012 and will be completed in 18 months.

3. The subproject site is located in government-owned land and are clear of human habitation. There are no protected areas, wetlands, mangroves, or estuaries. There is no need for land acquisition and relocation of people. Vegetation in the subproject site is mostly shrubs and grasses. The geological structure of the area is stable and no potential land subsidence is foreseen.

4. Regardless of these various actions in locating and designing waste water treatment plant during the IEE process, there will still be impacts on the environment when the plant is built and when it is operating. This is mainly because of the invasive nature of earth and concrete works during construction; and because the treatment plant will produce wastes during operation. Because of these factors the considerable impacts are on the physical and human environment.

5. The Nakhcivan subproject involves straightforward construction and low-maintenance operation, in an environment that is not especially sensitive, so it is identified that there will be no major adverse impacts. The likely impacts are mostly short-term, localized and can either be easily avoided or mitigated. Most of the predicted impacts associated with the construction works, involve excavation, concrete and asphalt works and other ground disturbance. The routine nature of the impacts means that most of the impacts can be easily mitigated. There are well developed methods suggested for their mitigation. These include: (i) Measures to
reduce/control dust generation; (ii) Measures to handle solid waste and hazardous materials; (iii) Measures to prevent soil erosion and soil contamination; (iv) Taking noise reduction measures; and (v) Following standard and safe procedures for public and worker safety.

6. The impacts associated with the operational phase involve typical WWTP operational issues and can be easily mitigated by measures including: (i) Measures to handle and dispose sludge, (ii) Measures to handle solid waste and hazardous materials; and (iii) Measures to reduce/control possible odor issues. The impacts and mitigation measures are provided in detail in the IEE report.

7. The major impacts of the implementation of waste water treatment plant subproject will be beneficial to the citizens of Nakcivan as it will provide constant and safe sewage disposal, which will serve the entire City. This will improve the quality of life of people as well as benefiting both individual and public health as the improvements in hygiene should reduce the incidence of disease associated with poor sanitation. This should lead to economic gains as people will be away from work less and will spend less on healthcare, so their incomes should increase.

8. An Environmental Management Plan (EMP) is proposed as part of this IEE which includes (i) mitigation measures for significant environmental impacts during implementation, (ii) environmental monitoring program, and the responsible entities for mitigation, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) grievance redress mechanism. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. A number of impacts and their significance have already been reduced by amending the designs. Mitigation will be assured by a program of environmental monitoring to be conducted during construction stages. The environmental monitoring program will ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for remedial action will be reported to the ADB.

9. The stakeholders were involved in developing the IEE through discussions on site and public consultation after which views expressed were incorporated into the IEE and the planning and development of the project. The IEE is made available at public locations and will be disclosed to a wider audience via the ADB website. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

10. Therefore, the components proposed under this water and sewerage subproject in Nakhcivan are unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without much difficulty through proper engineering design and the incorporation/application of recommended mitigation measures and procedures. Based on the findings of the IEE, the classification of the Project as Category “B” is confirmed, and no further study or detailed EIA is required to comply with ADB SPS (2009). As per Law of Environmental Protection, 1999, an EIA study was conducted and was duly approved by the MENR.
II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. Environmental Laws and Institutions

1. Institutions

11. There are four principal environmental institutions (or Ministries in the NAR) who handle water resources protection, management and operation. These include (i) MENR, (ii) the Ministry of Health, (iii) the Ministry of Emergency Situations (which implements construction safety supervision and standards and regulates safe sewage discharges and WSS operations), and (iv) State Amelioration and Water Management Committee (SAWMC) who will manage the WSS in their respective areas under the Investment Program:

**Table 1. Principle Environmental Institutions / Ministries in Azerbaijan**

<table>
<thead>
<tr>
<th>INSTITUTIONS / MINISTRIES</th>
<th>Name</th>
<th>Leading Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. MENR, Ministry of Ecology and Natural Resources</td>
<td>This ministry upholds all natural resource protection laws. The State Ecological Expertise (SEE) acts within this agency on the Program level in reviewing IEE /EIAs.</td>
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<tr>
<td></td>
<td>2. MoH, Ministry of Health</td>
<td>Sanitary and hygienic safety is the responsibility of the Ministry of Health. Its main function is the implementation of control over meeting the sanitary and epidemiological rules and standards as well as hygienic standards. This entity implements anti-epidemiological measures throughout Azerbaijan and NAR by legal and physical persons through application of laboratory and sampling controls.</td>
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<tr>
<td></td>
<td>3. MES, Ministry of Emergency Situation And CES (Commission of Emergency Situation in NAR)</td>
<td>This agency implements construction safety supervision and standards. This department will involve to the Project through the Commission of Emergency Situation (CES) in NAR. Their main involvement in this Program will be to regulate leakage from sewer lines, safe discharges from the sewage treatment system, and safe operation of the wastewater treatment plant and water treatment units.</td>
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<tr>
<td></td>
<td>4. SAWMC (State Amelioration and Water Management Committee in NAR)</td>
<td>SAWMC, the implementing Agency of the Water Supply and Sanitation Projects in Nakchivan Autonomous Republic. They manage and operate the water and wastewater infrastructure such as the delivery of potable water and the collection of wastewater. They also manage and operate the water and wastewater treatment plants.</td>
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</table>

2. Laws

12. Laws affecting the Project which have been incorporated into the Environmental Management and Monitoring Plan include the followings. These laws have been adopted by the Nakchivan Autonomous Republic.
### Table 2. List of Related Laws and Regulations

<table>
<thead>
<tr>
<th>YEAR ADOPTED</th>
<th>LAWS AND REGULATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>Environmental Protection and Utilization of Natural Resources</td>
</tr>
<tr>
<td>1999</td>
<td>Environmental Protection</td>
</tr>
<tr>
<td>1996</td>
<td>State Ecological Expertise, SEE</td>
</tr>
<tr>
<td>1999</td>
<td>Environmental Safety</td>
</tr>
<tr>
<td>1998</td>
<td>Water Code of the Azerbaijan Republic</td>
</tr>
<tr>
<td>2000</td>
<td>Water Supply and Wastewater</td>
</tr>
<tr>
<td>1999</td>
<td>Health Protection</td>
</tr>
<tr>
<td>1992</td>
<td>Sanitary-Hygienic state, part of GOST</td>
</tr>
<tr>
<td>-</td>
<td>Water quality, air and noise standards: GOST (various years)</td>
</tr>
<tr>
<td>2002</td>
<td>Program on Strengthening Financial Discipline in the Water Sector</td>
</tr>
<tr>
<td>-</td>
<td>Construction Norms and Regulations: SniP</td>
</tr>
<tr>
<td>2005</td>
<td>Rule for Use, Protection and Preservation of Trees and Bushes, No 173</td>
</tr>
<tr>
<td>1999</td>
<td>The Land Code</td>
</tr>
</tbody>
</table>

13. Detailed information on the most pertinent aspect of the laws to be applied for this Project are explained below:

### Table 3. The Laws of Azerbaijan with respect to environmental aspects

<table>
<thead>
<tr>
<th>LAWS AND REGULATIONS</th>
<th>MOST PERTINENT ASPECT</th>
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<tbody>
<tr>
<td>1 Law on Environmental Protection, 1999</td>
<td>This Law establishes the main environmental protection principles, and the rights and obligations of the State, public associations and citizens regarding environmental protection. According to Article 54.2 of the Law, IEE/EIA is subject to SEE. This also explains that the MENR is responsible for the review and approval of IEE/EIA reports submitted by developers. Furthermore, in Articles 81 and 82 of the Law on Environmental Protection (1999), the Law specifically provides for the application of international agreements in case an international institute or body has provisions that are different from those of the Azerbaijani legislation.</td>
</tr>
<tr>
<td>2 State Ecological Expertise, SEE, 1996</td>
<td>The State Ecological Expertise (SEE) mandates an IEE/EIA for infrastructure development projects. The objective of the SEE is to identify impacts on the environment caused by construction projects, examine the results of such impacts and propose mitigation measures to prevent adverse effects on the natural environment and people's health. It is essentially a</td>
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</table>
stand-alone check of compliance of the proposed activity with the relevant environmental standards (e.g. for pollution levels, discharges, and noise).

<table>
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<th>Appendix 4</th>
<th>5</th>
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<tbody>
<tr>
<td><strong>3</strong> The Law on Sanitary-Hygienic State, 1992</td>
<td>The Law on Sanitary-Hygienic State is GOST 17.1.3.07-82. This law serves as a basis for drinking water quality standards and mandatory implementation of sanitary-hygienic expertise regarding chemical and biological standards for water quality. Similarly, noise standards are described in GOST 12.1.003-83. However, the GOST does not specify regulations on permitted effluent discharge levels post wastewater treatment. As such, Azerbaijan has adopted Directive No 91/271 from the European Environmental Commission (EEC) in GOST. This regulation identifies the allowable biological and chemical levels for sewage effluent.</td>
</tr>
<tr>
<td><strong>4</strong> The Water Code, 1998</td>
<td>The Water Code (1998) regulates legal relations concerning the protection and use of water bodies (surface, subsoil, and boundary water bodies) in Azerbaijan. The Law details the obligations of the State with respect to the use and protection of water bodies in terms of monitoring and protection schemes as well as the supervision over the use and protection of water bodies. The items most relevant to the Project include the outlining of; The use of water bodies as potable and service water; The use of specially protected water bodies; and The use of water bodies for the discharge of wastewaters.</td>
</tr>
<tr>
<td><strong>5</strong> SNIP, Construction Norms and Regulations</td>
<td>The Construction Norms and Regulations are identified in SniP which details how to carry out noise reduction measures to assure compliance with the relevant sanitary norms (section 3.9) and it details regulations on the dumping of excess materials (section 3.12). SNIP III-4-80 also details regulations on construction worker’s health and safety. Chapters 2 and 5 provide organizational procedures of construction work sites and material transport. SNIP specifically claims that workers need to be informed and trained about sanitation and health care issues and the specific hazards of their work.</td>
</tr>
<tr>
<td><strong>6</strong> Rule for Use, Protection and Preservation of Trees and Bushes, No 173, 2005</td>
<td>The Rule for Use, Protection and Preservation of Trees and Bushes (2005) is a regulation that details the way to protect trees and shrubs in case of necessary cutting or replanting. These trees are excluded from the Forestry Fund of the Azerbaijan Republic.</td>
</tr>
<tr>
<td><strong>7</strong> Article 22 of the Land Code, 1999</td>
<td>Article 22 of the Land Code (1999) stipulates that the state is required to establish protection zones with a special (restrictive) regime for the purpose of construction and operation of industrial facilities.</td>
</tr>
<tr>
<td><strong>8</strong> EU Council Directive, 98/83/EC, Drinking Water Standards</td>
<td>Water quality sampling must be conducted to meet the frequency and methods stipulated in European Council</td>
</tr>
</tbody>
</table>
Appendix 4

Directive 98/83/EC and Section 7. The treated water should comply with the EU Directive 98/83/EC, and parameters are below:

<table>
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<tr>
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<tbody>
<tr>
<td>Aluminum (only if used as flocculents)</td>
</tr>
<tr>
<td>Ammonium</td>
</tr>
<tr>
<td>Color</td>
</tr>
<tr>
<td>Clostridium perfringens (if water originates from Surface water)</td>
</tr>
<tr>
<td>Escherichia coli</td>
</tr>
<tr>
<td>Hydrogen ion concentration</td>
</tr>
<tr>
<td>Iron (only if used as flocculent)</td>
</tr>
<tr>
<td>Nitrite (only when chloramination is used as a disinfectant)</td>
</tr>
<tr>
<td>Odour</td>
</tr>
<tr>
<td>Taste</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Parameters Max. Effluent Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD₅, biochemical oxygen demand</td>
</tr>
<tr>
<td>COD, chemical oxygen demand</td>
</tr>
<tr>
<td>TSS, total suspended solids</td>
</tr>
<tr>
<td>TN, total Nitrogen</td>
</tr>
<tr>
<td>TP, total phosphorus</td>
</tr>
</tbody>
</table>

As there are no specific water effluent discharge sampling requirements and limits specified under Azerbaijan regulations, the EU Directive 91/271/EEC (UWWTP- Urban Wastewater), has been adopted by the Ministry of Health (MoH) of Azerbaijan to regulate the urban effluent discharges.

B. Government’s Environmental Assessment and Review Procedures

14. Environmental assessment and review procedures in Azerbaijan in accordance with the SEE do not include the categorization of projects. The project is either initially approved with few mitigation conditions if necessary, or the project must undergo a full EIA. If the activity is assessed to result in major potential impacts, a full EIA is automatically required.

15. Since categorization is absent under Azerbaijan environmental regulations and Articles 81 and 82 of the Law on Environmental Protection (1999) specifically provides for the application of international agreements in case an international institute or body has provisions that are different from those of the Azerbaijani legislation, the ADB guidelines were adopted for project categorization under the Investment Program.

16. The procedure for IEE/EIA in Azerbaijan includes the following: During the first stage of the environmental examination process, an initial examination of the application of the proposed activity is made by the SEE within the MENR and the expected impacts of the proposed activity are considered. This may include preliminary consultations with other agencies, NGOs, experts and initial public inquiries. On the condition that the activity is likely to cause only minor impacts on the environment, the application may be approved with some conditions. If the activity is
assessed to have more than minor impacts, a full EIA is required. A decision on processing charges is taken and a scoping meeting of representatives of the applicant, invited experts and invited members of the public is organized and chaired by the MENR. Based on the outcome of this meeting, the SEE will notify the Program Management Offices (PMOs) on the required scope and depth of the investigation and on the results of public consultation during the EIA study.

17. For the current project, this IEE report was submitted to MENR as part of initial examination. An environment review expert group, chaired by MENR, carried out the investigations and consultations. Finally, a written approval was given, which can be found in the appendices.

III. DESCRIPTION OF THE PROJECT

A. Type of the Project

18. This project consists of construction of a new wastewater treatment plant with a capacity of approximately 53,000 m3/day. It is classified as part of Azerbaijan Water Supply and Sanitation Investment Program Project 2 and is categorized as Category B, based on the set criteria in OMF1 (paras 6-7).

19. Nahkcivan AR State Amelioration and Water Management Commitee (SAWMC) is implementing the Project, jointly financed by the ADB and by the government of Azerbaijan. The main objective of the Project is to provide safe, reliable and sustainable wastewater treatment services in the Nakhcivan city until year 2034.

1. Need for Project

20. Because of rapid population growth, excessive industrialization, increased drought and excessive consumption, freshwater bodies are globally exhausted. Accordingly, wastewater treatment gains importance. Recently, this problem has become more important in the Balkans and in the Middle East. Thus, water resources have become one of the main elements of the strategic relations and bargains between the countries. As renewing and enhancing the fresh water sources is technically and economically limited in terms of meeting the increasing demand, different and practical solutions which ensure the sustainable development are required. In this regard, “Nakhchivan Wastewater Treatment Plant” with Membrane Bioreactor System is being planned so as to regain the treated wastewaters and reuse them for a plenty of purposes with the idea of “at the first step of protecting the clean water sources, regaining the wastewaters take place”.

21. Currently no wastewater treatment is available in Nakhcivan. The effluent is being discharged to local streams and canals without any treatment. As a consequence of that, untreated wastewater which reaches to the ground waters, rivers and lakes pose danger for both environment and public health.

22. Agriculture is one of the sectors of which water demand is high in Nakhchivan. For this reason, reuse of the treated wastewaters in agricultural irrigation is very important in terms of reducing the fresh water demand. In this regard, advanced treatment technologies have the
capacity to not only produce treated effluent reliably and appropriately for agricultural irrigation, but also compete in terms of the initial investment and cost of the operation. A typical and best example for that technology is membrane bioreactor (MBR) system which is developed within the last decade. MBRs are considered to be the most appropriate treatment method for agricultural irrigation due to the water it produces nearly at the quality of drinking water.

2. Location and Accessibility

23. The new waste water treatment plant for Nakchivan City is planned to be located on the south side of the City, as the City slopes north to south. The total area of the proposed treatment plant site is approximately 14 ha, located approximately 3 km north of Araz River dam. The access is through the Haydar Aliyev Street Exit on E002 highway.

3. Proposed Schedule for Implementation

24. The main activities of assignment were planned to be handled in four main phases. These main phases are:
   Phase I: Design
   Phase II: Tendering
   Phase III: Construction
   Phase IV: Post Construction
Figure 1. Location of Nakhchivan City

25. Phase I design tasks are being planned to last for 3 months. Expected date of completion is end of December 2011.

26. The Phase II consists of preparation of contract documents, announcements of bidding, preparation of terms of references, standards and bidding documents, evaluation of bids, awarding of the contract. It is being planned that this phase will end in March 2012.

27. After signing of the contract between the Contractor and Client for designing and construction works for water treatment plant, Phase III will be commenced, which is being planned to last for 18 months.

28. The Phase IV, After end of construction works, the post construction support will be provided throughout the Defects Liability Period. This phase will also include training local staff on safe, reliable and efficient operation of the plant.
4. **Description of the Project**

29. The plant will have 3 major treatment steps. These will be pretreatment, membrane bioreactor treatment and disinfection. MBRs are the suspended growth biological treatment systems in which liquid/solid disintegration is performed by low pressured membrane filtration concept in wastewater treatment.

5. **The Flow Chart of Wastewater Treatment Plant**

6. **Process Explanation**

30. The City’s wastewater conveyed by the gravity will be collected at the balancing pond at the entrance of the Treatment Plant. Then the prescreened water will go through the Membrane Bioreactors. After the MBR, the water will be chlorinated and the treated effluent will be collected in the effluent storage tank. From this point on, the treated effluent will be pumped / discharged to agricultural sites for irrigation.
a. Screening

31. It is a pretreatment process carried out to protect the mechanical equipment in the plant, prevent physical damages and inhibit the reduction of the operation efficiency. Trash racks with mechanical cleaning retain the particles physically separated and reduces the congestions in the MBR unit. Generally, rotating drum trash racks which have smaller diameter (≈0.1–1 mm) and higher retaining capacity are preferred in MBR systems instead of conventional trash racks.

b. Balancing Pond

32. Main purpose of the flow rate balancing period for domestic waste water treatment plants is to inhibit the oscillations caused by the leakage and other flow rates as well as reducing the daily variations. Second purpose of the balancing is blending the concentration due to the mixture created in the balancing pond with pollution loads and obtaining relatively constant values.

c. Membrane Bioreactors

33. MBRs are the biochemical oxidation (such as active sludge) processes in the mod of suspension growth in which water treated via membrane equipments and biomass are physically disintegrated by filtration. Biochemical oxidation (in the air tank) and water/biomass disintegration (in the settlement tank with sedimentation) are performed in two different tanks in conventional active sludge process but in one tank in MBRs. In this tank, activated sludge is formed by aeration, treated water is withdrawn by performing vacuum from the relatively small pores of the membrane fibers embedded in the water in the tank or flat layer membranes and biomass used for the carbon removal by bio-oxidation is retained in the tank.

34. Generally, microfiltration (approximately 0.2 μm pore size) or ultra filtration (approximately 0.01 μm pore size) membrane units are used in the MBRs. During the treatment, foulant layer which occur on the fibers over time makes these pores smaller and increases the disintegration of water/biomass and efficiency of suspended soil and microorganism removal. In order to disintegrate the large-diameter materials (cloth, plastic, pieces of paper etc.) likely to congest the membranes in the wastewater, wastewater which pass through the coarse and fine trash rack (1-2 mm diameter) enters directly into the MBR tank without preliminary settling. Water withdrawn from the fiber pores by vacuum is of pretty good quality in comparison to the conventional systems. Resulting sludge is processed for ultimate disposal such as the same way in the other conventional systems.

d. Disinfection

35. Due to the fact that the treated wastewater shall be used for irrigation, it may be used for direct irrigation after a final disinfection (so as to dispose the remaining viruses and prevent the microbial growth likely to occur later).
e. Sludge Treatment Processes

36. There is relatively less sludge production in MBR systems when compared to the other treatment alternatives. Owing to the fact that the sludge operation and removal comprises a significant portion of total operation cost, less sludge production is an advantage for MBRs.

37. In order to prevent the harm of these sludges to the environment and the human health, stabilisation (corrosion) is needed. With an aim to reduce the sludge capacity to be corroded, sludge intensifiers are used. Thick sludges up to %5 solid concentration can be taken to sludge intensifier tanks. After the sludge is intensified and corroded, it is exposed to dewatering process. Thereby, sludge cake is attained and this material is easily transported to the ultimate disposal sites.

IV. ANALYSIS OF ALTERNATIVES

38. The alternatives analysis of the project in terms of project location and treatment processes have been studied and analyzed. Similarly, comparison between with and without project or the “No action option” is also studied and analyzed.

A. Alternatives in Project Location

39. The proposed WWTP will be located within a SAWMC owned area, surrounded by agricultural lots. The selected area is approximately 14 Ha and is currently partially fenced with barbed wire. This location was in fact selected as a WWTP site during the Soviet Union time. Initial construction works for a WWTP had been started approximately 25 years ago, but had to be stopped due to the dissolution of the Soviet Union. No significant adverse environmental impacts are found with present location of project. The proposed WWTP site location is also topographically suitable since the City is sloping towards to the proposed site. No better sites than proposed have been found. The anticipated impacts due to location of the treatment plant in environment are very small and insignificant.

B. Alternatives in Treatment Processes

40. Conventional systems (activated sludge, extended aeration systems etc.) can be alternatives of the MBR systems.

41. Due to the fact that the biological suspended material concentrations can reach to 1200-1500 mg/L values in MBRs (MLSS is approximately 2000-4000 mg/L in conventional activated sludge), hydraulic retention time (HRT) required for the treatment is less compared to the conventional systems. As HRT is the basic parameter for the volume design of the aeration basin, low HRT requirement decreases the necessary basin volume, reduces the initial investment cost and provides ease of operation. In addition to that land requirements also reduce.

42. There is no need for final settlement tank in the conventional sludge systems and this is a reducing factor for the cost of initial investment and operation.
43. Operation may be performed by excessive sludge age (solids retention time, SRT) due to the high MLSS concentrations in the MBRs. When operation is carried out by SRT over twenty days, various advantages come out. The first one of these advantages is that the new biomass (yield) which is formed due to the increased internal respiration decreases and as the amount of the waste biomass decreases, the cost is also reduces. Secondly, nitrification is performed more efficiently by high SRT values and the possibility of the negative contagion of the nitrification from various ambient conditions reduces. The third advantage is that the special microorganisms which provide the biological disintegration of the synthetic toxic organic materials perform more efficiently by high SRT values. When operation is carried out by high MLSS concentrations, organic loading to the system may be excessive. This high biomass concentration is also more resistant to the shock toxic loadings.

44. One of the most important advantages of the MBRs is that the biomass/water disintegration is independent from the settlement property of the biomass. The reason of that is the fact that this disintegration process is performed by not settlement principle but physical filtration. Therefore, biomass (due to the formation of the flocks with filaments and Nocardia type microorganisms) which cannot settle and causes serious problems in the final settlement basin of the conventional system is out of question for MBRs.

45. As disintegration to relatively small pores process is performed in MBRs by microfiltration and ultra filtration, whole of the biomass is retained. Accordingly, total suspended material value which is one of the discharge standards is generally pretty low (approximately 1-3 mg/L) in MBRs. On the other hand, for well-operated conventional systems, this value is at the range of 10-30 mg/L. Turbidity also decreases to low values (<0,5 NTU) in MBRs due to the filtration and effluent seems so clear.

46. Because of the fact that good quality water produced by MBRs, wastewaters treated by this process are regained and used for irrigation (agricultural, reaction, civil works etc.) industry and other sectors (process waters, fire extinction, pissoir etc.) especially in the USA. In that way, drinking water sources are underused and protected and treated wastewaters are utilized.

47. During the operation in MBRs, SRT is controlled more effectively in comparison to the conventional systems because the condition of the presence of suspended solid materials leaking from the sluices due to the biomass not well-settled on certain conditions in final settlement tanks is out of question in MBRs. The only exit of biomass from the system is the sludge discharged for disposal in MBRs.

48. As well as the physical biomass disintegration, a high grade physical disinfection is also ensured in MBRs. It is observed in the pilot or real plants in USA that nearly all protozoans, 5-6 log (logarithmic or %99,999-%99,9999) bacteria and 1-2 log virus are removed by MBRs.

49. Cryptosporidium and Giardia which are among the pathogenic protozoans resistant to disinfection by chlorine are easily retained in MBRs. These numbers are expected numbers considering the 0,1 μm pore size in the membrane. In this regard, as well as the low turbidity, treated water with so low pathogenic water can be used for agricultural irrigation conveniently.

50. Wastewaters treated in MBRs are relatively more reliable in terms of environmental health and microbial content compared to the conventional systems. According to the standards in USA, wastewaters treated by MBRs can be used for agricultural irrigation directly under the
condition of performing a final disinfection (so as to remove the remaining viruses and prevent microbial growth likely to occur later).

51. There is less sludge production in MBR systems in comparison to the other treatment alternatives. Owing to the fact that the sludge operation and removal comprises a significant portion of total operation cost, less sludge production is an advantage for MBRs.

C. Conclusion

52. The above assessments showed that the MBR Sistem is the most feasible option to provide the adequately treated water for the irrigation.

D. No Project Option

53. The analysis has also been done with and without project scenario. Implementation of proposed project will create lot of positive impacts on health and hygiene of people, public environment and socio-economic status of community as well. Provision of good quality wastewater treatment facilities will help to enhance the quality of life of the people. The project will also help to create job opportunities to considerable number of people during construction and to few people during operational phase. During the implementation of the proposed project, treated effluent will be utilized for irrigation purposes. The implementation of the proposed project will produce only negligible and insignificant environmental impacts.

54. On the other hand, if the project is not implemented, the people of the project area will still have to suffer from various problems they are facing today. There is no waste water treatment system in the existing sewerage system. Currently the untreated effluent is being discharged to canals and streams causing significant environmental and health problems. Due to polluted water bodies and unhygienic environment, the community is facing high level of related disease incidences every year.

55. The No Project option alternative would see the continued release of untreated sewage into the canals and hence into the Araz river reservoir, exacerbating the deterioration of the ecosystem. The Nakhcivan Wastewater Treatment Plant is seen as a long awaited option for the treatment of sewage for the Nakhcivan area.

V. DESCRIPTION OF THE ENVIRONMENT

56. The proposed wastewater treatment plant will be located south of Nakchivan City, which will serve and affect the entire city. Hence environmental baseline survey area was extended to the entire City in terms of physical, ecological, economical and social and cultural environments.
A. Physical Resources

1. Climate

57. Winters are too cold and summers are hot in Nakhchivan City and the proposed project area. Annual average temperature is 14,260 and average temperature of the hottest months is about 26,6°. Sometimes temperature reaches to 40-43° during the hot months.

58. The average temperature in winter is - 5.50. The average temperature of the coldest months is – 24, however sometimes lower temperatures can be observed.

59. Frost depth of the rocks is 0,6 m but it reaches to 0,8 m on severe winter seasons. North and north-west winds prevail on the field. Maximum wind speeds in the territory is about 20 km per hour. Average monthly precipitation is about 280-330 mm on the treatment plant area. Surface steaming is about 1200-1400 mm which is 3-4 times more than the precipitations. Rate of humidity in the air is % 10-20.

2. Topography and Soils

60. Nakhchivan City is laid out across the elevated part of the flood plain of the river Aras, which is dammed just below, and forms a large reservoir lake, for hydropower production. The City is bounded to the east by the right bank, lower slopes of the river Nakhchivan-cay. The alluvial gravels of Nakhchivan cay are the main source of potable water supply.

61. The City lies on three ground levels; a plateau above the 900m contour, land between this contour line an almost continuous cliff running more or less north-south through the city and the land below the cliff, that slopes to the banks of the Aras.

62. The field on which the construction works to be carried out is slightly inclined plain area and its maximum elevation and minimum elevations are about 790 m and 788 m respectively. The proposed treatment plant field is composed of silts with sand, clays and sands. Its geography is simple and there is nothing that makes the construction harder.

3. Water Resources

63. The current source of the water for Nakhcivan City is from a new infiltration gallery placed in the bed of the river Nakhchivan-chay. Located 11km from the City, the raw water is transferred to the new reservoir area with a new transmission main. However, once the water is delivered to the town, some consumers do not receive the water due to the old WSS network. These consumers therefore rely on other informal and sometime unhygienic sources within the town. The Investment Program Project 2 also aims to replace all WSS network of the City.

64. Hydrogeological situation of the region is poor and simple. Precipitations, creeks and waters coming from the artificial dams play a significant role on the existence of ground waters. Depth of the ground waters is about 1,8-25 m. Water level is 1,0-3,0 m in some places, especially in erosion plains of Aras River. Ground waters observed in the field are poor and mesohaline.
65. Ground waters in the proposed treatment plant area are found beginning from the depth of approximately 1.5 - 2 m. Waters are in the class of waters with hydrocarbonate- sulphate-calcium-magnesium. There are open agricultural collectors and canals around the project site, which discharges to Araz water reservoir approximately 3 km downstream of the WWTP project site. The City’s all untreated waste waters are also discharging to these collectors and canals that flow to the Araz water reservoir.

4. Geology and Seismology

66. Geological structure of Nakhchivan City including the plant site is composed of Sherur-Culfa and Zengezur anticlinorium and Ordubad synclinorium. Sediments of Third (QIII) and Forth (QIV) Age are widespread in geological structure around the plant site. Sediments of third age are composed of Sarmatian age layers. Thickness of these sediments reaches to a hundred meter.

67. Thickness of these old sediments is a few hundreds meters. Due to their lithological structure, these sediments are composed of clays similar to argillite, argillites, alevrolites and sands. Fourth Age alluvium-prolluvial, prolluvial-deluvial sediments are widespread over Third Age sediments. General thickness of Fourth Age sediments is no more than 20-50 m.

68. Earthquakes have the most damaging effect among the natural geology processes in Nakhchivan field. Sometimes severe earthquakes occur here. A significant part of the earthquakes result from the hypocenters of Zanzegur Mountains, Aras River shores and Mount Agri. The region was shown in the part of 8 magnitude depending upon the General Seismic Regional Map of Azerbaijan field which was prepared in 1981 and accepted as technical regulation. Having realized after Hamamlı Earthquake in 1988 that the seismic of the region shown in the previously prepared GSR (General Seismic Regional) Map does not reflect the truth; general seismic of the region was shown as 9 magnitude by adding 1 in accordance with TN-Q-II-7-81 and HH-02/3-, 16/1191 numbered and 11.09.1991 dated decision of State Construction and Architecture Directorate of Azerbaijan.

69. Significant hypocenters in the region are on Zanzegur Mountains and Mount Agri which are so far away from the lines of the project. WWTP project area is out of the region to be damaged in case of an earthquake.

B. Ecological Resources

70. Seven climate zones out of 11 existing in the world are met in Nakhchivan Autonomous Republic. There are about 3000 plant species, 373 animal sorts, 226 bird kinds in Nakhchivan Autonomous Republic.

71. The flora of Nakhchivan is rich compared with other botanic-geographic regions of Azerbaijan. 2782 kinds of supreme plants are met in this region. They in their turns assembled in 773 species and 134 families. 68 of these kinds are cultivated. Wild plants possess 123 families and 697 species. 732 kinds flora are met in the lowlands along the Aras river, 1326 kinds in the middle mountainous and 640 kinds in the highest mountainous areas. The following plants and their types in Nakhchivan Autonomous Republic divide into –deserts and semi-deserts; friganoid
and bozgir plants; high pasture, subalp and Alp meadows, Alp piles; woods, oasis, along river small woods; deposit and rock plants, water march plants.

72. The territory of Nakhchivan is distinguished from the other regions of Azerbaijan according to its natural condition and richness of fauna. The kinds of animals and its number comprise 60-80% percent of the Azerbaijan fauna. The fauna of the autonomous republic has been investigated since the second half of the 19th century. The scientists have defined 813 butterfly kinds, 134 kinds of sovca, 4 kinds of insects, 3 kinds of runaways, 4 kinds of praying mantis, 67 kinds of straight wings, 75 kinds of grasshoppers, 480 kinds of halfhardwings. There are 6 kinds of amphibians and 19 kinds of reptiles in Nakhchivan Autonomous Republic. 218 kinds of birds live in the Nakhchivan territory. 61 kinds of mammals are known in the area. 40 kinds of vertebral animals out of 350 kinds living in the autonomous republic were included to the “Red book”.

73. The proposed treatment plant area has semi-desert type vegetation and no forestation exists within the limits of the proposed site boundary. Semi-deserts are generally found in dry habitats that have stony, fine earth and mildly salinated soil variants. Semi-desert vegetation does not form a thick cover (typically, 30-50 percent vegetation cover). Annual plants that develop during spring and/or autumn under comparatively high precipitation are most common. The pictures of the proposed plant site can be found in Appendices.

74. The wildlife resources in the project area are scarce. The present vegetation cover, together with human disturbances, provides very few or no habitat variations in terms of feed, shelter, and protection. No rare species exists in the project area.

C. Economic Development

1. Industries

75. The total rate of the industrial production in 2007 rose 17 times in comparison with 1995. The percentage share of the non-state sector in the total output of the industrial product constituted 69%. The percentage share of the industry in the gross domestic product reached 22,5 % in 2007, compared with 10,1% of 2000.

76. Late years the industrial enterprises producing bread and rolls buns, flour, meat and milk productions, chicken, macaroni, tea, sugar, salt, sweets, fruit juice, alcoholic drinks, condensed and packed honey, roasted and packed agriculture products, mineral waters, decorative stones, travertine faced stones, plastic materials, lime, gypsy, marble, furniture of various sorts, metal, cast iron and precious metal and output of other products were established and used in the autonomous republic.

77. The minerals output of Nakhchivan are of great importance. The rock salt of industrial importance, dolomite, travertine, tuff, the marbled lime stone, gyps, clay, sand, mergel, zink-lead, molibden, copper-molibden, gold and mineral waters rich Nakhchivan Autonomous Republic has a very available atmosphere in extracting different kinds of building materials of which, ferconcrete items, brick, travertine, marble and other products to expand their production and deliver to the world market.
78. The numbers of unemployed have remained stable, and up to 60% of the work force of about 41,150 is employed in state enterprises and in the many private SME’s.

2. Infrastructure

79. All required drinking water are supplied from the sub-artesian wells, and capitations on the rivers in the Region, but most of sub-artesian wells have lack of maintenance and/or unhygienic conditions, and from Capitations on the river basins, but they are no sufficient to meet long time water demand, because, holes of the infiltration pipes on the capitation area are ever so often covered by sedimented silty layer carried with water flow.

80. The feasibility study has shown that the demand for reliable WSS services is very high; in apartment blocks the demand is for water as it does not reach them without pumping. There are many unconnected households using stand pipes or water from keherises. Due to institutional overlaps, some residents resent the perception that they need to pay for WS. In multi storey apartments, the payments for WS&S are collected by the Housing Department, with an additional charge of 20%.

81. The sewerage system is failing, and pipes are clogged and broken. During heavy rains raw sewage floods the streets and house compounds, and there is no sewage treatment facility. River pollution increases, and stagnant sewage threatens health conditions. There is no functional sewage treatment facility.

3. Transportation

82. The infrastructure improvement is of great significant together with the role of the key production fields in the development of economy. From this point of view, to improve the transport sector in the autonomous republic which has been living in blockade condition for a long time, is much more important. Mainly, the services at the motor transport, air and railway transports are used in the autonomous republic.

83. The motor transport is the main in passenger and goods transportation inside the autonomous republic. Mostly, all villages and region centers of the autonomous republic were supplied with the fixed route buses.

84. For the purpose to simplify the visit with the main land of Azerbaijan, the regular fixed Nakhchivan – Baki – Nakhchivan bus routes passing the territory of Iran have been working since the ends of 2007.

85. The development of the motor transports mainly depends on the condition of the existing roads. The Motor Roads State Company of Nakhchivan Autonomous Republic services the motor roads of 1473 km distance. 274 km of these roads are of the republic importance, but 1199 km of local importance. The measures to standardize the motor roads to the modern world standards are being continued at the present moment.

86. The railway transport is of great importance in the autonomous republic. There is a railway junction in the part of Julfa in the direction of Tabriz of the Islamic Republic of Iran. As a
result of the occupation policy of Armenia, the railway line connecting the autonomous republic with Azerbaijan was completely cut at the beginning of 1992.

87. The goods transportation in the transport sector rose 11.2 times but the passengers transportation 1.9 times in 2007 compared with 1995.

4. Land use and Agriculture

88. The available climate-soil condition of the autonomous republic gives an opportunity to develop the agriculture here. As the major part of population live and engage with the agrarian sector, it needed to pay a great attention to the promotion of this filed. The population are mainly busy with grain-growing, fruit-growing, potato-growing and cattle breeding.

89. For the purpose to develop the agriculture the land reform was completed in Nakhchivan. As a result of the agrarian reforms, 10.5% of the total land plot of the autonomous republic was given to the private property, 56.3% to the municipal property and 33.2% was kept under a state property. Only 176.9 thousand ha or 33% out of 536.3 thousand ha of the total land are available for the agriculture. 14.5 thousand ha or 8.2% of the available lands for the agriculture fall to the share of yard plots.

90. The proposed project site is owned by SAWMC. Agricultural areas exist around the proposed 14 Ha site. These agricultural areas will be positively effected by the treated effluent of the plant. The site will include the plant and administrative buildings and will be surrounded by a fence wall for no trespassing.

D. Social and Cultural Resources

1. Population

91. The population of Nakhchivan is young and dynamic, with an average age of 26. The age distribution shows that 56% of the total population is of active working age; thus it has the human resources potential for development based on people’s priorities, ascertained through the 2004 Project Household Survey (PHS) the top three problems are water supply, economic hardships and sewerage. They are followed by heating problems. The water difficulties are exacerbated by low water pressure and the related lack of access to water. Unemployment, high prices, lack of favourable business environment makes life strenuous. Sewerage related problems relate to the lack of centralized sewerage, blocked pipes, overflowing sewage, which all threaten social wellbeing. Households also stressed lack of electric power during the -30oC conditions.

92. People have developed coping strategies to alleviate the severe impact of low cash income such that subsistence living is possible. There are 14915 households, made up of family dwellings, majority of which have a plot of land for growing vegetables, and of 5593 households in multi story apartment blocks. In the more rural parts of the city, many also own some livestock, cows, chicken & sheep. The PHS also found that a large proportion of the males work outside the country and send important remittances that are not declared as income.
2. Health facilities

93. Today 2 hospitals of 2799 beds, the Diagnostic-Treatment Center, 72 out-patients' clinics, 1 First–Aid Medical Center, 7 first–aid departments, the Court Medical Expert and Pathology Anatomy Union, the Nakhchivan city Infants House, 9 Hygiene and Center of Epidemiologies, 74 chemist’s shops and chemist’s shop stations act in NAR.

94. Today per 10 thousand persons there are 72,8 beds of hospital of the population of the autonomous republic. At present 739 doctors, 2794 middle medical personals work in the public health institutions of the autonomous republic. The average number of doctors per 10 thousand persons is 19,2 doctors and 72,7 middle medical personals.

3. Education facilities

95. The Nakhchivan branch of the Azerbaijan National Academy of Sciences was established on the basis of the scientific institutions acting in the autonomous republic and joining them such as: Nakhchivan Regional Scientific Center, Nakhchivan Scientific-Investigation base, the Batabat station of the Shamakhi Astrophysics Observatory. The branch embraces 6 scientific –investigation institutions – History, Ethnography and Archaeology, Art, Language and Literature, Natural Reserves, Bioresources Institutions, the Manuscripts Foundation and Batabat Astrophysics Observatory.

96. In the Nakhchivan branch of the Azerbaijan National Academy of Sciences acting since January, 2003 there are 34 departaments and laboratories, areas for experiment, seismological center, scientific library, publishing house and department of postgraduate. 274 employees work in the Nakhchivan branch (2008).Among the scientific workers there are two full members of the Azerbaijan National Academy of Sciences, 5 associate members, 6 doctors of sciences, 21 candidates of sciences. Among the young personnals 30 are post graduate students, 40 are candidates for a degree.

97. Today 221 day time secondary schools act in Nakhchivan Autonomous Republic. 205 out of them are middle schools. 12 are basical schools and 4 are primary schools. Also there are 44 out of school educational institutions, Children-Youth Sport and Chess school, 18 preschool educational institutions.

4. Cultural heritage

98. There are 1162 historical-cultural monuments in Nakhchivan Autonomous Republic. 58 monuments are of the world importance, 455 monuments are of the country importance and 649 monuments are of the local importance. No cultural heritage was found within 750m radius of the proposed plant site.

99. The followings are included to the historical-cultural monuments.
   (i) The archaeological monuments -663
   (ii) The architectural monuments - 285
   (iii) The monumental art monuments -31
   (iv) The historical monuments -36
VI. FORECASTING ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

100. The proposed Nakhchivan Wastewater Treatment Plant is a project to be put into practice so as to meet the effluent quality of the City’s wastewater healthfully and thus enhance the quality of life. Activities to be performed within the scope of the Project were examined in 2 phases.

A. Construction Phase

101. Pre-construction activities such as contractor office set ups and necessary equipment stacks

102. Construction of the Treatment Plant per tender drawings

103. Environmental effects likely to occur during the construction of the Project are noise, dust, solid and liquid wastes. Effects likely to occur during the construction phase are short term effects and they can not deteriorate the existing conditions.

B. Operational Phase

104. Commissioning and Operation of the Wastewater Treatment Plant

105. Use of treated effluent for irrigation

106. Possible environmental effects during operational phase arise from effluent discharge, solid and hazardous wastes, sludge disposal and odor and do not include any adverse environmental effects as long as monitoring and mitigation measures, if needed, are executed.

C. Possible Environmental Impacts of the Project

107. Considering the worst-case scenarios, contaminant sources and environmental units to be affected are anticipated separately for both construction and operational phases. Data showing the units to be affected according to the worst-case scenario are given in Table 4 and Table 5.

Table 4. Construction Phase Contaminant Sources and Environmental Units to be Affected

<table>
<thead>
<tr>
<th>Contaminant Sources</th>
<th>Environmental Units Likely to be Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission Arising from Equipments used for the Excavation and Filling Works</td>
<td>Air, Flora and Fauna, Socio-Economic Environment</td>
</tr>
<tr>
<td>Dust Released from Excavation and Filling Works</td>
<td>Air and Visual Effects</td>
</tr>
<tr>
<td>Waste Water Arising from the Workers</td>
<td>Surface and Underground Waters</td>
</tr>
</tbody>
</table>
Table 5. Operational Phase Contaminant Sources and Environmental Units to be Affected

<table>
<thead>
<tr>
<th>Contaminant Sources</th>
<th>Environmental Units Likely to be Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effluent Discharge for Irrigation purposes</td>
<td>Surface Waters, Flora and Fauna</td>
</tr>
<tr>
<td>Solid and Hazardous Wastes</td>
<td>Soil, Flora and Fauna, Visual Effects</td>
</tr>
<tr>
<td>Sludge Disposal</td>
<td>Soil, Flora, Fauna, Visual effects, Socio-Economic Environment</td>
</tr>
</tbody>
</table>

D. Use of Natural Sources

108. During the construction phase the use of natural resources consists of the elements such as land use, water use of the workers and use of diesel source for construction vehicles. In the operational phase, natural gas and fuel will be used for heating the administration building. There will also be electrical consumption for the operation of the WWTP and consumption of the personnel in the administration building.

E. Environmental Impact Assessment of the Project

109. Proposed wastewater treatment plant project will certainly produce some environmental impacts in project area. But it must be kept in mind that the impacts of project activities are not always negative, it may be positive as well. The attempt should be to minimize the negative impacts by applying necessary mitigation measures and to maximize the positive impacts. Based on the severity and extent of impacts, the impacts may be classified as high, medium and low. The environmental impacts during various stages have been predicted. These impacts are described below.

1. Impact Assessment on the Air Quality

110. This section discusses the impact of construction and subsequent operation on the ambient air quality around the Project direct impact area.

111. Construction activities have the potential to generate a substantial amount of air pollution. In some cases, the emissions from construction represent the largest air quality impact...
associated with the Project, even though, the generation of construction-related emissions is temporary in nature.

112. The emissions generated from common construction activities include:
   (i) Exhaust emissions of particulate matter (PM) and of nitrogen oxides (Nox) from fuel combustion for mobile heavy-duty diesel- and gasoline-powered equipment, portable auxiliary equipment, material delivery trucks, and worker commute trips,
   (ii) Fugitive PM dust from soil disturbance and demolition activity,
   (iii) Evaporative emissions of reactive organic compounds from paving activity and the application of architectural coatings. The application of architectural coatings is typically the largest source of reactive organic compounds emissions during construction activity,
   (iv) Exhaust emissions of greenhouse gases (GHG) such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O),
   (v) Air quality will be affected by fugitive dust and emissions from construction machinery, concrete/asphalt works, and vehicular traffic during the construction phase. Emissions may be carried over long distances, depending on wind speed and direction, the temperature of the surrounding air, and atmospheric stability.

113. There are no residences, places of work shops, schools, hospitals and the civic cultural and other heritage sites within a radius of 800m of the project site. However, in case some residences are disturbed by dust, water is available in the study area to suppress dust.

114. The critical sources of air pollution during the construction phase are listed below:
Concrete and asphalt plants that generate toxic emissions containing unburned carbon particulates, sulfur compounds, and dust from aggregate preparation,
Quarry areas that generate fugitive dust during rock blasting and crushing,
Earthen haulage tracks that generate dust, particularly during loading and unloading processes.

115. However, emission and dust effects of the construction activities are temporary, and will come into being in low level. This impact will discontinue once the construction is completed. No negative impact will come into being in the operation phase of the Project.

2. Impact Assessment on the Water Quality

116. This section explains how the Project service area will be affected in terms of water resource use, water supply, water body contamination, and alterations in drainage pattern.

117. Water is a critical resource for the local community and resources will be protected during construction and operation. The surrounding land’s drainage system, water resources and treated water quality may be affected by construction and operational activities as follows:
   (i) Surface and subsurface water resources in the Project area may be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens, by toilets at construction campsites.
   (ii) Natural streams and irrigation channels may become silted by borrow material (earth) in the runoff from the construction area, workshops and equipment washing-yards.
   (iii) In the operational phase, the treated effluent may flow to the open canals and streams arund the WWTP site.
118. However, the treatment plant design included several steps to provide sufficient treatment and irrigation quality effluent. The quality of the effluent will be within the EU Effluent Discharge Standards, and hence in case of an unexpected flow of treated effluent to the nearby water bodies will have no or minimal effects to the receiving bodies. Plus, typical effluent discharge characteristics of advanced MBR treatment is significantly better that the EU Effluent Discharge Standards.
### Table 6. Typical effluent qualities in MBRs which increase the domestic wastewaters (Aldham and Gagliardo, 1998; Adham vd., 2000)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typical Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemical oxygen demand (BOI₅)</td>
<td>&lt; 2.0 mg/L</td>
</tr>
<tr>
<td>Total suspended soil (SS)</td>
<td>&lt; 2.0 mg/L</td>
</tr>
<tr>
<td>NH₃-N</td>
<td>&lt; 1.0 mg/L (in the nitrified plants)</td>
</tr>
<tr>
<td>Total phosphore (TP)</td>
<td>&lt; 0.1 mg/L (via alum contribution as biological or chemical)</td>
</tr>
<tr>
<td>Total nitrogen (TN)</td>
<td>&lt; 10 mg/L (in mean temperature climates)</td>
</tr>
<tr>
<td>Total nitrogen (TN)</td>
<td>&lt; 3.0 mg/L (in hot climates)</td>
</tr>
<tr>
<td>Silt density index (SDI)</td>
<td>&lt; 3.0</td>
</tr>
<tr>
<td>Turbidity</td>
<td>&lt; 0.5 NTU</td>
</tr>
<tr>
<td>Microbiological:</td>
<td></td>
</tr>
<tr>
<td>Bacterials</td>
<td>5–6 log removal</td>
</tr>
<tr>
<td>Viruses</td>
<td>1–2 log removal</td>
</tr>
<tr>
<td>Protozoans (Cryptosporidium and Giardia)</td>
<td>Total removal</td>
</tr>
</tbody>
</table>

119. Overall, this impact’s magnitude will come into being in **low** level. However, a series of mitigation measures identified in the following section should take place to minimize and/or avoid the potential negative effects of the construction and operational activities on water quality.

3. **Impact Assessment of Noise**

120. Potential noise impact arising from the Project would be the construction noise. This section presents the assessment on noise impact during construction. The representative noise assessment points to be affected by the Project and potential noise impacts are identified and assessed.

121. Powered mechanical equipment such as generators, excavators, trucks, stabilizers and concrete-mixing plant can generate significant noise and vibration. Whereas various modern machines are acoustically designed to generate low noise levels there is not much evidence that acoustically insulated plant is available in Azerbaijan. The cumulative effects from several machines can be significant and may cause significant nuisances.

122. The noisest construction activities associated with the Project would likely be excavation or exterior finishing, which can generate the noise levels upto 89 dBA from a distance of 5m, per U.S. Environmental Protection Agency, Noise from Construction Equipment and operations, 1971. Applying the attenuation of point source method and without taking into account of such attenuation by sound barriers or atmospheric absorptions, noise generated by powered construction machinery and subsequently by vehicular traffic during the construction phase, is likely to affect sensitive receptors located within about 50 to 75 m of the Project direct impact area. This impact will be temporary, the impact will disappear upon completion of the Project. Plus, the closest living area is approximately 800m away from the project site. Hence the noise effect will come into being **low** level.
4. Impact Assessment on Solid Waste and Hazardous Waste Disposal

123. Solid wastes will be generated mostly during the construction operations, such as dumping base, sub-base and fine sand for building construction and embedding operation of the pipes, filling back the excavated soil, paving roads, and other ancillary works within the Project activities. Scrap metals, rocks, asphalt and concrete chunks, remaining gravel and sands will cause the piled up solid wastes.

124. Solid wastes during construction and operational phases include wood and paper from packaging, sanitary wastes, rubber, plastic and glass. Food containers, cigarette packages, leftover foods, and aluminium foil also contribute solid wastes.

125. Construction chemicals, chemical compounds, such as paints and acids, cleaning solvents and chemicals to be used for wastewater treatment will also cause the negative effects in respect of the hazardous impact when they dispose without taking preventing measures to the earth in the workplace and construction site.

126. These impacts will be temporary, and its magnitude will be in the medium level. The construction related impacts will discontinuie once the construction is completed. A series of mitigation measures identified in the following section is recommended to minimize and/or avoid the potential negative effects of the solid waste and hazardous waste disposal during the construction and operational phases.

5. Impact Assessment on Sludge Disposal

127. As explained in the treatment process section, Membrane bioreactors (MBR) will be used in the WWTP. One of the key benefits of MBR systems is that they effectively overcome the limitations associated with poor settling of sludge in conventional activated sludge processes. In MBR systems, less sludge is produced compared to conventional systems, (see Table below). Once the sludge is drained and dry, it will be gathered by mechanical means and removed to the nearby Nakhcivan City Solid Waste Disposal site.

<table>
<thead>
<tr>
<th>Treatment Process</th>
<th>Sludge Production(kg/kg BO\text{\textsubscript{t}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submerged type MBR</td>
<td>0,0–0,3</td>
</tr>
<tr>
<td>Ordered media bioaerated filter</td>
<td>0,15–0,25</td>
</tr>
<tr>
<td>Trickling filter</td>
<td>0,3–0,5</td>
</tr>
<tr>
<td>Conventional activated sludge</td>
<td>0,6</td>
</tr>
<tr>
<td>Granular media bioaerated filter</td>
<td>0,63-1,06</td>
</tr>
</tbody>
</table>

Impacts of Sludge Disposal will come into being in low level. A few mitigation mesures identified in the following section is recommended to minimize and/or avoid the potential negative effects.
6. Impact Assessment on Odor

128. Potential source of odour in WWTP’s is scum that is collected on ponds, basins, tanks etc of conventional treatment plants.


130. However the proposed WWTP will utilize MBR type treatment where much less ponding will take place leading to fewer odors. In addition, no residential area exists within a radius of 800m of the site. Hence this impact’s magnitude will come into being in low level. However, a series of mitigation measures identified in the following section should take place to minimize and/or avoid the potential negative effects of odor problem.

7. Impact Assessment on Land Use, Soil Erosion and Soil Contamination

a. Land Use

131. The land use classification system is not developed yet in Nakhchivan. However, according to inspection and investigations in the Project area and its environment, the Project will not cause the physical divide an established community, and doesn’t conflict with any applied and /or applicable habitat conservation plan and natural community conservation plan. The Project has no-conflict with the City’s general land use plan including specific plans or zoning ordinances.

132. However, the areas where will be used to acquire borrow material will be impacted most significantly. Utilizing land for project activities, and the subsequent operation of increased traffic on the Project corridor may induce temporary as well as permanent changes in the existing land use pattern.

133. Temporary impacts during the construction in the Project area will be sourced from the following activities, but not limited to:

(i) Trenching and excavation works for pipe laying and jointing,
(ii) Earth Works for plant building foundations, pipe bedding, encasing and trench backfilling,
(iii) Cut and fill and grading activities,
(iv) Transportation of the materials from the excavation,
(v) Reinstating the road and sidewalk profile,
(vi) Activities for ancilliary works,

b. Construction Contractor Camp Site

134. The contractor(s) will require land for:
(i) Contractors’ camps and facilities, ie, storage, equipment parking and washing areas,
(ii) Sources of borrow material and earth-fill,
(iii) Aggregate quarries,
(iv) Access roads for haulage,
(v) Disposal sites and procedures for the safe disposal of surplus construction and waste material.

135. Temporary impacts, which will be generated during the preparation of the constructor(s)’ camp and facilities are;

   (i) Excavation activities,
   (ii) Trenching and construction of water pipelines for connecting the water to the facilities,
   (iii) Erection of the site buildings,
   (iv) Construction of fuel facility,
   (v) Connections the electrical conduits and cabling,
   (vi) Perimeter fencing,

   c. Soil Erosion

136. Professional experience suggests that it will be typical for contractors to claim that there is insufficient space to set up erosion control and sedimentation facilities along the working areas. Based upon observation it is not credible that there is no space, and it is not acceptable that there are no opportunities to use at least some form of sediment basin sediment traps.

137. Soil erosion may occur;
   (i) In workshop areas as a result of unmanaged runoff from equipment washing-yards.

138. The soil erosion will come into being in the magnitude of Low level. Mitigation measures to obviate these impacts are developed in the subsequent sections.

   d. Soil Contamination and Surface Run-off

139. Scarified/scraped asphalt and concrete materials, if not disposed of properly, may contaminate soil resources.

140. The possible contamination of soil by construction chemicals, i.e. oils and chemicals at concrete application sites, workshop areas, and equipment washing-yards may limit the future use of the land for agricultural purposes.

141. Other pollutants such as wash water from concrete mixers, acid and alkaline solutions from exposed soil or rock, and alkaline forming natural elements, may also be presented.

   • Possible construction chemicals, which cause the soil contamination in the Project are listed below;
   • Petroleum products used during construction include fuels, lubricant for vehicles, for power tools, and for general equipment maintenance.
- Chemical pollutants such as paints, acids, cleaning solvents, soil additives used for stabilization, and concrete curring compounds, may also be used on construction sites and carried in runoff.
- Pesticides, insecticides, rodenticides, and herbicides used on construction sites to provide safe and healthy conditions.
- Nutrients, fertilizers used on construction sites, when re-vegetating graded and disturbed areas.

142. The soil contamination and surface run-off will come into being in the medium level. Mitigation measures to obviate these impacts are developed in the subsequent sections.

8. Impact Assessment on Flora and Fauna

143. For defining the effects of the project on fauna and flora, existence of the endangered species, endemics and nationally or internationally protected species were examined but none of them was encountered in the project site.

144. The noise and emissions generated by the construction activities can destroy habitat used for nesting and migrating bird species. However, there is no nursery for nesting bird species and/or aquatic community located closer than 800 m to the Project site. This impact can be considered insignificant.

145. There are no trees necessary to fell and replant in the proposed location of the waste water treatment plant.

146. There are open irrigation canals close to the Project site. Currently the untreated effluent is being discharged to the main irrigation canal 3 km upstream of its final discharge to Araz water reservoir. Once the WWTP is in operation, no effluent will be discharged to these irrigation canals, and hence this will have a positive effect on the water quality of the canal.

147. There are no forest and forest blades located in the Project area. There will be no impact of the Project on the forests and forest blades. In addition, the project involves planting of several trees within the proposed treatment plant boundary after the construction which will have a positive impact to the immediate environment.

9. Impact Assessment on Socio-Economic Environment

148. While examining the effects in terms of socio-economic environment, construction and operational phases were handled separately. Human groups to be affected negatively or positively after the commissioning of the project were defined and profit and loss relationship was examined.

149. Effects in terms of socio-economic environment are; positive effects on health, employment opportunities, visual values, positive effects on life standards by enhancing the quality of water bodies, recreation areas, and cultural structures. In this respect, the project doesn’t have any harmful effects on the environment. The project will brighten the economic and social structure of the environment. Consequently, the project is a useful one and will not have negative effects on physical, biological and social environment.
150. Economic and social life will be affected positively by the Project. Health problems will be removed by effluent treatment. Furthermore, employment opportunities will be provided during the construction and operation phases of the project.

F. Mitigation Measures

151. As mentioned in the previous section, the project will have low / medium adverse impacts on physical and biological environment. Some of the possible impacts are of temporary in nature and insignificant in magnitude. Even though the negative impacts on environment are small and insignificant, it will be better to implement some of the mitigation measures to minimize the impacts. These mitigation measures will help to reduce the negative impacts at the same time it will help to maximize the positive impacts. The proposed mitigation measures are listed below.

1. Air Quality

152. The following measures will be implemented to mitigate the impact of construction works on ambient air quality, however, heavy equipment and machines to be used within the construction phase should be mainly new and comply with all national and International standards. Impact of emissions from ancilliary equipments (welding equipment, pumps etc), construction mechanisms and lories on athmosphere will be minimal;

a. Emissions and Dust Control Measures

- Quarry areas and asphalt plants if needed will be located at least 500 m downwind from populated areas, wildlife habitats, and contractors' camps, to minimize the impact of dust emissions.
- Asphalt, hot mix and batching plants will be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions.
- The National Ambient Air Quality Standards applicable to gaseous emissions generated by construction vehicles, equipment, and machinery, will be enforced during construction works.
- Heavy construction vehicles should be performed in compliance with their exploitation standards.
- Regular check of technical condition of all vehicles should be prepared and carried out regularly by the contractor's safety manager and approved by SAWMC/EMU/ECO.
- 30 km/h speed limit should be set for movement of heavy construction vehicles on the dirt and service roads.
- All excavation Works, building temporary service roads, and loading/unloading operations should be stopped when wind speed exceeds 12 km/s.
- If the working surfaces become dry and dusty, water will be sprinkled on.
- No work will be carried out during the night (21.00hrs to 07.00hrs).
- If works give rise to complaints over dust, the contractor shall investigate the cause and review and propose alternative mitigation measures before works recommence.
- Fuel-efficient and well-maintained haulage trucks will be employed to minimize exhaust emissions. Smoke belching vehicles and equipment will not be allowed and will be removed from the project.
All diesel heavy construction equipment shall not remain running an idle for more than five minutes.

Using alternative fueled equipment when feasible (such as biodiesel and electric).

All diesel-fueled engines used for on- and offsite construction activities shall be fueled only with ultralow sulfur diesel, which contains no more than 15 ppm sulfur.

2. Water Quality

Measures to mitigate the adverse impact on water resources, surface drainage patterns and treated effluent are discussed below:

- Where works are in progress, erosion control and sedimentation facilities including sediment traps and straw bale barriers or combinations thereof will remain in place and be maintained throughout the works to protect local water resources.
- Lubricants, fuels and other hydrocarbons will be stored at least 100m away from water bodies.
- Topsoil stripped material shall not be stored where natural drainage will be disrupted.
- Solid wastes will be disposed of properly (not dumped in streams).
- Solid Construction material and spoil stockpiles will be covered to reduce material loss and run-off and stockpiles will not be nearer than 100m to water bodies.
- Borrow sites will not be close to sources of drinking water in case of runoff.
- The contractors will be required to maintain close liaison with the local community to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.
- Guidelines will be established to minimize the wastage of water during construction operations and at campsites.
- The water ways and drainage streams en-route of the project should not be impeded by the works and the scale of the works does not warrant hydrological monitoring.
- During construction, machinery and transport will be used by the contractor, both have potential of causing contamination to under ground and above ground water assets. There is need to compile temporary drainage management plan before commencement of works.
- Proper installation of temporary drainage and erosion control before works within 50m of water bodies should be done.
- Borrow sites (if required) should not be close to sources of drinking water.
- The treated effluent quality sampling must be conducted to meet the frequency and methods stipulated in European Council Directive 91/271/EEC, by WWTP Personnel of SAWMC.
- In the operational phase, WWTP Management of SAWMC will be responsible for monitoring and testing of the treated effluent discharge from the treatment plant to the agricultural lots. In the unlikely case the effluent do not meet the EU Standards, the poorly treated effluent will not be used for irrigation until the problem is found and the EU effluent standards are met.

3. Noise

The Project is scheduled to commence in early 2012 and to be completed at the end of 2013. All construction tasks will be carried out during unrestricted hours (09.00 to 18.00 hour
Monday to Saturday, excluding general holidays). There are not any residents near the project site (with a radius of 0.8 km), so no adverse effects of the noise is expected. However, for good construction practices, the following mitigation measures are recommended to minimize any adverse effects of the noise:

- Not operating the noisy powered mechanical equipments simultaneously, (i.e. such as concrete pumper and road paver together);
- Maintain machinery and vehicle silencer units in good working order. Offending machinery and / or vehicles will be banned from use on site until they have been repaired.
- Keep noise generating activities associated with construction activities to a minimum and within working hours.
- Notify the residents close to the Project area prior to commencement of the construction phase.
- Regular inspection and maintenance of all vehicles and construction equipment working on-site.
- Equipment used on site will be quietest reasonably available.
- Best available work practices will be employed on site to minimize occupational noise levels.
- Locate equipment to minimize nuisances,
- Mufflers of heavy vehicles should always be kept in good condition.
- The scheduled daily working hours should be recommended by law between 9.00 AM and 6.00 PM.

4. Solid Waste and Hazardous Waste Disposal

155. Constructor’s Equipment will be cleaned and repaired (other than emergency repairs) in the dedicated facility or and area at the contractor’s site or at a repairshop in an industrial park. All contaminated water, sludge, spill residue, or other hazardous compounds will be disposed of outside the construction boundaries, at a lawfully permitted or authorized destination.

- Construction chemicals, chemical compounds, such as paints and acids, cleaning solvents, chemicals used for waste water treatment during operational phase will not be disposed at any place of a construction site, and dumped only in demarcated waste disposal sites, designated by MENR.
- All solid wastes will properly be packaged, and disposed at a lawfully area.
- Contractor’s workers and WWTP Personnel shall employ the following measures to minimize exposure to potential pathogens:
  1- Wash hands regularly, especially before eating, drinking, smoking, or using the restroom.
  2- Wear gloves.
  3- Cover wounds with clean, dry bandages.
- Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions.
- The Contractor will furthermore be responsible for the training and education of all personnel on site who will be handling the material about its proper use, handling and disposal for the first six months of operation.
- All hazardous materials will be stored in a secured, appointed area that is fenced and has restricted entry.
o Storage of hazardous products shall only take place using suitable containers approved by the ECO.
o Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.
o Thinners or solvents should not be discharged into sanitary or storm water system when cleaning the machinery.
o Any accidental chemical / fuel spills to be corrected immediately.
o Exercise extreme care with the handling of diesel and other toxic solvents so that spillage is minimized.

5. **Sludge Disposal**

156. Sludge disposal shall be inconsistent with “Landfill of Waste” article (1999/31/EC directive) and “Waste Framework” article (75/442/EC directive).

157. The sludge that is removed from the wastewater must be properly treated. Once the sludge is dried, it will be gathered by mechanical means and removed to the nearby Nakhcivan City Solid Waste Disposal site.

158. The following list provides current, in-practice mitigation measures and management practices for sludge drying beds of WWTP:
   • Install a cover or cap over the beds that can be used to cover the beds after operation cease.
   • Install a negative and/or positive aeration system to control moisture and temperature and provide oxygen for microbial decomposition.
   • Install a flare for treatment of methane gas prior to release.

6. **Odor**

159. Whereas one of the main sources causing odour is scum, overloading of the ponds, basins or tanks will also result in odour problems because the treatment capacity will have been exceeded. The design of the proposed WWTP will be for the 2034 demands of the City. Hence no overloading is expected.

160. If for process reasons or others, scum does accumulate at a particular time, scum removal systems will be in place including:
   o High-pressure water spray to break up the scum so that it will settle.
   o Boats and rakes to allow staff to break up the scum or remove it from the ponds, tanks, etc.
   o Preliminary treatment (screening) shall be added at the entrance of the plant, thereby reducing one of the sources of odours.

161. An at least 20 m beautification zone from the perimeter fence of the WWTP is required.

162. In the unlikely event that the odor becomes an issue, following mitigation measures are recommended:
   o Installing activated carbon filters/carbon adsorption in the aeration basin influent channel, and/or all waste gas exhaust systems,
   o Installing biofiltration/bio trickling filters for all waste gas exhaust systems,
- Installing hooded enclosures on grit dumpsters and primary clarifier weir covers, and/or channel seals,
- Installing wet and dry scrubbers on waste gas exhaust systems from treatment tanks,
- Installing caustic and hypochlorite chemical scrubbers on waste gas exhaust systems from treatment tanks,
- Installing an ammonia scrubber on waste gas exhaust from treatment tanks,
- Installing thermal oxidizer to oxidize all waste gas exhaust,
- Caping and covering the storage basins the anaerobic ponds to avoid release of odorous compounds,
- Installing mixed flow exhaust system to dilute waste gas exhaust.

7. Land Use, Soil Erosion and Soil Contamination

163. Prior to the commencement of construction the contractor, all subcontractors and all his workers will need to be trained on the requirements for environmental management. In order to ensure that the contractor, subcontractors and workers understand and have the capacity to implement the environmental requirements and mitigation measures there will be regular and frequent training sessions and tool-box talks.

164. At the beginning of the project, the Contractor shall identify named staff to supervise and responsible for mitigation measures for all works including but not limited to earthworks, drainage re-provisioning, erosion control, materials management, noise and dust control, waste management.

165. Engineering controls will be designed by the contractor as mitigation measures and approved by the EMU (supervising authority) prior to the commencement of the construction works. No construction works will commence until all mitigation measures are in place and approved by the supervising authority.

166. The Project was designed not to interfere with the drainage on adjacent lands and paths and to prevent soil erosion.

167. The contractor(s) will be required to have an environmental engineer to check the implementation of any temporary drainage mitigations on the site and make modifications on a daily basis as necessary.

168. In addition, the following guidelines will be applied to minimize the impact on land used to extract borrow material:

   a. Land Use

169. Project facilities will be located at a minimum distance of 500 m from existing settlements, built-up areas, wildlife habitats, or archaeological and cultural monuments.

170. As far as possible, waste/barren land ie, areas not under agricultural or residential use, and natural areas with a high elevation will be used for setting up Project facilities.
171. The excavation of earth fill will be limited to an approximate depth of 50 cm. This practice will be applied uniformly across the entire extent of the farmland unit acquired for borrowing earth material.

172. Where deep ditching is to be carried out, the top 1 m layer of the ditching area will be stripped and stockpiled. The ditch will initially be filled with scrap material from construction and then leveled with the stockpiled topsoil to make it even with the rest of the area.

173. Ditches or borrow pits that cannot be fully rehabilitated will be landscaped/converted into fish ponds to minimize erosion and to avoid creating hazards for people and livestock.

174. The following restrictions or constraints should be placed on the contractors camp sites, and construction staff in general:
   - The use of welding equipment, oxy-acetylene torches and other bare flames where veld fires constitute a hazard.
   - Indiscriminate disposal of rubbish or construction wastes or rubble.
   - Littering of the site.
   - Spillage of potential pollutants, such as petroleum products.
   - Collection of firewood.
   - Poaching of any description.
   - Use of surrounding veld as toilets.
   - Burning of wastes and cleared vegetation.

b. Soil Erosion and Surface Runoff

175. Good engineering practices will help the control soil erosion both at construction sites, particularly in excavation and borrow areas, and along haul tracks.

176. The contractors will be required to include appropriate measures and implement them accordingly. These will include the following measures:
   - Schedule work so clearing and grading are done during the time of minimum rainfall.
   - Temporary stabilization is required within 70 days, if the site will be inactive for more than 30 days.
   - Permanent stabilization is required, if the site will be inactive for more than one year.
   - Clear only areas essential for construction.
   - Perimeter control shall be installed, and temporary and permanent stabilization is required for topsoil stockpiles, and other disturbing areas within seven calender days of site disturbance.
   - Highly erodible soils should be avoided.
   - Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.
   - Stockpile topsoil and reapply to re-vegetate the site.
   - Cover and stabilize topsoil stockpiles.
   - Use wind erosion controls.
   - On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.
   - Use seeding and mulch/mats, if necessary.
   - Use turfing.
Use wildflower cover.
Stockpiles should be covered before heavy rain to prevent wash out due to the runoff. Stockpiles should not be located within 20m of the water courses and there should be an intervening vegetated buffer to control any unexpected runoff.

c. Soil Contamination

177. The following practices will be adopted to minimize the risk of soil contamination:

- The contractors will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
- Soil contamination by asphalt will be minimized by placing all containers in caissons.
- Solid waste generated during construction and at campsites will be properly treated and safely disposed of only in demarcated waste disposal sites.
- Debris generated by the dismantling of existing pavement structures will be recycled subject to the suitability of the material.
- Solid wastes generated in the contractor’s camp and other workplaces will be managed as follows;
  - Construction site’s borders should be marked beforehand and signs should be erected warning people ‘not to dump garbage’ and ‘not to enter’.
  - Construction debris (sand, soil, rocks, asphalt, concrete) should be used as an additional material for filling deep trenches when needed. If not needed, they will be taken to the city’s dump site.
  - An adequate disposal facilities should be provided for solid wastes in or near the contractor’s camp.
- Construction chemicals will be managed as follows;
  - Pesticides: Properly store, handle, apply and dispose of pesticides. Pesticides storage areas in the construction sites should be protected from the elements. Warning signs should properly placed in the areas sprayed or treated. Persons mixing and applying these chemicals should wear use suitable protective clothing (Personal Protective Equipment-PPE).
  - Contractor(s) should submit a detailed PPE Policy for approval of the SAWMC and EMU prior to commence the work.
  - Petroleum Products: When storing the petroleum products, the following measures should be taken;
    - Creating a shelter around the area with cover and wind protection,
    - Lining the storage area with a double layer of plastic sheeting or similar material,
    - Clearly labelling all products,
    - Keeping the tanks off the ground and stopping the source of the spill,
    - Covering the spill with absorbent material

178. Special attention should be paid for construction of contractor’s fuel facility, and those are:
o Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.0 m high with the concrete or plastered masonry wall,
o Fuel facility should be located at least 30 m far from the storage area and other facilities of the camp, and should be protected with a separate wire fence wall,
o The area of the fuel facility should be covered with a shed for the protective measure against the sunshine and rain.
o A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages,
o Nutrients: The fertilizer and liming materials into the soil to depths of 10-15 cm.
o Washouting from concrete trucks and mixers should be disposed of into a designated area that can later be backfilled.
o The Contractor will be required to instruct and train their workforce in the storage and handling of materials and chemicals that can potentially cause soil contamination.
o If waste oils or other contaminants are accidentally spilled on open ground the waste including the top 2 cm of any contaminated soil shall be disposed of as chemical waste to a disposal site acceptable to the SAWMC and agreed with the local authority / community.
o Control measures for oily residues, lubricants and refueling are prescribed in the EMP. The maintenance yards that will be created will have dedicated drainage which can capture run-off.
o Oily residues and fuel should be captured at source and refueling and maintenance should take place in dedicated areas away from surface water resources.

8. Flora and Fauna

179. The mitigation measures on flora and fauna are described below.
   • Any existing vegetation should be preserved to the greatest extent possible.
   • The Contractor and his employees shall not bring any domesticated animals onto the site.
   • The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals.
   • No poaching of fauna and flora shall be tolerated by the Contractor or his personnel on Site or elsewhere.
   • Contractors will be required to establish their campsites, crusher plants and concrete batching plant (if needed) on waste/barren land rather than on forested or agriculturally productive land.
   • Construction vehicles, machinery and equipment will remain confined within their designated areas of movement.
   • Before ground disturbing activities begin, identify and locate all equipment staging areas.

180. Where cut and fill cannot be avoided, slopes shall be designed for long term stability. Permanent vegetation should be used as the priority approach to stabilization of cut and fill areas where slopes are less than or equal to 3:1.

181. The contractor(s) shall provide the sand/gravel (crushed or naturally sieved and washed material) for filling, underlaying the pipes, using of base and sub-base material, asphalt mixture, and concrete mixture in all Project activities from the existing plants in NAR.
182. Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.

VII. PUBLIC CONSULTATION AND DISCLOSURE

183. In this part, informing studies carried out about the project for the public residing on the settlements likely to be affected by the project will be explained.

A. Public Consultation Details

184. The proposed Nakhchivan City Wastewater Plant will be constructed at south side of the City, approximately 3 km north of Araz Water Reservoir. The group to be affected most by the project is expected to be the public residing in Nakhchivan City.

185. The public information and consultation was done to allay any fears of people and to receive any objections/suggestions on the project. Public Consultation Meetings were carried out in Nakhchivan City on 05-09.09.2011. By giving advertisements in advance, attendance of a wide range of related people to the meetings was encouraged. Opinions, ideas and suggestions of the locals and related people were received during the public attendance meetings and other related studies.

B. Information Disclosure & Public Opinions

186. Concerning the activities performed in the Public Attendance Meetings; citizens were informed about the studies to be carried out within the scope of the project, environmental effects of the project and measures to be taken against these effects. The topics discussed were:

- project awareness
- expected start and end of the project
- benefits of the project to society and state and as a whole
- the environmental issues related to the project
- any disadvantages and how these can be mitigated

187. Resident attendants were aware of the facts that the untreated effluent is a major health and environmental problem and that the City is lacking a WWTP. The attendees liked the idea of using the treated effluent for irrigation purposes. Some of the attendees asked if the sludge can be used for agriculture. They are informed that the use of sludge in agriculture is very likely, as long as no heavy metals toxic to plants and humans are present in sewage sludge. The EU Council Directive 86/278/EEC regulates the use of sludge in agriculture and SAWMC / MENR will work together to regulate its use by following the mentioned directive once the WWTP is in operation.

VIII. GRIEVANCE REDRESS MECHANISM

188. PIU of SAWMC has overall responsibility for project implementation and EMU of SAWMC will have overall responsibility for environmental compliance. The Ministry of Ecology and
Natural Resources (MENR) is the responsible administrative body for the protection of environmental and natural resources. The affected population and stakeholders may send their grievances, related to the project induced environmental impacts and nuisance to EMU or directly to the MENR.

189. The MENR is obligated to respond to the grievances, which have been received from the population or other interested parties in accordance with the rules of the Government of Azerbaijan.

190. However, the EMU will facilitate the response through implementing the following grievance redress mechanism. During the ongoing public consultation process, the PIU will inform the stakeholders and the public that an EMU within SAWMC will be responsible for environmental compliance and grievance redress. EMU will continuously provide information on the public consultation meetings and post on the media (i.e. wallpapers and or newspapers) the contact details of the persons responsible for grievance collection and response.

191. Upon receiving the grievance (in written or oral form) the EMU will carry out the following actions:
   (i) send its representatives to check the claims and monitor the situation
   (ii) involve SAWMC and MENR when and where appropriate
   (iii) receive expert’s conclusion (from PIU personnel, consultant experts or MENR experts)
   (iv) submit an instruction on corrective measures to the construction company and the operators during 10 days after receiving the grievance
   (v) inform the affected person or persons about the experts’ decision and corrective measures applied;
   (vi) If the affected person is not satisfied by the decision, they may present further information in support of new case. The subsequent decision of the EMU/MENR is considered finally.

192. In case the affected stakeholder or person is not satisfied with the response, the grievance may be directed to the court.

IX. ENVIRONMENTAL MANAGEMENT PLAN

193. EMP is a plan or programme that seeks to achieve a required end state and describes how activities that have or could have an adverse impact on the environment, will be mitigated, controlled, and monitored.

194. To implement the mitigation measures described in above chapter, an Environmental Management Plan has been prepared. The Environment Management Plan should be implemented strictly.

195. The EMP will address the environmental impacts during the construction and operational phases of a project. Due regard must be given to environmental protection during the entire project. In order to achieve this a number of environmental specifications/recommendations are made. These are aimed at ensuring that the contractor maintains adequate control over the project in order to:

- Minimize the extent of impact during construction
- Ensure appropriate restoration of areas affected by construction.
• Prevent long term environmental degradation.

196. The contractor must be made aware of the environmental obligations that are stipulated in this document, and must declare himself to be conversant of all relevant environmental legislation. The contractor should also be aware that the SAWMC / Environmental Management Unit (EMU) and Environmental Control Official(s) (ECO) with the Supervisory Engineer will monitor the implementation of the procedures.

A. Environmental Mitigation/Management Plan

197. Environmental aspects addressed in this EMP include;

For the Construction Management Plan,

1. Ambient Air and Dust,
2. Water Pollution,
3. Noise Pollution,
4. Solid Waste,
5. Hazardous Materials,
6. Improper Land Use,
7. Erosion Control,
8. Soil Contamination,
9. Flora and Fauna,

For the Operation Phase Management Plan,

1. Sludge Disposal
2. Effluent Discharge Quality
3. Solid and Hazardous Wastes
4. Odor Control

198. The EMP shall be attached in the bidding documents as guidance to the Bidders / Contractors. The plan must be read in conjunction with the contract documents including the relevant Bill of Quantities, Specifications and Drawings. When carrying out the Works, the environmental objective is to minimize the footprint of damage, disturbance and/or nuisance (of the social and biophysical environment), to properly manage use of water resources and to prevent pollution. This is the responsibility of the Contractor.
## 1. Construction Mitigation/Management Plan

### Environmental Impact at the Construction Phase

<table>
<thead>
<tr>
<th>Impacts</th>
<th>Sites</th>
<th>Mitigation Measures Recommended</th>
<th>Timeframe</th>
<th>Responsibility for Implementation and for Monitoring &amp; Enforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Air and</td>
<td>Construction site</td>
<td>• Limit the production of dust and damage caused by dust to the satisfaction of ECO.</td>
<td>Daily during construction</td>
<td>Construction Contractor(s) / ECO, Supervisory Engineer, and Contractor(s)</td>
</tr>
<tr>
<td>Local Dust</td>
<td></td>
<td>• Reschedule vegetation clearing activities or earthworks during periods of high wind, if visible dust is blowing off-site.</td>
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<td></td>
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<td>• Regular watering and other treatment of exposed construction areas subject to vehicle and machinery movement.</td>
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<td>• Ensure that vehicles and equipment are appropriately maintained or covered to minimize air emissions.</td>
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<td>• Vehicle speeds in construction shall be limited to a maximum of 30 km/h.</td>
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<td>• Revegetate disturbed areas as soon as possible.</td>
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<td>• No open burning of wastes to be undertaken</td>
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<tr>
<td>Water Pollution</td>
<td>Construction site</td>
<td>• Use erosion control and sedimentation facilities including sediment traps and straw bale barriers or combinations thereof</td>
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<td></td>
<td></td>
<td>• Store lubricants, fuels and other hydrocarbons at least 100m away from water bodies.</td>
<td>Daily during construction</td>
<td>Construction Contractor(s) / ECO, Supervisory Engineer, and Contractor(s)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Topsoil stripped material shall not be stored where natural drainage will be disrupted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Solid wastes will be disposed of properly (not dumped in streams).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cover solid construction material and spoil stockpiles</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Noise Pollution      | Construction site | • Maintain machinery and vehicle silencer units to minimize noise  
|                     |                   | • Keep noise generating activities associated with construction activities to a minimum and within working hours.  
|                     |                   | • Vehicles and machinery that are used intermittently should not be left idling condition for long period of time.  
|                     |                   | • Equipment used on site will be quietest reasonably available.  
|                     |                   | • Best available work practices will be employed on site to minimize occupational noise levels. |
|                     |                   | Daily during construction  
|                     |                   | Construction Contractor(s) / ECO, Supervisory Engineer, and Contractor(s) |
| Solid Waste         | Construction site | • Provide adequate number of ‘scavenger proof’ refuse bins at the construction sites and at the construction camps.  
|                     |                   | • Ensure that all personnel immediately deposit waste in the waste bins provided.  
|                     |                   | • Store all refuse and solid waste generated at all work sites in appropriate scavenger proof containment vessels  
|                     |                   | • All waste must be transported in an appropriate manner (e.g. plastic rubbish bags).  
|                     |                   | • Do not dispose of any waste and / or construction debris by burning, or by burying.  
|                     |                   | • Discard all construction waste at a registered waste management facility / landfill site  
|                     |                   | • All soil contaminated, for example by leaking machines, 42efueling spills etc. to be excavated to the depth of contaminant penetration, placed in drums and removed to an appropriate landfill site. |
|                     |                   | Monthly during construction  
<p>|                     |                   | Construction Contractor(s) / SAWMC/ECO, Supervisory Engineer, and Contractor(s) |</p>
<table>
<thead>
<tr>
<th>Hazardous Material wastes</th>
<th>Construction site</th>
<th>Monthly during construction</th>
<th>Construction Contractor(s) / SAWMC/ECO, Supervisory Engineer, and Contractor(s)</th>
</tr>
</thead>
</table>
| • Comply with all national, regional and local legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials.  
  • Establish an emergency procedure for dealing with spills or releases of petroleum.  
  • Storage of all hazardous material to be safe, tamper proof and under strict control.  
  • Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers.  
  • Any accidental chemical / fuel spills to be corrected immediately. | | | |

<table>
<thead>
<tr>
<th>Improper Land Use</th>
<th>Construction site</th>
<th>Monthly during construction</th>
<th>Construction Contractor(s) / EMU/ECO of SAWMC, Supervisory Engineer, and Contractor(s)</th>
</tr>
</thead>
</table>
| • Ditches or borrow pits that cannot be fully rehabilitated shall be landscaped/converted into ponds to minimize erosion and to avoid creating hazards for people and livestock.  
  • Apply following restrictions or constraints on the site camp, and construction staff:  
    - Indiscriminate disposal of rubbish or construction wastes or rubble.  
    - Littering of the site.  
    - Spillage of potential pollutants, such as petroleum products.  
    - Collection of firewood.  
    - Poaching of any description.  
    - Use of surrounding veld as toilets.  
    - Burning of wastes and cleared vegetation.  
  • The natural vegetation encountered on the site to be conserved and left as intact as possible. | | | |

<table>
<thead>
<tr>
<th>Erosion</th>
<th>Construction</th>
<th>Monthly during construction</th>
<th>Construction Contractor(s) / SAWMC/ECO, Supervisory Engineer, and Contractor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Protect all areas susceptible to erosion and take</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Contamination</td>
<td>Construction site</td>
<td>Continual during construction</td>
<td>Construction Contractor(s) / ECO, Supervisory Engineer, and Contractor(s)</td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td>measures, to the approval of the ECO.</td>
<td>• During construction, areas susceptible to erosion must be protected by installing temporary or permanent drainage works and energy dispersion mechanisms</td>
<td>• Storm water drainage measures are required on site to control runoff and prevent erosion.</td>
<td>Continual during construction</td>
</tr>
<tr>
<td>• Schedule work so clearing and grading are done during the time of minimum rainfall.</td>
<td>• Clear only areas essential for construction.</td>
<td>• Avoid highly erodible soils.</td>
<td>Construction Contractor(s) / EMU/ECO of SAWMC, Supervisory Engineer, and Contractor(s)</td>
</tr>
<tr>
<td>• Stockpile topsoil and reapply to re-vegetate the site.</td>
<td>• Use wind erosion controls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cover and stabilize topsoil stockpiles.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properly treat solid waste generated during construction and at campsites and safely dispose only in demarcated waste disposal sites.</td>
<td>• Persons mixing and applying construction chemicals should wear use suitable protective clothing (Personal Protective Equipment-PPE).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Submit a detailed PPE Policy for approval of the SAWMC and EMU prior to commence the work.</td>
<td>• Keep chemical/fuel tanks off the ground.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fuel facility should be located at least 30 m far from the storage area and other facilities of the camp, and should be protected with a separate wire fence wall.</td>
<td>• Washouting from concrete trucks and mixers should be disposed of into a designated area that can later be backfilled.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Instruct and train workforce in the storage and</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>•</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Handling of materials and chemicals that can potentially cause soil contamination.

- If waste oils or other contaminants are accidentally spilled on open ground the waste including the top 2 cm of any contaminated soil shall be disposed of as chemical waste to a disposal site acceptable to the SAWMC and agreed with the local authority / community.

<table>
<thead>
<tr>
<th>Impact on Flora and Fauna</th>
<th>Construction site</th>
<th>Continual during construction</th>
<th>Construction Contractor(s) / ECO, Supervisory Engineer, and Contractor(s)</th>
</tr>
</thead>
</table>
|  | • Any existing vegetation should be preserved to the greatest extent possible.  
  • The Contractor and his employees shall not bring any domesticated animals onto the site.  
  • The Contractor shall ensure that the work site be kept clean, tidy and free of rubbish that would attract animals.  
  • No poaching of fauna and flora shall be tolerated by the Contractor or his personnel on Site or elsewhere. |  |  |

*Estimated Costs for implementation of mitigation measures described in the construction phase EMP are insignificant and are considered to be included in the Project Budget.*
## 2. Operation Phase Mitigation/Management Plan

<table>
<thead>
<tr>
<th>Environmental Impact During Operational Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impacts</strong></td>
</tr>
</tbody>
</table>
| Sludge Disposal | Waste Disposal Site of MENR | • Routinely gather sludge by mechanical means and remove to the nearby Nakhcivan City Solid Waste Disposal site  
| Effluent quality violation | Discharge to Irrigation sites | • Daily sample analysis and testing of treated water  
• Full compliance to EU council directive 91/271 EEC  
• If the effluent do not comply with the Directive, its use for irrigation be stopped, until acceptable quality test results and sufficient disinfection are demonstrated as per the Directive. | Continual during operational phase | WWTP Management / SAWMC |
| Waste Implications Solid and Hazardous Wastes of WWTP operations | Wastewater Treatment Plant Site | • Visual assessment during the Works;  
- Field inspection,  
- Report of waste volumes generated  
- Report and record all leakages and spills  
• All solid wastes will properly be packaged, and disposed at a lawfully area.  
• All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry.  
• Storage of hazardous products shall only take place using suitable containers. | Monthly control during operational phase | WWTP Management / SAWMC, WWTP Management |
• Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.
• Any accidental chemical / fuel spills to be corrected immediately.

<table>
<thead>
<tr>
<th>Odor</th>
<th>Wastewater Treatment Plant Site</th>
<th>Odor</th>
<th>Wastewater Treatment Plant Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Visual assessment</td>
<td>Continual during operational phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High-pressure water spray to break up any scum so that it will settle.</td>
<td>WWTP Management / SAWMC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Keep at least 20 m beautification zone from the perimeter fence of the WWTP</td>
<td></td>
</tr>
</tbody>
</table>

*Estimated Costs for implementation of mitigation measures described in the operational phase EMP are insignificant and are considered to be included in WWTP normal operational expenses.
B. Institutional arrangements

199. Supervision and monitoring are fundamental to the successful implementation of an Environmental Management Plan. Therefore, it is vital that monitoring of the extent to which the mitigation measures of this project, which are adhered to by consultants and contractors, takes place.

200. All of the issues described and discussed in this document will require monitoring, and it will be the responsibility of SAWMC to undertake this monitoring according to the specifications of the monitoring plan.

- To draft and implement a monitoring programme to assess compliance with the EMP.
- To establish an Environmental Management Unit (EMU) during the Construction Phases.
- To undertake the monitoring of operations during the operational phase. Any problems that are identified or encountered must be reported to SAWMC so that appropriate action may be taken to rectify the situation.

C. PIU of SAWMC

201. SAWMC has already a Project Implementation Unit (PIU). This unit is typically a Fully Integrated PIU, as the project implementing unit, which has taken the full responsibility and implement the project using its own structure and staff. Because in such a case when he needs an expert staff from other agencies or ministries, he will have all supports of them by reassigning the expert staff to carry out project activities by releasing them from other ministry functions. PIU of SAWMC may be supported by limited technical assistance for specific areas that require additional skills or expertise (e.g. environmental specialist, health and safety specialist and quality control experts experienced on the ADB financed projects).

D. Environmental Management Unit (EMU) of PIU

202. The SAWMC’s PIU currently has few staffs and there will be a need for more human resources. A substantial amount of training shall be undertaken in order to ensure that the EMU officials are trained to understand how to apply the EMP. The training will ensure they have the resources to apply the EMP and have the capacity to evaluate the environmental requirements and contractors’ mitigation measures, and also to facilitate capacity building activities. This will work towards the development of a strengthening plan for the environmental management undertaken by EMU as the project moves from the detailed design to the construction and maintenance phases. It is recommended that the proposed environmental staff within the Construction on Nakhchivan City Water Supply Network and Sewage Collection System subproject is also engaged on this WWTP subproject.

E. Duties of Environmental Control Officer

203. The Environmental Control Official shall ensure that the mitigation measures and other requirements set forth in the EMP are adhered to.
The following guidelines apply to the functions of an ECO:

- The ECO should have the ability to understand the contents of the Environmental Management Plan (EMP) and explain it to the contractor, the site staff, the supervisors and any other relevant personnel.
- The ECO would have to be on site on a regular basis, preferably daily to supervise environmental actions associated with construction activities.
- The ECO should be able to understand, interpret, monitor and implement the EMP. This is his most important function.
- The ECO must then give feedback of the monitorings to SAWMC’s PIU/EMU and Contractors. This must be in the form of a written report.
- The ECO must ensure that the contractor understands what is to be done to rectify and address any problems that have arisen from the monitoring.

F. Suggested Environmental Management Team for SAWMC

205. The environmental management team proposed to be constituted under the PIU of SAWMC within the Construction on Nakhchivan City Water Supply Network and Sewage Collection System Subproject is recommended to be assigned this WWTP Project too.

206. The team shall manage and monitor all environmental issues and shall provide full control on the terms of EMP. An expat EMP manager should be employed for six months to manage the team and to create training opportunity, and thus the team would specialize on the environmental management at the end of the construction phase. A local ECO, a local environmental specialist and a local clerical staff are the other minimum suggested team members for EMU.

G. Estimated Costs for Environmental Management

207. The Estimated Cost for the Environmental management for construction period is included in the Environmental management estimated cost of Construction on Nakhchivan City Water Supply Network and Sewage Collection System Subproject. No additional cost is being anticipated.

H. Feedback to SAWMC’s PIU and EMU

208. Reporting to the SAWMC’s PIU and EMU should take place during site meetings. In the case of potential “fatal flaws”/crises developing due to implementation of the project, reporting should be done immediately and the potentially adverse activities immediately halted in order that corrective action can be taken.

209. Reporting on the status of implementation of the EMP and the results of the environmental monitoring programme must be recorded and summarised in monthly and semiannually reports by the EM/ECO and submitted to the SAWMC’s PIU.
I. Failure to comply with EMP

210. Outlined below are a number of steps, relating to increasing severity of environmental problems, which will be implemented. The principle is to keep as many issues within the first few steps as possible.

**Step 1:** The ECO discusses the problem with the contractor or guilty party, and they work out a solution together. The ECO records the discussion and the solution implemented, and submits to EMU (or EM).

**Step 2:** The ECO and Supervisory Engineer observe a more serious infringement, and notifies the guilty party in writing, with a deadline by which the problem must be rectified. All costs will be borne by the contractor.

**Step 3:** The ECO shall order the contractor to suspend part, or all, the works. The suspension will be enforced until such time as the offending party(ies), procedure or equipment is corrected and/or remedial measures put in place if required. No extension of time will be granted for such delays and all cost will be borne by the contractor.

**Step 4:** Breach of contract – One of the possible consequences of this is the removal of a contractor and/or equipment from the workplace and/or the termination of the contract, whether a construction contract or an employment contract. Such measures will not replace any legal proceedings that SAWMC may institute against the contractor.

J. Environmental Monitoring and Supervision

211. The Employer (SAWMC) with its authorized environmentally sub-sections (EMU/ECO), and the Supervisory Engineer (or Environmental Specialist of CMF) will monitor the implementation of the EMP. Overall potential environmental and safety impacts are readily avoidable and can be easily mitigated by adopting good engineering practices.

212. The Employer will ensure that the contract document include the relevant environmental protection clauses. The Contractor that will perform the works will also follow the requirements of the current Azerbaijan construction and environmental regulations. Compliance with the Azerbaijan regulations and the terms of the EMP will be monitored and verified in the monthly reports submitted to the SAWMC by EMU/ECO and the Supervisory Engineer, based on consultations with the Contractor and site visits. The Supervisory Engineer will also look into any new critical issues that may come up during the construction works and suggest actions for various agencies.

213. All environmental measures will be monitored and enforced, together with health and safety measures (accident prevention, etc.) applied by the contractor for his workforce to cover all aspects of rehabilitation works, including control of pollution and wastes at work sites and camps.

214. Various types of monitoring activity exists. Below are brief description of the types that are included in the monitoring requirements of this study.

215. Impact Monitoring: The biophysical and socio-economical (including public health) parameters within the project area, must be measured during the project construction and...
operational phases in order to detect environmental changes, which may have occurred as a result of project implementation.

216. Compliance Monitoring: This form of monitoring employs a periodic sampling method, or continuous recording of specific environmental quality indicators or pollution levels to ensure project compliance with recommended environmental protection standards.

217. Monitoring should be regular and performed over a long period of duration. Interruptions in monitoring may result in generating insufficient data to draw accurate conclusion concerning project impact.

1. Environmental Monitoring

218. The objectives of carrying out Environmental Monitoring for the Project include the following:

- Providing a database against which any short or long term environmental impacts of the project can be determined.
- Monitoring environmental compliance with the EMP.
- Providing an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards.
- Monitoring the performance of the Project and the effectiveness of mitigation measures.
- Taking remedial action if unexpected problems or unacceptable impacts arise.

219. Monitoring in this Project should be developed in two consequent phases, and those are Construction Phase and Operation Phase.

2. Environmental Monitoring Requirements

220. The predicted monitoring requirements in the construction phase and operation phase are below.
### Monitoring Plan for Specific Mitigation

<table>
<thead>
<tr>
<th>Item</th>
<th>Media</th>
<th>Parameter</th>
<th>Frequency</th>
<th>Action Level</th>
<th>Response When Action Level Exceeded</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ambient Air</td>
<td>Dust</td>
<td>Continual</td>
<td>Visual assessment during the Works: Impact Monitoring</td>
<td>If dust levels are above acceptable visual levels, implement dust suppression techniques (wetting down area) and/or assess weather conditions and maybe temporarily cease works until conditions ease</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
<tr>
<td>2</td>
<td>Water Quality</td>
<td>Quality/Contaminant concentrations</td>
<td>Continual</td>
<td>guideline/licence requirements (whichever is applicable): Impact Monitoring Compliance Monitoring</td>
<td>If contaminant concentrations/licence conditions are exceeded, review disposal options and decide on most applicable. Report any exceedences of licence (of applicable) to issuing authority.</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
<tr>
<td>3</td>
<td>Waste Management Implications</td>
<td>Segregation, Storage and transport of wastes</td>
<td>Monthly inspection</td>
<td>Visual assessment during the Works; - Field inspection, - Report of waste volumes generated Report and record all leakages and spills Impact Monitoring Compliance Monitoring</td>
<td>Solid waste cycled as 0% of movement of solids or liquid waste through the soil, rocks, water, atmosphere.</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
<td>Soil Monitoring and Erosion Control</td>
<td>Continual</td>
<td>Assess adequacy of sedimentation/environmental controls on-site Impact Monitoring</td>
<td>If controls have failed or are considered inadequate, cease works immediately and repair to an acceptable standard.</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
<tr>
<td>5</td>
<td>Ecological Resources</td>
<td>Terrestrial Fauna and Flora</td>
<td>Continual</td>
<td>Minimal ecological impacts Impact Monitoring</td>
<td>Required to ensure the recommended mitigation measures are properly implemented.</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
<tr>
<td>6</td>
<td>Landscape and Visual</td>
<td>Surface treatment of temporary</td>
<td>Once at the Completion of work</td>
<td>Minimum disturbance of the original landscape Impact Monitoring</td>
<td>Required to ensure the recommended mitigation measures are</td>
<td>ECO, Supervisory Engineer and Contractor</td>
</tr>
</tbody>
</table>
Appendix 4

- The Estimated Costs for Construction Phase Monitoring are included in Environmental Management Estimated Cost of Nakhcivan City WSS Network Construction Costs.

**Operational Phase**

<table>
<thead>
<tr>
<th></th>
<th>Sludge Disposal</th>
<th>Sludge Quality</th>
<th>As per directive 1999/31 EC ve 75/442/EEC</th>
<th>Full compliance to requirements of Council directive 1999/31/EC Impact Monitoring Compliance Monitoring</th>
<th>Cease the treatment activity Immediate remedial action</th>
<th>SAWMC, WWTP Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Waste Management Implications</td>
<td>Segregation, Storage and transport of wastes</td>
<td>Monthly inspection</td>
<td>Visual assessment during the Works; - Field inspection, - Report of waste volumes generated Report and record all leakages and spills Impact Monitoring Compliance Monitoring</td>
<td>Solid waste cycled as 0 % of movement of solids or liquid waste through the soil, rocks, water, atmosphere.</td>
<td>SAWMC, WWTP Management</td>
</tr>
</tbody>
</table>

The Estimated Costs for Operational Phase Monitoring are minimal and will be handled by SAWMC, through WWTP operational expenses.

221. Institutional factors determining the effectiveness of monitoring should not be underestimated. There needs to be a firm institutional commitment by the agencies and/or
ministeral departments responsible for the monitoring process (i.e. EMU, SAWMC, MENR), particularly in regard to the following:

222. Willingness on the part of the institutions involved and organizational personnel to support the monitoring process with the necessary level of resources and authority,
- Maintaining continuity in the monitoring programme,
- Technical capabilities of the personnel involved must be developed,
- Integrity or honesty of the process must be maintained,
- Decisions must be taken based on a thorough review of results,
- Monitoring information must be made available to all agencies and departments concerned,

223. Necessary institutional reforms need to be made within the planning and implementation agencies.

3. Reporting

224. The Environmental Monitoring reporting shall be carried out in paper based plus electronic submission upon agreeing the format with the MENR of NAR. All the monitoring data shall also be submitted in CD-ROM.

225. Types of reports that the Environmental Manager (EM) should prepare and submit include monthly Environmental Monitoring reports and semi annual Environmental Monitoring reports. All Environmental Monitoring reports should be made available to the PIU of SAWMC. In addition, semi annual monitoring reports shall be submitted to ADB, by the PIU of SAWMC.

226. The reports will be based on recurrent site inspections as described in Section 8.2.4 and will report on the effectiveness of the mitigation measures; the Contractor’s compliance with the environmental specifications; progress on the implementation of the EMP; measures recommended in the events of non-compliance and recommendations for any other remedial actions, etc.

4. Site Inspection

227. Site inspection provides a direct means to initiate and enforce specified environmental protection and pollution control measures. These should be undertaken routinely to inspect construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. The site inspection is one of the most effective tools to enforce the environmental protection requirements at the works area.

228. The Environmental Manager (EM) of EMU of SAWMC should be responsible for formulating the environmental site inspection, the deficiency and action reporting system, and for carrying out the site inspection works. He/she should submit a proposal for site inspection and deficiency and action reporting procedures to the Contractor for agreement, and to the SAWMC for approval.

229. Regular site inspections should be carried out at least once per week. The areas of inspection should not be limited to the environmental situation, pollution control and mitigation
measures within the site, the site inspections should also review the environmental situation outside the works area which is likely to be affected, directly or indirectly, by the site activities. The EM should make reference to the following information in conducting the inspection:

230. The IEE and EMP recommendations on environmental protection and pollution control mitigation measures (including dust control measures and good site practice measures for ecological impact), Ongoing results of the Environmental Monitoring programme, Work progress and programme, Individual work methodology proposals (which shall include proposal on associated pollution control measures), Contract specifications on environmental protection, Relevant environmental protection and pollution control laws.

231. The Contractor should keep the EM updated with all relevant information on the construction contract necessary for him/her to carry out the site inspections. Inspection results and associated recommendations for improvements to the environmental protection and pollution control works should be submitted to the SAWMC and the Contractor within 24 hours for reference and for taking immediate action.

232. The Contractor should follow the procedures and time-frame as stipulated in the deficiency and action reporting system formulated by the EM to report on any remedial measures subsequent to the site inspections.

233. The EM should also carry out additional site inspections if significant environmental problems are identified. Inspections may also be required subsequent to receipt of environmental complaint, or as part of the investigation work for environmental monitoring.

X. CONCLUSIONS AND RECOMMENDATIONS

A. Findings

234. The screening process carried out in the IEE has not identified any significant negative environmental impacts. It is concluded from the screening test that:

(i) The Project will not result in any unwarranted loss of natural resources and any adverse impact on national heritage sites.
(ii) The Project will not cause any additional hazards to endangered species.
(iii) The Project will not require any resettlement of the people as there is no likelihood of displacing the people.
(iv) The Project will not cause any increase in the affluent-poor income gap. Any potential problems that might arise from untreated and hard water supply will be eliminated. This will consequently have a positive impact on the economic conditions of the poor.

B. Recommendations

235. The Environmental Monitoring Plan developed to guide the specific environmental assessment of schemes with structural measures and institutional arrangement and monitoring shall be fully implemented during construction and operational phases.
C. Conclusions

236. The proposed Nakhchivan Wastewater Treatment Plant is a project to be put into practice so as to meet the sewerage treatment of the City healthfully and thus enhance the quality of life. Wastewaters are released to the environment without any treatment in Nakhchivan. As a consequence of that, untreated wastewater which reaches to the ground waters, rivers and lakes pose danger for both environment and public health. Because of rapid population growth, excessive industrialization, increased drought and excessive consumption, freshwater bodies are globally exhausted. Accordingly, wastewater treatment gains importance.

237. Environmental impacts of the construction phase are short term factors and measures will be taken to minimize these impacts. Possible environmental effects during operational phase are also minimal and do not include any adverse environmental effects as long as monitoring and mitigation measures, if needed, are executed.

238. Overall, the major social and environmental impacts associated with wastewater treatment plant project are minimal and can be mitigated to an acceptable level by implementation of EMP and recommended measures and by best engineering and environmental practices.

239. As described within this IEE Report, the project will not have significant negative environmental impacts and the project would help in improving the socioeconomic conditions of this developing state. As per the findings in this IEE Report, no detailed EIA study is required.
APPENDICES

A- Project Location Map
B- Pictures

Proposed new waste water treatment plant site
Looking south from the waste water treatment plant site
(View of Araz Water Reservoir from the site)
Irrigation canal where the untreated sewage of the City discharges
Team Meeting on WWTP environmental issues at SAWMC Office

Public Consultation at local park in Nakhcivan City
Public Consultation in Nakhcivan City
Public Consultation at an outside tea house in Nakhcivan City

Public Consultation at home visits in Nakhcivan City
Public Awareness Campaigns (Representatives of ADB)
C- IEE Approval Letter of Ministry of Ecology and Natural Resources

Azərbaycan Respublikası ile Asiya İnişəf Bankı arasında bağlanmış kredit sazişinə əsasən Çoxtranşlı Su Tahcizatı və Kanalizasiya İnvestisiya proqramı layihəsi çərçivəsində Naxçıvan şəhərinin Qaraaxanbəyi kəndi ərazisində yerləşən arazidə tikiləcək çırkəb sutişlayıcı qurğun üçün hazırlanmış Ətraf Mühiti Təsirin Qiymətləndirilməsi sənədinin dövlət ekoloji ekspertizasına dair

RƏY

Naxçıvan Muxtar Respublikası Dövlət Melorasiya və Su Təsərrüfatı Komitəsinin Naxçıvan Muxtar Respublikası Ekologiya və Təbi Sərvətlər Nazirliyinə təyinən 21 sentyabr 2011-ci il tarixli 241 nömrəli məktubu vasətində Naxçıvan şəhərinin Qaraaxanbəyi kəndi ərazisində tikiləcək çırkəb sutişlayıcı qurğun üçün hazırlanmış Ətraf Mühiti Təsirin Qiymətləndirilməsi sənədini nazirliyin dövlət ekoloji ekspertizasına təqdim edilən dair.

“Ətraf Mühitin Mühafizəsi Haqqında” Azərbaycan Respublikası Qanunun, Azərbaycanda “Ətraf Mühitin Təsirin Qiymətləndirilməsi prosesi Haqqında” əsasnamənin tələblərinə uyğun olaraq ətraf mühitin təsirin qiymətləndirilməsi sənədində zərər ekoloji tələbləri əzəmdə olmaq ətdiран ekoloji qanunvericiliyin prinsip və müddədərə çərçivəsində nazirliyin dövlət ekoloji ekspertizasına baxılış və aşağıdakı şəraitlə qənaət qalınmasıdır.

Təkintin aparılacaq ərazi haqqında məlumat

Çırkəb sutişlayıcı qurğunun tikintisi aparılacaq şəhər Naxçıvan şəhərinin Qaraaxanbəyi kəndinin arazisində olun sahəni ahalten edir. Çırkəb sutişlayıcı qurğunun tikintisi aparlan arazi Naxçıvan şəhərinin cənub-qərb hissəsinədən, danız səviyyəsindən 780 metr yüksəklikdədir. Naxçıvan şəhərinin mərkəzi ilə qurğunun tikintisi aparlan arazi yaxın 3 km-dır. Təmizləyici qurğun üçün ayrılmış arazinin ümumi səhəsi 14 ha təşkil edir. Təmizləyici qurğunun tikintisi aparılacaq arazida ətraf mühitin komponentlərinə (torpaq, su və hava mühitinə) təsir göstəran amillər və eyni zamanda fauna və flora sərənin aşı qalınması və yumuşaldılması Ətraf Mühitin Təsirin Qiymətləndirilməsi sənədində öz aksini təşkil edəcək.

Naxçıvan şəhərində çırkəb sutişlayıcı qurğunun tikintisi üçün tələb olunan şərtlər.

1. Çırkəb sutişlayıcı qurğunun tikinti işlərinin aparılması nazarda tutulmuş arazinin mövcud ekoloji durumunun vəziyyəti nazarda alınmalı;
2. Tikinti işlərinin aparılması ilə əlaqədar mühit təsir edəcək infrastruktur obiyektlərinin vəziyyəti nazarda alınmalı;
3. Təmizlayıcı qurğunun tikinti işləri ilə əlaqədar tələb olunan xamməlin (qum, çınqlı, qurtan və s.) həcmi, nəzərdə tutulmuş göstərilmə mənbələri və bu barada müvafiq icra hakimiyyəti qoşunlarının razılığının olması;
4. Təmizlayıcı qurğuda təmizlama prosesindən sonra nəçə olunan tullantı suları üstü açıq halda beton kanalla 1000-1500 m axıdildiçədən sonra təbii su mənbələrinə, yaxud Araz çayına axıdilməsi nəzərə alınmalı;
5. Təmizlama prosesindən sonra xaric olan məişət və təsərrüfat məşəli tullantı suların təkrar edən və təsərrüfatında və digər məşələrdə istifadə edilməsi nəzərə alınmalı;
6. Təmizlama prosesindən sonra xaric olan tullantı sularının arazidə mövcud olan kollektor drenaj şəbəkələrində qurt sularını daşıyan kollektorlara axıdilməməsi halları Ətraf Mühitin Qiyamətdənirilməsi Sənədində nəzərə alınmalı;
7. Təmizlayıcı qurğunun tikintisi aparılacaq araziya vəshi halda yaşayışın heyvan və qış növlərinin daxil olmasına qarşısinin alınması məşəli ilə arazinin hasarlanmasının təmin olunması;
8. Tikinti işləri başa çatdırıldığında sonra arazinin rektifikasiya edərək şəxsiyə vəziyyətinə gatirlənməsi və arazidə fito-sanitar şəhərliyyət daşıyan yaşlılıq zolaqlarının salınması təmin edilməlidir;

Tikintisi nəzərdə tutulan təmizlayıcı qurğudan xaric olan çırqab sularının zərərsizləşdirilməsində aşagıdaqələr nəzərə alınmalıdır.

- Tullantı sularının həcmi, tərkibi və axıdilmə rejimi;
- Layihəşəhləşdirilen müəssisinin yerleştirilən arazidə təmizlayıcı qurğunun sanitət vəziyyəti ətraf mühitin təsirin qiymətləndirilməsi sənədində öz əksini tapmalıdır.

Tikinti aparılan araziya xəxin su mənbələrinin səciyyəsi;

- Çırqab sularını təmizləyən qurğunun tikintisi zamanı su obiyektinin (Araz çayının) hal-hazırdə və gələcəkdə təsərrüfat, içərəli su təhcizati, əhalinin mədəni-məişət ehtiyacları, bəhçəliq təsərrüfat və digər məşələr üçün istifadəsi nəzərə alınmalıdır;
- Layihənin icra edilməsinə başlanan an üçün müəyyən edilmiş normativlər olmasa, sudan istifadə edən tullantı sularının tərkibində olan maddələrin zərərlə təsirinə dərəcəsini təyin etmək üçün tədqiqat aparılması və analiz üçün su obiyektinin növündən və kateqoriyasından asılı olaraq bura xərclənilən Qatılıq Haddini (BBQH) asasənirilməsi Ətraf Mühitin Təsirin Qiymətləndirilməsi sənədində öz əksini tapmalıdır.
- Təsərrüfat və məişət məşəli tullantı sularının təmislənməsi, zərərsizləşdirilməsi və kanalizasiya qurğusu inşə edilərən yerli ərazilərin imkanları və məşələ uyğunluğu nəzərə alınmalıdır.

Tullantı sularının təkrar və dövrü su təhcizatında istifadəsi:

- Təmizlənmiş və zərərsizləşdirilmiş təsərrüfat məişət tullantı sularının su təhcizatında istifadəsi.
1. Sonaye məşəli tullantı sularının tərkibi və miqdarı kasğın dayişilen və ya mütəmadi olaraq yüksək qatlıq malik tullantı sularının birdən axırdığı halda xüsusi tənzimlayıcı tutumların qurulması nəzərə alınmalıdır.
2. Tullantı suların axıdılması yerli çayın axarı boyu yaşayış məntəqələrinin və bütün sudan istifadə edən zalələrindən aşağıda yerləşdirilməlidir.
3. Tullantı suların su obyektiina aparlan sistemə su nümunəsi göstərək və daxil olan tullantı sularının miqdarını ölçək üçün müvafiq cihaz və alatlar nəzərə alınmalıdır.Tullantı suların sərfinə, tərkibinə və xassələrinə daim nəzarət etmək lazımdır, onların müvafiq avtomat qurğularla təchiz olunması nəzərə alınmalıdır.
4. Tamizlayıcı qurğuya daxil olan məişət və təsərrüfat məşəli tullantı sularının tamizlayıcı qurğuya daxil olması, suyun öz axının təzyiqi hesabında axıdılması nəzərə alınmalıdır.

Araz çayı və Araz dərəyasında balıqçılıq təsərrüfatı məqsədilə istifadə olunan su obyektinin suyunun tərkibi və xassələrinə olan ümumi tələblərə aşındırılması göstərilən qaydalara şəxsi edilməsi nəzərə alınması lazımdır tamizlayıcı qurğudan xaric olan məişət məşəli tullantı sularının Araz çayına axıdılması təmin edilə bilsə.

Tənzimlayıcı qurğudan xaric olan tullantı məşəli cırkab sular üçün tələb olunan buraxila birləşən qatlıq haddi və suların kimyavı tərkibi aşındırı qeyd edilən standartlara uyğunlaşdırılması nəzərə alınmalıdır:

1. Asılı maddələrin miqdərini 5,0 mg/l və 10,0 mg/l dən yüksək olmamalıdır.Suyun ortalama səviyyəsində 30 mg/l dən çox tabii mineral maddələr olan su hövzələrinin üçün suyun tərkibi asılı maddələrin miqdərinin 5% -dən yuxarı artması hallarına yol verilməməlidir.
   - Axidılan tullantı sularında oksigenə olan bioloji tələbat 20°C-də 4,0-6,0 mg/l olması nəzərə alınmalıdır.
   - Axidılan tullantı sularında oksigenə kimyavi tələbat 30 mg/l dən çox olmamalıdır.
   - Tullantı sularının mineral tərkibi 1000mg/l dən çox olmamalıdır, o cümlədən əkülolar 350 mg/l və sulfatlar 500 mg/l təşkil etməlidir.
   - Azot birleşmələrinin ümumi mədəni miqdərini 9,32 mg/l dən əlavə olmamalıdır.
   - Axidilan tullantı sularında ümumi fosforun miqdərini 1-1,5 mg/l dən çox olmamalıdır.
2. Üzvü qarşıqlıqlar su hövzasının səthinə neft məhsulları, yağlar və digər qarşıqlıqların ləqəbələri və spektir izləri məşəhidə olmamalıdır.
   - Axar su hövzələri üçün qarşıqlıqların cəkəmə surəti 0,4 mm/san çox, su anbarı üçün isə 0,2 mm/san yüksək olduğu halda tullantı sularının tabii su mənbələrinə axıdılması yol verilməməlidir.
   - Suyun iyələnməsi iki haldan yuxarı olmamalıdır. Suyun kənar iyləri və təmələri su heyvanlarının və balıqların atınca keçməməlidir.
- Suyun şəffəfləği sənən şərifi ilə 30 sm-dan aşağı olması hallarına yol verilməməlidir.
- Hidrojen göstəricisi 6,5 -8,5 həhudlərdən kənara çıxməməlidir.
- Suda xəstəlik törədici olmamalıdır, tərkibində xəstəlik törədici olan tullantı suların məşəyyən təmizlənmə prosesindən keçdirilən hənərolorludən dezinfiksiya edildikdən sonra tabii sütutlarla axidələşməsi təmin edilməlidir.
- Tullantı sularının tərkibində xəstəlik törədici səviyyəsinin yoxluğu, bioloji üsulla təmizlənmış maşqat və təsərrüfatın məşəyli chữa dərəcəsində suların dezinfiksiya edilməsi yolun ilə əldə olunan məsəyə alınmalıdır.Bu zaman suyun 1 litrində koli- indeks 100-dan çox, qalıq xlor içərisində 1,5 mq/l təskil etməlidir.Zəhərlə iataxların qida mənbəyi olan balıq və su organizmlərinin birbaşa və ya bilavasitə zərərlə təsir göstərə bilə.Aləmdən sonqətə zəhərlə iata�性sa məqərdə zəhərlə mənbələrin müƏvədələşənə yol verilməməlidir.

**Naxşəvan şəhər çırqəb sıtməzlayici qurğusunun təkinəsinin ətraf mühitin təsirində qiyamətənən hesabatının qənəli olması prosesində aşağıdakı məlumatlar öz əksini tapmışdır.**

- Fəaliyyət növündən asılı olaraq ekoloji qiyamətənənə prosesi yerli, milli və beynəlxalq qanunvericilik yaxud hazırlanmışdır.
- Burada layihənin icrası prosesində nəzarət tutulan fəaliyyətdən istifadə olunacaq ehtiyatlar, tələblərin həcmi, fiziki-kimyəvi xüsusiyyətləri, texnoloji qurğular barədə məlumatlar yer almışdır.
- Ətraf mühitin təsirində qiyamətənənənə prosesində şərq və uzun mədənli təsirin təsviri öz əksini tapmış, bunun minimməna endirilməsi və miqyası və vurula biləcək ziyarət aradan qaldırılması yolayən göstərilməmişdir.
- Ətraf mühitin təsirin azaldılması, yenidənəxləşdirilmiş ilə ya alternativ dərəcəli variantların seçimləri əsaslandırmaq olmalıdır. Burada seçilmiş variantın üstünlülük səخلاف və tətbiq olunacaq təşbihlərin təsviri əzahı verilməmişdir.

**Ətraf mühitin torpaq ehtiyatlarının döyüşməsində təsir edən faktorların azaldılması istiqamətində qədərələrin nəzarətə alınması.**

- Təmizləyici qurğunun təkinəsi zamanı qazıntı işləri və istifadə olunacaq səhərdə həmiş qatı ilə zəngin olan bitki maşəli torpaq təbəqəsi götərilmək ərazidə ayrımış və qurğun yerlərdə istifadə olunacaq təsvirin rektifikasiyasından istifadə edilməsi təmən edilməlidir. Fəaliyyət zamanı həyə bir halda tələblərin dərə yatağında boşa çıxmaq, ameləqələcək torpaq maşəli tələblərin və qurğun ərazidə qəmiq, götərilməs bitki maşəli torpaq təbəqəsindən bir qismi ərazidə istifadə edilməlidir.

**Flora və fauna ehtiyatlarına edilə biləcək təsirin azaldılması.**

- Ətraf mühitin qiyamətənənənənə prosesində çırqəb suların təmizləyici qurğunun təkinəsi aparılan arazinin 5-6 km hissasını Araziyoyu Dövlət Tabiət Yasaqlığının şəhər etdiyi ərazilərdən ad olunan əlavə əksini tapmalı, burada ətraf mühitin landşaftına, fauna və flora, hidromühitin bioloji sərvətlərinə olacaq təsirə və
bulaşların yaşayışi üçün suyun keyfiyyət göstəricilərinə təsir göstərən faktorlar minumumu endirilməsi nəzərə alınmalıdır.
- Aparilmiş tədqiqatlar və mövcud adəbiyyatlara əsasən istehsal prosesini şəhər edən Arəboyux düzanlıqda endemik bitki növlərinə rast gəldinməmişdir.
- Nasil kəsilmək təhlükəsi altında olan hər hansı bir fauna növü tədqiqatlar zamanı bu oasisədə qeydə alınmamışdır.

**Yekun nəticə.**

Naxçıvan şəhərində çirkab su təmizlayıcısı qurğunun tikintisi aparılacaq ərazənin torpaq örtüyüün pozulması ilə olaqlar ətraf mühitə ciddi ziyani vurulmayacaqdır. Bitkiler və heyvanlar alanına, o cümlədən sürünənlər mümkün təsirə ayyı-ayı lokal sahələrdə istehsal prosesində işlərin aparıldığı müvəqqəti zaman ərzində və zəif intensivlikdə baş vərə biləxədər. Fəaliyyət prosesində su mühitə birbaşa təsir olmayaçaqdır. 
Çirkab su təmizlayıcısı qurğunun tikintisinin aparıldığı ərazə yaşayış məntəqələrinindən uzadqa yerləşdiriləndi, bu yaşayış məntəqələri manfi təsirə məruz qalınacaqdır. Sosial və əqliyat mühitə təsirə əsasən müsbət istiqamətdə baş verəcəyi nəzərə alınmamışdır.


1. Naxçıvan Muxtar Respublika Ekologiya və Təbii Sərvətlər Nazirliyinin Ətraf Mühit və Təbii Sərvətlərdən İstifadənin Tanziqliməsi Şöbəsinin müdiri: Mamedov O. Quliyev


No: 11
«23» sentyabr 2011-ci il.
The Environmental Impact Assessment Report prepared for Waste Water Treatment Plant to be built in the area in Qarakhanbeyli village, Nakhchivan City, according to the letter No 241, dated 21 September 2011 from Nakhchivan AR State Amelioration and Water Management Committee addressed to The Ministry of Ecology and Natural Resources, Nakhchivan AR, was presented to the State Ecological Expertise of the Ministry of Ecology and Natural Resources.

It was reviewed by the state ecological expertise within the Ministry complying with the ecological legislations principals and requirements that include the most important ecological demands in the Environmental Impact Assessment Documents due to the regulations of “Environmental Impact Assessment Process” in Azerbaijan, “Protection of the Environment” law of the Republic of Azerbaijan. The following are the conclusion:

Description of the area to be under construction:

The area to be under construction for the Waste Water Treatment Plant covers an area in the Qarakhanbeyli Village in Nakhchivan City. The area under construction for the Waste Water Treatment Plant is situated in the south-west part of the town of Nakhchivan, 780 m above sea-level. There is a 3 km distance between the Nakhchivan City center and the construction area. The total plot of the area allocated for the treatment plant is 14ha. Reducing actions of environmental impacts (especially for soil, water and air) as well as fauna and flora impacts must be reflected in the Environmental Impact Assessment Report.

Following criteria & requirements were checked in the Environmental Impact Assessment Report.

Requirements for the Waste Water Treatment Plant construction in Nakhchivan

The following criterias must be taken into consideration:
1. Current ecological situation in the area allocated for the construction of the Waste Water Treatment Plant
2. Spesifications of the infrastructure objects to impact the environment because of the construction works
3. Amount of the required raw material (sand, gravel, soil), planned sources for this material to be taken, and approval of the relevant executive organs.
4. In the treatment plant after the process of treatment the treated waste water will be discharged into the natural water sources or the river Araz, after running 1000-1500m through the open concrete canal of the treatment plant.
5. After the treatment process the discharged household and farm waste water will be reused with the rural and other purposes.
6. After the treatment process the wastewater must not be discharged into the underground water collectors in the existing collector drainage networks. And it should be reflected in the environmental assessment documents.
7. The area planned for the construction of the WWTP must be provided with a fence to prevent the wild animals and birds.
8. After the completion of the construction works the area should be recultivated, restored, and supplied with green zones of phytosanitary importance.

During the treatment process of the waste water discharged from the treatment plant the following must be taken into consideration:
- Amount, composition and discharging conditions
- Sanitary state of the treatment plant in the area where the projected establishment is situated must be shown in the environmental impact assessment document.

Water sources near the construction area:
- During the construction works the water object (Araz river) will be used for household, farm, drinkable water, cultural and welfare needs of the population, fish farming and other purposes at the present time and in the future, so it must be also taken into consideration.
- For the beginning period of the project execution in case there are no appropriate norms, to enable the water users to determine the waste water composition and the degree of the harmful impact of its components, as well as to conduct water hardness analysis depending on the water object type and category and all these matters must be covered in the environmental assessment documents.
- Local conditions must be considered during the treatment and discharging process of household and farm waste water, also installation of sewerage system.

Reuse of waste water in the circulating water supply:
- Use of treated farm and household waste water in the water supply.
1. in case bulk discharge of industrial waste water with sharply changing composition and amount, also constant maximal hardness, special regulatory mechanism must be considered.
2. discharging point of the waste water must be installed below the dwellings along the river and the areas of all the water users.
3. appropriate equipments and tools must be considered to take water samples from the waste water outlet to the water object and to determine the inlet waste water amount. If there is a need of constant control of waste water consumption, composition, and properties, appropriate Automatic devices must be supplied.
4. farm and household wastewater inlet to the treatment plant and discharge of it by means of its own pressure must be taken into consideration.
Treated farm and household waste water may be discharged into Araz river and Araz reservoir which is used with the purpose of fish farming only on the following conditions according to the water composition and properties:

**Hardness and chemical composition requirements for the treated waste water discharged from the treatment plant must comply the following standards:**

1. The amount of suspended substances must not exceed 5.0 mg/l and 10.0 mg/l. In the medium level of water, for water areas with minerals more than 30mg/l suspended substances must not exceed 5%.
   - Biological demand for oxygen must be 4.0-6.0mg/l in 20°C, in the discharged waste water.
   - In the discharged waste water chemical demand for oxygen must be not more than 30 mg/l
   - Mineral composition of the waste water must not exceed 1000mg/l and also, chlorids - 350 mg/l and sulphate must be -500 mg/l
   - Total amount of nitrogen must not exceed 9.32 mg/l
   - Total amount of Phosphorus in the discharged waste water must not exceed 1-1.5 mg/l

2. Oil products, organic mixtures, grease, and other mixture spots must not be observed on the surface of the water
   - If the sinkink speed of mixtures for the flowing water basins is 0.4 mm/sec, and for the water reservoir more than – 0.2 mm/sec, the waste water must be prevented from discharging into the natural water sources
   - Water filthing must not exceed 2 points. The flesh of fish and other water animals must not taste and smell unpleasantly because of the water composition.
   - Water transparency must not be below 30 sm with snellen font.
   - Hydrogen must not exceed 6.5-8.5
   - Waste water must be clear from infectious composition and it must be treated by means of biological method and all the farm and household waste water should be disinfected. In this case 1 litre water must contain more than 100 koli-index, and remaining chlorine must be 1.5 mg/l. Water must be clear of poisonous substances that may be dangerous for fish and other water animals.

The following information was included in the documentation process of Environmental impact assessment of Nakhchivan City Waste water treatment plant:

- depending on the activity type the ecological assessment has been prepared complying with local, national and international legislations.
- It includes information about the resources to be used for the planned activities under project implementation, amount of waste water, its physical-chemical specifications, technological devices and so on.
- The environmental impact assessment report also covers long and short-period impact, its maximal diminution, its amount and activities to be conducted for diminishing possible future damages.
- Environmental impact diminution, liquidation, mitigation or alternative actions have been grounded. Here superiority reasons of the chosen methods have also been reflected and explanatory descriptions of requirements to be implemented are shown.

Activities to be taken into consideration for diminishing the factors that impact and change the soil and ground resources of the environment.
During the construction of WWTP, the soil rich in humus will be carried away into a specially planned place to be taken back to this area after the construction work for using in recultivation of this area. During the construction not any waste will be emptied to the valley bed, soil waste will be collected in an appropriate area, and part of the removed plant layer will be used in the area.

**Future impact to the flora and fauna resources and its diminution.**
- It must be taken into consideration that 5-6 km away of construction area belongs to State natural reservation along the river of Araz, this fact should be reflected in the Environmental Impact Assessment Report if there are anticipated impacts to the landscape, fauna, flora and biological resources of the hydroenvironment.
- According to the surveys and existing literature, there are not any endemic plant species in the plains along Araz river that cover the treatment process.
- During the survey not any extinct fauna species were observed in this area.

**CONCLUSION**

There will be no severe damage to the environment and soil layer of the construction area during WWTP construction in Nakchivan City. Impacts to the plants and animals also reptiles will be so scarce and short lasting in different construction areas that it will not be even felt. During the works water environment will be directly impacted by no means.

As the construction area is far away the dwellings they will be out of any impact. It is estimated that there will be only positive social and economical impacts.

Consequently, Nakchivan AR, Ministry of Ecology and Natural Resources doesn’t object construction of WWTP in Nakchivan City, complying with the regulations: “about the Environmental Impact Assessment along Araz river” under the law of The Azerbaijan Republic on “Protection of the environment”. And it is also recommended that environmental protection requirements reflected in the Environmental Impact Assessment Report must be seriously followed.

1. Nakhchivan Autonomous Republic, Ministry of Ecology and Natural Resources, Regulating the use Of environment and natural resources
   Department manager: O. Quliyev.

2. Nakhchivan Autonomous Republic, Ministry of Ecology and Natural Resources, Ecological Expertise And Monitoring Department Director: I. Ibrahimova
   Leading Adviser: D. Hasanova

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