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World Bank



Republic of Azerbaijan

Amelioration and Water Management Open Joint Stock Company (AWM OJSC)

Second National Water Supply & Sanitation Project

Loan # 7518 AZ
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Environmental Impact Assessment Study in 12 Rayons

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ENVIRONMENTAL IMPACT ASSESSMENT FOR RAYON ASTARA

DRAFT EIA REPORT



Prepared by:



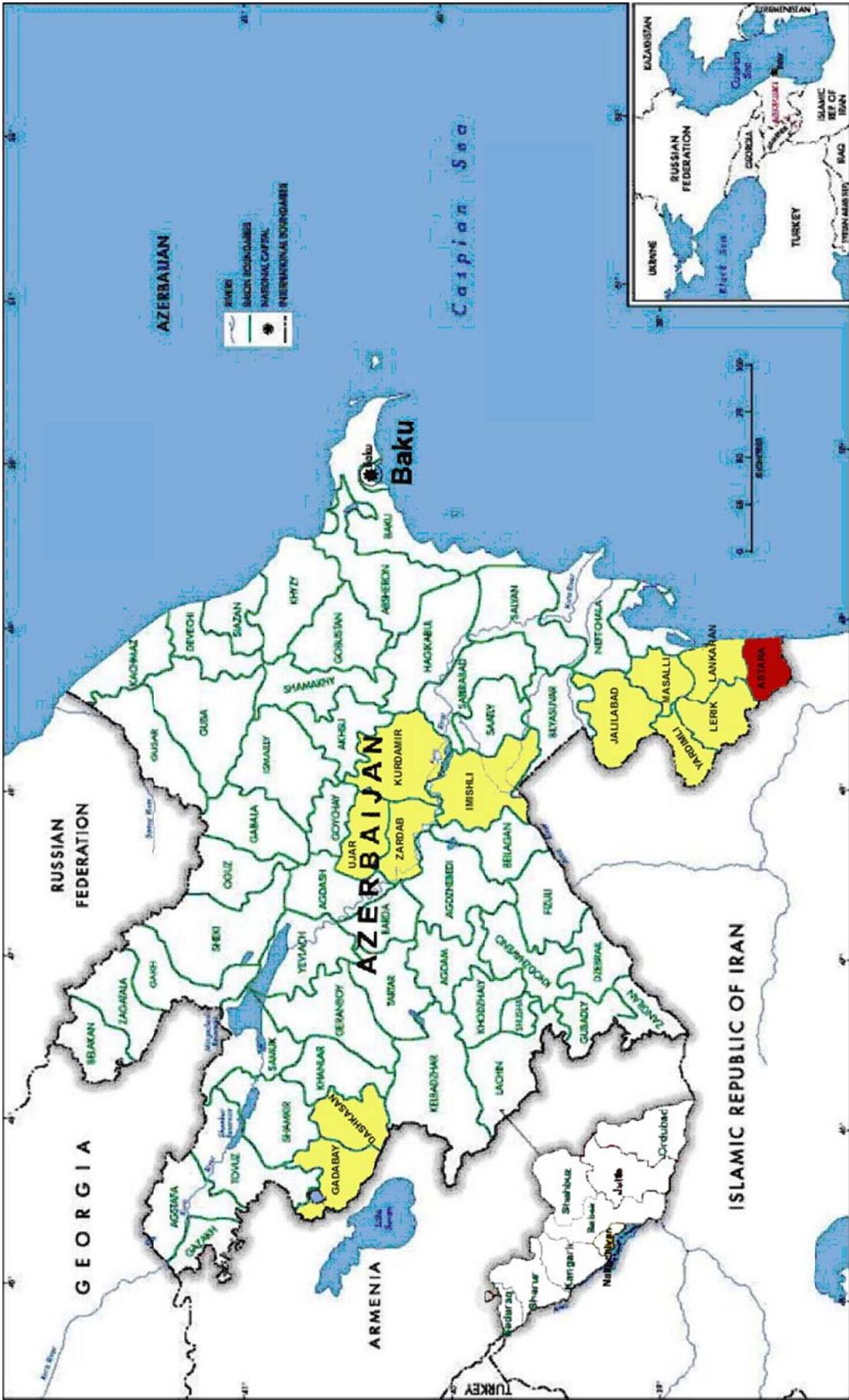
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-  Greater Baku, National Capital of Azerbaijan
-  Rayons in Scope of the Contract
-  Astarayon

Table of Contents	i
List of Exhibits	vi
List of Tables	vi
List of Figures	viii
List of maps	viii
Acronyms	ix
Definitions	x
Executive Summary	xiv

Chapter 1

1 Introduction	1.1
1.1. Project Background	1.1
1.2. Basic Features of Proposed Project.....	1.2
1.2.1 Objective of the Project	1.2
1.2.2 Specific Goals of the Project.....	1.2
1.3. Involved Organizations and Authorities.....	1.3
1.3.1. Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan	1.4
1.3.2 AZERSU Open Joint Stock Company (AzerSu OJSC)	1.5
1.3.3 Ministry of Ecology and Natural Resources (MENR) of Azerbaijan.....	1.6
1.3.4. Ministry of Health (MoH) of Azerbaijan	1.7
1.3.5 Regional (city and/or rayon) Executive Authorities.....	1.7
1.3.6 Municipalities.....	1.7
1.3.7 Ministry of Emergency Situations (MES) of Azerbaijan.....	1.8
1.3.8 State Urban Development and Architecture Committee.....	1.8
1.3.9 Tariff Council of Republic of Azerbaijan.....	1.8
1.4. Objective and Scope of the EIA Study	1.8
1.5. Assessment Area	1.9
1.6. Field Survey	1.11
1.7. Project Affected People (PAP).....	1.12
1.8 Resettlement Issues.....	1.12
1.9. Regulatory Requirements	1.13
1.10 Structure of the Report	1.13

Chapter 2

2 Project Description	2.1
2.1. The Scope of the Project	2.1
2.2. Brief Information about the Project Area	2.1
2.2.1. Summary Information about Azerbaijan	2.1
2.2.2. Summary Information Astara Rayon	2.2
2.3. Proposed Water Supply and Sanitation (WSS) Investment for the Rayon	2.4

2.4.	Proposed Water supply System	2.6
2.4.1.	Service Area and Water Demand Projection	2.6
2.4.2.	Potential Raw Water Source Evaluation	2.7
2.4.3.	Water Supply Network and Facilities	2.8
2.4.4.	Water Supply System Design Criteria	2.9
2.5.	Proposed Sewage System and Criteria.....	2.10
2.5.1.	Wastewater Service Area and Wastewater Generation.....	2.10
2.5.2.	Sewage Network Design Criteria	2.12
2.5.3.	Sewage Network Components	2.12
2.6.	Project Implementation, Construction and Commissioning	2.15

Chapter 3

3	Environmental Baseline.....	3.1
3.1.	Land Use Classification in Astara City and Surroundings.....	3.1
3.1.1.	Land Use Category	3.1
3.1.2.	Commercial and Services	3.2
3.1.3.	Industrial Land Uses	3.2
3.2.	Socio-economic Environment	3.3
3.2.1.	Administration	3.3
3.2.2.	Main Economic Activities	3.3
3.2.3.	Transportation	3.4
3.2.4.	Key Socio-economic and Demographic Indicators of the Project Area	3.5
3.2.5.	Water Supply and Sanitation Utilities	3.6
3.2.6.	Solid Waste Disposal in Rayon Centre.....	3.8
3.3.	Study Area Concept	3.8
3.3.1.	Project Corridor Design	3.8
3.3.2.	Delineation of Rights of Way (RoW)	3.8
3.3.3.	Corridor of Impact	3.9
3.3.4.	Delineating the Col	3.10
3.3.5.	Buffer Zones	3.11
3.4.	Physical Environment	3.12
3.4.1.	Physiography	3.12
3.4.2.	Water Resources	3.14
3.4.3.	Climate	3.21
3.4.4.	Soil	3.23
3.5.	Ambient Air Quality	3.24
3.5.1.	Ambient Air Quality Standards	3.25
3.5.2.	Sensitive Receivers in the Project Corridor	3.28
3.6.	Noise Levels	3.29
3.7.	Ecological Resources	3.31
3.7.1.	Vegetation	3.31
3.7.2.	Nature Protection and Protected Areas.....	3.34
3.7.3.	Terrestrial Wildlife and Endangered Species	3.35
3.7.4.	Aquatic Biology	3.37
3.8.	Cultural and Historical Environment	3.37

3.9	Construction Camps and other Contractor(s)' Facility	3.38
3.9.1.	Construction Camp	3.38
3.9.2.	Contractor(s)' Equipments and Plants	3.38
3.9.3.	Construction Materials	3.39
3.10.	Encroachments and Structures within the RoW	3.40
3.10.1.	Encroachments	3.40
3.10.2.	Structures within the RoW	3.40

Chapter 4

4	Analysis of Alternatives	4.1
4.1.	No-Project Option	4.1
4.2.	Water Supply	4.2
4.2.1.	Alternatives of Raw Water Capture	4.3
4.2.2.	Alternative Alignments of Raw Water Pipeline	4.5
4.2.3.	Water Treatment Plant	4.6
4.2.4.	Alternatives Locations of WTP Sites	4.9
4.3.	Wastewater Collection and Treatment	4.11
4.3.1.	Wastewater Treatment	4.12
4.3.2.	Alternatives of Treatment Processes	4.12
4.3.3.	Alternatives of Sludge Dewatering and Disposal	4.14
4.3.4.	Reuse Alternatives	4.18
4.3.5.	Treatment of Industrial Water	4.19
4.3.6.	Alternative Locations for Wastewater Treatment Plant Sites	4.19
4.4.	Location Alternatives for Construction Contractor's Camp Site	4.21

Chapter 5

5	Regulatory Framework	5.1
5.1.	Environmental Laws, Regulations and Institutions in Azerbaijan	5.1
5.1.1.	Institutions	5.1
5.1.2.	Laws	5.1
5.2.	Government's Environmental Assessment and Review Procedures	5.3
5.3.	Environmental Categorization & World Bank Policies	5.4

Chapter 6

6	Impact Assessment and Mitigation Measures	6.1
6.1.	Methodology and Assessment Criteria	6.1
6.1.1.	General Approach	6.1
6.1.2.	Scoping the EIA	6.2
6.1.3.	Scoping Report	6.2
6.1.4.	Objective of the Scoping Report	6.3
6.1.5.	Assessment Methodology	6.5
6.1.5.1.	Criteria for Assessment of Significance	6.5
6.1.5.2.	Impact Identification	6.6
6.1.5.3.	Impact Prediction	6.6

	6.1.5.4. Impact Evaluation	6.6
6.1.6.	Definitions of the Concept of Significance	6.6
6.1.7.	Generic Approaches and Criteria	6.7
	6.1.7.1. Extent or Spatial Scale of the Impact	6.8
	6.1.7.2. Intensity or Severity of the impact	6.8
	6.1.7.3. Duration of the impact	6.9
	6.1.7.4. Mitigatory Potential	6.9
	6.1.7.5. Acceptability	6.9
	6.1.7.6. Degree of Certainty	6.10
	6.1.7.7. Criteria for Tresholds of Significance	6.10
6.1.8.	The Use of Significance at Different Stages of the EIA Process	6.11
6.2.	Analysis of Impact and Mitigation.....	6.11
6.2.1.	Land Use and Planning	6.14
	6.2.1.1. Analysis of Impacts	6.14
	6.2.1.2. Mitigation	6.16
6.2.2.	Solid Waste and Hazardous Waste Disposal	6.20
	6.2.2.1. Analysis of Impacts	6.20
	6.2.2.2. Mitigation	6.20
6.2.3.	Water Resources	6.22
	6.2.3.1. Analysis of Impacts	6.22
	6.2.3.2. Mitigation	6.23
6.2.4.	Ambient Air Quality	6.25
	6.2.4.1. Analysis of Impacts	6.25
	6.2.4.2. Mitigation	6.29
6.2.5.	Noise	6.30
	6.2.5.1. Analysis of Impacts	6.30
	6.2.5.2. Mitigation	6.35
6.2.6.	Temporary Traffic Management	6.36
	6.2.6.1. Analysis of Impacts	6.36
	6.2.6.2. Mitigation	6.37
6.2.7.	Ecological Environment	6.37
	6.2.7.1. Analysis of Impacts	6.37
	6.2.7.2. Mitigation	6.39
6.2.8.	Cultural Environment	6.41
	6.2.8.1. Analysis of Impacts	6.41
	6.2.8.2. Mitigation	6.41
6.2.9.	System Utilities	6.42
	6.2.9.1. Analysis of Impacts	6.42
	6.2.9.2. Mitigation	6.42
6.2.10.	Summary of Impact Levels	6.44
6.2.11.	Cumulative Impact	6.44
6.3.	Environmental Benefits of the Project	6.44
6.4.	Socio-economic Benefits of the Project	6.45
	6.4.1. Construction Phase Economic Benefits	6.45
	6.4.2. Operations Phase Economic Benefits	6.45
	6.4.3. Wider Economic Benefits	6.45

Chapter 7

7	Environmental Management and Monitoring	7.1
7.1.	Draft Environmental Management Plan (EMP)	7.1

7.1.1.	Components of the EMP	7.2
7.1.2.	The EMP in Context	7.3
7.1.3.	Flexibility	7.3
7.1.4.	EMP Implementation Period	7.4
	7.1.4.1. Construction Environmental Management Plan (CEMP)	7.6
7.1.5.	Roles and Responsibilities	7.10
	7.1.5.1. Institutional Strengthening & Capacity Building	7.10
	7.1.5.2. Estimated Costs for Environmental Management	7.12
7.1.6.	Feedback to PIU and EMU of AWM OJSC of Azerbaijan	7.13
7.1.7.	Failure to comply with EMP	7.13
7.2.	Draft Environmental Mitigation/Management Plan	7.14
	7.2.1. Pre-construction Mitigation/Management Plan	7.15
	7.2.2. Construction Mitigation/Management Plan	7.15
	7.2.3. Emergency Procedures	7.15
7.3.	Environmental Monitoring and Supervision	7.16
	7.3.1. Environmental Monitoring and Audit	7.17
	7.3.2. Environmental Monitoring and Audit Requirements	7.17
	7.3.3. Reporting	7.18
	7.3.4. Site Environmental Audit and Environmental Complaints	7.23
	7.3.5. Monitoring Form	7.25

Chapter 8

8	Public Consultation	8.1
8.1.	Scoping Sessions	8.1
	8.1.1. Stage 1 Consultation	8.2
	8.1.2. Stage 2 Consultation	8.3
	8.1.3. Stage 3 Consultation	8.3
	8.1.4. Summary of Feedback	8.4
8.2.	General Public	8.6

Chapter 9

9	References	9.1
9.1.	Selected Bibliography	9.1

Annexe

Annex-1	TOR of the EIA and Relevant World Bank Policies
Annex-2	Waste Water Effluent Discharge Quality Standards
Annex-3	Hydrology, Hydrogeology, Water Quality and Water Balance in the Proposed Catchment and Relevant National / International Standards
Annex-4	Minutes of Meetings of Scoping and General Public Consultation Process
Annex-5	Biological Research Report for the Proposed Project Corridor
Annex-6	Photos, Site Surveyings and Scoping Consultation Activities

List of Exhibits

Chapter 1

Exhibit 1,1	Borders of Assessment Area and Project Corridor
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Chapter 2

Exhibit 2,1	Existing Water Supply System
Exhibit 2,2	Existing Sewage System
Exhibit 2,3	Proposed WSS System Concept preferred by the Beneficiary and Feasibility Consultant
Exhibit 2,4	Proposed WTP and WWTP Sites

Chapter 3

Exhibit 3,1	Limits of Row
Exhibit 3,2	Intersections on the RoW-1
Exhibit 3,3	Intersections on the RoW-2
Exhibit 3,4	Intersections on the RoW-3
Exhibit 3,5	Sensitive Receivers in Astara City
Exhibit 3,6	Sensitive Archeological Receivers nearby the Project Corridor
Exhibit 3,7	Typical Land Uses in and nearby the Service Area
Exhibit 3,8	Nature Protection and Protected Areas nearby the Project Corridor
Exhibit 3,9	Rayon's Vegetation Map for Assessment Area
Exhibit 3,10	Rayon's Wildlife Map for Assessment Area
Exhibit 3,11	Rayon's Land Structure and Soil Map for Assessment Area
Exhibit 3,12	Rayon's Geological Map for Assessment Area
Exhibit 3,13	Seismicity Map of Azerbaijan

Chapter 4

Exhibit 4,1	Alternatives of Raw Water Capture
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Chapter 6

Exhibit 6,1	Affected Agricultural Areas nearby the Project Corridor
Exhibit 6,2	Riverfront Areas in and nearby Astara City -1
Exhibit 6,3	Riverfront Areas in and nearby Astara City -2
Exhibit 6,4	Minimum Mandatory Buffers around the Water and Wastewater Treatment Plant

Chapter 7

Exhibit 7,1	Environmental Mitigation / Management Plan
Exhibit 7,2	Monitoring Plan for Construction and Operation Phases

List of Tables

:

Chapter 2

Table 2.1	Statistical Information of the Country	2.1
Table 2.2	Statistical Information for Astara rayon	2.2
Table 2.3	Assumptions for Systems Design	2.4
Table 2.4	Regulations and Standards for the Project	2.5
Table 2.5	Predicted Population Figures to be used in the Systems Design.....	2.6
Table 2.6	Daily Raw and Recovered Water Demand by Planning Horizon 2030.....	2.7
Table 2.7	Daily Raw Water Demand by Planning Horizon 2030.....	2.7
Table 2.8	Minimum Design Criteria for Water Supply System	2.9
Table 2.9	Wastewater Generation for Actual and Future Inhabitants in Study Area.....	2.11
Table 2.10	Council Directive 97/271/EEC	2.11
Table 2.11	Typical Characteristics of a Domestic Wastewater	2.11
Table 2.12	Sanitary Sewer Collection Network Design Criteria	2.12
Table 2.13	Design Criteria for WWTP	2.14
Table 2.14	Estimated Project Implementation Schedule	2.15

Chapter 3

Table 3,1	Key socio-economic indicators of the Project area	3.5
Table 3,2	Population Dynamics for the last three years	3.6
Table 3,3	Number of incidences on water borned diseases	3.6

vi

Table 3,4	Intersecting Table for Proposed System Components	3.9
Table 3,5	Limits of Col 1	3.10
Table 3,6	Some characteristics and forecasted reserves of the thermal waters in the region	3.15
Table 3,7	National drinking water quality standards	3.20
Table 3,8	Climate in the Rayon	3.22
Table 3,9	Wind Directions	3.22
Table 3,10	Common Soil Types in the lowland	3.23
Table 3,11	National soil quality criteria	3.23
Table 3,12	National allowable heavy metal concentration standards in soil	3.23
Table 3,13	Limit Values of Directive 1999/30/EC	3.25
Table 3,14	Air Quality Standards of USEPA and WHO	3.25
Table 3,15	National Ambient Air Quality Standards	3.25
Table 3,16	Criterion Applicable to Odor Emissions	3.27
Table 3,17	Dust Deposition Nuisance	3.27
Table 3,18	Emissions from Vehicles	3.27
Table 3,19	Environmental Quality Standards for Motor Vehicles Exhaust and Noise	3.28
Table 3,20	Summary Project Air Quality Criteria	3.28
Table 3,21	Details of Representative Air and Noise Sensitive Receivers in Astara city	3.28
Table 3,22	Noise Environment	3.30
Table 3,23	Building Damage Assessment Criteria	3.30
Table 3,24	Typical noise levels that can be applicable for the Project environment	3.30
Table 3,25	National Maximum Allowable Noise Levels	3.31
Table 3,26	Cultural and Historical Heritages along the Project corridor	3.38
Table 3,27	Estimated Workforce Requirement for the Construction Contract	3.38
Table 3,28	Estimated machinery requirement for the construction contract	3.38
Table 3,29	Possible sources of aggregate and sand for construction	3.39
 Chapter 4		
Table 4,1	Evaluation of the Raw water pipeline Alingment	4.6
Table 4,2	Environmental impacts of location Alternatives compared to Project for WTP location	4.11
Table 4,3	Max. permissible concentrations in sludge considered on agricultural land	4.17
Table 4,4	Environmental impacts of location Alternatives compared to Project for WWTP location	4.21
 Chapter 5		
Table 5,1	Principle Environmental Institutions / Ministries in Azerbaijan	5.1
Table 5,2	List of Laws and Regulations to be incorporated into the EMMP	5.2
Table 5,3	The most pertinent Laws of Azerbaijan with respect to Environmental Aspects	5.2
 Chapter 6		
Table 6,1	Comments Raised by AWM OJSC of Azerbaijan	6.5
Table 6,2	Selected Examples of the Definitions or Interpretations of the Concept of Significance	6.7
Table 6,3	The Three Broad Categories of Determining Impact Significance	6.7
Table 6,4	Categories for the Rating of Impact Magnitude and Significance	6.8
Table 6,5	The sensitivity (value of) of receptors	6.8
Table 6,6	Examples of Criteria for Rating the Extent or Spatial Scale of Impacts	6.8
Table 6,7	Examples of Criteria for Rating the Intensity or Severity of Impacts	6.9
Table 6,8	Examples of Criteria for Rating the Duration of Impacts	6.9
Table 6,9	Examples of Criteria for Rating the Mitigatory Potential of Impacts	6.9
Table 6,10	Examples of Criteria for Rating the Acceptability of Impacts	6.10
Table 6,11	Examples of Criteria for Rating the Degree of Certainty of Impacts	6.10
Table 6,12	Stages in the EIA process where the Concept of Environmental Significance	6.11
Table 6,13	Matrix for Assessment of Significance Level of Impact and Magnitude of Impact	6.13
Table 6,14	General Conformity Review and Emission Inventory for the Proposed Project	6.27
Table 6,15	Actual work days during the construction period	6.28
Table 6,16	NOx and VOC Calculation for Employee Vehicles	6.28
Table 6,17	Recommended Odor Screening Distances	6.30
Table 6,18	Typical Construction Noise levels	6.31
Table 6,19	Noise levels generated by the powered construction machinery	6.31

Table 6,20	Typical Combined Construction Noise Levels	6.32
Table 6,21	Land Use Category of U.S. DoT for Noise Levels	6.32
Table 6,22	Impact levels matrix	6.44
Chapter 7		
Table 7,1	Suggested Environmental Management Team for AWM OJSC of Azerbaijan	7,11
Table 7,2	Summary of administrative cost estimates for EMP implementation of EMU/AWM OJSC of Azerbaijan* in 12 rayons	7,12
Table 7,3	Summary cost estimates for EMP implementation of Astara rayon	7,13
Table 7,4	Sample form for Environmental Monitoring Checklist	7,26
Chapter 8		
Table 8,1	Details of meetings held in the consultation process	8,3
Table 8,2	Summary Feedback issues raised through the consultation programme	8,4
Table 8,3	Summary Public Feedback issues raised through the consultation programme	8,7
Table 8,4	Summary Public Feedback (scores are obtained from the results of hard copy interview questionnaires disseminated to Astara Public, between October and December, 2010).....	8.9
List of Figures :		
Chapter 2		
Figure 2,1	Proposed Process Scheme for Astara WWTP by the Feasibility Consultant	2,13
Chapter 3		
Figure 3,1	Topography in the Astara Rayon	3,13
Figure 3,2	Hydrography in Astara Rayon	3,16
Figure 3,3	Wind Rose, Astara Rayon.....	3,22
Chapter 4		
Figure 4,1	Typical treatment process scheme	4,7
Chapter 6		
Figure 6,1	Scheme of Process for Development requiring EIA	6,3
Figure 6,2	Threshold Criteria of Significance	6,10
Figure 6,3	Sound Attenuation – Worse Case Scenario for Pipe Laying in Astara City	6,33
Figure 6,4	Sound Attenuation – Worse Case Scenario for Topsoil Stripping Activities along the treated water pipeline alignment between Abbasbeyli Village and Astara city	6,34
Figure 6,5	Sound Attenuation – Worse Case Scenario for New Access Road Activities for WWTP, southwest of Onjeqala village and southeast of Astara City	6,34
Chapter 7		
Figure 7,1	Suggested Scope and Interaction of CEMP	7,9
Figure 7,2	Environmental Management Team Composition for AWM OJSC	7,12
Figure 7,3	Complaint Assessment Criteria	7,25
List of Maps		
Chapter 2		
Map 2,1	Rayon Administrative Map	2,3

Acronyms

ANSR	Air and Noise Sensitive Receivers
AZN	Azeri New Manat
AWM OJSC	Amelioration and Water Management Open Joint Stock Company of Azerbaijan
AWWA	American Water Work Association
ASTM	American Standards for Testing Materials
ANSI	American National Standard Institute
BOD	Biological Oxygen Demand
BS	British Standards
COD	Chemical Oxygen Demand
CMF	Construction Management Firm
DIN	German National Standards
dB(A)	Decibel-sound level- measured with using 'A' scale sound level filter
DMP	Drainage Control Plan
EC	European Council
ECO	Environmental Control Official
EN	European Norms
EU	Europe
EMP	Environmental Management Plan
EC-TDP	Erosion Control and Temporary Drainage Plan
EMU	Environmental Management Unit of AWM OJSC of Azerbaijan
GOST	Russian National Standards (<i>gosudarstvennyy standard</i>)
HIGD	Horizontal Infiltration Gallery Diversion
ISO	International Standard Organization
IEC	International Electrotechnical Commission
Masl	Meters Above Sea Level
MLSS	Mixed Liquor Suspended Solids
MMP	Material Management Plan
MENR	Ministry of Ecology and Natural Resources of Azerbaijan
MoA	Ministry of Agriculture of Azerbaijan
MES	Ministry of Emergency Situation of Azerbaijan
MoH	Ministry of Health of Azerbaijan
NGO	Non-Governmental Organization
NTU	Turbidity Unit
NDCP	Noise and Dust Control Plan
OP	Operational Policy
PM	Particulate Matters
PPE	Personal Protective Equipment
PMO	Project Management Office
REP	Rayon Executive Power
RPF	Resettlement Policy Framework
RSKD	Rayon SuKanal Department
RAS	Return Activated Sludge
SIPE	Supply and Installation of Plant and Equipment
SP	Safety Plan
SEE	State Ecological Expertise
SNIP	Construction Norms and Regulations of Azerbaijan
SNWSSP	Second National Water Supply and Sanitation Project
SSC	State Statistical Committee
SWTR	Surface Water Treatment Rules
TP-TMP	Temporary Pedestrian and Traffic Management Plan
USEPA	United States Environmental Protection Agency
WAS	Waste Activated Sludge
WHO	World Health Organization
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
WMP	Waste Management Plan

Definitions :

- Alternatives** : These are different ways of achieving the goals or objectives of a plan or proposal. Alternatives are also referred to as options
- Arid Climate** : A climate characterized by less than 254 mm of annual precipitation.
- Avoidance** : Measures taken to prevent impacts from happening in the first place.
- Baseline Studies** : Work done to determine and describe the environmental conditions against which any future changes can be measured.
- Charize , and/ or Khariz** : This expression is used to describe a type of traditional irrigation system which is commonly used in the central Asia and south west Asia since the ancient times (Parthians) . It can be written chariz , Charize, and/ or Khariz.
- Compensation** : Measures which may be taken to enhance, restore or create a habitat to compensate for residual impacts on a habitat and/or its associated species to achieve no-net-loss of habitat and/or species. Such measures are normally off-site, but as close as possible to the site.
- Cultural Heritage** : Any place or object of cultural significance including buildings, structures, landscapes, graves and geological, archaeological and palaeontological sites.
- Cumulative Effects** : The effects that result from changes caused by a project, plan, programme or policy in association with other past, present or reasonably foreseeable future plans and actions. Consideration of cumulative effects emphasizes the need for broad and comprehensive information regarding the effects.
- Effluent** : Something that flows out, such as wastewater, treated or untreated, that flows out of a wastewater treatment plant, sewer, or industrial outfall.
- Environment** : The surroundings in which humans exist and which comprise:
- a. The land, water and atmosphere of the earth.
 - b. Micro-organisms, plant and animal life.
 - c. Any part or combination of a) and b) and the interrelationships among and between them.
 - d. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.
- Environmental assessment** : Generic term used to describe the process of integrating environmental considerations into decision making by assessing the significant environmental effects.
- Environmental Impact** : The change to the environment resulting from an environmental aspect (an activity)

on the environment, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Environmental Assessment (EIA)	Impact	The effects that result from changes caused by a project, plan, programme or policy in association with other past, present or reasonably foreseeable future plans and actions. Environmental assessment as applied to projects.
Environmental Management Plan (EMP)		A detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.
Generic		Generic term used to describe the process of integrating environmental considerations into decision making by assessing the significant environmental effects.
Indicator		A measure of variables over time, often used to measure achievement of objectives.
Mitigation		Measures which aim to reduce impacts to the point where they have no adverse effects (i.e. no residual impacts).
Monitoring		Activities undertaken after the decision is made to adopt the plan, program or project to examine its implementation. For example, monitoring to examine whether the significant environmental effects occur as predicted or to establish whether mitigation measures are implemented.
Objective		A statement of what is intended, specifying the desired direction of change in trends.
Offset		A wide range of measures that may be taken to offset residual impacts, e.g. habitat restoration, improved site protection and management, and capacity building.
Plan		A detailed proposal, scheme, program, or method worked out beforehand for the accomplishment of an objective.
Plan-making authority		The authority that writes the plan or project.
Precautionary principle		Prudent action which avoids the possibility of irreversible environmental damage in situations where the scientific evidence is inconclusive but the potential damage could be significant.
Project programme		<i>'The execution of construction works or of other installations or schemes — other interventions in the natural surroundings and landscape including those involving the extraction of mineral resources'</i> . Defined in Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment (as amended by Directive 97/11/EC).
Pollution		Any change in the environment caused by substances, radioactive or other waves,

or noise, odors, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

- Public Easement** : The right of the general public to use certain streets, highways, paths or airspace, beaches, river basins, coastal zones, tributaries. In most cases the easement came about through reservation of the right when land was deeded to individuals or by dedication of the land to the government. But, the term " Public Easement" is used in document as dedicated lands in use of government.
- Residual Impacts** : Impacts that remain after the effect of mitigation measures have been accounted for.
- Riparian Vegetation (Zone)** : Vegetation occurring on the banks of a river or stream (i.e. vegetation fringing a water body). In this specification, riparian vegetation in terms of removal, storage and replacement is only applied to sedge, grass, groundcover, reed, bulrush, or herbaceous component of riparian vegetation and excludes the woody component.
- Sanitation**: Sanitation describes interventions for the safe management and disposal of excreta, with the principal safety mechanism being the separation of excreta from all future human contact.
- Screening** : The process of deciding whether a plan or programme requires SEA or whether a project requires EIA.
- Scoping** : The process of deciding the scope and level of detail of an SEA or EIA, including the environmental effects and alternatives which need to be considered, the assessment methods to be used, and the structure and contents of the Report.
- Solid Waste** : All solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
- Strategic Environmental Assessment (SEA)** : Generic term used to describe environmental assessment as applied to policies, plans and programmes.
- Sub Soil** : Subsoil is the soil horizons between the topsoil horizon and the underlying parent rock. Subsoil often has more clay-like material than the topsoil. Subsoil is of less value to plants, in terms of nutrient (food) and oxygen supply, than topsoil. When subsoil is exposed it tends to erode fairly easily.
- Sustainability Appraisal (SA)** : An appraisal of the economic, environmental and social effects of a plan from the outset of the preparation process to allow decisions to be made that accord with sustainable development.

- Sustainable Development** : A widely-used and accepted international definition of sustainable development is 'Development which meets the needs of the present without compromising the ability of future generations to meet their own needs'.
- Tiering** : The linking of assessments for policies, plans, programmes and projects to achieve a logical hierarchy and avoid unnecessary duplication of assessment work.
- Top Soil** : This is defined as a horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic (humic) fraction. Topsoil is deemed for the purposes of this specification as the layer of soil from the surface to the specified depth required for excavation. Where topsoil is referred to, it is deemed to be both the soil and grass/ground cover fraction.
- Wastewater** : Effluent water from residences, businesses and other water users that contains contamination. Sewage.
- Water supply system** : Means a permanently installed system providing piped water to the public for potable purposes, if such system has at least five service connections used by year-round residents. Such term includes source, collection, pumping, treatment, transmission, storage and distribution facilities used in connection with such System.
- Water body** : Any open body of water including streams, dams, rivers, lakes, and the sea.
- Wetland** : A seasonally, temporally, or permanently wet area, which also may exhibit a specific vegetation community. It is often marshy in character.

EXECUTIVE SUMMARY

Overview

This Environmental Impact Assessment (EIA) report for the proposed Water Supply and Sanitation (WSS) investment in Astara rayon of Azerbaijan has been prepared by the EIA consultant in response to fulfill the requirement of Law on Environmental Protection of Azerbaijan, 1999.

This document has also been prepared to address the items identified in other relevant National Laws and Regulations of Azerbaijan, and relevant International Regulations and Conventions being addressed in the Project appraisal documents, e.g., State Ecological Expertise (SEE) 1996, the Law on Safety - Sanitary State 1992, the Water Code 1997, Construction Norms and Regulations (SNIP), Rule for Use, Protection and Preservation of Trees and Bushes No. 173, 2005, relevant European Council Directives 91/271/EEC (UWWTP directive) and 98/83/EC (drinking Water Standards), World Bank Operational Policies (WB OP 4.01, and etc). Chapter 5 of this document is specific for these acts and regulations.

This EIA presents the results and conclusions of environmental assessment for the proposed construction of the WSS investment, which is intended to be implemented in rayon Astara.

Consideration will be given to improving integration of National / International development strategies and for developing the mitigating measures.

This EIA is planning instruments that aim to contribute to the design phases of the development as well as function as management tools to minimize potential negative impacts and maximize benefits during construction and operational phases of the Project.

To be effective in this role, EIA needs to form an integral part of the Project design process, and should be incorporated into the bidding documents.

1. Background

The Second National Water Supply and Sanitation Project (SNWSSP) is financed by the World Bank and the Government of Azerbaijan. The project is expected to address the problems facing the WSS sector through reconstruction and rehabilitation of infrastructure in 21 rayons in Azerbaijan.

Second National Water Supply and Sanitation Project Implementation Unit under the Amelioration and Water Management Open Joint Stock Company of Azerbaijan (AWM OJSC), is responsible for 16 rayons of Azerbaijan in scope of SNWSSP.

2. Project Purpose

The overall aim of the Project (SNWSSP) is to improve access to safe, reliable and sustainable water supply and sanitation (WSS) services in the urban centres of the said above 21 rayons of Azerbaijan. One of these rayons is Astara, which is located in the Lankaran Economic Region (Talış Region) of Azerbaijan.

This objective will be achieved through rehabilitation and reconstruction of the water supply and sanitation infrastructure in the rayon.

Realization of the Project will positively affect the environmental safety, economic, social development and the health of population; as well as put the basis for correspondence to legislative requirements in the area of environmental safety and to state standards of water usage.

The project is part of the country wide strategy to bring the improvements in living standards further than the major urban areas and into the smaller towns and cities of the rural rayons.

3. Summary Project Description

Location of the Project

The rayon is situated in the south-eastern part of Azerbaijan, and surrounded by Lankaran rayon to the north, Lerik rayon to the northwest, and Caspian Sea to the east. The rayon has also an approximately 50 km border line with Islamic republic of Iran in the south and west. Approximately one fourths of the rayon area is situated in southern part of Lankaran lowland along the coastline of Caspian Sea in the east. The rest of the rayon area in the west and northwest is located on the low highlands of the eastern inclinations of the Talish mountains. The existence of the plentiful hills and lowlands is a peculiarity of region's relief.

Rayon's total area is 620 square km.

Service Area of the Proposed Project

The drinkable water supply scheme for the rayon has been envisaged to conclude the additional seven villages (Selakaran, Jukes, Sipiypard, Veneshikesh, Noyabud, Durriyye, and Barzubend), which are located on the course of the raw water and treated water transmission mains, by the Feasibility Consultant and AWM OJSC of Azerbaijan. The local officials and relevant departments of the rayon have agreed with this scheme during the initial project evaluation period. A similar approach has been adopted for sewerage system service area envisaging to conclude the additional one village (Selakaran) to the system.

Rayon's total area is 620 square km. The rayon has one city (Astara city) and 91 villages. Rayon's total population is 95,900 by 2009. Astara city's population is 15,717 by 2009.

However, the population of the full service area is 17,432 (inhabitants) by 2009, including Astara city and Selakaran village. The project corridor passes through an area that collectively sustains almost 17 % of the rayon's population for water supply and sewerage systems.

According to Feasibility Consultant's population forecast, the service area population for water supply will be 22,720, and for sewerage system will be 20,080 by the horizon year of 2030 taking into consideration the average annual 0.700 % growth rate for each horizon year.

Project Design Criteria and Project Elements

The WSS system Option for rayon proposes to divert the raw water from Tengerudchay. The water will be treated in a WTP to be located at the lower levels of Barzuband village in this Option. No additional booster pumps and pump stations are required in the Option. The alternative site for WTP has been sufficiently high (at about 41 - 45 masl) to provide the gravity flow of water which will be conveyed to Astara city. The treated water will be conveyed to Astara city by an approximately 11 km of gravity transmission main.

Aspect	Assumptions
Project Assumption	
<i>Planning Horizon</i>	: 20 years (2010-2030)
<i>Scope of the Project</i>	: The study area of the project for the rayon is identified in the relevant project appraisal documents, and summarized for water supply investment as 'based on the premise of providing water service to entire urban centre plus adjacent villages and/or villages along the transmission mains' , and for the

wastewater investment as **'based on the design premise to connect the central business/apartments block district of each urban centre to a main sewage collector plus settlements close to this main sewage collector for transfer to a wastewater treatment plant'**.

Water Consumption per capita per day-pcpd (l/day) : 150 l / day

Water Supply System Criteria and Components

<i>Source Development</i>	: Development of New Sources instead of the old ones at the same site.
<i>Type</i>	: To be preferred by way of gravity.
<i>Quality of Water</i>	: As per European Council Directive 98/83/EC
<i>Storage Capacity</i>	: Attaining 100% of average daily peak demand, including non-residential demand, wastage and leakages
<i>Design Elements</i>	: Alternative water resources, parallel treatment streams, main pipe loops, distribution pipes without dead ends, back-up power generation, etc.
<i>Recovered Drinkable Water Demand with non-residential demand</i>	: 47.79 l/s
<i>Service Area Population by 2030</i>	: 22,720 based on yearly average population growth rate 0.700 %.
<i>Raw water Extraction Method</i>	: The surface water diverted from Tengerudchay, will be treated in a WTP to be located at the lower levels of Barzuband village.
<i>Raw Water Source</i>	: Surface Water from Tengerudchay river.
<i>Tranmission Main</i>	: Approx. 11 km from Water Treatment Plant (WTP) to Astara city.
<i>Customer Connections and customer water meters</i>	: 3,796 including non residential customer connections.
<i>Main Drinkable Water Distribution Tank</i>	: Total drinkable water storage capacity of at least minimum 4,129 cum/day, recovered water.
<i>Water Treatment Plant (WTP)</i>	: 1 ea, in the capacity of at least 47,79 l/s recovered water with the multiple treatment barrier.

Sewage Collection System and Wastewater Treatment Criteria and Components

<i>Scope of the System Network</i>	: Municipal Sanitary sewers only (storm water system is not included in the project)
<i>Wastewater Treatment Effluent Quality Standard</i>	: As per European Council Directive 91/271 EEC.

<i>Treatment Type</i>	: Extended Aeration-Activated Sludge process.
<i>Non-domestic Sewage</i>	: Effluent water quality standards are not applied to factories discharging wastewater into the sewage system.
<i>Service Area population by 2030</i>	: 20,080 based on yearly population growth rate 0.700 %.
<i>Daily Dry Weather Flow</i>	: 4,502 cum/day
<i>Estimated average daily loads and concentrations (dry weather peak day) BOD₅, COD, TSS</i>	: BOD ₅ : 1,054 kg/day COD : 2,109 kg/day TSS : 1,456 kg/day
<i>Sanitary house connections</i>	: 3,796 including non residential customer connections.
<i>Wastewater Treatment Plant</i>	: 1 ea, in the treatment capacity of at least 4,502 cum/day (dry weather flow) sewage water with the Extended Aeration-Activated Sludge Process.
Power Supply	: Minimize or even avoid the use of electrical components both for Water Supply System and Sewage Collection and Treatment System (e.g., gravity over pumping transmission/ distribution/ collection) according to cost and limited availability of electricity.

4. Environmental Baseline Data

The project corridor passes through an area that collectively sustains almost 17 % of the rayon's population for water supply and sewerage systems.

Land Use in Astara city

The residential strips generally have a uniform size and spacing of structures, linear driveways, and lawn areas in the urban core area; the commercial strips have buildings of different sizes and spacing, large driveways, and parking areas. Residential development along Baku – Astara Highway is also linear and sometimes extends back only one residential parcel west of the city.

Linear residential developments along the transportation route extending outward from the urban area exist at the western part of the city, and north of Shiyakaran village. This part of the residential development area is included as residential appendages to urban centre mostly along the Astara – Shiyakaran road at the north. Only, the olden village - Selakaran village and the neighbouring area between Astara city and Erchivan village have already been included to the city master plan that has recently been exploited by the State Urban Development and Architecture Committee.

Commercial

The central business districts in Astara city are commonly densed along H. Aliyev Avenue, Azerbaijan, Sattarkhan, Nizami, Z. Bunyadov, Gencler, and Baku – Astara railway which lies throughout the Caspian seashore northernly and southeasternly. The business districts include some institutions and local administrative buildings, hospitals and schools, and some residential units. They are often abutted by residential or other contrasting uses, which help define them.

There is no separate category for recreational land uses is pervasive throughout any other land uses.

Industrial

There are no heavy industrial land uses in Astara city or in its development area. A few small and light industrial developments locate sparsely among the residential districts along Z. Bunyadov Street northerly. There are one private and three public enterprises, and 10 agroindustrial and stockbreeding businesses in Astara.

In general, the industry in Astara is based on processing of local agricultural products, especially fruit-vegetable canning, tea processing. Furniture production, concrete based constructional goods manufacturing, maintenance and small scale production of agricultural machinaries are the main small and light industrial sectors in and surrounding the rayon centre.

Transportation

The rayon centre Astara city is located at the end of the Baku – Astara highway (M3) nearby the state border of Azerbaijan – Islamic Republic of Iran. The city is situated on the 313th km of this highway. Road Exploitation Office (REO) of the rayon reports that the Rights of Way (RoW) of the highway is 60 m (30 m + 30 m according the road center line). REO reports that the traffic in line with Astara is currently at about 7000 – 7500 vehicle per day (vpd) on the highway. 26 km of Baku – Astara highway section and 13 km of Baku-Astara railway section travel in the rayon area. There is a railway station, which is the end of the Baku – Astara railway. The freight terminal near Astarachay river serves 6500 – 7000 vehicles and approximately 8000 -10000 passengers per day. This situation is increasing the daily population in Astara city.

Economic Activities

Agrarian-industrial complex is the main component of the economy. Humid subtropical climate, fertile soil, water and appropriate labor force creates a big potential for the development of the agriculture. The main sectors of the agriculture include early vegetable-growing, tea-growing, vine-growing and grain-growing. The Lankaran Economic Region produces 99% of tea, 27% of vegetable, 15% of grain, 24% of potato, 13% grape, 10% of fruits produced in Azerbaijan. Citrus fruit-growing is quite developed in Astara.

The industry of Astara is based on processing of local agricultural products, especially fruit-vegetable canning, tea processing. Furniture production, concrete based constructional goods manufacturing, maintenance and small scale production of agricultural machinaries are the main small and light industrial sectors in and surrounding the rayon centre. Cultivation of tea is the most developed and profitable agricultural activity in the region.

Stockbreeding is also a collateral business activity in the rayon. Transportation system has an important impact on the development of Astara. Baku-Astara railway, Baku-Astara motorway, and custom gate and freight terminal have important impact on cargo and passenger transportation and development of economic relations between Azerbaijan and Islamic Republic of Iran.

Municipal Water Supply in the City

Although a 4.1 km distribution mains exists in the rayon centre Astara city, the satisfactory and hygienic drinkable water cannot be supplied to the customers because of no sufficient exploitation, no adequate storage capacity and water release, and dilapidated distribution network. Feeder mains mostly consist of the steel pipes which are 14.5 km in length, and they were constructed between 1961. However, the distribution mains in the city consist of steel pipes (4.1 km), which were constructed at the same period. The rayon's SuKanal Department reports that the whole distribution network is partially damaged. The drinkable water distribution system in the city seems to have depleted its economic life span.

Currently, the municipal water supply for the city is provided by horizontal infiltration gallery diversion (HIGD) unit located nearby Alasha village in Astarachay river bank. Amount of water exploited is distributed to 10 percent of the city by a two km gravity transmissio main and three reinforced concrete reservoirs located nearby Qapicimahalle village. However, this system does not provide the adequate pressure in the existing distribution system. Many multi-storey buildings have their private

reservoirs installed to their own systems at their basements. Almost all houses and apartments block have their own elevated water reservoir equipped with a pump.

It is assumed that at least 60% and temporarily up to 80% of population are depending solely on unsafe groundwater from the wells. Water Supply by tank trucks seems to be of minor importance in Astara. There is no information about privately operated tank trucks. Water Metering is limited to few households and larger enterprises with an own interest in measurement and invoicing by real data. Invoicing of the other consumers is based on flat-rates which doesn't represent the real consumptions. There are no centralized fire fighting network, and no water treatment and disinfection facility established in the system.

Conclusively, Astara city has a scattered, dispersed, and inadequate water supply system. It no longer has the strength to endure the economical and social development of the city. The economical development in rayon shows the rapid tendency, and this will cause to increase the unlicensed and uncontrolled water use.

Sewage Network in City

Presently, there is a small scale centralized sewage collection system which serves to the institutional, residential and commercial buildings along the Azerbaijan street. However, only 10 % of the premises which are installed to the system has direct connections, and the others have no direct connections. Almost all sewage collection system were constructed from 1970 to 1980. All gravity collector sewers in the system consist of asbestos cement pipes, which are 6 km in length. All force mains are installed by the steel pipes.

The waste water generated by the institutional and multistorey buildings is collected in two wetwells (2 lift stations), and envisaged to convey out of the city by the lift stations and force mains to the area of old WWTP site south of Shiyekaran village. However, the existing interceptor sewer seems that it has never reached to the WWTP site. It disappears in the Caladahna marshland, and is disposed to the natural environment. Some parts of carcass of the old WWTP already exist in the site south of Shiyekaran village. Rayon SuKanal department reports that construction of the WWTP was stopped in the early 1980s, and there is no access to the site presently. However, the existing site provides a six hectares land, which is sufficient to construct a new WWTP

The current situation of the system constitutes a serious health risk in the city, and cause to increase the rates of water borne diseases (Infective Hepatitis, Gastroenteritis etc.). Some houses and institutions dispose their sewage to nearby open channels and ditches along the main axis roads of the city. The current practice of sewage disposal at the remaining part of the city is in the manner of use of private septic and latrines. The septic pits are commonly located at the kitchen gardens of the houses.

Presently, there are no sewerage tank trucks in Astara city to dispose sludge from septic pits. According to Feasibility Consultant, service is limited to a minority which can afford to spend money on sludge disposal. Most of the pits are assumed to be not emptied. Owners dig a new pit if the existing one is full. Storm water is collected with open drainage channels on the sides of the roads and is evacuated to nearby waterways according to local relief. However, In case of rain all streets get flooded by wastewater.

Solid Waste Disposal

Solid Waste Disposal (SWD) site is located in a distance of 8 km to Astara city along the Serakchay river. The landfill is on the balance of Astara House Exploitation Department. The area of site is 0.4 ha, and a 15-20 cum SWD in a day is disposed to the site with three old and non-standard dumptruck. The landfill is surrounded with a protective wall which its height is 1.8 m. However, there is no protective wall and/or perimeter fence between Serekchay river and Landfill. No waste is buried by the earth in the site, and no separation is managed. Source-separating of the wastes is not applied in the city. All solid wastes are collected in manner of commingled including the medical wastes, and disposed to the site.

Project Corridor Design

The project corridor is strategically located, including the National and respective regional principles. It should also serve the most heavily populated regions of the rayon. No demarcation an alternative route would require vast amounts of land acquisition, disrupt rural communities, interfere with established natural and agro-ecosystems, and result in further environmental and social degradation. The alignment of the pipe lines is routed to bypass irrigation canals, ditches, public and private amenities, and even some small part of agricultural lots. The RoW limits inside the settlements are generally confined to the streets' width.

Major construction activities will remain confined to the existing RoW. However, situations in which construction-related activities will extend beyond the existing RoW include:

- Establishing construction campsites and asphalt plants on temporarily acquired land,
- Borrowing soil material from temporarily acquired land,
- Quarrying aggregate material,
- Constructing haul tracks in order to transport construction material, etc.

For the purposes of this study the Corridor of Impact (**Col**) has been divided into two zones (**Col 1** and **Col 2**). The approach in delineating the **Col 1** for the direct effects of the project activities is agreed on and outlined between 105 - 30 m in the open areas, and 50-53 m in residential areas.

Col 2 marks the limit within which the indirect impact of project activities is expected. This includes the effects associated with noise, vibrations, vehicular enmissions, toxic emissions and fugitive dust from batching and mixing plants, and the consumption of natural resources, such as earth fill and water, required during construction. Air quality impact area is agreed on the area within a distance of 500 m from the Project boundary, and Noise impact area is agreed on the area within 300 m from the Project boundary in the open areas considering riparians and wildlife habitats nearby the Project corridor. The ecological impact area will cover all the Project units where the topsoil is to be stripped and the original land cover is disturbed. All other potential induced impacts will remain within a distance of 500 m from the Project boundary.

Climate in the Rayon

The humid-subtropical climate prevails in the rayon. A severe snowy winter occurs rarely in the Astara Lowland. Summer is dry and hot, and autumn is rainy. Annual average temperature is (+)14.2 °C. January is the coldest month (+4.3 C), and July is the hottest month (+24.5 C) of year. The precipitation varies between 1200 and 1400 mm in the lowland. While the maximum rainy days are observed in autumn, minimum precipitation occurs from June to July. The Project area falls entirely into this climatic zone. Annual precipitation is 50-70% of possible evaporation. The snow falls rarely in winter. The cloudiness is maximal in mid highlands and at foothills (200-800 meters). Annual average cloudiness constitutes 7.4 % of a year (27 days). The average humidity deficiency value for the Project corridor is calculated on the climatic irrigation standard 250 mm depending on the heights of 1000 masl.

Annual Relative Humidity in Talish region's mountainous area is 50 – 55 % in summer time, and it reaches on the Caspian seashore (75-80%). The relative humidity is minimal through winter months in the highlands of the region.

Winds

Strong winds are less frequent in the rayon and Project corridor. According to information of the Meteorological Station of Astara rayon, average annual wind speed equals 2.8 metres per second in the rayon. The winds in rayon that are the southeasterly (30%) and northwesternly (36 %), prevail. The number of days of which are windy more than 15 m/s in speed, varies between 20 and 39 days in a year.

Topography in the Rayon

Approximately one thirds of the rayon area is situated in Lankaran lowland along the coastline of Caspian Sea. Two thirds of the rayon area at the west and northwest is located on the low highlands of the eastern inclinations of the Talish mountains. The relief of the mountainous area varies between 2194 masl (Mardashig Dagh in the border of Astara-Lerik-Islamic Republic of Iran) and 18 masl nearby Shuvash village in the south. The relief of the rayon area in the lowland varies between 17-54 masl and (-) 28 masl towards the coast line easternly from the bottom of the hills. The existence of the plentiful hills and lowlands is a peculiarity of region's relief.

Rayon centre city is settled at about between (-17) and (-) 28 masl along the Caspian seashore.

Geology and Seismicity in the Area

River valleys are also widespread easternly and southeasterly in the area of Talish east anticlinal. The border-line between the plain and mountainous areas is extended along the normal fault. Its surface is covered with Late Pliocene-Anthropogenic terrestrial clay matrix pebble deposits. Mountain zone has undergone severe dissection caused by the dense transversal relative to the ridge extension drainage network. Marine terraces have evolved within the river valley watercourses trending towards the Lankaran lowland.

The rayon area consists of some swampy marshland in the east. In the lowland of the Lankaran unfavourable hydrogeological conditions occur. Geologically, these areas are formed of continental-marine and marine deposits of upper Pliocene-Quaternary age, with the continental sediments having a subordinate position. Under ground water are salty, with dry residues of 100-200 g/l in these lowlands. East and southeast of the region are rimmed by a narrow margin of inclined foothill alluvial-proluvial, and partially marine plain (Lankaran lowland).

The Project corridor section of the settled area of the city falls into the areas are formed of continental-marine and marine deposits of upper Pliocene-Quaternary age.

The rayon is located in the zone which is exposed to earthquake force of Richter magnitude 6-7.

Water Resources

Caspian Sea

The Caspian Sea is the largest closed inland water body in the World with a current surface of more than 400,000 sq km and avolume of 78,000 cum. The Caspian Sea consists of brakish water. The level of the Sea is currently 27 m under the mean level of oceans. The maximum depth of Sea is 1025 m, and the average 184 m.

The Sea is mainly fed by Volga river in the north and other main river of the western bank, including the Kura river in Azerbaijan. The rainfall contributes only for 20 % of the total water input of the Caspian Sea. The salinity of the Caspian Sea is at about 13 g/l, except in the northern part where the dilution due to discharge of the Volga river reduces the salinity down to 5-10 g/l. The rayon has approximately 22.3 km coast line of the Caspian Sea.

The Caspian Sea is subject to complex tectonical influences, which result in fluctuating sea levels and regularly changing shorelines. The rayon also suffered severely from the rising level of the Caspian Sea.

Spring Water and Ground Water in the Rayon

Since the mountain slopes are mainly steep and amount of waters of rainfall and melting snow flow through the surface and create plenty of tributaries, these waters become captured by forests and transferred to grounds. The water appear at the surface like small springs in mid highland and lower elevations of eastern Talish range. Intensive use of ground water is widespread almost in two to

three of rayon area both for irrigation and drinking purposes. The most famous spring in the area of rayon is Sim which is sourced from folded structure of the Talish east inclination nearby Sim village. The flow rates of this spring water source varies between 50-60 l/s, and joins Tengeruchay river at the lower levels of Palikash village.

No water sampling campaign is conducted on the ground waters in the rayon by the Feasibility Consultant. However, the results of the water sampling campaign performed by the Feasibility Consultant in Jalilabad lowlands are acceptable for the under ground water quality of Astara lowlands because of the similarity of regional, geographical, socio-economical and land-use.

According to the test results conducted by the Feasibility Consultant with the sub-artesian wells' water in Jalilabad, the color (mg/l Pt/Co) of the samples is 127, and turbidity (NTU) is 2. TSS value is (<1 mg/l) in the under ground water of Astara – Jalilabad lowlands. The measured value of mg CaCO₃/l in the samples is 342, and it corresponds to the “hard” class water. The sample tested has the value (0.041 mg/l) of Iron, and (<0.0185 mg/l) of Manganese. The sample tested, has the value of Nitrite (0.27), Nitrate (16.4), and Sulphate (211). Detected value of Chloride in the under ground water of Astara – Jalilabad lowlands has the value of 333 mg/l.

Intensifying land use, lack of sanitation, and the use of agrochemicals are a threat to the quality of groundwater as the soils are highly permeable and the groundwater is directly exposed to infiltration from the surface. This is one of the major concerns in the rayon.

Thermal Waters

The thermal springs are denser in Astara rayon of Talish range's east inclinations. The mineral water gushes from the ground at 69 degrees Celsius. Mineral baths are used to treat pains in the joints and muscles, and skin, gynaecological and many other problems. Natural outcrops of thermal and thermal-mineral water are confined to zones of tectonic dislocations and faults in the low highland of Talish range between 48 – 1000 masl.

Thermal sulphide, chloride, sodium-calcium waters of the Thermal Springs are situated 60-70 km to the west from the city. The well known thermal springs in the rayon form Istisuchay, which is sourced from the thermal Springs in the Shandanqalasi mountain (1816 masl) nearby Iran border. The river joins Astarachay river nearby Alasha village. Mineral water sources in the Talish zone have TDS content ranging from 0.5 up to 7.4 g/L. Water temperature in some sources reaches 51-74°C (Alakhbarov, Adishirin B.).

Surface Water in the Rayon

The surface flows start to decline from the southeastern and eastern slope of the Talish range (1800-2200 masl). Due to the orographic specifications of the Talysh mountains, the flow is inconsistent with the average height. It decreases with the increase of altitude in the mountainous area, it rises with Talish mountains declines.

Accordingly, Astara rayon is rich in respect of spring water and surface water source network at the mountainous area. Fresh groundwater are widely spread, their numerous outcrops are captured and are used for water supply and irrigation both for homestead of inhabited localities (villages) and irrigation for relatively limited agricultural lots. All rivers are sourced from the highlands and mid-highlands of the Talish ranges.

The main surface water in the rayon is Astarachay, Tengeruchay, Istisuchay, Penserchay, and Veshcheruchay rivers, which are born from Peshteser range of Talish mountains and falls to Caspian Sea. However, only Astarachay, Tengeruchay, and Penserchay rivers flow directly to Caspian Sea. Istisuchay is a branch of Astarachay river, and Veshcheruchay joins Lankaranchay river in Lankaran rayon. The other surface waters (Sigeruchay and Kulerichay rivers) are sourced from the mid-highland of Talish eastern inclination, and travel relatively in a short distance in the Lankaran lowland. These surface water bodies feed a big part of the Astara irrigation network, and fall to Caspian Sea. Apart from these rivers, few small ones sourced from numerous springs at the bottom

of Talish eastern anticlinal highland feed the Lavain Water Reservoir (Lovaysherudchay river).

Specifically for the purposes of this Project, Tengerudchay and Istisuchay rivers' hydrographic characteristics are examined. In addition, the rivers' flow characteristics and water quality are assessed in a separate Annex (Annex-3) for helping the decision –making process to the Project proponents.

Tengerudchay River

The Tengerudchay is sourced from the several springs at the highlands of the northwest declivities of Shandanqala mountain (1620 masl). The river travels northeasterly up to Caspian Sea. Its length is 36 km, the basin area 239 square km. A 21 km upstream of the river travels at a mid highland zone up to Vanashikash village. A section of approximately 6.2 km of the river basin falls into the Hirkan National Park from Vovoda to Vanashikash village in the area of Astara rayon. The rest 11 km section of the river travels in the Lankaran lowland northeasterly. The main branches of the river are Siyakuchay and Pelikeshchay rivers which join Tengeruchay nearby Pelikesh and Siyaku villages.

The Veshcheruchay river is fed mostly by several springs (40 %) along its basin, storm water (40 %), partially subsurface (10%), and snow (10%) in its upstreams.

The annual average water flow is 36.95 cum/s. Its 30% passes in spring, 11% in summer, 40% in autumn, and 19% in winter. However, on its low streams in the Astara section, surface run-off from the atmospheric precipitation (89 %) and sub-surface lateral inflows (11 %) play the main role in its flow volume.

The river's water is being tested routinely by MENR of Azerbaijan. According to the test results obtained from MENR for 2010, the total mineralization of river's water varies between 467.4 (in February) and 684.1 (in June) mg/l in Vaqo level. DO levels vary between 6.94 mg/l (in June) and 7.91 mg/l (between Feb. and April), and TSS between 4 mg/l (in February) and 69 mg/l (in June) at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

A separate water sampling campaign is conducted on the surface waters of Tengerudchay river obtained from this section by the Feasibility Consultant. The water sampling campaign with the surface water of Tengerudchay river has been completed in September 27, 2010.

According to test results of this water sampling campaign, the pH value of the river's water is 7.71. Although, a slight increase is observed in the pH value (7.71) of samples tested, it is between the limits of the standards prescribed by Gost and EU 98 and WHO standards. No undesirable odor and unacceptable taste is detected in the samples. The samples have higher value (4) than the standard (1.5) prescribed by GOST. TSS value of the samples is <1, and the measured hardness value as mg CaCO₃/l is 90. However, the hardness of the raw water is appropriate for drinking water. Detected Iron and Manganese values as mg/l in the samples are 0.0779 mg/l (iron) and 0.0193 mg/l (Mn). These values are well below the standards prescribed by Gost and EU 98. Detected values of the major cations in the river's water are 2.13 mg/l of Mg, 17.25 mg/l of Ca, and 15.4 of Na. These values are well below the standards prescribed by Gost and EU 98. Detected values of Nitrite (NO₂) and Nitrate (NO₃) in the samples are 0.009 mg/l (NO₂) and 5.8 mg/l (NO₃) which are well below the standards prescribed by relevant standards. Detected values of Sulphate (SO₄), Chloride and Fluoride in the samples are 63 mg/l (SO₄), 1.5 mg/l (Cl) and 0.66 mg/l (F) which are well below the standards prescribed by relevant standards.

Number of colony per each ml at 22^oC is 140, and 105 at 36^oC. Number of Enterococi per each 250 ml is 20, and Escheria coli per each 250 ml is 11 in the river water. Number of Coliform Pathogenes per each 100 ml is 38, and Clostridium Perfiringens per each 100 ml is 22.

The test results show that the surface water of Tengerudchay river is highly contaminated by the Enterococs and other microbial indicators because of breeding of stocks and grazing activities at the upstreams of river.

The river water tested is fully in compliance with the limit values defined in the EU standards for the other physical, chemical and organic parameters.

Istisuchay River

The river is sourced from the several springs at the highlands of the northwest declivities of Almband mountain (1400 masl), and it join Astarachay river nearby Alasha village at about 100 masl. Its length is 18 km, and its basin area 60 square km. It runs through westeast inclination of Peshteser range up to Astarachay river. The average slope of its basin is 7.2 %. The Istisuchay flow is being measured on Istisuchay-Alasha Hydrometeorological Stations (HS) since 1941.

The annual average water flow is 17.12 cum/s. Its 26% passes in spring, 8% in summer, 44% in autumn, and 22% in winter. The Istisuchay river is fed mostly by storm water (76 %), partially subsurface (18%), and snow (6%) at its upstreams.

The river's water is being tested since 2006 routinely by AWM OJSC. According to the test results obtained from AWM OJSC, the total mineralization of river's water varies between 144 and 426 mg/l in Alasha level. BOD₅ levels varies between 0.80 mg/l and 6.78 mg/l, and COD levels between 2.4 mg/l and 14.1 mg/l at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

Lavain Water Reservoir (LWR)

The reservoir is completed in 1962, this reservoir, which is justified on a seasonal basis, storing 6.3 million cum behind a dam wall height of 7.5 m with crest length of 2 km. The reservoir is mainly fed by Lovaysherudchay river and few springs, and its water is used for irrigation. The reservoir has a surface area of 0.9 sq km. Water is delivered to the irrigated areas with the discharge canals. The reservoir was planned to retain irrigation water for 3,000 – 5,500 hectares irrigated land, however, the actual scheme has rarely reached up to this capacity for several years.

The reservoir's water is being tested since 2004 routinely by AWM OJSC. According to the test results obtained from AWM OJSC, the total mineralization of reservoir's water varies between 151 and 460 mg/l in Astara scheme's right entrance. BOD₅ levels varies between 0.50 mg/l and 6.78 mg/l, and COD levels between 1 mg/l and 14.1 mg/l at the same point. However, the test results show that the reservoir's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

Preferred Raw Water Source and Catchment

The Feasibility Consultant and Beneficiary (AWM OJSC) envisage for using of surface water which will be diverted from Tengeruchay river nearby Sipyapart village, to provide the raw water for the water supply system of Astara city. The surface water diverted from the river will be treated in a WTP to be located in front of Burzuband village. The treated water will be conveyed to Astara city by a 10.5 km of gravity transmission main.

Water Balance of the Proposed Catchment (Tengerudchay)

In most of the smaller rivers (such as Tengerudchay river), habitat/flow relationships are linear, so that the flow that retained two-thirds habitat at median flow is two-thirds the median flow, or approximately 30% of average flow (Tennant, 1976). 30% of average flow or higher provides average depth and velocity, and is considered to be in the good to optimum range for aquatic organisms.

In Astara case, water planning quantitative evaluations of 'Ecological Flows' considered as minimum instream flows are patterned with limnological and hydrogeological knowledge of the proposed catchment on the course of Tengerudchay river. We generally select as an indicator a large native fish species of the stream reach that is at the top of the trophic pyramid (trout, barbell, salmon, nase). However, this section of Tengerudchay river has the torrential stream; it does not naturally sustain

much fish species up to Lankaran lowland. As this situation does not predict fish densities or biomass, we are interested only in the physical habitat that is controlled by instream flows.

Because of this reason, the water balance for this section of Tengerudchay river is examined from the perspective of required minimum ecological flow (30 % of average flow of the river) for the aim of this Project. Quantitative instream flow method is used patterning the results of international investigations for the required ecological minimum flow balance.

The following figures are assumed as the worse case scenario for the section of the proposed raw water catchment on the Tengerudchay river course, and those are as follows;

- Minimum required ecological flow (30 % of average flow of the river) is $1600 \text{ l/s} \times 0.30 = 480 \text{ l/s}$ see Table 4 of this Annex.
- Water Supply Requirement of Astara by 2030 is **65.85 l/s**, see Chapter 2, Table 2.6.
- Surplus flow after meeting the requirement of water supply and minimum required ecological flow is $(480 + 65.85 - 1600) = 1054.15 \text{ l/s}$.

Accordingly, constructing a diversion unit to divert the required raw water at this section of Tengerudchay river will disturb neither the river's ecological environment nor natural flow of the river.

The National Drinking Water Quality Standards of Azerbaijan will be used as drinking water quality standards for this project. However, the treated water should comply with the EU Directive 98/83/EC, and the parameters is given in Annex-3.

Soil Characteristics within the Project Corridor

A peculiar type of soil, yellowish, is distinguishable in the Talysh and Astara regions. This soil forms in a warm and humid climate and the red and yellow color in this soil comes from iron and aluminum dioxides left behind after rains have washed away other dissolved materials. The Project corridor section between Astara city and SWDU contains soils that are plain-forest, grey, brown, meadow-salinized grey soils, boggy and sandy soils are widespread.

The most important soils in the area are humus carbonate soils (Rendzinas) as well as podzolized yellow, gley and alluvial soils (MENR 2004).

As the standards and guidelines for the maximum allowable concentrations (mg/kg) of the heavy metals and other pollutants in the soil, National Quality Criteria for Soils and National allowable heavy metal concentration standards will be used for the proposed Project.

Ambient Air Quality

The annual and daily limit values given in the Council Directive 1999/30/EC for the Particulate Matter and the limit values given in the National Ambient Air Quality Standards of Azerbaijan will be used for PM₁₀, SO₂, CO, NO₂, and Lead on the Project. However, there is no criteria for PM₁₀, PM_{2.5}, TSP, Thresholds for nuisance impacts of fugitive dust and odor, and dust deposition levels in the National Ambient Air Quality Standard of Azerbaijan. Applicable other international quality criteria for these pollutants and a summary Project Air Quality Criteria are given in Chapter 3.5.1 for the Project.

General confirmity for total NO_x and VOC emission to be discharged to the atmosphere by the group of construction machineries of the Contractor, is calculated, including employee vehicles, see Chapter 6.2.4. The analysis is performed as a worse case scenario. Total direct and indirect emission from the proposed Project/action are estimated at less than 100 tons for Ozone, and are below the conformity treshold value established at US Clean Air Act, 40 CFR 93.153(b) of 100 tons/year of Ozone.

Air and Noise Sensitive Receivers

The domestic premises, hotel, hostel, hospital, clinic, nursery, school, educational institution, office,

factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre are considered to be an Air and Noise Sensitive Receiver (ANSR).

There is no domestic premises, hotel, hostel, hospital, clinic, nursery, school, educational institution, office, factory, shop, shopping centre, place of public worship, and cultural and historical heritage is considered to be an Air and Noise Sensitive Receiver (ANSR) in the Corridor of Impact 2 (**Col 2**).

The locations included residences, schools, and hospitals in the urbanized areas, situated at a distance between 0 m and 100 m from the edge of the embankments of the trenches.

Noise

According to State Ecological Expertise, SEE, 1996, the National Maximum Allowable Noise Levels as indoor criteria will be used in this Project. As there is no National specific range of outdoor (outdoor wall) noise level threshold criteria, the requirements of the United States Quiet Communities Act of 1978 have been patterned for the margin of sound power levels for this Project. This Act has established the criteria of 70 dbA equivalent steady state for residential areas, schools, parks, hospitals, and 75 dbA for other sensitive receptors and for commercial land use.

Additionally three simulations are prepared using the data for combined construction noise levels, to illustrate the impacts of noise sources in the vicinity of the noise sensitive receivers, see Chapter 6.2.5.

Ecological Resources

Marshy territories are widely spread in the territory of the Talish plain. There are marshes with predominant *Potamogeton pectinatus*, *Myriophyllum spicatum*, *Trapa hyrcana*, *Ceratophyllum demersum*, *Iris pseudocorus*, *Sparganium erectum*, *Heleocharis eupalustris*, and others. Short plants in drying marshes scattered all over the plain are typical. Among them the most widely spread are *Ranunculus ophioglossifolius*, *Buschia lateriflora*, *Lippa nodiflora*, *Mentha aquatica*, *Polygonum minus*, *Alisma plantago*, etc.

The littoral and sandy coastal soils are habitats for *Artemisia arenaria*, *Artemisia scoparia*, *Convolvulus persicus*, *Melilotus caspius*, *Astragalus hyrcanus* and ephemeral plants.

A separate biological investigation in and nearby the Project corridor has been conducted by two Local NGOs' experts (Ilyas Babayev, the Chairman of the Protection and Ecology of Birds Society, Local NGO, and Sujaadin Guliyev, Dr. on Biology) specific for the Project. According to result of this investigation, no endemic species, including aquatic and terrestrial, have been identified in or nearby the Project corridor

Landscape Characteristics

Despite the forests being very diverse in composition broadleaf forests are generated mainly by pistachio, oak and hornbeam (also called ironwood).

The foothill plains of Talish ranges are mainly covered with annual and perennial xerophytic plants and bushes at a height from 200 meters up to 600-700 and sometimes even 1200 meters. Among relict and rare trees of Tertiary period iron-tree, Astara acacia, chestnut-leaved oak, zelkova, Caucasus date palm, box-tree, wing nut, Hirkan fig-tree, Hirkan birch-tree, etc are rare patterns of nature.

The montane belt, starting at about 800 masl, is dominated by Oriental Beech (*Fagus orientalis*), which is accompanied by alder (*Alnus subcordata*) and maple (*Acer velutinum*), mainly on slopes with northern exposure.

Forests

The mountain forest occurs at elevations between 500 and 2,500 m and generally consists of Oriental Beech (*Fagus orientalis*), hornbeam (*Carpinus orientalis* and *Carpinus betulus*) as well as several species of oak. There is a 37,000 hectares forestry land in the mid-highlands of Talish mountains at about 200-800 masl west and southwest of the rayon. However, no part of the Project corridor falls into the forest zone.

High Mountain Ecosystems

No part of the Project corridor and rayon area fall into the high mountain eco-systems area.

Steppe Ecosystem

No part of the Project corridor and rayon area fall into the Steppe Eco-system area.

Semi-Dessert Ecosystem

No part of the Project corridor falls into the Steppe Eco-system area.

Wetland

Rayon's eastern part lies along the Caspian Sea, which is the largest inland water body of the World. The rayon has approximately 22.3 km coast line of the Caspian Sea. Astara city has a 9.6 km of coastal ecosystem along the shoreline of Caspian Sea. Only, this shoreline in front of the city falls into the Corridor of Impact 2 (**COI 2**), however, no part of the Corridor of Impact 1 (**COI 1**) falls into this zone.

Waterlands and riverine ecosystem in this region track with a narrow strip along the main rivers and numerous creeks at the western and southwestern parts of the rayon.

The section of approximately 546 m of Kulerichaychay river's valley in the northern part of the Astara city and the section of 3.5 km of Tengerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in the Project corridor. This section of the Project corridor refer to the area of land adjacent to a water body, and is called 'riverfront area' for the assessment. This zone is accepted as the riparian buffer corridor.

The Project corridor section of approximately 3.5 km of Tengerudchay river valley falls into the area of Hirkan National Park. The river valley in this section provides Hircanian habitats for plant, animal and other wild life species. According to Feasibility Concept, the raw water will be supplied from the Tengerudchay flow channel in the lower levels of Lomin village, and the raw water pipeline will be aligned with the Sim – Astara asphalt paved road up to WTP. Only, catchment facility will be constructed nearby the flow channel of the river.

Cultivated Garden Plants

Mainly, irrigated agricultural lots within the Project corridor spread around Astara city, along the treated water transmission main and interceptor sewer.

No agricultural lot falls into the Project impact corridor 1 (**COI 1**), however, 1228 hectares of agricultural land fall into the Project impact corridor 2 (**COI 2**) around the Astara city, along the treated water transmission main and interceptor sewer.

Terrestrial Fauna and Birds within the Project Corridor

Similar to their flora, the Talish Mountains also boast an abundant fauna with 200 species of vertebrates and countless invertebrates, among them many Tertiary relicts and endemics.

Fauna is characterized by several species of reptiles, such as the steppe racerunner (*Eremias arguta*), several endemic subspecies of the lizards (*Agama Caucasica* and *Helcioscopus*), and in

particular, the sunwatcher lizard (*Phrynocephalus persicus*) and snakes and Large Whip snake (*Eumeces Schnalider Coluber Coluber juglaris*).

Mammalian diversity is mainly made up of small animals such as Caspian White-toothed Shrew, Lesser Horseshoe Bat or the endemic Hirkan Wood Mouse, which are all included in the IUCN or National Red Data Books. Brown Bear, Lynx and Wildcat are common species in the rayon. The voices of Golden Jackal can be heard all over the territory.

The breeding season of the most terrestrial habitats is from May to June.

The fauna includes mammals comprised of Lesser whitetoothed shrew (*Crosidura Suaveolens* and *Sorex Mumutus*), eterin hedgehog (*Erinaceus concolor*). However, only lesser shrews, fox, golden jackal, water snakes around the water bodies, and caucasian viper, can be seen nearby and around the Project corridor. However, no endemic species occur within the Project corridor, see Annex-5.

To a large extent, the avifauna of the lower Talish Mountains resembles that of any European broadleaved forest. About 83 species, which include Caspian Tit, Black Stork, Lesser spotted eagle and Ring-necked Pheasant, breed in the forest of Talish mountains.

Among the birds, Goshawk, Golden eagle, Falcon, and Black Vulture occurs rarely around the project corridor. Goshawk, Golden eagle, and Falcon are included into Red Book of Azerbaijan, and Black Vulture is included into the Red List of International Nature Protection Union. Although, they are encountered around the project area, they occasionally land for feeding.

However, no endemic bird species occur in or nearby the Project corridor, and no migration path of the migratory bird species gets across the project corridor, see Annex-5.

Aquatic Species, Fish and Fisheries

The Caspian Sea has about 450 species, varieties, or forms of phytoplankton, 87 species of benthic algae, 718 known fauna species, and 315 species and sunspecies of zooplankton. This not only includes the Caspian Seal, an isolated species of brackish water seal, but also 90% of the world's population of sturgeon, a group "archaic" fish species, " five of which are common in the Caspian Sea. Affected by the fluctuating sea level, the coastal regions are very dynamic and contain important habitats for numerous nesting, wintering, and migratory bird species.

The upstreams of the rivers in rayon are very weak potential of the aquatic- terrestrial species. However, green toad (*buto viridis*) commenly occurs in or nearby the Project corridor. For a list of terrestrial aquatic species (amphibians) living nearby the Project corridor, see Annex-5.

The breeding season for most amphibians is winter period from the end of the December to the end of the February with the exact date depending on local climatic conditions (Nyman, 1991).

Endangered species

The Talish subspecies of the Pheasant has strongly declined due to poaching and is now very rare in dense thickets in the lower valleys. Most interesting among songbirds is the Sombre Tit, which is an uncommon breeder along forest edges and in woods at the mid-highlands of east inclinations of mountain belt.

While the Turanian Tiger became extinct only during the last century, a small number of Caucasian Leopards still inhabit the Hirkanian Forest. Threatened by poachers, the protection of this species is one of the most important conservation tasks in this region.

The leopard is listed in the Red Data Books of Rare and Endangered Species (Red Book) in all countries in the Ecoregion (Turkey, Armenia, Iran and Azerbaijan, *from the Ecoregional Plan for the Caucasus, 2003*).

Triturus cristatus is listed in the Red Data Book as endangered in Azerbaijan. The herpetofauna of the Hirkan Forest is represented by 22 species, two of which – Mediterranean tortoise (*Testudo graeca*) and Aeskulapian snake (*Elaphe longissima*) are listed in the Red Data Book of Azerbaijan.

The government of Azerbaijan has several acts to stop and check for hunting and poaching this species (i.e, leopard, mouflon and waterfowl).

Recognizing that sturgeon stocks have declined strongly in recent years, the states bordering the Caspian Sea agreed to reduce the combined catch quotas for the six sturgeon species native to the Caspian Sea. The quotas now allow for a 20% lower catch than in 2005, with reductions of one third for some of the species. The Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) banned the sturgeon export in 2005 and published decreased export quotas in 2007 (UNEP 2008).

However, overfishing by poachers is threatening the survival of Caspian sturgeon stocks, the source of most of the world's supply of caviar. The Convention on International Trade in Endangered Species (CITES) has listed all sturgeon species as threatened, including all commercial Caspian varieties.

No rare, endangered, and threatened population recorded in the Red Data Book of Azerbaijan inhabit in or nearby the Project corridor, see Annex-5.

Nature Protection and Protected Areas

These include the National Parks, wildlife sanctuaries, and game reserves under the control of the Forest Department of Azerbaijan and MENR. Hirkan National Park, and protected Hircanian forest zones are the protected areas in the rayon. See **Exhibit 3,8**.

Hirkan National Park

The Hirkan National Park which was established in 2004 on the basis of the Hirkan State Reserve which it superseded, on a surface area of 29,760 hectares (297.6 km²), was enlarged in 2008 to 42,797 hectares (427.97 km²). It was enlarged by presidential decree on April 23, 2008 from 29,760 hectares (297.6 km²) to 42,797 hectares (427.97 km²). The Hircanian Forest is regarded as bearing the potential for the recognition as World Natural Heritage Site. Yet, the relevant cluster can only be submitted for approval to UNESCO, together with Iran, where the majority of this forest type remains. For the purpose of including the Hirkan National Park and the Caspian Hyrcanian (Girkan) forests respectively into UNESCO's World Heritage Site list of cultural and natural heritage and Biosphere Reserves Programme, documents substantiated from the scientific point of view have been prepared and introduced to the UNESCO Secretariat by MENR of Azerbaijan.

The ecological and species potential does makes it highly valuable to establish cross-border environmental protection and conservation programmes.

There is a reforestation program of the lowland on a designated non-forested lot which is the only non-cultivated land on the plain, in order to restore the ecology to its previous forested state.

This area preserves many endemic plants species, relicts of the Tertiary period which were not affected by Pliocene and Pleistocene glaciations.

The Caspian Hyrcanian (Girkan) forests account for 150 endemic species of trees and bushes out of 435 species of them. Some endemic tree species are, the Hyrcanian Box Tree (*Buxus hyrcana*), Caucasian Pear (*Pyrus communis subsp. caucasica*), Lenkoran Acacia (*Albizia julibrissin*), Chestnut-Leaved Oak (*Quercus castaneifolia*), Caucasian Oak (*Quercus macranthera*), Caucasian Ash (*Fraxinus angustifolia subsp. oxycarpa*), European Ash (*Fraxinus excelsior*), European Hornbeam (*Carpinus betulus*), Oriental Hornbeam (*Carpinus orientalis*), Oriental Beech (*Fagus orientalis*), Caucasian Persimmon (*Diospyros lotus*), Caspian Locust Tree (*Gleditsia caspica*), Caucasian Alder, (*Alnus subcordata*), Black Alder (*Alnus glutinosa subsp. barbata*), White Poplar (*Populus alba*)

Caucasian Wingnut (*Pterocarya fraxinifolia*), Persian Ironwood (*Parrotia persica*), Caucasian Zelkova (*Zelkova carpinifolia*), Butcher's Broom (*Ruscus aculeatus*), Velvet Maple (*Acer velutinum*), Cappadocian Maple (*Acer cappadocicum*), Wych Elm (*Ulmus glabra*), Caucasian Lime Tree (*Tilia dasystyla subsp. caucasica*), Wild Cherry (*Prunus avium*), Wild Service Tree (*Sorbus torminalis*), Sweet Chestnut (*Castanea sativa*), among many others.

Shrub species occurring in the area include the Poet's Laurel (*Danae racemosa*), Hyrcanian Holly (*Ilex hyrcana*), Greenbrier (*Smilax excelsa*), Common Ivy (*Hedera helix*), etc.

Only, a small part of the Hircanian forest zone (approx. 3.5 km) falls into the Corridor of Impact 2 (**Col 2**) along the raw water pipeline between Lomin and Vanashikash villages.

Cultural and Historical Environment

Astara rayon has a very ancient history. There are 81 cultural heritage sites and 21 archeological sites in the rayon. Archeological sites dating back to bronze age exist, and some of those are ruins of Dashkutu necropolis in Azerrud village, Miki dolmen necropolis in Miki village, and Siyaku ancient settlement. Many tumulis, and barrow areas are also located in rayon area, and the famous ones are Tengerud, Baba Cabbar, Seyidcamal, Vaqo, Siyaku, Axicabal in Artupa village, Alasha, Binebey, and Lavain barrow areas.

Many cultural and historical heritage sites are also located in rayon area. The well known ones are tomb (XII century) and public bath (XIX century) in Shahagach village, Hadji Teymur mosque (XIX century) and Mashadi Abu Talib bath (XIX century) nearby Siyakesh village, Tomb of Ahmad ibn Karim (1472) in Mashkan village, and Piyacenapar bridge (XIII century) nearby Palikash village.

However, only three historical heritage buildings exist in the city's settled area, and those are Pravoslav Church, Qum and Gilakaran mosques. No archeological site falls into the Project corridor.

Lands to be developed for the Project

The land proposed for the permanent development of Water Supply and Sanitation Project for Astara city covers an area of approximately 1872 ha, largely comprising the mainly settled area of the city. Other lands may be required for construction of raw water catchment, pipelines from the catchment to the service area, water treatment facility and wastewater treatment facility, and access or potential ancillary developments.

The nominated site boundary will also include an 6 hectares land for WWTP (the old WWTP site which has already been allotted by REP of rayon for construction of a WWTP), and the areas that will be proposed for the raw water catchment facility, pipelines from the catchment area to WTP, distribution reservoirs, interceptor sewer.

Resettlement Issues

There is to be no permanent land acquisition under construction works will be confined within the existing Right of Ways (RoW) of the Government of Azerbaijan. Any potential resettlement issues and issues related to loss of access to farm land should be handled in accordance with the provisions of the Resettlement Policy Framework to be prepared for the project.

All required lands for the Project components are owned by the Rayon Executive Power (REP) of Astara Rayon of Government of Azerbaijan. The required lands will be allocated by REPs of Astara Rayon for the Project prior to commence of the Design and Build bidding process. These lands are currently empty and not in use for any purpose.

Project Affected People

There are no project affected people in or nearby the project corridor. All components of the project will be located on the public easements. All project activities inside the settlements will be confined

with the public rights of ways and streets' width. During the field surveys, no-squatters, no-shops, no-kiosks, thatched, and mobile vendors established within the RoW were found with the permission and/or protection of village notables and local administration.

Construction Camp, Acquiring and/or Mining the Aggregates, Solid Material for Backfill and Water Requirements for Construction

The construction contractor camp(s) will be temporarily established for the construction period, and land will be leased for setting up campsites and for acquiring earth fill. The earth and water required for construction are available in Astara rayon. Coarse aggregates and fine aggregates (sand) are available in Astara in and around the Project corridor.

The Design and Build contractor shall transport the required aggregate from the possible quarry areas earmarked by the AWM OJSC and/or the relevant department of Rayon Executive Power.

A list of possible sources of aggregate and sand for construction is given in Chapter 3.9.3.

The canal waters are available to use for construction purposes in rayon. The contractor will obtain permission from AWM OJSC and/or the irrigation department of the Rayon for acquiring surface water (canal water), groundwater from the sub-artesian well, if required.

All surface water diversion structures and/or sub-artesian well construction will be restored or hand over to the rayon irrigation department according to directions of AWM OJSC and/or Rayon Executive Power after the completion of the Project by the contractor.

Major Environmental Concerns:

- Regular Wasting of Water Distributed in the location Area of the Astara city

The wasting the water is basically caused by,

- The public taps among the districts in the settlements are old, and they are obsolete at somewhere. The joining parts and distribution mains, which convey the water have the leaks and are corroded. Almost two to three of the water distributed goes to waste.
- There are few water meters connected to some houses and institutions with their own interest to get them measured and invoiced by real data.

- Ground Water Quality beneath the Lankaran Lowlands:

The ground water quality is basically affected by;

- Lack of sanitation measures in Astara city and discharging the waste water along the local relief is a threat to groundwater quality .
- The water which infiltrates without being directly consumed by leakages is automatically seeped to the upmost aquifer beneath the city area, and is seeped toward Caspian shoreline, Astarachay, Kuleruchay, Tengerudchay, and Pensarchay flow channels.
- There is no protective fence and/or wall surrounded at the perimeter Solid Waste Disposal Site of the city. No waste is buried by the earth in the site, and no separation is managed. Source-separating of the wastes is not applied in the city. All solid wastes are collected in manner of commingled including the medical wastes, and disposed to the site. All contaminants and toxic substances are easily seeped to the under ground water

- The under ground water beneath the Lankaran lowlands is highly contaminated by the Enterococcs and other microbial indicators because of the intensive breeding of stocks and agricultural activities.

- *Soil Contamination;*

This contamination is basically caused by;

- Presently, there is a scattered and dispersed partial sewage network, which serves only some institutional, commercial, and residential buildings located on the routes of main internal transportation axes inside the city. Some houses and institutions dispose their sewage to nearby open channels and ditches along the main axis road of the city.
- The current practice of sewage disposal at the remaining part of the city is in the manner of use of private septic tanks and latrines. The septic pits are commonly located at the kitchen gardens of the houses.
- Leakages easily seeped from the private septic tanks and latrines to the soil are regularly contaminated the soil inside the settlement, and be provided the cycle of disease transfer to human community.

- *Public Health:*

The public health risks are basically caused by;

- The risk of infection greatly depends on availability and reliability of public water supply (see site survey photos).
- Existing water supply is provided the cycle of disease transfer to human community.
- There is no disinfection facility in the existing water supply system.
- There is no sanitation system adequately designed and extended to cover the entire service area in accordance with the requirements of the modern engineering practices.

5. Legislative Requirements

The following institutions and Ministries will be involved to the Project in accordance with the current legislations and regulations of Azerbaijan, and those are;

Table 5,1; Principle Environmental Institutions / Ministries in Azerbaijan

INSTITUTIONS / MINISTRIES		Leading Exercise
Name		
1	MENR, Ministry of Ecology and Natural Resources	This ministry upholds all natural resource protection laws. The State Ecological Expertise (SEE) acts within this agency on the Program level in reviewing Environmental Impact Assessments (EIAs).
2	MoH, Ministry of Health	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 by legal and physical persons through application of laboratory and sampling controls.
3	MES,	This agency implements construction safety supervision and standards.

Ministry of Emergency Situation

4	State Urban Development and Architecture Committee	The Committee has authority to conduct studies on population distribution, on planning the usage of nature regional, on general plans and detailed planning of inhabitant areas, etc.
5	Tariff Council of Republic of Azerbaijan	Tariff Council acts under Azerbaijan Republic Economic Development Ministry, and he responsible for definition of tariffs, service fees which are applied in nationwide.
6	AWM OJSC Amelioration and Water Management Open Joint Stock Company of Azerbaijan	He is a stock company which provides State services for amelioration and water farm, and stocks of which belong to the State. The Company's activities focus on irrigation, for which it sets water-use norms and handles user relations. . In addition, it is in charge of land improvement on irrigated land, and the operation and maintenance of the irrigation infrastructure.
7	Azersu OJSC, Joint SuKanal LLC, and Rayon SuKanal Departments (RSKD)	The AzerSu OJSC's main water supply activities in rural areas are comprised of establishment of policies, project planning, and functioning as an intermediary between central government and international donor organizations. However, AzerSu OJSC has its own potential to plan projects in cooperation with Joint SuKanal Limited Liability Company (LLC) and Rayon SuKanal Departments (RSKDs).

The most pertinent environmental laws and regulations to be applied for this Project are explained below:

LAWS AND REGULATIONS		MOST PERTINENT ASPECT
1	Law on Environmental Protection, 1999	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, EIA is subject to SEE. This also explains that the MENR is responsible for the review and approval of EIA reports submitted by developers. Furthermore, in Articles 81 and 82 of the Law on Environmental Protection (1999), <i>the Law specifically provides for the application of international agreements in case of an international institute or body has provisions that are different from those of the Azerbaijani legislation.</i>
2	State Ecological Expertise, SEE, 1996	The State Ecological Expertise (SEE) mandates an 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 stand-alone check of compliance of the proposed activity with the relevant environmental standards (e.g. for pollution levels, discharges, and noise).
3	The Law on Safety - Sanitary State, 1992	The Law on Safety – Sanitary 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.
4	The Water Code, 1997	The Water Code (1997) 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: <ul style="list-style-type: none"> • The use of water bodies as potable and service water; • The use of specially protected water bodies; and

		<ul style="list-style-type: none"> The use of water bodies for the discharge of wastewaters.
5	SNIP, Construction Norms and Regulations	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. Annex 9 contains standards on maximum concentrations of toxic substances in the air of working zones. Annex 11 specifically claims that workers need to be informed and trained about sanitation and health care issues and the specific hazards of their work.
6	Rule for Use, Protection and Preservation of Trees and Bushes, No 173, 2005	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.
7	Article 22 of the Land Code, 1999	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.
8	EU Council Directive, 91/271/EEC, Urban Wastewater Treatment Plants-UWWTP directive*	Wastewater treatment shall meet effluent quality discharge Standard according to European Council Directive 91/271/EEC on Urban Wastewater Treatment Plants (UWWTP), but phased in be compared the developing regulations and conditions in Azerbaijan. Plant design shall meet EU Member State Standards (comparable with the smallest settlement/treatment plant size category) .
9	EU Council Directive, 98/83/EC, Drinking Water Standards	Water quality sampling must be conducted to meet the frequency and methods stipulated in European Council Directive 98/83/EC and article 7 (monitoring) and the related Annexes, e.g. Annex I, Table A (parameters to be analyzed) and Table B1 (minimum frequency of sampling and analysis for water intended for human consumption supplied from a distribution network). The treated water should comply with the EU Directive 98/83/EC.

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

6. Summary of Alternative Analysis

The alternative analysis, as discussed in Chapter 4 of this document, includes no Project alternative, an assessment of alternative raw water capturing method, a comparison of alternative raw water pipeline routes.

An assessment of alternative water treatment technologies and processes and location of Water Treatment Plant site were conducted both from the environmentally perspective and engineering perspective.

A comparison of alternative wastewater treatment technologies processes and an assessment of alternative sludge stabilization methods were conducted for reliability and their ability to serve regional need and their associated environmental impacts.

Criteria were developed for screening site selection of alternatives. Factors considered included;

- Legal and regulatory requirements,
- Land availability or permissible use,
- Land available on the public easement to avoid land purchase,
- Availability of sufficient pressure by gravity transmission,
- Engineering design and limitations,
- Environmentally sensitive processes,
- O & M requirements including management and administration,

The intent of this alternatives analysis is not directly to select a preferred alternative. During the EIA study stage, these alternatives are subjected to an evaluation process to help identify and refine additional reasonable alternatives. The alternatives evaluated should provide the decision makers with different geographical locations for the proposed project and with different technical or planning solutions. Thoroughly assessing a range of alternatives enables project proponent, decision makers to gain a complete understanding of the potential impacts of the proposed project over the full spectrum of implementation scenarios.

6.1. Proposed Project Changes According to Feasibility Study

Subject	Project Options proposed by the Feasibility Study Team	Alternative Options proposed by the EIA Team
Raw Water Capture	Surface Water will be diverted from Tengerudchay river, and a Water Treatment Plant will be constructed below Barzuband village.	Surface Water will be diverted from Tengerudchay river, and a Water Treatment Plant will be constructed below Barzuband village.
Alingment of Treated Water Transmission Main	The proposed alignment of pipeline has been foreseen entirely along the existing RoW of the secondary road network among the villages between Barzuband village and Astara city.	The proposed alignment of pipeline has been foreseen entirely along the existing RoW of the secondary road network among the villages between Barzuband village and Astara city.
Water Treatment Plant (WTP) Process type	A multiple treatment barrier system process type is required to provide the adequately treated drinkable water for the Astara city .	A multiple treatment barrier system process type is required to provide the adequately treated drinkable water for the Astara city .
Location of WTP site	The alternative site is the old WWTP site South of Shiyakaran village.	The alternative site is the old WWTP site South of Shiyakaran village.
Wastewater Treatment Plant (WWTP) Process type	An extended aeration process with sludge drying beds for the proposed WWTP is selected by the Feasibility Consultant as project proposal.	The EIA study Team supports on the designation of an extended aeration process with sludge drying beds.
	<p>However,</p> <ul style="list-style-type: none"> ▪ No anoxic zone exist in the proposed scheme, ▪ No Chlorination Unit is suggested before discharging the treated water to the receiving body. ▪ No by-pass channels and connections are envisaged in the proposed WWTP scheme. ▪ And, a septic sludge acceptance station is appended to the sewage water inlet cell. 	<ul style="list-style-type: none"> ▪ The major advantages of a <i>continuous flow extended aeration plant</i> are the natural process, the relatively low capital cost, and its technology is the best understood by the operators. <p>However,</p> <p>Requirements of the Anoxic Zone</p> <p>The EIA study team recommends that the designation of a <i>MLE process type continuous flow wastewater treatment plant</i> will be an appropriate solution both for more environmentally sound and easy operation.</p> <p>As well known, this process type is a single sludge nitrification-denitrification process utilizing the biodegradable organics in the influent by recycling nitrates from a</p>

Draft Executive Summary

single aerobic zone to a single anoxic zone, and by physically separating the anoxic zone from the aerobic zone.

Denitrifying microorganisms require an anoxic environment free of molecular dissolved oxygen, along with a soluble, or dissolved, organic food source. Soluble BOD, methanol, acetate, or the volatile fatty acids from fermented sludge can serve as this food source. As with nitrification, denitrification can occur in either suspended growth, attached growth or combined processes.

This process is capable of reducing total nitrogen (TN) to the 10-15 mg/l range.

Chlorin Contact

Chlorine is used to disinfect WW plant effluents, prior to discharge to a receiving body. It is normally present as "combined" chlorine (chloramines). Chlorination is generally followed by dechlorination with sulfur compounds, prior to release of effluent.

Chlorination facilities are required to provide disinfection for the ultimate discharge to irrigation canal nearby the WWTP and to support the following process operations:

- Influent pre-chlorination (backup odor control, when required).
- Return Sludge Chlorination (filamentous bacteria control)
- Pretreatment Building Odor Control Facility chlorine solution demand.
- Solids Thickening and Dewatering Odor Control Facility chlorine solution demand.

The proposed chlorination facility will include:

- Enclosed chlorine building, including an emergency chlorine cylinder scrubber
- Chlorine scales.

Azerbaijan regulations require pathogen and virus control for effluent discharge to receiving water bodies.

A common proven criteria is recommended for such requirements are typically referred to as high level disinfection and, as such, must meet the following disinfection criteria:

Draft Executive Summary

- 1 mg/l chlorine residual at 15 minutes detention time at peak flow.
- 1 mg/l chlorine residual at 30 minutes detention time at average flow.

The above detention time criteria can be met in the effluent canal prior to discharge. This is a common practice throughout the world.

The units shall be sufficient in number and size so that, with the largest-flow-capacity unit out of service, the remaining units shall have a design flow capacity of at least 50 percent of the total design flow.

By-Pass Channels

Integrating Collection System and Wastewater Treatment Plant Hydraulic Modeling for Wet Weather Control, a by-pass channel network should be improved in the treatment system. Treatment plant flows, combined sewer overflows and general collection system performance will be affected by hydraulic capacities in primary treatment systems. Plant modeling aided in understanding several aspects of the plant and collection system interaction including:

- How the plant responds to rising flows.
- How the interceptors respond to the plant treatment capacities.
- How the plant would respond to increased flows resulting from collection system facilities planning alternatives.
- How flows change for various operating conditions.

Acceptance of Septic Sludge into WWTP

Sewage treatment plants offer another alternative for septage treatment. Because septage is approximately 50 times as concentrated as domestic sewage, it must be blended with sewage before entering the plant to avoid upsetting the treatment process.

The concerning of accepting septage into a WWTP can also be considered and addressed. However, the Daily volume of septage may need to be managed to avoid plant overload. Restricting the hours of septage receiving, or limiting the number of loads per day may be necessary to control the

xxxvii

Sludge Dewatering and Disposal

Sludge Drying Beds (SDB) for dewatering the sludge to be generated in the treatment process, is recommended.

It is stated in FS *'In first priority the sludge will be used in agriculture. In case this is not possible it will be disposed on a landfill, see FS Chapter 4.1.3'*

However, no separate mono-landfill facility is recommended in FS. Agricultural application of the sludge dried in SDB is recommended in first priority.

plant loading rate.

For added protection, the treatment plant may collect a small sample from each load and analyzed to reveal the hauler who contributes the bad load.

Because of the above reasons, the EIA team does not support this alternative in this stage.

The EIA team supports the alternative of Astara FS for sludge dewatering. Sludge drying beds are recommended the best appropriate option for sludge dewatering by the EIA team on account of;

- Easy operation,
- Needing no high qualified operators,
- Having no technical sophistication, and
- Needing no back-up facility,

However, the use of dried sludge (sludge cake) in agriculture will be most probably unfeasible because of heavy metal concentration and effects of toxicity of dried sludge.

Alternatives of sludge cake's disposal are comprehensively examined in Chapter 4.3.3, and disposal of dewatered sludge at a separate mono-landfill site is selected best appropriate option because of the negative environmental effects of other options by the EIA team.

Reuse of Treated Wastewater

In Astara case, reuse of agricultural purposes is possible.

Reuse of treated wastewater can represent a potential new water source in the rayon. This alternative can be possible in the area. The treated wastewater will be discharged into the irrigation canal nearby the WWTP.

Use of Drinking Sludge on the agricultural application

The sludge can be disposed off on a regular landfill area. *Astara FS, Chapter 4.3.3.*

The EIA team supports this alternative.

Location of proposed WWTP

The area which will be used as the WWTP site for Astara city, is and public easement. Currently, old WWTP of Astara city is not active in this area. The new WWTP will be constructed in the same site. The area is not planned for another usage.

The EIA team supports this alternative location.

Because;

- It is a public easement,
- No need to purchase the private and/or agricultural land for this alternative location,
- The area is currently used as existing WWTP site, and not planned for

another usage.

Location of Construction Contractor(s)' Camp site	of	Any construction camp place for Contractor(s) has not been proposed in the Feasibility Study.	Construction contractor camp place is not discovered within this period of EIA study. The final location of the contractor(s) camp site should be determined with the approval of AWM OJSC and/or Rayon Executive Power within the period of pre-construction phase, and the most environmentally sensitive location should be selected.
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6.2. Anticipated Project Schedule

The anticipated schedule for the entire Project is as follows;

- 1) during the fall, winter and spring of 2010 approval of EIA studies and bidding procedures will be completed,
- 2) during the last quarter of 2011 plus the whole year of 2012 actual construction works will be completed,
- 3) Defects liability period of the contractor(s) in this Project will be lasting for 12 months as of the project's completion.

Procurement for the Design and Build Contract will be according to open and transparent procedures for international competitive bidding.

Bidding under World Bank loans is allowed in all currencies of their member countries. However, AWM OJSC will request bidders to specify which part of the bid will be paid in local currency – to lessen the currency exchange risk (but this factor cannot be part of the evaluation process). All currencies will be converted to one currency for the bid evaluation process.

7. Summary of Environmental Effects, Benefits and Mitigation

The potential impacts, benefits, and proposed mitigation measures anticipated to be associated with the proposed Project are presented in Chapter 6 and 7 including specific data and references. A summary level presentation of the impacts, benefits and mitigation measures is below;

Proposed Project Benefits

Positive impacts and benefits identified for the Project are;

- The Project's construction phase activity will generate a two year burst of economic benefits because of the high temporary levels of Project employment and local purchasing, e.g., peak employment will exceed 300 workers in a project year. By contrast, the operations phase will employ perhaps 20 % of this peak number. Considering spinoff effects generated by these wages and purchases, the construction phase will boost the gross domestic product of the rayon by a projected approx. 10 % per year.
- During operation phase, improvement of public health, and potential environmental benefits from the elimination of contamination and degradation on the soil in and around the Astara city.

The potential Negatif Impacts of the Project

The potential *less than significant impacts with mitigation incorporated* on the natural and socio-economic environment, is;

- Impacts on Ambient Air Quality during the construction phase.
- A temporary negative effect on the agricultural lots nearby the Project corridor.

The potential *less than significant impacts* on the natural and socio-economic environment, are;

- Biological Resources; Negative effects on the terrestrial and aquatic wildlife will occur most likely on the wildlife community nearby the Project corridor,
- Hazards and Hazardous Materials; the construction chemicals to be used in the contractor's camp and on the worksites will cause the impacts in less than significant level during the construction phase,
- A temporary negative effect on the hydrology and water quality in or nearby the Project corridor will occur in less than significant level.
- During rain events, the potential exists for loss of soil from the unpaved access route referred to as the trail roads (service roads), particularly if heavy truck traffic causes a deterioration in the road surface.
- Temporary, periodic increases in ambient noise levels within the Project corridor will cause a negative effect, which is in less than significant due to their short-term duration. Implementation of mitigation measures will further reduce impacts.
- Transportation and Traffic; Disruption of road traffic and disruption of public services may cause an impact, which is in less than significant level.

All other impacts are considered *insignificant*.

Environmental effects from the proposed Project will generally not have substantial adverse effects on humans. However, possible impacts from construction accidents, noise, and other safety hazards will exist. These impacts will be reduced with the appropriate mitigation measures comprehensively explained in Chapter 6 and 7.

8. Environmental Management and Monitoring

Environmental Management plan

The proposed work will have some short-term adverse impacts on the environment during the construction period. Based on the impact analysis, mitigation measures have been developed in two phases as required to minimize or reduce the potential impacts of the Project (see Chapter 6 and 7).

The pre-construction or planning management plan is to be used as a guide during the planning, design and detailing of the development components. This part of the plan is to be referenced by all involved in decision making during the planning and design phases.

For the Pre-construction Phase, see **Exhibit 7.1**.

1. Environmentally Related Authorizations, Permits and Licenses,
2. EMP Training,
3. Contract Areas,
4. Sensitive Ecology,
5. Heritage Areas,
6. Roads,
7. Site Establishment,
8. Materials Handling, Use and Storage,
9. Water Supply,
10. Power Supply,
11. Liquid Waste,

The Construction Management Plan forms part of the contract documentation. The plan must be read in conjunction with the contract documents including the relevant Bill of Quantities and Specifications.

When carrying out the Works during the construction phase, 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.

For the Construction Phase, see **Exhibit 7.1**.

1. Vehicular Access and Movement of Construction Vehicles,
2. Movement of Construction Personnel, Labors and Equipments,
3. Vegetation Clearing,
4. Protection of Fauna,
5. Heritage and / or Archeological Sites,
6. Soil Management,
7. Erosion Control,
8. Slope Protection,
9. Access Roads,
10. Excavating, Backfilling, and Trenching,
11. Levelling,
12. Sand Extraction,
13. Stockpiling, Handling, Storage of Building Materials,
14. Servicing and Re-fueling of Construction Equipments,
15. Solid Waste Management,
16. Hazardous Material,
17. Run-off from Construction Camp,
18. Fire,
19. Ambient Air and Dust,
20. Noise,
21. Crossing at Rivers, Streams and Wetlands,
22. Visual,
23. Site Clean-up and Rehabilitation.

The stipulations of the report should be conveyed to the contractors prior to the commencement of construction.

Environmental Monitoring and Supervision

Specifically, the contract for the proposed project will include the Monitoring Plan will be attached to the Technical Specifications, see **Exhibit 7.2**.

The Employer (AWM OJSC) 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.

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 and construction works, including control of pollution and wastes at work sites and construction contractor's camps.

The objectives of carrying out Environmental Monitoring and Audit for the Project include the following:

- Providing a database against which any short or long term environmental impacts of the project can be determined.
- 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.
- Verifying the environmental impacts predicted in the EIA Study.
- Determining project compliance with regulatory requirements, standards and government

policies.

- Taking remedial action if unexpected problems or unacceptable impacts arise.
- Providing data to enable an environmental audit.
- Providing real-time reporting of monitoring data through a dedicated internet website.

Monitoring and Audit should be developed in two consequent phases, and those are *Construction Phase* and *Operation Phase*.

9. Consultant's Recommendations

1. The AWM OJSC's PIU currently has few staffs and there will be a need for more human resources. An Environmental Management Team envisaged in Chapter 7.1.5.1 should be constituted under the PIU of AWM OJSC in the Project implementation period. The envisaged 'Environmental Management Team' composition and its budget were discussed and agreed with AWM OJSC. 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.
2. 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.
3. An international environmental specialist should also be engaged to support the EMU at least for two years from pre-construction until the operation phase. An auditing methodologies will be established by the EMU.
4. It is recommended that AWM OJSC appoint the Environmental Control Official(s) (ECO) during the construction phase of the project. The ECO should be a Section Ranger.
5. An environmental management team should be constituted under the PIU of AWM OJSC in the Project implementation period.
6. The Environmental Monitoring and Audit reporting shall be carried out in paper based plus electronic submission upon agreeing the format with the MENR of Azerbaijan. All the monitoring data (baseline and impact) shall also be submitted in CD-ROM.
7. Types of reports that the EM should prepare and submit include baseline monitoring report, monthly Environmental Monitoring and Audit report, quarterly Environmental Monitoring and Audit report summary report and final Environmental Monitoring and Audit report review report. A copy of the monthly, quarterly summary and final review Environmental Monitoring and Audit reports should be made available to the PIU of AWM OJSC and World Bank.
8. The EM should prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report should be submitted to the Contractor, the PIU of AWM OJSC of Azerbaijan, the MENR of Azerbaijan, MOH of Azerbaijan. The EM should liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format should be agreed with the MENR prior to submission.
9. No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly Environmental Monitoring and Audit reports. However, any such document should be well kept by the EM and be ready for inspection upon request. All relevant information should be clearly and systematically recorded in the document. Monitoring data should also be recorded in magnetic media form, and the software copy must be available upon request. Data format should be agreed with MENR of Azerbaijan. All documents and data should be kept for at least one year following completion of the construction contract.
10. With reference to the Event and Action Plan, when the environmental quality performance

limits are exceeded, the EM should immediately notify the AWM OJSC and MENR, as appropriate. The notification should be followed up with advice to AWM OJSC and MENR on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals.

11. All complaints should be referred to the EM for action. The EM should undertake the procedures explained in Chapter 7.3.4. upon receipt of any complaint.

10. Project Related Environmental Management and Monitoring Costs

The Project environment related costs have been detailed in Chapter 7.1.5.2. The amount for the rayon is US \$ 326,921.28, and its breakdown is as follows;

<i>Item</i>	<i>Measure</i>	<i>Cost</i> <i>(US Dollars)</i>
1	<i>Environmental Supervision and Monitoring</i>	221.921.28
2	<i>Hazardous Waste Disposal Facility to be constructed in Astara city</i>	105.000.00

11. Public Consultation

Series of scoping sessions and focus group discussions were carried out with AWM OJSC, RPUDs, local Communities and NGOs. Additional meetings were held at various sites along the project corridor. These meetings were held with AWM OJSC, RPUDs, and relevant governmental departments both in rayon level and regional level.

Generally, people were found to be aware of the need to upgrade the WSS systems, and indicated their support for the AWM OJSC. The proposed construction of the new systems met with particular support since it will reduce the health problems of the public in their region.

Local departments of rayon demanded they be part of a continuous consultation process with other stakeholders at different stages of the project including the design, construction, and operation periods.

The first call of an information meeting for scoping consultation attending the representatives of RPUDs and other interested parties, including representative of AWM OJSC, has been forwarded to AWM OJSC at the date of September 01, 2010, see Annex-4. Agenda items of meeting request were as the followings;

- Distributing of an Environmental Checklist drawn up by the EIA consultant,
- Discussing of the Public review Process for scoping the EIA, and

Since the study areas consist of 12 rayons, two information meetings, each of six rayons, has been planned for scoping consultation process. The first information meeting for the southern six rayons (Lankaran, Astara, Lerik, Yardimli, Jalilabad, and Masalli) were held at seventh of September, 2010 in Astara. The second information meeting for other six rayons (Imishli, Zardab, Kurdamir, Ujar, Gadabay, and Dashkasan) were held at September 17th, 2010 in Ujar rayon. See Annex-4.2.

In this period, a scoping report has been carried out, and submitted to AWM OJSC at the date of March 25, 2011.

The general public were consulted through all three phases of the consultation process as described

above. A contact list of individuals and groups that were considered or known to be interested in the process and/or had identified themselves as having an interest, was created and maintained with EMU of AWM OJSC and Rayon Irrigation Department throughout the consultation process. Individuals and organizations on the list were contacted.

The general public consultation included a two-part process;

1. **Phase 1;** Creation of a background information package (hard copy questionnaires), and obtaining of public feedback both from the 'engaged public' and 'general public' with the notification and dissemination of the questionnaires set to Astara Public. See Table 8,4.
2. **Phase 2;** Arranging a general public meeting in Astara city as an open public forum. Notice for the forum has been posted in local municipal Office through EMU of AWM OJSC and Rayon Irrigation Department. Interested parties included, but were not limited to residents and residents groups, NGOs, business groups including farmers, and environmental groups. A general public consultation meeting was held in January 28, 2011 at Deputy Governor's Office in REP Building. See Table 8,2 and Annex-4.

12. Conclusion

This study was carried out at the planning stage of the project. Primary and secondary data were used to assess the environmental impacts. The potential environmental impacts were assessed in a comprehensive manner. The report has provided a picture of all potential environmental impacts associated with the proposed Project, and recommended appropriate mitigation measures. This study recommends that some further follow up studies are undertaken during project processing in order to meet the requirements of World Bank, and relevant National/International regulations.

There are some further considerations for the planning stages such as obtaining clearance for the project under the Azerbaijan Environmental Protection Act and Water Code, however, environmental impacts from the proposed project will mostly take place during the construction stage.

At the detailed design stage the number of and exact locations for the placements of proposed Project may change subject to detailed surveys, however, the impacts are likely to be broadly similar at most locations and impacts have been reviewed in this EIA report.

There are a number of key actions required in the detailed design phase. AWM OJSC must receive clearance certification from the MENR designing an EMP that will be accepted by the MENR, and agreed by the contractor prior to signing the contract.

An environmental monitoring and audit programme has been recommended to monitor the implementation of the mitigation measures and to ensure compliance with environmental standards.

However, the baseline monitoring activities should be carried out during project detailed design stage to establish the baseline of parameters for checking during the construction stage. The results should be integrated with the contract documentation to establish performance action thresholds, pollution limits and contingency plans for the contractor's performance.

The proposed Project have impacts that are individually limited, therefore, they are not cumulatively considerable.

- Although, the impacts in the less than significant level will occur on the environment in or nearby the Project corridor during the construction phase, these impacts will be minimize with the mitigation measures recommended in the EIA report.
- The findings of this EIA have provided information on the nature and extent of potential environmental impacts arising from the proposed Project.

- This EIA Study has predicted that the Project, after the adoption of appropriate mitigation measure, would comply with the environmental legislation and standards, and the residual impacts are considered to be acceptable.
- The implementation of the proposed project would have significant positive impacts to the social-economic and public health development of the rayon in particular.

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SNWSSP Phase II
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Baku, March 28, 2011.

Chapter 1

INTRODUCTION

Overview

This document is a combination of the positive and negative list and expert judgement; for a number of activities, an Environmental Impact Assessment to improve the construction of water supply and sanitation (WSS) investment proposed for rayon Astara.

This Environmental Impact Assessment (EIA) presents the results and conclusions of environmental assessment for the proposed construction of the WSS investment, which is intended to be implemented in rayon Astara.

This EIA will be realized under the provisions of its scope of work and the relevant World Bank Operational Policy OP 4.01, and will refer to the relevant National, International and Regional legislation, regulations, guidelines and other policy documents.

Consideration will be given to improving integration of National / International development strategies and for developing the mitigating measures.

This EIA is planning instruments that aim to contribute to the design phases of the development as well as function as management tools to minimize potential negative impacts and maximize benefits during construction and operational phases of the Project.

To be effective in this role, EIA needs to form an integral part of the Project design process, and should be incorporated into the bidding documents.

1.1. Project Background

The Second National Water Supply and Sanitation Project (SNWSSP) is financed by the World Bank and the Government of Azerbaijan. The project is expected to address the problems facing the WSS sector through reconstruction and rehabilitation of infrastructure in 21 rayons in Azerbaijan.

Second National Water Supply and Sanitation Project Implementation Unit under the Amelioration and Water Management Open Joint Stock Company of Azerbaijan (AWM OJSC) is responsible for 16 rayons of Azerbaijan in scope of SNWSSP.

Investments under this Project will be implemented in two phases. Phase I is expected to cover four Rayons (Aghsu, Ismayilli, Shabran and Siyazan), and Phase II will cover additional 12 Rayons (Imishli, Kurdamir, Ujar, Zardab, Astara, Astara, Masalli, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay). The strategic approach being adopted under the Project is based on two complementary interventions: (i) rehabilitation and construction of WSS infrastructure in the Rayon's centres plus the villages located in close proximity to them, or along the transmission mains for the water supply; (ii) implementation of a comprehensive Institutional Development Plan to strengthen the WSS sector's capacity to manage WSS services in an efficient, effective, and sustainable manner.

A Contract has been made at 27th of August, 2010, between AWM OJSC of Azerbaijan (Client) and Aim Texas Trading LLC, Engineering Department Overseas Management Group (Consultant) with the Contract No. SNWSSP-CS-QCBS-01/2010 for preparing the Environmental Impact Assessment of 12 rayons.

The consulting services will include the preparation of the detailed Draft Environmental Impact Assessment (DEIA), Final Environmental Impact Assessment (EIA), Environmental Management Plan (EMP) of the proposed WSS investments of the 12 rayons mentioned above, a well defined and processed Scoping Consultation, General Public Consultation and Scoping Report for each rayon.

These studies will identify the potential impacts of the projects, both positive and negative, and review alternatives. The EMP will include implementation procedures and arrangements for ensuring full consideration of Environmental Safeguards for the investments in the mentioned 12 rayons, in accordance with WB OP 4.01 and the relevant environmental procedures of Azerbaijan. Particular attention will be given in the studies practice to preventing, mitigating and offsetting the significant adverse effects of proposed undertakings.

1.2 Basic Features of Proposed Project

The Project has two complementary features to accomplish this purpose and, in turn, support local economic growth and poverty reduction addressed to its respective communities:

- Rehabilitation and construction of WSS infrastructure,
- Implementation of an Institutional development plan in large scope to strengthen the WSS sector's capacity to manage WSS services in an efficient, effective, and capable of being sustained.

1.2.1 Objective of the Project

The overall aim of the Project (SNWSSP) is to improve access to safe, reliable and sustainable water supply and sanitation (WSS) services in the urban centres of the said above 21 rayons of Azerbaijan. One of these rayons is Astara, which is located in the Lankaran Economic Region (Talish Region) of Azerbaijan.

This objective will be achieved through rehabilitation and reconstruction of the water supply and sanitation infrastructure in the rayon.

Realization of the Project will positively affect the environmental safety, economic, social development and health of population; as well as put the basis for correspondence to legislative requirements in the area of environmental safety and to state standards of water usage.

The project is part of the country wide strategy to bring the improvements in living standards further than the major urban areas, into the smaller towns and cities of the rural rayons.

The proposed project addresses the basic problems, and includes four primary components in its comprehensive scope:

- A. Regional Investment
- B. Baku Investment Planning
- C. Institutional Modernization
- D. Project Implementation and Management

1.2.2 Specific Goals of the Project

The primary objective of the Project is to improve the health and livelihoods of the urban communities through the provision of safe, potable, and adequate water supply and sanitation.

The following indicators are listed;

- Secure supply with potable water meeting World Health Organization (WHO) and/or national quality standards,
- Continuous water supply for 24 hours per day,

- Supply of each user with sufficient water for domestic needs,
- Water distribution system workable under operation pressures with low leakage rates,
- Safe collection and treatment of domestic and industrial wastewater, and reduction of aquifer pollution,
- Compliance of water supply facilities, sewer system and wastewater treatment plant based on international and/or Azeri standards,
- Affordable Water Supply and Sanitation Prices for consumers and within determined service tariffs,
- Minimum use of natural resources to keep the impact of WSS measures on the environment at minimum level during implementation and maintenance

The secondary objective is to implement an Action Plan that will upgrade and improve the sustainability in the Rayon centers. The Project aims to achieve its objectives through;

- Implementation of a new, efficient and appropriately sized water and sanitation infrastructure by rehabilitation of existing facilities and construction of new ones where necessary,
- Determining of the operational bottlenecks of the water and sanitation system and develop project proposals to improve efficiency,
- Strengthening of local know how and capacity to deliver and maintain these services,
 - Developing a sense of local ownership through community participation

The Presidential Decree Number 3 dated November, 2003, requires the Cabinet of Ministers to undertake measures for elimination of socio economic problems and to apply the norms of the European Social Charter. The proposed WSS project falls squarely within the scope of the Decree. The national WSS norms state that the water supply investments shall provide 24 hour coverage of potable quality and be delivered to the consumers at the appropriate pressure.

The Governments sector policies, strategy and development are based on a National WSS Strategy (2000), which has recommended the setting up of 'Autonomous Commercially-Run Utilities, under the Regulatory Control of Local Government. In secondary towns, these utilities, known as Su Kanal (water supply agencies of secondary towns are prefixed by town name to designate the local branch – Astara Su Kanal Department refers the agency in the town of Astara). These utilities were to be transformed into financially self-sufficient institutions eventually able to attract the private sector to participate in their operation and management. This was followed by a Presidential Decree Number 893 dated March 2002, which further set out the sector development approach. This Decree promotes private section participation, an improved tariff system, metering of water supply and revision of the accounting systems.

1.3 Involved Organizations and Authorities

In order to progress towards the objectives, the Project Implementation Unit (PIU) was formed by Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan. The Consultant has maintained close contact with the Project Implementation Unit (PIU) as Employer on all aspects of the Consultant's work. All formal communications from the Consultant has been addressed through the PIU.

The PIU has assisted the Consultant in obtaining all staff permits, authorizations and licenses required for the performance of the Consultant's services in Azerbaijan. It has also provided all existing data,

reports and maps as far as they were available and has assisted the Consultant in obtaining other relevant information and materials from governmental institutions and state authorities.

Statutory and non-statutory consultation process was followed in order to supply the information required for preparation of the EIA report at the rayon Astara. A representative of the Rayon Executive Power has supervised to the EIA study team during the process. The organizations and authorities contacted at the rayon were mostly;

- Representative of Rayon Executive Power,
- Head of Architecture and Construction Division,
- Mayor of the city,
- AWM OJSC of Azerbaijan and EMU of AWM OJSC,
- Head of the Rayon Statistics Department ,
- Head of the Rayon Hygiene and Epidemiology Centre,
- Head of the Rayon Irrigation Systems Department,
- Head of the local Su Kanal (water and sewerage) Department,
- Head of the Land and Cartography Committee Regional Department,
- Representative of Lankaran Ecology Department,
- Representative of Astara Water User Associations (Local NGOs),
- Rayon Road Patrol Department,
- Rayon Forest Department,

1.3.1 Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan

Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan was established based on the Amelioration and Water Farm Agency of Azerbaijan under Ministry of Agriculture of Azerbaijan according to President Order Number 372 dated February 23, 2006 for Amelioration and Water Farm Management Improvement Activities. AWM OJSC is a stock company which provides State services for amelioration and water farm, and stocks of which belong to the State.

AWM OJSC of Azerbaijan is responsible for monitoring water use and issues annual reports based on information from water users. The Company's activities focus on irrigation, for which it sets water-use norms and handles user relations. It is also responsible for establishing the charges for water use. In addition, it is in charge of land improvement on irrigated land, and the operation and maintenance of the irrigation infrastructure.

According to its existing legislative status AWM OJSC of Azerbaijan has responsibility;

- To supply water for different economical sectors throughout the country,
- To organize operation of amelioration and irrigation systems under State possession,
- To provide State control of waters supply and protection,
- To implement measures for melioration of salined lands, for land sliding and for flooding,
- To prepare integrated plans for water supply and protection at basins including groundwater resources,
- To organize international transboundary water aspects and manage joint operation of amelioration and irrigation systems,
- To construct amelioration and water farm facilities,
- To conduct and confirm State expertise of projects within its responsibility,
- To perform budget-finance and other activities regarding the development of areas.

Within the scope of the Second National Water Supply and Sanitation Project AWM OJSC of Azerbaijan has been assigned to construct the water supply and sanitation infrastructure and necessary treatment installations and hand over these installations to relevant local SuKanal authorities.

1.3.2 AZERSU Open Joint Stock Company (AzerSu OJSC)

The AzerSu OJSC's main water supply activities in rural areas are comprised of establishment of policies, project planning, and functioning as an intermediary between central government and international donor organizations. However, AzerSu OJSC has its own potential to plan projects in cooperation with Joint SuKanal Limited Liability Company (LLC) and Rayon SuKanal Departments.

AzerSu OJSC was established during the WSS system reforms of Azerbaijan according to President Order Number 252 dated June 11, 2004 about Water Supply Management and Improvement of Azerbaijan Republic on the base of Absheron Regional Stock Water Company. All stocks of AzerSu OJSC belong to the Government of Azerbaijan. According to the Order, city-wide, regional institutions and agencies of Baku City Executive Power Bakikanalizasiya Industrial Union and State Construction and Architecture Committee's liquidated Azersukanaltemir and Azerkendsutechizat Industrial Unions were placed under the authority of AzerSu OJSC. AzerSu OJSC management is assigned by the OJSC president and his four deputies (vice-presidents).

AzerSu OJSC has responsibility to perform the below functions;

- To organize water supply and sanitation service in the country, to manage institutions under its authority, to coordinate their work, to participate the implementation of State water supply and sanitation services policy,
- To organize water offtake, processing, transportation and sale through agencies under its authority, to provide operation, design, construction, repair and maintenance of treatment plants, pumping stations, water pipelines under its authority,
- To organize activities of agencies under its authority on treatment plants and systems,
- To provides establishment of legislation based sanitary-protection zones in water supply and sanitation system facilities and compliance audit of their implementation,
- To use surface water facilities and groundwater facilities for the water supply,
- To provide and commission the installation of flow meters and water measuring devices to measure produced and consumed quantity of water and sewage,
- To define respective technical specifications and controls observation of the specifications for connection to water and sewerage canals based on application of legal and natural persons,
- To conduct the control of drinking water supplied for drinking purposes and sewage produced from industrial sewage,
- To deal with scientific-research and design activities, to participate in preparation and implementation of legislative acts specifying general rules of water supply and sanitation system, to define the investment programs required for water supply and sanitation system improvement and development.

Joint SuKanal Limited Liability Company

AzerSu OJSC possesses all state shares of Joint SuKanal LLC. However Joint SuKanal is a financially independent "Limited Liability Company" bound by the laws of Azerbaijan Republic. Joint SuKanal LLC governs 53 SuKanal Departments responsible for WSS services in each rayon of the country.

The main activities of Joint SuKanal LLC are given below;

1. Technical assistance to SuKanal Departments in the rayons,
2. Monitoring and supervision of the activities of SuKanal Departments,
3. Compilation and sorting of statistic data and reporting to AzerSu OJSC,
4. Checking existing condition of WSS in each rayon through the local SuKanal Departments,
5. Design planning of WSS systems together with AzerSu OJSC,
6. Management of labour resources,
7. Investment contract and budget assessment and approval,
8. Distribution of budget funds.

Rayon SuKanal Departments

The “Local Executive Body” has representative at the town level, as a counterpart to the town Municipality, as well as in rural villages and settlements. The Rayon “Local Executive Body” plays a considerable role in the monitoring, supervision, and control of the SuKanal Departments (RSKD), since the “Local Executive Body” assumes ultimate responsibility for the provision of all services, including WSS.

The Order provides guidance for its structure and the management. The Manager of Astara SuKanal Department is nominated by the “Local Executive Body”, but appointed by the Head of AzerSu OJSC.

The obligation of RSKD is to manage the water, waste water systems and networks in the rayon. It is required to set up plans for its operations based on the demand for its services. In estimating the demand, the RSKD is required to conclude agreements and contracts with consumers and to provide these supplies at prices that cover operating expenses. The RSKD is also required to improve and extent its service, give new customers the appropriate technical specifications of the systems that they may wish to connect to.

The RSKD can be financed through sale of WSS services to consumers, special budget allocations, connection fees and charges to new customers, income from credits (i.e. loans), funds arising from fines and charges for unauthorized use of water systems. It has also sufficient rights necessary to operate the WSS systems profitably.

1.3.3 Ministry of Ecology and Natural Resources (MENR) of Azerbaijan

MENR was established within structural reforms conducted in Azerbaijan Republic according to Azerbaijan Republic President Order Number 485 dated May 23, 2001 on the base of State Ecology and Natural Resources Use Control Committee, Azermeshe Industrial Union, Geology and Mineral Resources Committee, Azerbaliq State Concern and State Hydrometeorology Committee, which previously dealt with different areas of environmental protection and natural resources use.

MENR is a central executive power body which implements State policy for environmental protection, nature use organization, groundwater, mineral crude resources and use of surface natural resources, their rehabilitation, hydro-meteorological observation and prognoses in the area of Azerbaijan Republic.

MENR has the authority to;

- implement State policy for natural resources and their usage, rehabilitation, protection and environmental safety in this area,
- prepare and implement National Action Plans and State Programs on forests, on geological and mineral resources, on biological diversity, on water usage and protection,
- implement State management for environmental protection and natural resources usage,
- give special permission (license) for activity types specified in the legislation,
- determine and apply ecological norms and standards for protection and usage of nature,
- prepare and apply payment norms for environmental pollutants emission (discharge),
- conduct State ecological expertise of projects covering different areas of national economy and significantly impacting environment,
- implement State control for hunting and aquatic resources in the country area, to prepare and apply rules, instructions and other legislative acts for fauna and flora protection and their usage,
- determine emission limits of environmental noxious substances and to implement its control,
- establish State environmental and natural resources monitoring system,
- conduct observations and analyses for spread of pollutants in atmosphere, earth bowels, land and water basins.

1.3.4 Ministry of Health (MoH) of Azerbaijan

MoH is a central executive body which implements State policy and regulation for the public health maintenance. MoH functions according to responsibilities which are specified in the Regulation on Public Health Ministry approved by Azerbaijan Republic President Order Number 413 dated May 25, 2006. MoH has realized its duties on State sanitary-epidemiological control through the city (regional) Hygiene and Epidemiology Centers.

When the water and sanitation has been considered, MoH has responsibility to;

- lead and control State public health system agencies, medical education, scientific-research works on medicine, implement State sanitary-epidemiological activities, etc.
- study public health situation, to prevent diseases, and to take measures in order to decrease diseases and deaths,
- participate in preparation of hygienic legislation, rules and standards preparation and controls observation of the norms within the country,
- coordinate projects and provide inputs for different economical sectors at any phase, like design, construction, reconstruction, modernization, supply of industrial and agricultural facilities, water supply, sanitation, sewage treatment systems and hydraulic structures with new engineering, implementations. To make compliance audit of these activities during their implementation based on the sanitary norms and rules and hygienic normatives.

1.3.5 Regional (city and/or rayon) Executive Authorities

According to Azerbaijan Republic Constitution, Item 124, rayon executive authorities are head of government administration in the rayon level. Head of rayon executive authorities are appointed and/or dismissed by President of Azerbaijan Republic.

The rayon executive authorities govern the administrative area by executive power staff and local departments, institutions and agencies under its authority. They take respective measures for relevant areas like economic, social and cultural development and implement State programs, like social-economic development programs of the Republic, local ecological plans and programs; besides, they also solve city-wide problems. Rayon Executive Heads have the right to adopt normative acts, which do not conflict with the Republic legislative system acts for the areas administration and other respective problems.

Rayon Executive Heads are responsible to manage property under their balance: like lands, State housing fund, non-residential buildings, engineering-communication, infrastructure facilities (in-house water pipelines, sewer utilities, heat, power and gas supply), transport inside the city, educational, cultural, health, sporting institutions and other recreational facilities taking measures for their preservation, repair/rehabilitation and development.

Local executive power bodies have the following kind of authorities for health and municipal sector;

- To make land use planning, to conduct and organize land cadastre Works,
- To implement hygiene and sanitary-epidemiology activities and to provide the monitoring of sanitary and hygiene norms and rules,
- To organize environmental protection in region, city and regional city area, to prepare ecological programs in this direction, to participate in implementation of ecological programs of Azerbaijan Republic,
- To inform people about ecological conditions, to take necessary measures for public in case of natural disaster or accidents.

1.3.6 Municipalities

Municipalities have the right to prepare and implement development programs on social protection and development, local economic development, and on the ecological fields, which are not envisioned to be implemented by State. The programs might cover projects on pre-school, middle school education,

public health, culture, maintenance and development of residential and non-residential buildings, construction and maintenance of locally important roads, organization of ceremonial services, organization of transportation and communication services, maintenance of historical and cultural monuments, etc. The activities of municipalities include the water supply and sanitation, solid waste collection and disposal, as well as protection of environment.

There are numerous of laws, which form the liability limits of municipalities like Property Transfer to Municipalities Status, Municipality Ownership, Finance Principles of Municipalities, and on the Municipal Lands Management, etc.

1.3.7 Ministry of Emergency Situations (MES) of Azerbaijan

MES was established within State management system reforms by President Order Number 1182 dated December 16, 2005. The relevance of this ministry to the water sector has been originated from the task assigned to it on the implementation of normative regulatory and check-control functions for issues under the Ministry powers.

1.3.8 State Urban Development and Architecture Committee

Azerbaijan Republic State Urban Development and Architecture Committee was established by Azerbaijan Republic President Order dated February 26, 2006 on Establishing Azerbaijan Republic State Urban Development and Architecture Committee. The Committee has authority to conduct studies on population distribution, planning the usage of nature regional, general plans and detailed planning of inhabitant areas, and etc.

1.3.9 Tariff Council of Republic of Azerbaijan

Tariff Council acts under Azerbaijan Republic Economic Development Ministry. The Committee is responsible for definition of tariffs, service fees which are applied in nationwide. Tariff Council activity is headed by the Council Chairman Azerbaijan Republic Economic Development Minister. The main legislation providing liability to the Committee is the List of Goods with State-Regulated Tariffs was approved by Azerbaijan Republic Ministers Cabinet Decision No.178 dated 28 September 2005.

The Committee is also responsible for the definition of;

- water use service prices related to authority area of SAWMC,
- water and wastewaters tariffs related to authority area of Azersu.

Every year on 1st of March, relevant institutes submit required data to the Tariff Committee in order to review and define the new tariffs.

1.4. Objective and Scope of the EIA Study

The objective of the Environmental Impact Assessment (EIA) is to:

- Collect data in relation to the environment of the Study Area,
- Describe the Project and associated works together with the requirements for carrying out the Project,
- Identify and describe elements of community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the Project, including natural and man-made environmental and the associated environmental constraints, including the alternative scenarios with no-project alternative,
- Provide information on the consideration of alternatives to avoid and minimize potential environmental impacts to ecologically sensitive areas and other sensitive uses; to compare the environmental benefits and dis-benefits of each of different options; to provide reasons for selecting the preferred option(s) and to describe the part environmental factors played in the selection of preferred option(s),

- Identify and quantify any potential landscape and visual impacts and to propose measures to mitigate these impacts,
- Identify and quantify any potential hazard to life impacts and to propose measures to mitigate these impacts,
- Identify and quantify any potential losses or damage to flora, fauna and natural habitats and to propose measures to mitigate these impacts,
- Identify any negative impacts on the site of cultural heritage and to propose measures to mitigate these impacts,
- Propose the provision of mitigation measures so as to minimize pollution, environmental disturbance and nuisance during the construction and operation of the Project,
- Identify, predict and evaluate the residual environmental impacts (i.e. after practicable mitigation) and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses,
- Identify, assess and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and cumulative effects and reduce them to the acceptable levels,
- Investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures and to identify constraints associated with the mitigation measures recommended in the EIA study, as well as the provision of any necessary modification,
- Design and specify environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures,
- Assist the Project Implementing Agency – Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan – to hold the public consultations prior to the commissioning of the EIA, and
- Carry out consultation with the key stakeholders meeting with public authorities and other institutional stakeholders, and interviewing with members of local communities, civil society, including NGOs and other stakeholders.

1.5. Assessment Area

The Assessment Area for the EIA Study is presented below (see **Exhibit 1,1**);

COMPONENT		CRITERA
1	Air Quality Impact Assessment	Area within a distance of 500m from the boundary of the Project site.
2	Noise Impact Assessment	Area within 300m from the Project boundary in the open areas because of the riparian buffer zones and wildlife habitats. The assessment area may be reduced accordingly up to 50 m in the settlements (restricted areas) with the provision of being taken the appropriate mitigation measures foreseen in Chapter 6.2.5.2, see Exhibit 1,1
3	Water Quality Impact Assessment	Cover an area within 500m of the Project site boundary, see Exhibit 1,1
4	Waste Management and Land Contamination Assessment	Cover the area within the Project boundary, see Exhibit 1,1
5	Hazard to life Assessment	The study area is the consultation zone of Water Treatment Plant and Wastewater Treatment Plant, and this area for Wastewater Treatment Plant will be at least 750 m from the nearest residential area for impact of odor. This criteria may be

used for Water Treatment plant location as 200m. The surroundings of the plants should be provided a min. 30 m beautification zone, see **Exhibit 6,5**.

- | | | | |
|---|---|----------------|---|
| 6 | Ecological Assessment | Impact | The study area for ecological impact assessment shall include all areas within 500 m from the site boundary of the land based works area. The area shall cover all the Project components where the topsoil is to be stripped and the original land cover is disturbed, see Exhibit 1,1 |
| 7 | Landscape and Visual Impact Assessment | | The assessment area for landscape impact assessment will include areas within a 100m distance from the site boundary of the work areas. |
| 8 | Aquatic Environment | Ecology | When a proposed activity involves work within the riverfront area, the area is presumed to be significant to the protection. The width of this area may be undulating across a piece of property in order to provide protection to site specific features. Current scientific research indicates that a "tiered approach" to waterbody buffers is more effective than a single setback, see Chapter 3.3.5 (Buffer Zones), Exhibit 6,2 , and 6,3 . |

The Aquatic Ecology Environment is agreed the with and length of the water body plus water body buffer zones in both sides of the relevant water body in or nearby the Project corridor.

This approach provides more flexibility on the location and nature of disturbance in the riparian zone within the aquatic life living in the relevant water body. The following tiered approach to waterbody setbacks should apply to all activities that require development approvals.

Buffer Zones in or nearby the Project corridor:

The section of approximately 546 m of Kulerichaychay river's valley (see **Exhibit 6,2**) in the northern part of the Astara city and the section of 3.5 km of Tegerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in the Project corridor.

Buffer Zones, Kulerichay river Valley:

Restrictive Inner Buffer: 7.5 m from typical high water mark.
Variable Outer Buffer : 25 m beyond the outer edge of the restrictive inner buffer zone, see Chapter 3.3.5 and **Exhibit 6,2**.

Buffer Zones, Tengerudchay river Valley:

The section of 3.5 km of Tegerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in the Project corridor. This section of the river valley falls into the area of Hirkan National Park. The river valley in this section provides Hircanian habitats for plant, animal and other wild life species. According to Feasibility Concept, the raw water will be supplied from the Tengerudchay flow channel in the lower levels of Lomin village, and the raw water pipeline will be aligned with the Sim – Astara asphalt paved road up to WTP. Only, catchment facility will be constructed nearby the flow channel of the river, and indicated in **Exhibit 6,3**. However, the high water mark is unknown in both sides of the river.

The width of variable outer buffer in the catchment area may undulate in order to provide protection to site specific features. See Chapter 3.3.5, 3.7.1, 6.2.7.1 and **Exhibit 6,3**.

9 Cultural Heritage Impact Assessment Cover the area within the Project boundary, see **Exhibit 1,1**

1.6. Field Survey

The surveys and consultations conducted in the process of preparing this EIA are summarized below:

Topic	Surveys and Investigations
Geology, hydrogeology and soils	Desk Based Assessment of geotechnical and ground engineering issues, soil contamination, geology and hydrogeology, geomorphology.
Landscape and visual amenity	<p>Assessment of landscape character and visual resources from desk study and field survey.</p> <p>Valued landscape and visual resources are identified at international, national and local levels within the study area which is taken to be up to 5 km from the proposed site boundary.</p>
Ecology and nature conservation	<p>Ecological surveys to characterize the ecology of the site. These include:</p> <p style="text-align: center;">Terrestrial Ecology</p> <ul style="list-style-type: none"> • Habitat survey (to verify existing information), • National Vegetation Classification (NVC) – selected habitats, • Hedgerows, • Trees, • Wintering birds, • Waterfowls, • Invertebrates, • Riparian Habitats • Reptiles, • Amphibians,
Archaeology and cultural heritage	<p>Collection of additional baseline data relating to known and potential cultural heritage resources.</p> <p>Existing and available geological and geotechnical information have been examined.</p> <p>Site surveys has been undertaken to identify previously unrecorded sites of potential interest.</p> <p>An archaeological survey has been undertaken.</p>

1.11

Ambient Air Quality and Dust An assessment of the potential air quality impact of emissions from construction and daily worker traffic has been compared with the National and International emissions standards.

Noise and vibration The requirements for ambient noise monitoring are agreed in accordance with the National and International emissions standards.

An assessment of construction noise has been undertaken using predictive noise calculations and modelling based on noise propagation data for typical construction machineries.

Public Access and Recreation Assessment of the level of use of the rights of way within and around the site of the proposed project to inform the evaluation of their importance as a recreational resource, and the assessment of the significance of the potential impacts of their closure and/or diversion.

Socioeconomic Information is obtained for the baseline study about the existing situation. It addressed employment at the site, labour market characteristics, population/ demographic characteristics and information about the housing stock and existing services and facilities. Potential effects on agriculture have also been assessed.

Public Consultation In addition to the field surveys, formal consultation sessions were held to assess stakeholders' views on the existing condition of the project area, and volume of traffic, to stem the concerns from the impact of construction works, as well as safety-related issues.

Water Quality Based on samples collected from the proposed raw water source (nearby Sipiypard bridge) by the Feasibility Consultant, and the results of the tests periodically performed by AWM OJSC of Azerbaijan from Vaqo level of Tengeruchay river.

1.7 Project Affected People (PAP)

There are no project affected people in or nearby the project corridor. All components of the project will be located on the public easements. All project activities inside the settlements will be confined with the public rights of ways and streets' width. During the field surveys, no-squatters, no-shops, no-kiosks, thatched, and mobile vendors established within the RoW were found with the permission and/or protection of village notables and local administration.

1.8 Resettlement Issues

There is to be no permanent land acquisition under construction works will be confined within the existing Right of Ways (RoW) of the Government of Azerbaijan. Any potential resettlement issues and issues related to loss of access to farm land should be handled in accordance with the provisions of the Resettlement Policy Framework.

All required lands for the Project components are owned by the Rayon Executive Power (REP) of Astara of Government of Azerbaijan, and the required lands will be allocated by REP of rayon for the Project prior to commence of the Design and Build bidding process.

The construction contractor camp(s) will be temporarily established for the construction period, and land will be leased for setting up campsites and for acquiring earth fill.

The proposed activities include the construction of additional access roads for the entry of water and wastewater plants, and involve earthworks, drainage provision, and intersection remodeling.

1.9 Regulatory Requirements

Azerbaijan Government adopted the amended EIA procedures in 1996 corresponding to the systems applied in other countries. The new rules have been described in the regulations for conducting Environmental Impacts Assessment (EIA) in Azerbaijan.

The regulations state that “ *activities on assessments of impacts of wastes to environment should begin in the stage of planning of the project*”. According to Environmental Law, development of EIA for all projected investments having potential impacts on environment is compulsory.

The requirements established for development of an EIA shall match with the World Bank policy OP / BP 4.01.

1.10 Structure of the Report

Executive Summary

This section is mainly derived in part from material refined from the concept of the EIA report, and links to findings and conclusion of the study. The section has been prepared as comprehensible for the lay readers.

Chapter 1: Introduction

This Chapter identifies the Project objectives, objective and scope of the EIA study, and gives a criteria for the area, where will be assessed in accordance with the environmental baseline. This Chapter also gives the summary information for the field surveys, generic information environmental and resettlement issues, and regulatory requirements of this EIA study.

Chapter 2: Project Description

This Chapter provides a technical outline for the proposed Project. Most information in this section is refined and condensed from the Feasibility Study being performed for the rayon.

Chapter 3: Environmental Baseline

This Chapter presents the existing regional and local environmental conditions relevant to the consideration of project impacts. Issues evaluated in this Chapter consist of a full range of potential environmental topics originally identified for review related to the proposed Project and its area.

Chapter 4: Analysis of Alternatives

This Chapter provides a project rationale for the proposed Rehabilitation and Reconstruction of the Water Supply and Sanitation infrastructure in rayon; an overview of the investment alternatives considered in this study and description of the design alternatives considered for the project corridor.

Chapter 5: Regulatory Framework

The applicable regulatory framework, including plans and policies (National/International) under which the proposed project would be implemented, are discussed in this Chapter.

1.13

Chapter 6: Impact Assessment and Mitigation Measures

This Chapter sets out the methodology for undertaking the EIA, and identifies the potential impacts of the project on the physical, biological, and socioeconomic environment of the proposed Project Corridor.

This Chapter also identifies measures that will help to mitigate the project's adverse environmental effects. The discussion of potential significant effects of the proposed project on the environment, based on whether it exceeds expressed thresholds. Project impacts and mitigation measures are numbered sequentially in each sub-section. For instance, in sub-section 6.2.4, "Ambient Air Quality," Impact Analysis is numbered as 6.2.4.1, Mitigation measures are explained in sub-section 6.2.4.2, and so on.

Chapter 7: Environmental Management and Monitoring

This Chapter gives the detailed information on how an Environmental Management Plan or Programme seeks to achieve a required end state and describes how activities, that have or could have an adverse impact on the environment, would be mitigated, controlled, and monitored.

This chapter highlights the specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactory prevented or mitigated, corrective action will have to be taken.

The Chapter also defines the arrangements that will be put in place to ensure that the mitigation measures are implemented by including recommendations of the roles and responsibilities of the project proponent, environmental management team and contractors.

Chapter 8: Public Consultation

This Chapter describes the outcome of the public consultation sessions held with different stakeholder groups and sequentially focus group discussions were held with general water users, including householders in the towns and villages, farmers, and housewives that may be impacted by the project.

The consultation process was carried out in accordance with the World Bank Operational Policy (OP 4.01) on public consultation.

Chapter 9: References

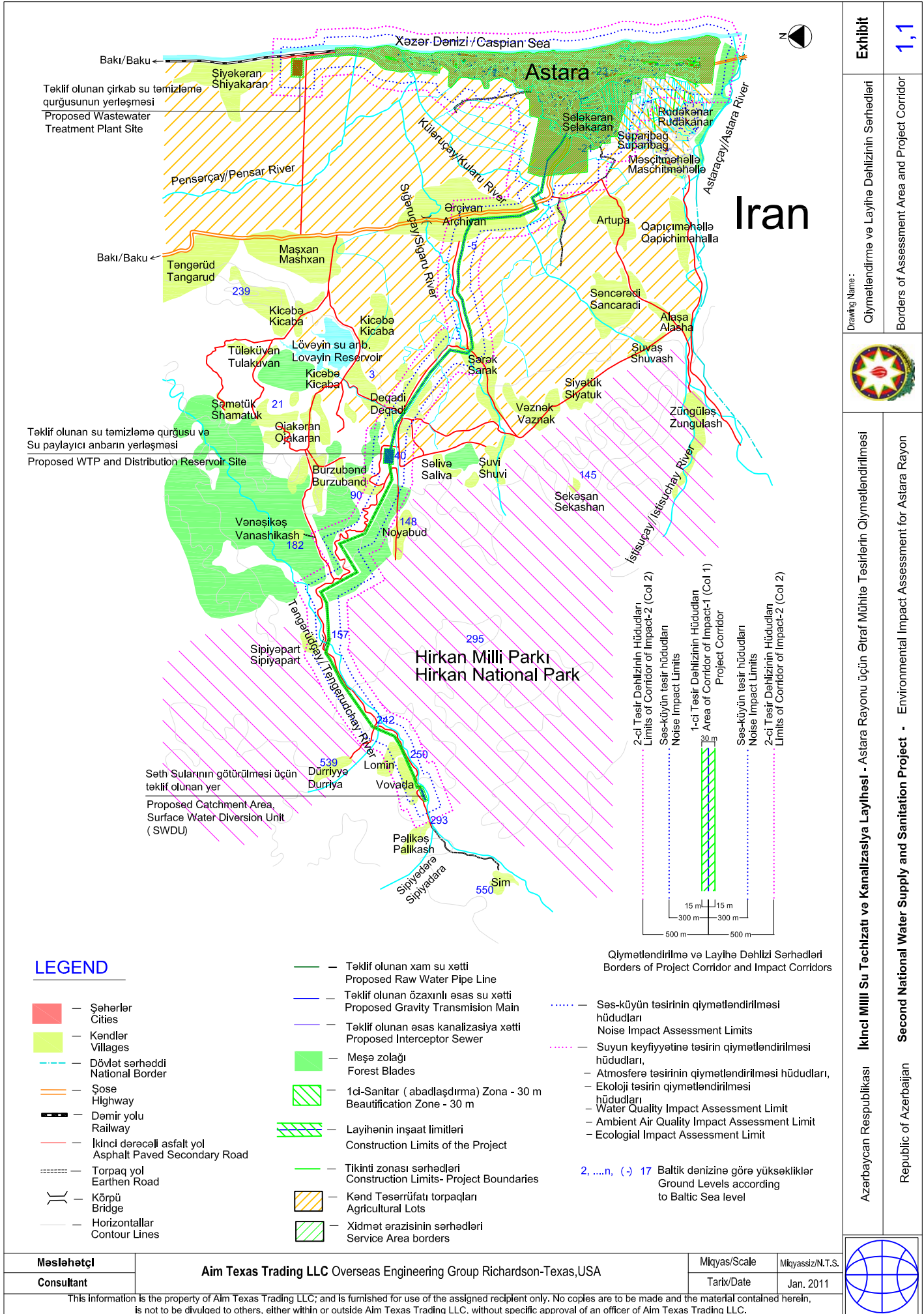
This Chapter provides a bibliography both for referencing of National / International standards and general informative sources.

Annexe

This section provides the supplemental and processing documents circulated during the EIA studying period, e.g., TOR of the EIA Study, relevant WB policies, communications during the scoping process, and, etc.

Exhibits

The term '**Exhibit**' in the report directly refers to the rough sketches and non-scale drawings to give more explicit physical information for the proposed Project corridor. Each exhibit is linked to its relevant Chapter with the chapter numbers.



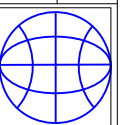
Iran

Exhibit 1,1

Drawing Name : Qiymətləndirmə və Layihə Dəhlizinin Sərhədləri
Borders of Assessment Area and Project Corridor



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Republic of Azerbaijan



LEGEND

- Şəhərlər Cities
- Kəndlər Villages
- Dövlət sərhəddi National Border
- Şose Highway
- Dəmir yolu Railway
- İkinci dərəcəli asfalt yol Asphalt Paved Secondary Road
- Torpaq yol Earthen Road
- Körpü Bridge
- Horizontallar Contour Lines

- Təklif olunan xam su xətti Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti Proposed Interceptor Sewer
- Meşə zolağı Forest Blades
- 1-ci-Sanitar (abadlaşdırma) Zona - 30 m Beautification Zone - 30 m
- Layihənin inşaat limitləri Construction Limits of the Project
- Tikinti zonası sərhədləri Construction Limits- Project Boundaries
- Kənd Təsərrüfatı torpaqları Agricultural Lots
- Xidmət ərazisinin sərhədləri Service Area borders

- Səs-küyün təsirinin qiymətləndirilməsi hüdudları Noise Impact Assessment Limits
- Suyun keyfiyyətinə təsirin qiymətləndirilməsi hüdudları, Atmosfere təsirin qiymətləndirilməsi hüdudları, Ekoloji təsirin qiymətləndirilməsi hüdudları Water Quality Impact Assessment Limit, Ambient Air Quality Impact Assessment Limit, Ecological Impact Assessment Limit

2, ...,n, (-) 17 Baltik dənizinə görə yüksəkliklər Ground Levels according to Baltic Sea level

Məsləhətçi Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

Miqyas/Scale Miqyasız/N.T.S.
Tarix/Date Jan. 2011

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Chapter 2

PROJECT DESCRIPTION

2.1. The Scope of the Project

The study area of the project for the rayon is identified in the relevant project appraisal document, and summarized for water supply investment as **'based on the premise of providing water service to the entire urban centre plus adjacent villages and/or villages along the transmission mains'**, and for the wastewater investment as **'based on the design premise to connect the central business/apartments block district of each urban centre to a main sewage collector plus settlements close to this main sewage collector for transfer to a wastewater treatment plant'**.

The extent and borders of the project study area is the area, which has been determined by the Feasibility Consultant in Consultation with AWM OJSC, relevant local departments, and representatives of the local communities.

2.2. Brief Information about the Project Area

2.2.1. Summary Information about Azerbaijan

Azerbaijan is a lower middle-income country with a gross national income per capita of \$ 2.550 in 2008. Azerbaijan is rich in mineral resources, mainly oil and gas. The country also has fertile agricultural land and a well-educated labor force with a strong entrepreneurial tradition. The oil and gas sector contributes approximately one-third of GDP, while agriculture contributes about 9 percent but provides livelihoods to just under half of all households.

Table 2,1; Statistical Information of the Country

INDICATORS	2009*
Population (millions)	8,6
Population Growth (annual %)	0,723
Life expectancy at birth, female (years)	71
Life expectancy at birth, male (years)	62,2
GDP (current US \$) (billions)- purchasing parity	77,97
GDP growth (annual %)	15,6
GNI (per capita) (current US \$)	2.550
Inflation Rate, consumer prices (annual %)	21,6
Budget	
Revenues (US Dollars, \$ Billion)	14,51
Expenditures (US Dollars, \$ Billion)	15,66
Foreign direct investments, net inflow, (% of GDP)	-2,94
Public Debt (% of GDP)	5,2
Debt External (Billion US Dollars-\$, Dec. 31, 2008)	2.733
Reserves of foreign Exchange and Gold (Billion US Dollars-\$, Dec. 31, 2008)	8,5
Stock of direct foreign Investment- (Billion US Dollars-\$, Est. 2008)	
At home	7,329
Abroad	5,812
Currency code – Azerbaijani Manat	AZN
Exchange Rate , AZN / US Dollar (Est. 2008)	0,8219
Unemployment Rate (% of total labor force)	8
Telephones main lines in use (million)	1,254
Telephones mobile cellular (million)	4,3
Imports (Billion FOB, Est. 2008)	7,496
Imports-Commodities	Machinery and equipment, oil products, foodstuffs, metals, chemicals
Imports - Partners	<ul style="list-style-type: none"> • Russia 17,6 % • Turkey 10,9 % • Germany 8,2 % • Ukrain 8,2 % • UK 7,2 % • Japan 5,2 % • China 4,9 %

- US 4,7 %

Time required to start a business (Days)	52
Internet Users (per 100 people)	12,04

* World Fact Book, 2009

Azerbaijan has 3 big cities, 23 towns with population of 20 000-100 000 people and 25 rayons with population of 5 000 -20 000 people. This project refers to water supply and sanitation sector of towns. Water supply and sanitation sector in Azerbaijan is characterized by institutional weakness, unsatisfactory work, obsolete and half destroyed physical infrastructure and big financial constraints. As a result, water treatment plants do not operate normally in majority of regions. Due to physically obsolete condition of water supply networks, water losses reach 25-50%. Not all subscribers are provided with network, and those who are provided, are supplied water for 5-12 hours per day (even in capital city, Baku). Sanitation system is not available in majority of Rayons, waste water is discharged without treatment to environment, water sources, relief, and topsoils (from sewers to sanitation wells)

2.2.2. Summary Information about the Astara Rayon

Geographical Location:

The site is located in Astara rayon of Azerbaijan, and specifically within the rayon centre city and its surroundings. The rayon is situated in the south-eastern part of Azerbaijan, and surrounded by Lankaran rayon to the north, Lerik rayon to the northwest, and Caspian Sea to the east. The rayon has also an approximately 50 km border line with Islamic republic of Iran in the south and west. Approximately one fourths of the rayon area is situated in southern part of Lankaran lowland along the coastline of Caspian Sea in the east. The rest of the rayon area in the west and northwest is located on the low highlands of the eastern inclinations of the Talish mountains. The relief of the mountainous area varies between 2194 masl (Mardashig Dagh in the border of Astara-Lerik-Islamic Republic of Iran) and 18 masl nearby Shuvash village in the south. The relief of the rayon area in the lowland varies between 17-54 masl and (-) 28 masl towards the coast line easternly from the bottom of the hills. The existence of the plentiful hills and lowlands is a peculiarity of region's relief.

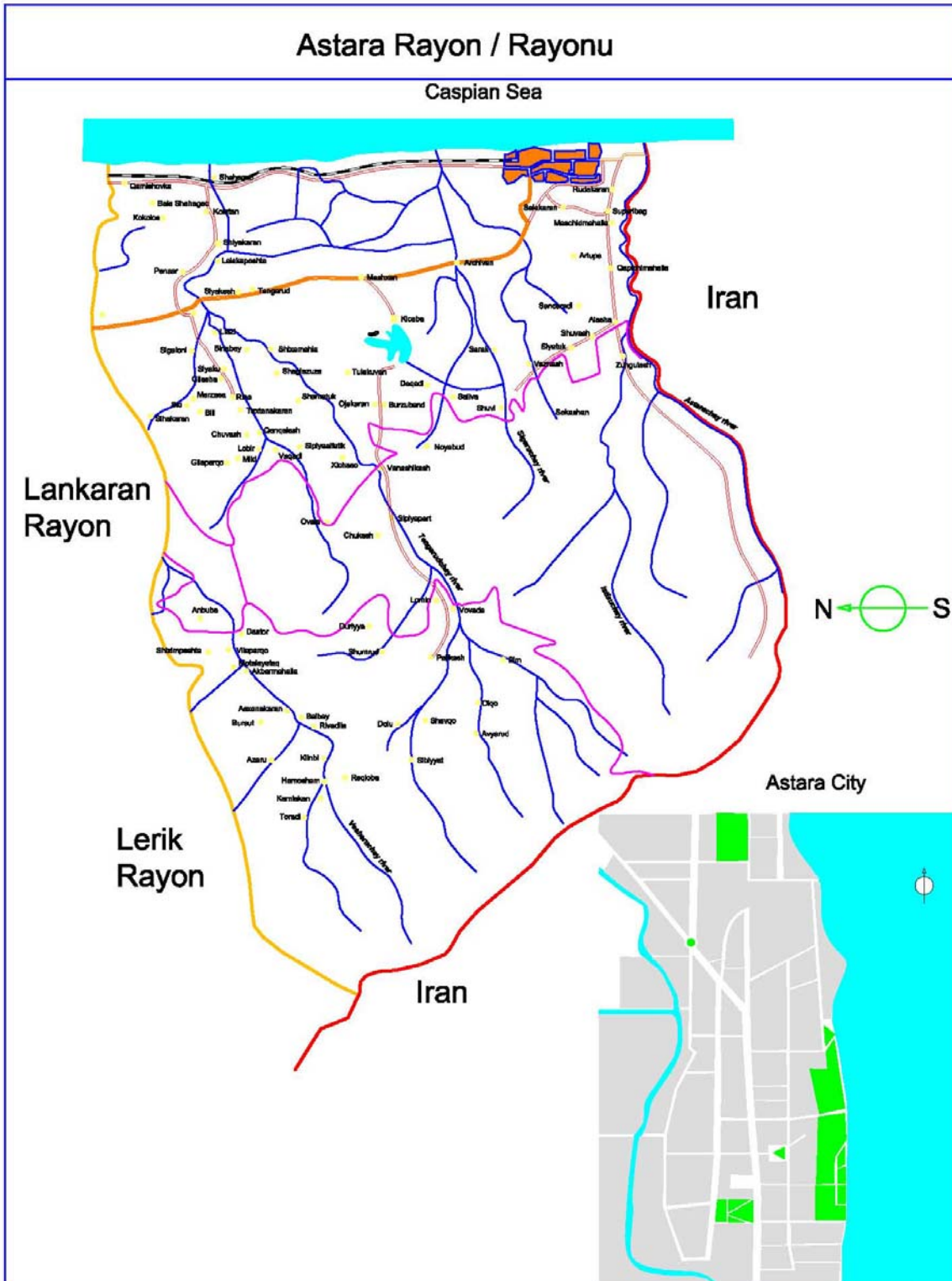
Rayon's total area is 620 square km. The rayon has one city (Astara city) and 91 villages. Rayon's total population is 95,900 by 2009. Astara city's population is 15,717 by 2009. Detailed information on the predicted population figures to be used in the systems design and the coverage areas of the water supply and sewage systems, is given in Chapter 2.4.

Table 2,2; Statistical Information for Astara rayon*

COMPONENTS	RAYON : ASTARA
Location	Republic of Azerbaijan
Geo-Economic Region	Lankaran Economic Region, South of Azerbaijan
Topographical Conditions	Lowlands in the northern and eastern parts, highlands and low hills in western and Northwestern parts.
River Basin	Mainly Tengeruchay, Astarachay, Veshcheruchay and Penserchaychay and Sigeruchay river basins.
Area	620 sq km
Altitude	(-28) - 2194
Climate	Partly subtropic, rainy and warm winter, hot and dry summer in the lowlands, snowy and cold winter in the mid-highland, mild and dry in summer. Min. and max. in the lowland: 0.04 – 38 °C Min. and max. In the low highlands: (-16) – 29.9°C
Annual Precipitation	Average annual Precipitation : 1200 – 1400 mm in the lowlands 1600 - 1800 mm in mid-highlands
Local governing	Local Executive Powers and Municipalities
Population (at the end of the year, 2009)	95,900 by 2009
Average population Growth rate for the last ten years (annually)	0.7 %
Rayon centre city	Astara city
Economic Base	Local commerce, International Commerce, Light and Small Food Industry, crops growing, fruits and vegetables growings, Citrus fruits growings, tea and rice plantations, Fisheries, largely animal husbandry, cattle - small cattle growing, and

Public Airport	medium - small scale workshops
Gross Domestic product per capita, 2009	No
	760 AZN / Year

* Sources: (i) Republic of Azerbaijan, State Statistic Committee, and Astara rayon department.



Map 2,1 – Administrative map of rayon

2.3. Proposed Water Supply and Sanitation (WSS) Investment for the Rayon

The information about WSS investment that is being considered to be implemented in the rayon has been provided by consulting the Feasibility Consultant, Feasibility Study, and AWM OJSC (Client) of Azerbaijan.

Most of the technical information set forth in this EIA report for the WSS systems is condensed from the Feasibility Study, the interim decisions of the technical crew of AWM OJSC, and the surveying reports and findings of the EIA study teams.

The hydrological and hydrogeological investigations of the Feasibility Consultant's teams on the preferred raw water source are ongoing in this period. Meantime, the Feasibility Consultant has conducted a water sampling campaign for the preferred water source (with the surface water of Tengerudchay river). The raw water samples taken by Azecolab Company, who is subcontractor of the Feasibility Consultant, have been tested at the laboratories of the subcontractor in September 27, 2010.

According to current legislature and regulations of Azerbaijan, and the agreements implemented between the Government of Azerbaijan and World Bank, the projections and design of the water and wastewater systems will be established upon Azerbaijan and international best practice to ensure compliances in accordance with the current engineering and operational norms.

The below criteria have been taken advantage of system projections and design.

Table 2.3: Assumptions for Systems Design

ASPECT	ASSUMPTIONS	
<i>Projection Assumption</i>	<i>Planing horizon</i>	20 years (2010 – 2030)
	<i>Population level</i>	Growth rates compatible with the local context
	<i>Water consumption, Per capita per day, lpcpd (l/day)</i>	150 liters per day per person
<i>Water Supply System</i>	<i>Source Development</i>	Development of new resources
	<i>Type</i>	To be preferred by way of gravity
	<i>Quality of Water (Treatment)</i>	European Council Directive 98/83/EC
	<i>Storage Capacity</i>	Attaining 100% of average daily peak demand, including non-residential demand, wastage and leakages
	<i>Design Elements</i>	Alternative water resources, parallel treatment streams, main pipe loops, distribution pipes without dead ends, back-up power generation, etc
	<i>Pressure at customer Conn.</i>	Between 2 – 3 bar
<i>Wastewater System</i>	<i>Scope</i>	Municipal Sanitary sewers only (storm water system is not included in this project)
	<i>Effluent Satndards</i>	Wastewater treatment shall meet effluent standards according to Council Directive 91/ 271/ EEC on Urban Waste Water Treatment (UWWTP), but phased in be compared the developing regulations and conditions in Azerbaijan, e.g. plant design shall meet EU member state standards (comparable with the smallest settlement/ treatment plant size category) for, <ul style="list-style-type: none"> - BOD₅-Biochemical Oxygen Demand (25 mg/l) - COD-Chemical Oxygen Demand (125 mg/l) - TSS-Total Suspended Solids (35mg/l) - N- Nitrogen, no yet, but may be anticipated in plant design for integration All effluent parameters are defined in the EU UWWTP directive, <ul style="list-style-type: none"> - P- Phosphorus, no yet, but may be anticipated in plant design for integration All effluent parameters are defined in the EU UWWTP directive,
<i>Non-Domestic Sewage</i>	<i>Factories</i>	Effluent water quality standards are not applied to factories discharging wastewater into the sewage system,

	<i>Application of the Standards</i>	Effluent water quality standards, or regulation of the total discharge load, are applied to a Municipal Treatment Plant (WWTP),
	<i>Precaution</i>	Waste Water Treatment plant will use the activated sludge process. This process will not remove heavy metals such as cadmium and refractory organic chemicals from wastewater. Therefore, heavy metals and refractory organic compounds should be removed from wastewater before discharge into the sewage system.
Facilities & Equipment	<i>Compliance</i>	Compliance with Azerbaijan and international best practice regarding civil, hydraulic, mechanical and electrical engineering norms for site selection, treatment processes and facilities dimensioning:
	<i>Operational Variations</i>	Materials and components suitable for healthy operations in rural, remote locations with extreme temperature variations (-30oC to 50oC) and continental weather
	<i>Technology</i>	Design incorporates practical and uncomplicated technology, which reflects existing local capabilities for operations & maintenance, and enables cost-effective running of the entire system.
Power Supply		Minimize or even avoid the use of electrical components (e.g. gravity over pumping transmission/ distribution/ collection) according to cost, limited availability of electricity

Table2,4: Regulations and Standards for the Project

REGULATION TO ASPECT	PRECEDENCE TO REGULATION	ACCOMPANY TO RELEVANT LOCAL LEGISLATION
Contractual Issues	<ul style="list-style-type: none"> ▪ Foreseen Conditions at the NWSS Project Agreements done between Azerbaijan Government and WB-IBRD ▪ World Bank Policy-<i>Procurement</i> (OP 11) 	
Technical Issues	<ul style="list-style-type: none"> ▪ World Bank Policy- <i>Projects on International Waterways</i> (OP 7.50) ▪ World Bank Policy- <i>Water Resources Management</i> (OP 4.07) 	
Dam Safety	<ul style="list-style-type: none"> ▪ World Bank Policy- <i>Safety of Dams</i> (OP 4.37) 	
MDG 's Target	<ul style="list-style-type: none"> ▪ Millenium Declaration signed by 191 countries including Azerbaijan, 2000 	
Water Access and Rights	<ul style="list-style-type: none"> ▪ Water code of Azerbaijan 	
Drinking Water Quality	<ul style="list-style-type: none"> ▪ European Union Drinking Water Standards, Council Directive 98/83 EC (3 November 1998), see Annex-3. 	<ul style="list-style-type: none"> ▪ The Water code of Azerbaijan Republic ▪ Law of Azerbaijan Republic on Water Economy of Municipalities ▪ Cabinet of Ministers of Azerbaijan Republic Decree No: 50 (Regulation on Regularity of Payment for Water use in Azerbaijan Republic)
Waste Water Treatment & Effluent / Discharge Quality	EU Standards, EU Council, Urban Waste Water Treatment Directive (UWWTP) 91 / 271 /EC (21 May, 1991), see Annex-3.	<ul style="list-style-type: none"> ▪ Article 44 of Azerbaijan Water Supply and Wastewater Law for pre-treatment of wastewater prior to release into the community sewerage network (determined based on application to service provider regarding endangerment of health, property or operation & maintenance of wastewater system assets) ▪ Cabinet of Ministers Decree No. 74 (of 21 April 2005) regarding latrines for properties not connected to the community sewerage network ▪ WWTP system principles and design parameters, treatment technology (extended aeration) and effluent standards

Construction Standards	- Water Treatment Plant	<ul style="list-style-type: none"> ▪ EN ▪ BS ▪ DIN ▪ ASTM ▪ AWWA ▪ USEPA 	<ul style="list-style-type: none"> ▪ Wastewater treatment plants: SNIP 2.04.03-85. issued by the State Committee for Construction in 1985 ▪ Water treatment plants: SNIP (construction norms and regulations) 2.04.02-84. issued by the State Committee for Construction in 1985, Building & Electrical codes (Order of State Building and Architecture Committee № 137 dated June 24, 2004 and the Order of Standardization, Meteorology and Patents Agency № 054 dated July 29, 2004)
	- Waste Water Treatment Plants		
	- Building Codes		

2.4. Proposed Water Supply System and Criteria

2.4.1. Service Area and Water Demand Projection

Service Area

The drinkable water supply scheme for the rayon has been envisaged to conclude the additional seven villages (Selakaran, Jukes, Sipiypard, Veneshikesh, Noyabud, Durriyye, and Barzubend), which are located on the course of the raw water and treated water transmission mains, by the Feasibility Consultant and AWM OJSC of Azerbaijan. The local officials and relevant departments of the rayon have agreed with this scheme during the initial project evaluation period. A similar approach has been adopted for sewerage system service area envisaging to conclude the additional one village (Selakaran) to the system.

The predicted population figures for the service area of water supply, wastewater and wastewater treatment plant including the adjacent areas are given below.

Table 2,5: Predicted Population Figures to be used in the Systems Design

Year	Population Growth Rate	Lenkaran Population Values in Future	
		For Water Supply System (vicinity villages included ¹)	For Sewerage System (vicinity vilages included ²)
2009	-	19,625	17,342
2010	0.700	19,780	17,470
2015	0.700	20,460	18,080
2020	0.700	21,180	18,730
2025	0.700	21,390	19,380
2030	0.700	22,720	20,080

¹ Astara city, Selakaran, Jukes, Sipiypard, Veneshikesh, Noyabud, Durriyye and Barzubend villages.

² Astara city and Selakaran village

Source: Feasibility Consultant.

Water Demand Projection

The essential elements of water demand include average daily water consumption and peak rate of demand. The average daily water consumption must be estimated for two reasons:

- To determine the ability of the water source to meet continuing demands over critical periods when the flows of source are low or groundwater tables are at minimum elevations,
- For purposes of estimating quantities of stored water that would satisfy demands during the critical periods.

The peak demand rates must be estimated in order to determine plumbing and pipe sizing, pressure losses, and storage requirements necessary to supply sufficient water during periods of peak water demand.

Also the non-residential water demand in the rayon should be assessed, and which are;

- Institutional water demand,
- Commercial water demand,
- Industrial water demand.

The average daily water supply system demand in the year of 2030 is calculated in detail based on the data of the proposed service area and foreseen population levels by the Feasibility Consultant.

Table 2,6: Daily Raw and Recovered Water Demand by Planning Horizon 2030

Planning Horizon	Unit	2010 Existing	2015	2020	2025	2030 Planning Horizon
AVERAGE DAILY DEMAND of the Water Supply System, as raw water to be diverted from catchment	l/s	25.57	44.84	46.42	48.05	50.65
	m ³ /d	2,209	3,874	4,011	4,151	4,376
AVERAGE DAILY DEMAND of the Water Supply System, as recovered water for WTP	l/s	25.57	42.26	43.76	45.29	47.79
	m ³ /d	2,209	3,651	3,781	3,913	4,129

Source: Feasibility Consultant.

According to Feasibility Consultant's population forecast, the service area population will be 22,720 by the horizon year of 2030 taking into consideration the average annual 0.700 % growth rate (incremental growth rates vary gradually as 0.700 % between 2020 – 2030) for each horizon year.

The raw water to be diverted from Tengeruchay river by a Surface Water Diversion Unit (SWDU) for Water Supply System of Astara will be approximately 25-30 % more than demand flows taking into account of loss of water during the cleaning cycles and conveying the water to WTP.

The following table shows the required raw water demand to be diverted by SWD Unit from Tengeruchay river.

Table 2,7: Daily Raw Water Demand by Planning Horizon 2030

Settlements	Astara city plus seven villages, see Table 2,5 l/s
Daily required actual water demand for settlements,	50.65
Loss of water during the cleaning cycles, wastages and leakages, 25-30 % of Daily required water demand	15.195
Total	65.85

Source: Feasibility Consultant.

2.4.2. Potential Raw Water Source Evaluation in the Feasibility Study

Three alternatives for raw water capture are presented in the Feasibility Study.

- Alternative 1;
This alternative envisages the collection of waters of a series of springs with the appropriate spring boxes in upper levels of Sim village. The springs area is located on the eastern declivities of east Talish range, and the springs flow toward the upstream of Tengerudchay valley. This alternative offers the construction of new raw water pipeline from the springs area to WTP. However, the section of the proposed pipeline in the upper levels of Sim village will travel on the steep terrains with no developed access for materials and equipment. Total length of the raw water pipeline will be 16.9 km to WTP which will be constructed at the lower levels of Barzuband village on a public easement.

- Alternative 2;
This alternative envisages to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the upper levels of Sipiypard bridge (Akkorpu). A SWDU will be constructed at about 170 masl on the river's flow channel. This alternative offers a WTP which will be constructed on a river bank terrace approximately 700 m downstream of Siyapard village.
- Alternative 3;
This alternative envisages to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement. Total length of the raw water pipeline will be 14.4 km to WTP in this alternative.

Although all three alternatives supply the raw water up to WTP site by the gravity, alternative 3 has been identified the preferred Option by the Feasibility Consultant and the Beneficiary (AWM OJSC).

The detailed explanations on the preferred raw water source is given on Chapter 3, and also an assessment of this and possible alternatives is given in Chapter 4.

2.4.3. Water Supply Network and Facilities

The Project will be conceived in a branched system up to the piped network area in order to supply drinkable water by a transmission main and feeder mains to convey the water to all proposed service area.

The Basic Components of the Water Supply System are;

1. A surface water diversion unit on the Tengeruchay river nearby Sipiypart village,
2. Construction of a raw water transmission main, approx. 14.4 km from the catchment to WTP,
3. A WTP in the lower levels of Barzubend village,
4. A Drinkable Water Tank (DWT) nearby WTP,
5. Construction of Treated Water Pipe Line, approx. 11 km gravity transmission main,
6. Construction of the Feeder Mains inside the city to piped networks,
7. Construction of the Distribution Mains for piped network.

Water Treatment

First parameter for the treatment of raw water into drinking water should be to meet the requirements of European Council directives (Directive 98/83/EC) in respect of the microbiological, turbidity, and monitoring parameters.

In the construction phase, prior to approval of the treatment process of the WTP, the raw water samples should be tested via an internationally certified laboratory, and a pilot treatment train (mini plant) should be established to confirm and determine whether the needs of any other steps of treatment are required.

According to Feasibility Study, the treatment process will include pre-filtration, enhanced coagulation (rapid mix and coagulation), settling ponds, secondary filtration by the media filters, disinfection, and backwashing utilities.

The proposed Water Treatment Plant will at least be designed according to design criteria said above, as well as biological, chemical, and physical parameters of the proposed raw water source.

The following facilities should be supplied for the WTP in the scope of this project;

- A connection to the rayon power grid,
- A transformer, surge protection-stabilizer and automation control,
- A generator for back-up power supply is necessary in the long run, as stand-by power supply.

2.4.4. Water Supply System Design Criteria

The following table shows the proposed minimum design criteria for Water Supply System foreseen in rayon;

Table 2.8: Minimum Design Criteria for Water Supply System

PARAMETERS		VALUE	SOURCE
1	Residential water demand (RWD)	150 l / day, without losses daily	FS Consultant
2	Institutional water demand	5 % of residential water demand	Recommendation
3	Commercial water demand	10 % of residential water demand	Recommendation
4	Industrial water demand	5 % of residential water demand	Recommendation
5	Peak hour factor (PHF)	1.30	FS Consultant
6	Peak daily factor (PDF)	4 hours	FS Consultant
7	Minimum recovered water storage capacity for the drinkable distribution tank	4,129 cum/day	FS Consultant
8	Minimum diameter	25 mm – in a building service connection	Recommendation
9	Minimum cover	900 mm	Recommendation
10	Minimum flow velocity	0.60 m/s	Recommendation
11	Maximum flow velocity	3 m/s	Recommendation
12	Wastage factor	5 % of residential water demand	Recommendation
13	Leakage factor	10 % of residential water demand	Recommendation
14	Stop valves	In each 200 meters of distribution main, and at each branch from the main pipe	Recommendation
15	Washout valves	At the lowest end point of the distribution mains, and at each intersection of downstream and upstream point of transmission main and feeder mains.	Recommendation
16	Air release valves	At each high point of the intersection between upstream and downstream on the transmission main, feeder mains and distribution mains.	Recommendation
17	Fire hydrants	At each 140 m of distribution mains in the residential area, and at each 100 m of distribution mains in the commercial area.	Recommendation
18	Water meters	At each customer connection	Recommendation

19	Bulk water meters	At each intersection of transmission main and feeder main, and at the intake facility of water treatment plant, and at the outlet of drinkable water distribution tank.	Recommendation
----	-------------------	---	----------------

FS ; means 'Feasibility Consultant'

Recommendation; Recommendations from EIA Team.

2.5. Proposed Sewage System and Criteria

According to Feasibility Consultant, redesigning the entire wastewater collection system alternative for Astara city, is presented as a single option.

Due to the topographic conditions, gravity sewerage collection is not possible in Astara case. Several pump stations (lift stations) are proposed by the Feasibility Consultant, to convey the waste water to the WWTP.

A new WWTP will be constructed at the old WWTP site South of Shiyakaran village. The whole sewage system will consist of the sewer pipelines (interceptor, collector and lateral), the manholes, a WWTP, and pump stations (lift stations).

2.5.1. Wastewater Service Area and Wastewater Generation

The wastewater service area corresponding to SNWSS project investment option and wastewater generation for actual and future inhabitants in the area of study is presented by the Feasibility Consultant, and summarized below;

Table 2.9: Wastewater Generation for Actual and Future Inhabitants in Study Area

Planning Horizon		Unit	2009 Available Data	2010 Existing	2013 Start of WWTP	2015	2020	2025	2030 Planning Horizon
Population	Astara								
	Population Astara	cap.	15.717	15.827	16.162	16.389	16.970	17.573	18.197
	Annual growth rate	% p.a.		0,700	0,700	0,700	0,700	0,700	0,700
	Astara (rounded)	cap.		15.830	16.160	16.390	16.970	17.570	18.200
	Population Selekeran	cap.	960	967	987	1.001	1.037	1.073	1.111
	Annual growth rate	% p.a.		0,700	0,700	0,700	0,700	0,700	0,700
	Selekeran (rounded)	cap.		970	990	1.000	1.040	1.070	1.110
	Population Additional PE	cap.	665	670	684	693	718	744	770
	Annual growth rate	% p.a.		0,700	0,700	0,700	0,700	0,700	0,700
	Additional PE (rounded)	cap.		670	680	690	720	740	770
	Population	cap.	17.342	17.463	17.833	18.083	18.725	19.390	20.078
Annual growth rate	% p.a.		0,700	0,700	0,700	0,700	0,700	0,700	
TOTAL Population (rounded)	cap.		17.470	17.830	18.080	18.730	19.380	20.080	
Design Criteria	Specific drinking water consumption per capita without losses	l/ca*d		96	156	156	156	156	156
	$K_{max-day}$	-		1,30	1,30	1,30	1,30	1,30	1,30
	Specific drinking water consumption per capita without losses daily	l/ca*d		125	202	202	202	202	202
	Wastewater Generation Rate	%		0,90	0,90	0,90	0,90	0,90	0,90
	Specific wastewater generation per capita	l/ca*d		112	182	182	182	182	182
	Wastewater Connection Rate	%		5	50	80	100	100	100
	$K_{max-hour}$	-		1,56	1,56	1,56	1,56	1,56	1,56
	Specific infiltration dry weather ($S_{inf,dw}$)	% of Q_s		0,20	0,20	0,20	0,20	0,20	0,20
	Specific infiltration wet weather ($S_{inf,ww}$)	% of $Q_{s,max}$		1,00	1,00	1,00	1,00	1,00	1,00
Specific industrial water consumption	l/PE*d		100	100	100	100	100	100	
Domestic and Industrial flows and Infiltration	Daily Domestic wastewater ($Q_{ave,dmax}$)	m ³ /d		1.957	3.245	3.291	3.409	3.527	3.655
	Peak flow domestic wastewater ($Q_{ave,max}$)	m ³ /h		127	211	214	222	229	238
	Population equivalent for industry	PE		874	892	904	937	969	1.004
	Daily industrial wastewater (Q_{ind})	m ³ /d		87	89	90	94	97	100
	Peak flow industrial wastewater ($Q_{ind,max}$) (8 hours operation)	m ³ /h		11	11	11	12	12	13
	Daily infiltration ($Q_{inf}=Q_s * S_{inf,dw}$)	m ³ /d		20	342	545	701	725	751
	Peak flow infiltration ($Q_{inf,max}$)	m ³ /h		0,8	14,3	22,7	29,2	30,2	31,3
	Wet weather infiltration ($Q_{inf,ww} = Q_{s,max} * S_{inf,ww}$)	m ³ /h		6	117	182	233	241	250
Wastewater Flow Rates for Design	DAILY SEWAGE FLOW ($Q_s=Q_{ave,dmax}+Q_{ind}$)	m ³ /d		98	1.712	2.723	3.503	3.624	3.755
		l/s		1,13	19,81	31,51	40,54	41,95	43,46
	PEAK SEWAGE FLOW ($Q_{s,max}=Q_{ave,max}+Q_{ind,max}$)	m ³ /h		6	117	182	233	241	250
		l/s		1,77	32,39	50,67	64,80	67,05	69,47
	DRY WEATHER FLOW ($Q_{dwr}=Q_s + (Q_s * S_{inf,dw})$)	m ³ /d		117	2.054	3.267	4.203	4.349	4.506
		l/s		1,36	23,77	37,82	48,65	50,33	52,15
	MAX HOURLY DRY WEATHER FLOW ($Q_{mdwf}=Q_{s,max} + Q_{inf,max}$)	m ³ /h		7	131	205	262	272	281
		l/s		1,99	36,35	56,97	72,91	75,44	78,16
	DESIGN FLOW FOR SEWAGE MAX HOURLY WET WEATHER FLOW ($Q_{des}=Q_{mwwf}= Q_{s,max} + Q_{inf,ww}$)	m ³ /h		13	233	365	467	483	500
		l/s		3,53	64,78	101,34	129,60	134,10	138,94

Source: Feasibility Consultant

Effluent Quality Discharge Standards

Processed wastewater in the treatment plant must be in consistent with the effluent quality standards in accordance with the European Council Directive 97/271/EEC May.

The values of the allowable maximum effluent concentrations are on the table below;

Table 2.10: Council Directive 97/271/EC

Parameters	Maximum Effluent Concentration
BOD ₅ - Biochemical Oxygen Demand	25 mg / l
COD – Chemical Oxygen Demand	125 mg / l

TSS – Total Suspended Solids	35 mg /l
TN- Total Nitrogene	15 mg /l
TP – Total Phosphorus	2 mg /l

Typical Characteristics of Domestic Wastewater

Table 2,11: Typical Characteristics of a Domestic Wastewater*

Component	Concentration
BOD ₅ - Biochemical Oxygen Demand	225 m /l
Total COD – Chemical Oxygen Demand	475 mg /l as COD
TSS – Total Suspended Solids	125 mg /l
N – Nitrogene (Ammonia)	35 mg /l, as N
TKN- Total Kjeldahl Nitrogene	60 mg /l, as N
Nitrate-N	0,00 mg /l, as N
Alkalinity	200 mg /l, as CaCO ₃
VSS	100 mg /l

* Estimation of kinetic parameters of heterotrophic biomass under aerobic conditions and characterization of wastewater, Water Science and Technology, 1992.

Standards to be used for Wastewater Analysis

All effluent parameters are defined in the EU Council Directive 97/221/EC (UWWTP Directive) and in particular Tables 1 and 2 of Annex I. The required sampling methodologies, frequencies, and “number of permissible failures” are also stipulated in the UWWT Directive, especially in Article 15 and Annex-I (Part D and Table 3). For example, according to the number of population equivalents in Astara, 12 samples are required per annum.

2.5.2. Sewage Network Design Criteria

Table 2,12: Sanitary Sewer Collection Network Design Criteria

PARAMETERS	VALUE
1 Design factor	0,9
2 Infiltration allowance	0,002 cum/sq.m/day
3 Minimum diameter	0.2 m (200 mm) for collector sewers and laterals, 0.15 m (150 mm) for house connections
4 Minimum cover	1.50 m
5 Minimum velocity	0.60 m/s
6 Maximum velocity	3 m/s
7 Self-cleaning velocity	0.60 m/ s

2.5.3. Sewage Network Components

Sewage Network Components

The Basic Components of the sewage network are:

- Interceptor Sewer (Force mai),
- Collector Sewers,
- Pump Stations (Lift Stations),
- Lateral Mains,
- Wastewater Treatment Plant.

Wastewater Treatment

The wastewater treatment plant that is to be constructed for Astara will be considered a mechanical-biological type with extended aeration-activated sludge technology, which is the beneficiary concept, and herein after called " WWTP ".

An extended aeration process with sludge drying beds for the proposed WWTP is selected by the Feasibility Consultant as project proposal for the treatment of wastewater of Astara city.

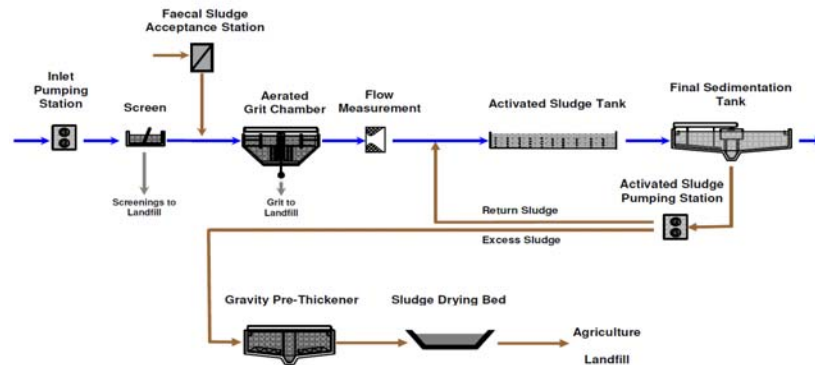


Figure 2,1: Proposed Process Scheme for Astara WWTP (Source, Feasibility Consultant)

According to Feasibility Consultant, the proposed WWTP will have three main processes and which are;

- Mechanical (Primary) Treatment Process,
- Biological Treatment (Secondary) Process, and
- Sludge Treatment (Stabilization) Process.

Mechanical (Primary) Treatment Process

The main components of Mechanical Treatment process are below;

- Inlet pumping station,
- Faecal sludge acceptance station,
- Fine Screen,
- Aerated Grit and Grease removal,

Biological (Secondary) Treatment Process

The main components of Biological Treatment process are below;

- Activated sludge tanks,
- Final sedimentation tank, and
- Return and excess sludge pumping station.

Sludge Stabilization Process

- Gravity Pre- thickener, and
- Sludge drying beds.

Sludge Stabilization

The sludge disposal solution is dependent on the quality of raw wastewater and resulting sludge. The wastewater law enables the disconnection or pre-treatment of detrimental waste waters from the municipal wastewater system. Therefore, it will be based on the assumption that only domestic-strength sewage will be delivered to the treatment plant.

The Feasibility Consultant also recommends a power back-up facility and administration complex including laboratory and workshop for the proposed WWTP.

The following table shows the proposed minimum design criteria given by the Feasibility Consultant for WWTP;

Table 2,13: Design Criteria for WWTP

Item	Symbol	Unit	Number
Planning Horizon	--	Year	2030
Population Equivalents to WWTP	--	PE	21,000
Inlet Flows:			
Daily Dry Weather Flow	Qd	m ³ /d	4,502
Peak Dry Weather Flow	Qt	m ³ /h	281
Peak Wet Weather Flow	qm	m ³ /h	499
Inlet Loads:			
Biochemical Oxygen Demand	BOD5	kg/d	1,054
Chemical Oxygen Demand	COD	kg/d	2,109
Total Nitrogen	N,tot	kg/d	217
Total Phosphorus	P,tot	kg/d	35
Total Suspended Solids	TS	kg/d	1,456
Max. Effluent Concentrations:			
Biochemical Oxygen Demand	BOD5	mg/l	25
Chemical Oxygen Demand	COD	mg/l	125
Total Nitrogen	N,tot	mg/l	15
Total Phosphorus	P,tot	mg/l	--
Total Suspended Solids	TS	mg/l	35
Temperatures:			
Dimensioning Temperature WW	--	°C	17
Max. Temperature Wastewater	--	°C	24
Max. Temperature Air	--	°C	36
Sludge Treatment:			
Minimum Dry Solids Content	DS	%	20-40
Max. Organic Dry Solids Content	ODS	%	45-55

Source: Feasibility Consultant.

Location of Wastewater Treatment Plant

Regarding the selection of a site for the wastewater treatment facility, several factors must be considered, such as floodplains, soils, receiving body, proximity to existing settlements, power supply, and etc. Further, a site must have sufficient area (estimated at about 4 - 6 ha.) for expansion of the facility to provide full coverage of the ultimate service area.

Location alternatives of the proposed WWTP are discussed and assessed in Chapter 4 of EIA.

2.6. Project Implementation, Construction and Commissioning

Table 2,14: Estimated Project Implementation Schedule

Milestones	Procurement	Dates Approx.	Years																
			2010		2011		2012		2013										
			First half	Sec. half	First half	Sec. Half	First half	Sec. Half	First half	Sec. Half									
1	Feasibility Study																		
2	Bidding of contractors (ICB)																		
3	EIA (Environmental Impact Assessment)																		
3	Contractor's Mobilization, Site Investigations and Design Works	90 days																	
4	Actual Construction Period	450 days																	
5	Partial Operations, and Supervision	180 days																	
6	Trainings, within the actual construction	450 days																	
7	Inspection and Commissioning	90 days																	
8	Handing over process	90 days																	
9	Defects Liability Period	365 days																	

Procurement for the Design and Build Contract will be according to open and transparent procedures for international competitive bidding. Some key conditions and considerations regarding the final type of procurement selected to include:

- Pre-qualification: AWM OJSC will ensure the companies with necessary capacity, expertise and experience – only these companies will participate in competitive bidding.
- Two stage bidding: Evaluation of the technical proposals will be done first, and all companies which pass the technical evaluation will be asked to prepare a financial proposal.
- Selection criteria will be financial qualification, price and equally technical qualification.
- Project management mechanism: contracts shall be organized by CM (Construction Management) Contractor under authority of AWM OJSC to make overall project management more efficient with fewer contractors.
- Type of Bid Documents: SIPE – Supply and Installation of Plant & Equipment vs. Procurement of Works; both are compatible with the envisioned Design and Build approach and final selection will be made by AWM OJSC in cooperation with the World Bank.

Bidding under World Bank loans is allowed in all currencies of their member countries. However, AWM OJSC will request bidders to specify which part of the bid will be paid in local currency – to lessen the currency exchange risk (but this factor cannot be part of the evaluation process). All currencies will be converted to one currency for the bid evaluation process.

Permits and Approvals

All final approvals for detailed design, construction permits will be issued by AWM OJSC. In the progress follow up, commissioning-acceptances of the construction activities will be performed by AWM OJSC.

Project Implementation will require the following national and local approvals;

- Water allocation (re) application to AWM OJSC (regarding allocation from an irrigation system).
- Abstraction Permits
- Application to energy utility for electrical facilities.
- Application and allocation land required for facilities and road construction for WTP, WWTP, and other system requirements including acquisition (if required).
- Building permits from the municipality(ies) of the rayon.

Water Access and Rights

All water access and rights of ground water, spring water and surface water in the rayon belong to Government of Azerbaijan, and are operated by AWM OJSC and Regional Astara Irrigation Department. All water access, water allocations, abstraction permits and discharge consents will be issued by Government of Azerbaijan, and will be executed by AWM OJSC.



Exhibit

2,1

Drawing Name :
Mövcud Su Təhizatı Sistemi

Existing Water Supply System



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi

Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon



Məsləhətçi

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA

Miqyas/Scale

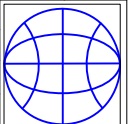
Miqyasız/N.T.S.

Consultant

Tarix/Date

Jan. 2011

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LEGEND

- | | | | |
|--|---|--|---|
| | Sərhədd Border | | Körpü Bridge |
| | Şəhərlər Cities | | Horizontallar Contour Lines |
| | Kəndlər Villages | | Mövcud şəhərdaxili kanalizasiya xətti Existing Collector Sewers |
| | Şose Highway | | Məşə zolağı Forest Blades |
| | Dəmir yolu Railway | | Kənd Təsərrüfatı torpaqları Agricultural Lots |
| | İkinci dərəcəli asfalt yol Asphalt Paved Secondary Road | | |

Exhibit

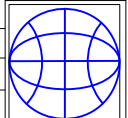
2,2

Drawing Name: Mövcud kanalizasiya sistemi və berk tullantılar poliqonu
Existing Sewage System and Existing Solid Waste Disposal Site of the City



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi

Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon



Məsləhətçi

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

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Miqyassız/N.T.S.

Consultant

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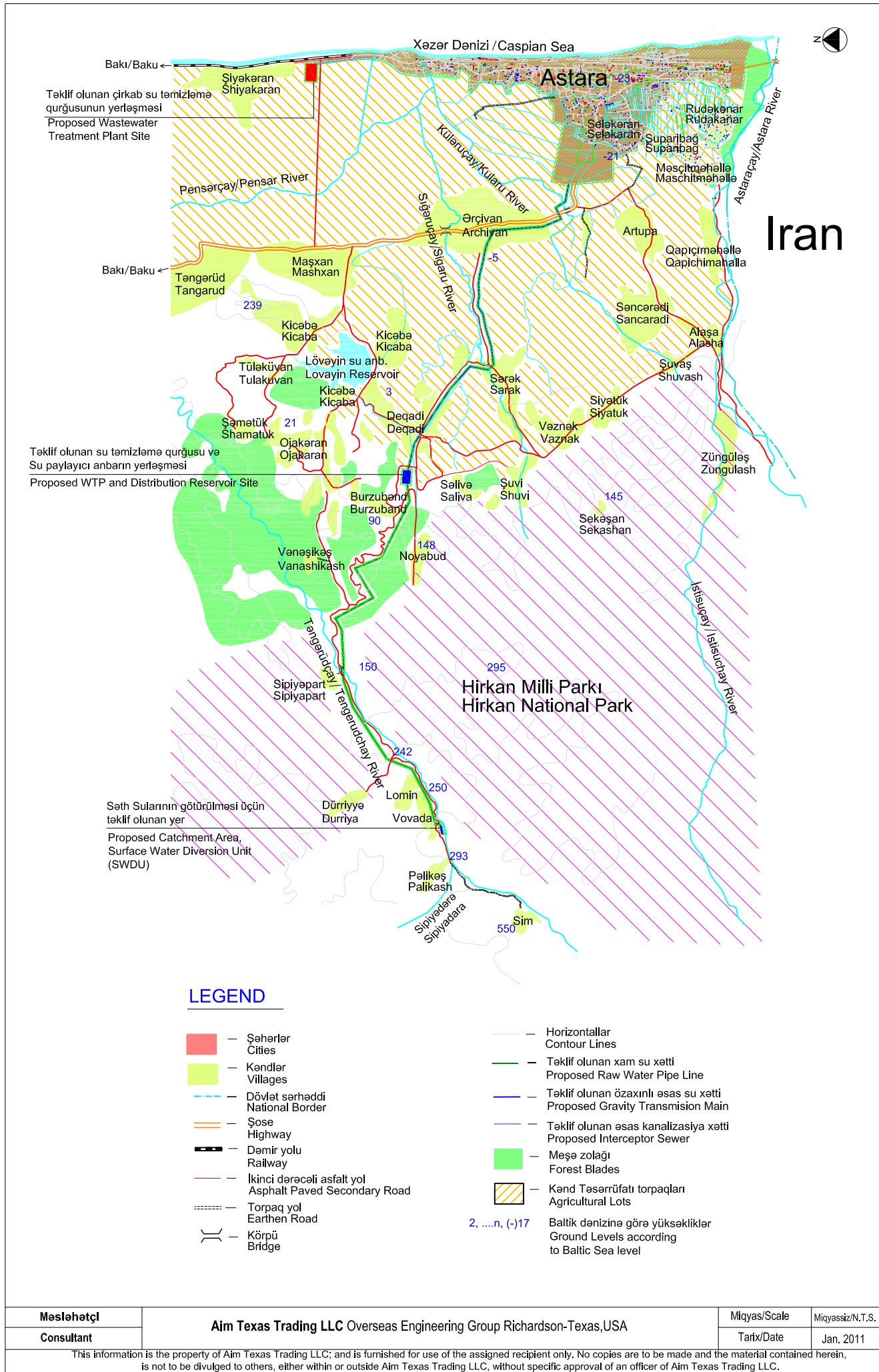


Exhibit
2,3

Drawing Name : TİB Məsələtçisi tərəfindən
Təklif edilən və üstünlük verilən Su təchizatı və
kanalizasiya(STK) sistemini
Proposed WSS System Concept preferred
by the Beneficiary and Feasibility Consultant



ikinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirinin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

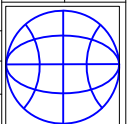
Azərbaycan Respublikası
Republic of Azerbaijan

LEGEND

- Şəhərlər
Cities
- Kəndlər
Villages
- Dövlət sərhəddi
National Border
- Şose
Highway
- Dəmir yolu
Railway
- İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- Torpaq yol
Earthen Road
- Köprü
Bridge
- Horizontallar
Contour Lines
- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti
Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
- Meşə zolağı
Forest Blades
- Kənd Təsərrüfatı torpaqları
Agricultural Lots
- 2, ...,n, (-)17
Baltik dənizinə görə yüksəkliklər
Ground Levels according
to Baltic Sea level

Məsələtçil	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA	Miqyas/Scale	Miqyassız/N.T.S.
Consultant		Tarix/Date	Jan. 2011

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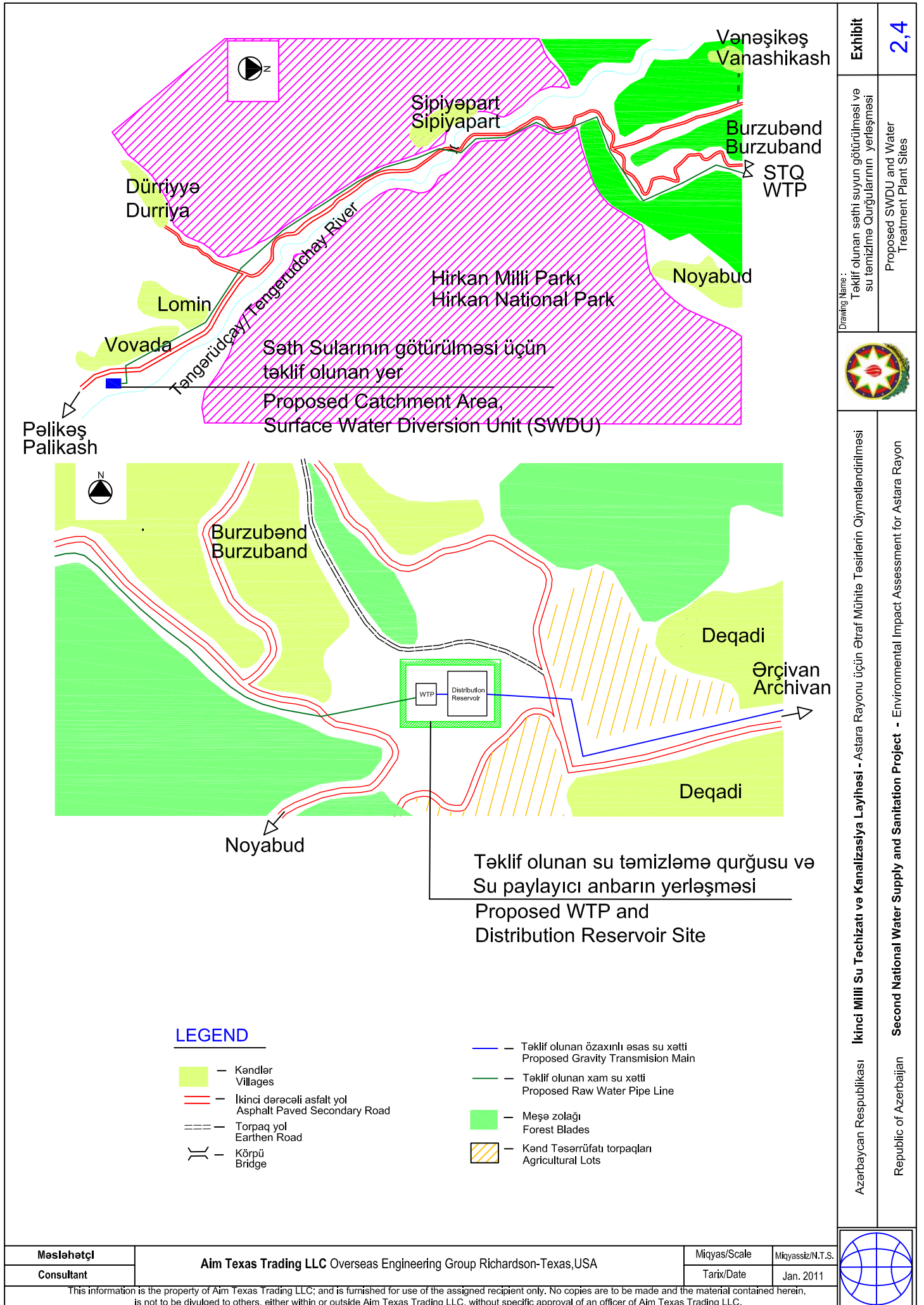


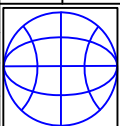
Exhibit
2,4

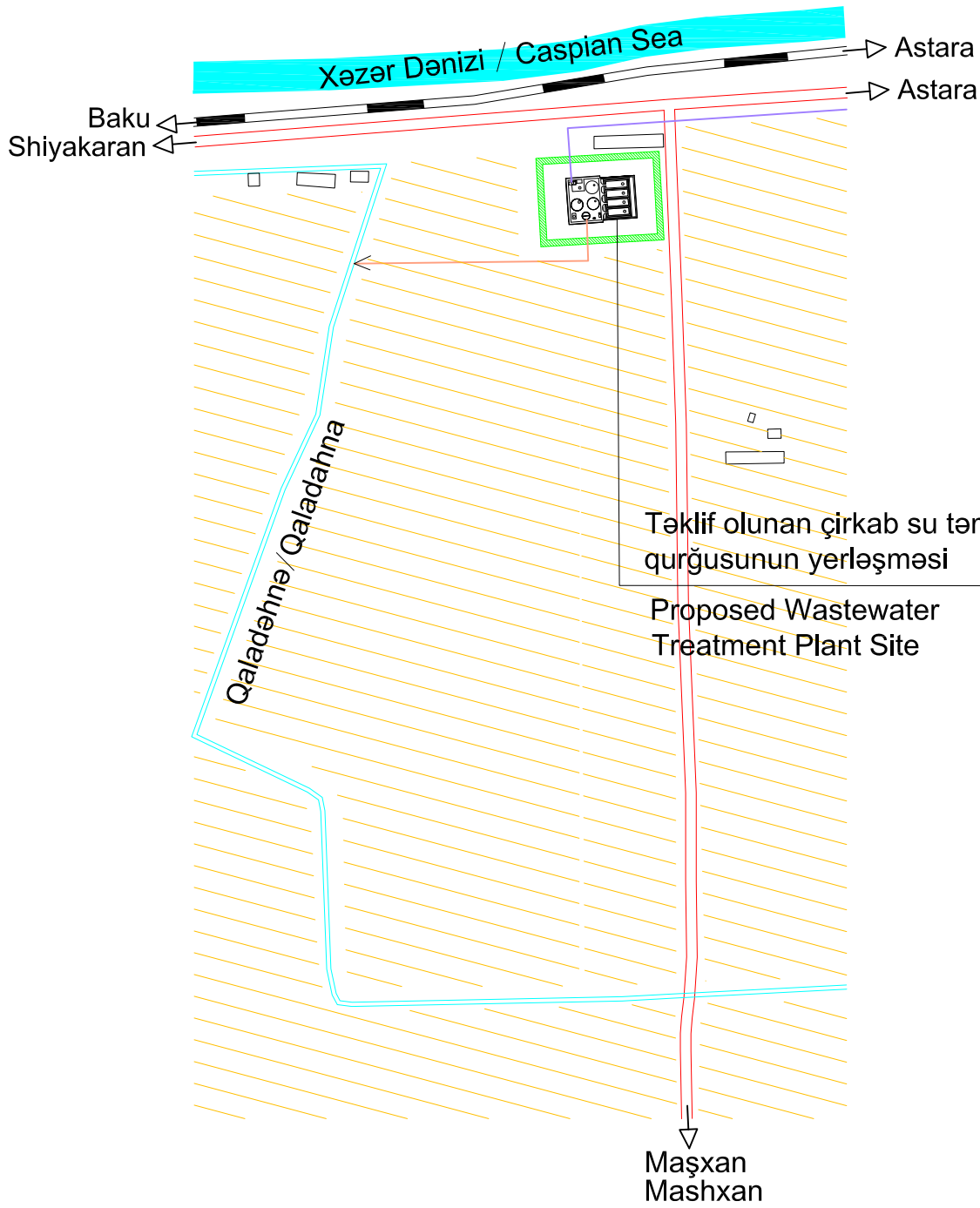
Drawing Name :
Təklif olunan səthi suyun götürülməsi və su təmizləmə Qurğularının yerləşməsi
Proposed SWDU and Water Treatment Plant Sites



Azərbaycan Respublikası
İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirənin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Republic of Azerbaijan

Məsləhətçi Consultant	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA	Miqyas/Scale Tarix/Date	Miqyasız/N.T.S. Jan. 2011
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LEGEND







-  İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
-  Dəmir yolu
Railway
-  Təmizlənmiş su xətti
Treated Water Discharge Line
-  Əsas kanalizasiya xətti
Interceptor Sewer
-  Kanal
Canal
-  Kənd Təsərrüfatı torpaqları
Agricultural Lots

Exhibit	2,5
Drawing Name :	Təklif olunan pis su təmizləmə qurğusunun yerləşməsi Proposed Waste Water Treatment Plant Site



Azərbaycan Respublikası
Republic of Azerbaijan

İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Məsləhətçi
Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA

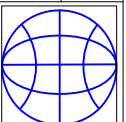
Miqyas/Scale

Miqyasız/N.T.S.

Tarix/Date

Jan. 2011

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Chapter 3

ENVIRONMENTAL BASELINE

Overview

Land Tenure and Land Use in Azerbaijan

Since Azerbaijan gained its independence, the legislation regarding land tenure, land markets and land registers has thoroughly changed. Accordingly, structures in land ownership and land use have diversified. Now, three forms of land ownership exist in Azerbaijan;

1. State ownership
2. Public (municipal) ownership
3. Private ownership

In Azerbaijan a municipality is a local self-governing institution. The municipalities have their own property, budget and election bodies. The municipal land includes land for different purposes and reserve stock land.

State ownership covers land on which governmental authorities, property of state importance or military estates are located. Also, mineral or water resources and areas of nature protection belong to the state and cannot be privatised.

All forms of ownership possess equal rights and are protected by the state. Land can only be purchased by Azerbaijani citizens; foreign persons or organizations can merely lease land.

This Chapter provides an overview of the localized land use categorization, socio-economic environment, physical, biological, ecological, cultural and historical environment of the project. The baseline area surveyed extends up to 50 m on both sides of the proposed locations in terms of the physical environment, and up to 500 m in terms of biological and ecological environment, see **Exhibit 3,1**.

These features and values will include, to the extent applicable, but not necessarily limited to;

- Land Use and Categorization
- Socio-economic Environment
- Physical Environment
- Ambient Air Quality
- Noise Levels
- Ecological Resources
- Cultural and Historical Environment

3.1. Land Use Classification in Astara City

3.1.1. Land Use Category

The land use Category in Astara city and surroundings can be typically agreed as Category " *Mixed Urban or Built-up*" land. Urban or Built-up Land in Astara city is comprised of areas of intensive use with much of the land covered by structures. Included in this category are strip developments along Baku - Astara highway and Astara – Shiyakaran road, transportation, power, and communications facilities, and areas such as those occupied by mills, shopping centers, industrial and commercial complexes, and institutions that, in some instances, are isolated from urban areas. As development

progresses, land having less intensive or nonconforming use are located in the mid of Urban or Builtup areas in the city and will generally be included in this category. See **Exhibit 3,8**.

Astara city:

Residential, commercial, industrial, and occasionally other land uses are included. Farmsteads intermixed with strip or cluster settlements are included within the built-up land, but other agricultural land uses are excluded.

The residential land uses range represents two types of structures in urban core area of Astara city. The general residential uses range is "medium density" where houses are located on lots less than 1000 sqm, and the multiple unit structures which have 4-5 floors (e.g. macrorayons built in former Soviet era), are denser in the rayon centre.

The residential strips generally have a uniform size and spacing of structures, linear driveways, and lawn areas in the urban core area; the commercial strips have buildings of different sizes and spacing, large driveways, and parking areas. Residential development along Baku – Astara Highway is also linear and sometimes extends back only one residential parcel west of the city.

Linear residential developments along the transportation route extending outward from the urban area exist at the western part of the city, and north of Shiyakaran village. This part of the residential development area is included as residential appendages to urban centre mostly along the Astara – Shiyakaran road at the north. Only, the olden village - Selakaran village and the neighbouring area between Astara city and Erchivan village have already been included to the city master plan that has recently been exploited by the State Urban Development and Architecture Committee.

3.1.2. Commercial and Services

The central business districts in Astara city are commonly denser along H. Aliyev Avenue, Azerbaijan, Sattarkhan, Nizami, Z. Bunyadov, Gencler, and Baku – Astara railway which lies throughout the Caspian seashore northernly and southeasternly. The business districts include some institutions and local administrative buildings, hospitals and schools, and some residential units. They are often abutted by residential or other contrasting uses, which help define them.

There is no separate category for recreational land uses is pervasive throughout any other land uses.

3.1.3. Industrial Land Uses

There are no heavy industrial land uses in Astara city or in its development area. A few small and light industrial developments locate sparsely among the residential districts along Z. Bunyadov Street northernly. There are one private and three public enterprises, and 10 agroindustrial and stockbreeding businesses in Astara.

In general, the industry in Astara is based on processing of local agricultural products, especially fruit-vegetable canning, tea processing. Furniture production, concrete based constructional goods manufacturing, maintenance and small scale production of agricultural machineries are the main small and light industrial sectors in and surrounding the rayon centre.

Several small scale workshops and bakeries, which are located between the residential and administrative units that are listed below, also exist in the city.

Currently, more than 300 ownership entities dealt with minor business activity exist in the rayon.

- Car repair shops,
- Wrought iron workshops,
- Small Bakeries,
- Small scale furniture production workshops,
- Wooden workshops, etc.

- Workshops for repairing and maintenance of the agricultural machinaries, etc.

3.2. Socio-economic Environment

Rayon's total area is 620 square km. The rayon has one city (rayon centre Astara city), and 91 villages. Rayon's total population is 95,900 by 2009. Astara city's population is 15,717 by 2009.

Astara city is settled at about between (-) 21 and (-) 28 masl. The relief of the rayon area at the Lankaran lowland varies between 17-54 masl and (-) 28 masl towards the coast line easternly from the bottom of the hills. The rayon's entire area is located at about (-28) - 2194 masl (Mardashig Dagh in the border of Astara-Lerik-Islamic Republic of Iran).

The population of the full service area is 16,677 (inhabitants) by 2009, including Astara city and Selakaran District (an olden village).

The project corridor passes through an area that collectively sustains almost 17 % of the rayon's population for water supply and sewerage systems.

3.2.1. Administration

Rayon's administrative departments are listed below;

- REP-Rayon Executive Powers
- Municipalities
- Rayon Police Department
- Construction Department
- Electric Department
- Road Exploitation Office
- Rayon Public Utility Department
- Rayon Emergency Situation Department
- Rayon Land and Cartography Department
- Rayon Agricultural Department
- Rayon Forest Department
- Communication Department (Post Office)
- Rayon SuKanal Department
- Rayon Health Department
- Rayon Sanitary and Epidemiological Department
- Veterinary Institution

A comprehensive information about the Ministries and Departments, which will be involved to the Project during the Implementation, Pre-construction, Construction, and Operation Period, is given in Chapter 1. Therefore, herein it will be satisfied with this information to avoid unnecessary repetitions.

3.2.2. Main Economic Activities

Agrarian-industrial complex is the main component of the economy. Humid subtropical climate, fertile soil, water and appropriate labor force creates a big potential for the development of the agriculture. The main sectors of the agriculture include early vegetable-growing, tea-growing, vine-growing and grain-growing. The Lankaran Economic Region produces 99% of tea, 27% of vegetable, 15% of grain, 24% of potato, 13% grape, 10% of fruits produced in Azerbaijan. Citrus fruit-growing is quite developed in Astara.

The industry of Astara is based on processing of local agricultural products, especially fruit-vegetable canning, tea processing. Furniture production, concrete based constructional goods manufacturing, maintenance and small scale production of agricultural machinaries are the main small and light industrial sectors in and surrounding the rayon centre. Cultivation of tea is the most developed and profitable agricultural activity in the region.

Stockbreeding is also a collateral business activity in the rayon. The number of livestock in the rayon is 44,432, of which 28,291 are heads of cattle and the rest is heads of small cattle.

The total area of arable land is 176 sq. km in the rayon. There are 22 sq. km of land for grazing livestock, 66 sq. km of cropping area, and 14 sq. km of orchards in the rayon.

Transportation system has an important impact on the development of Astara. Baku-Astara railway, Baku-Astara motorway, and custom gate and freight terminal have important impact on cargo and passenger transportation and development of economic relations between Azerbaijan and Islamic Republic of Iran.

Although the volume of agro-business in rayon has developed intensively, the regional governmental development program (approved Decree dated April 14, 2009) for the period of 2010 - 2013 has focused on measures of expansion of industrial and agricultural production, wood products and on the various public services specific for Astara rayon, and those are the followings;

- Supporting development of tea, vegetable, sub-tropic, citrus fruits growing and fishing, 2009 – 2013, by Ministry of Agriculture.
- Thoroughly repairing and laying asphalts on streets within Astara town, 2010 – 2013, Local Executive Power.
- Thoroughly repairing and laying asphalt on roads between villages, and construct bridges over rivers within the rayon, 2010 – 2013, MoT.
- Thoroughly repairing and laying asphalt on roads in Astara city, 2010 – 2013, Local Executive Power.
- Reconstructing electric power networks of the rayon, 2010 -2013, “Azerenergy” OJSC,
- Reconstructing air power transmission lines in the rayon, 2009 – 2012, “Azerenergy” OJSC,
- Restoring heating supply to some residential buildings in Astara city, 2010 – 2011, “AzeriStiliktejhizat” CJSC.
- Improving improve gas supply to Astara town and other residential areas of the rayon, 2009 – 2013, “Azerigas” CJSC,
- Changing ATSS with EATSS, constructing new EATSS and ensure connection of all EATSS with fiber-optic cables, 2010 – 2013, by Ministry of Communication and Information Technologies.
- Reconstructing water supply and sanitation systems of Astara town, 2009 – 2010, AWM OJSC of Azerbaijan.
- Improving water supply to villages, 2009 – 2013, by “Azersu” OJSC.
- Carrying out bank-reinforcement works at Penser river, 2011 – 2012, AWM OJSC of Azerbaijan.
- Repairing and building health care facilities and provide them with equipment, 2010 – 2013, MoH.
- Constructing new cultural facilities, as well as rehabilitating and conserving historical-cultural monuments in the rayon, 2010 – 2013, Ministry of Culture and Tourism.
- Constructing new sport-health facilities in the rayon, 2009 – 2012, Ministry of Youth and Sport.
- Thoroughly repairing education facilities, and constructing additional classrooms and new school buildings in the rayon, 2009 – 2013, Ministry of Education.
- To continue bank-reinforcement works at Astara river, 2009 – 2010, AWM OJSC of Azerbaijan.

3.2.3. Transportation

The rayon centre Astara city is located at the end of the Baku – Astara highway (M3) nearby the state border of Azerbaijan – Islamic Republic of Iran. The city is situated on the 313th km of this highway. Road Exploitation Office (REO) of the rayon reports that the Rights of Way (RoW) of the highway is 60 m (30 m + 30 m according the road center line). REO reports that the traffic in line with Astara is currently at about 7000 – 7500 vehicle per day (vpd) on the highway. 26 km of Baku – Astara highway section and 13 km of Baku-Astara railway section travel in the rayon area. There is a railway station, which is the end of the Baku – Astara railway. See **Exhibit 3,5**. The freight terminal near Astarachay river serves 6500 – 7000 vehicles and approximately 8000 -10000 passengers per day. This situation is increasing the daily population in Astara city.

3.2.4. Key Socio-economic and Demographic Indicators of the Project Area

The following table shows the key socio-economic and demographic indicators for the rayon;

Table 3,1: Key socio-economic indicators of the Project area. Astara

<i>Item</i>	<i>Indicators</i>			
	<i>Detail</i>	<i>Service Area</i>	<i>Rayon</i>	
Population	Total	16 677	95 900	
	Public Sector	7360	9300	
	Private Sector	264	26 415	
	Unemployed	unknown	131	
	Population Density	2281 people sq.km	155 people sq.km	
Land	Total area	7,31 sq.km	620 sq.km	
	Arable land	None	17 600 ha	
	Cultivated land	None	8 000 ha	
	Forest	None	37 000 ha	
Urbanization	City	1	1	
	Municipality	1	90	
Economics	GDP	962 USD	92 279 375 USD	
	Major Crops	Citrus, grain, vegetable growing, processing of fish, vegetable canned food, tea, construction materials		
	Cattle and Small Cattle Breeding-Head	73 686		
	Diary Production-metric ton/year	19 365		
	Meat production-metric ton/year	1546		
	Wool production (Curly)-metric ton/year	113		
	Major Industry	0	0	
	Light Industry	8	8	
	Small Scale Workshops	21	83	
	Touristic Facility	2	11	
	Infrastructure	Expressway	None	None
		Highway, Baku-Astara – km	12	26
		Railway	5	13
Power Distribution station		1	1	
Natural Gas Distribution Station		1	1	
WTP		None	None	
WWTP		None	None	
Water Supply Network		Yes, small scale, unhygienic, dispersed	None	
Sewage Network		Yes, small scale, dispersed	None	
Social Services		Medical Facilities (Clinics-ambulatorium)	1	17
	Hospitals	1	15	
	Schools	13	63	
	Day Care	7	17	
	Hotels	6	12	
	Archeological sites	0	21	
	Cultural Heritage	3	81	
	Architectural memorial buildings	5	48	
	Museum	2	3	
	Cultural Facilities	19	141	

GDP: Gross Domestic Product

ha: Hectare

USD: United States Dolar

WTP: Water Treatment Plant

WWTP: Wastewater Treatment Plant

Sources: State Statistical Committee, State Land and Cartography Institute of Azerbaijan, AWM OJSC of Azerbaijan, Rayon Land and Cartography Department, EIA Survey Team, Feasibility Consultant's Study Team.

Table 3.2: Population Dynamics for the last three years

Indicators	2008	2009	2010
Natural Growth Rate - % of total population of the rayon	0.7	0.7	Not registered yet
Mortality Rate - % of total population of the rayon	0.4	0.4	Not registered yet
Infant Mortality Rate - % of total population of the rayon	0.0021	0.002	Not registered yet

Source: Astara Rayon Statistical Department.

According to the Rayon Health Department, the number of incidence of approximately 25 types of water borned diseases have been explored within the rayon. Diseases transmitted by means of infection carriers (e.g., malaria etc.) are spread by insects and mollusks who are widely spread in water ecosystem. Diseases conditioned by water deficiency (e.g., the itch, trachoma) are endangered by bacteria or parasites falling an organism when enough pure water for individual hygiene (washing, bathing etc.) is absent. Since special and purposeful analytic researches aimed for revealing such diseases as disenteria, gastroenterite, drakunculosis etc. are not made by the responsible authorities at the rayon and city level, it's impossible to forward a certain opinion for dynamics of such diseases spreading among the city population.

The water borned type of diseases observed in the rayon are gastroenteritis, viral hepatitis and ascariasis.

Table 3.3: Number of incidences on water borned diseases

Name of Disease	Number of Incidences			
Year	2007	2008	2009	2010 first 6 months
Infective hepatitis	12	6	7	9
Gastroenteritis	71	65	28	20
Ascariasis	-	-	60	4

Source: Rayon Health Department and Feasibility Consultant.

3.2.5. Water Supply and Sanitation Utilities

Water Supply in Astara city

Although a 4.1 km distribution mains exists in the rayon centre Astara city, the satisfactory and hygienic drinkable water cannot be supplied to the customers because of no sufficient exploitation, no adequate storage capacity and water release, and dilapidated distribution network. Feeder mains mostly consist of the steel pipes which are 14.5 km in length, and they were constructed between 1961. However, the distribution mains in the city consist of steel pipes (4.1 km), which were constructed at the same period. The rayon's SuKanal Department reports that the whole distribution network is partially damaged. The drinkable water distribution system in the city seems to have depleted its economic life span.

Currently, the municipal water supply for the city is provided by horizontal infiltration gallery diversion (HIGD) unit located nearby Alasha village in Astarachay river bank. Amount of water exploited is distributed to 10 percent of the city by a two km gravity transmissio main and three reinforced concrete reservoirs located nearby Qapicimahalle village. However, this system does not provide the adequate pressure in the existing distribution system. Many multi-storey buildings have their private reservoirs installed to their own systems at their basements. Almost all houses and apartments block have their own elevated water reservoir equipped with a pump.

As there is no sufficient water release for the system, many one or two storey houses have an additional sub-artesian well in their own plot.

Many multistorey buildings and some institutional buildings provide the drinkable water from their own sub-artesian wells installed in the plots. However, no information exist on this water supply system, the number of wells and their capacities. It is unknown how many private deep wells are operated in Astara supplying water to public, industrial and commercial sectors.

It is assumed that at least 60% and temporarily up to 80% of population are depending solely on unsafe groundwater from the wells. Water Supply by tank trucks seems to be of minor importance in Astara. There is no information about privately operated tank trucks.

Water Metering is limited to few households and larger enterprises with an own interest in measurement and invoicing by real data. Invoicing of the other consumers is based on flat-rates which doesn't represent the real consumptions.

There are no centralized fire fighting network, and no water treatment and disinfection facility established in the system. See **Exhibit 2,1**.

Conclusively, Astara city has a scattered, dispersed, and inadequate water supply system. It no longer has the strength to endure the economical and social development of the city. The economical development in rayon shows the rapid tendency, and this will cause to increase the unlicensed and uncontrolled water use.

Sewage System, Wastewater Treatment and Storm Water in Astara City

Presently, there is a small scale centralized sewage collection system which serves to the institutional, residential and commercial buildings along the Azerbaijan street. However, only 10 % of the the premises which are installed to the system has direct connections, and the others have no direct connections. Almost all sewage collection system were constructed from 1970 to 1980. All gravity collector sewers in the system consist of asbestos cement pipes, which are 6 km in length. All force mains are installed by the steel pipes.

The waste water generated by the institutional and multistorey buildings is collected in two wetwells (2 lift stations), and envisaged to convey out of the city by the lift stations and force mains to the area of old WWTP site south of Shiyekaran village. However, the existing interceptor sewer seems that it has never reached to the WWTP site. It disappears in the Caladahna marshland, and is disposed to the natural environment. Some parts of carcass of the old WWTP already exist in the site south of Shiyekaran village. Rayon SuKanal department reports that construction of the WWTP was stopped in the early 1980s, and there is no access to the site presently. However, the existing site provides a six hectares land, which is sufficient to construct a new WWTP

The current situation of the system constitutes a serious health risk in the city, and cause to increase the rates of water borne diseases (Infective Hepatitis, Gastroenteritis etc.). Some houses and institutions dispose their sewage to nearby open channels and ditches along the main axis roads of the city.

The current practice of sewage disposal at the remaining part of the city is in the manner of use of private septic tanks and latrines. The septic pits are commonly located at the kitchen gardens of the houses.

Presently, there are no sewerage tank trucks in Astara city to dispose sludge from septic pits. According to Feasibility Consultant, service is limited to a minority which can afford to spend money on sludge disposal. Most of the pits are assumed to be not emptied. Owners dig a new pit if the existing one is full.

Storm water is collected with open drainage channels on the sides of the roads and is evacuated to nearby waterways according to local relief. However, In case of rain all streets get flooded by wastewater.

3.2.6. Solid Waste Disposal in Rayon Centre

Solid Waste Disposal (SWD) site is located in a distance of 8 km to Astara city along the Serakchay river. The landfill is on the balance of Astara House Exploitation Department. The area of site is 0.4 ha, and a 15-20 cum SWD in a day is disposed to the site with three old and non-standard dumptruck. The landfill is surrounded with a protective wall which its height is 1.8 m. However, there is no protective wall and/or perimeter fence between Serekchay river and Landfill. No waste is buried by the earth in the site, and no separation is managed. Source-separating of the wastes is not applied in the city. All solid wastes are collected in manner of commingled including the medical wastes, and disposed to the site. See Annex-6.

3.3. Study Area Concept

The study area of the project for each rayon is identified in the relevant project appraisal documents, and summarized for water supply investment as ***'based on the premise of providing water service to the entire urban centre plus adjacent villages and/or villages along the transmission mains'***, and for the wastewater investment as ***'based on the design premise to connect the central business/apartments block district of each urban centre to a main sewage collector plus settlements close to this main sewage collector for transfer to a wastewater treatment plant'***.

The extent of the project study area for the rayon has been comprehensively explained in Chapter 2 of this report. The reader can also find detailed information about the extent of the study area specific for the rayon in Chapter 2. Therefore, herein it will be satisfied with this information to avoid unnecessary repetitions.

3.3.1. Project Corridor Design

Design-related alternative considers the aspects such as route, alignment, cross-section, and public amenities. These are discussed below.

Route

The project corridor should be strategically located, including the National and respective regional principles. It should also serve the most heavily populated regions of the rayon. No demarcation an alternative route would require vast amounts of land acquisition, disrupt rural communities, interfere with established natural and agro-ecosystems, and result in further environmental and social degradation, see Chapter 3.3.3 and 3.3.4.

Alignment

The horizontal geometry of the project corridor should be under continual review and refinements. The alignment of the pipe lines should be routed to bypass irrigation canals, ditches, public and private amenities, and even some small part of agricultural lots. Special attention should be paid that all pipelines and other system components are located within the public RoWs or on the public easements, see Chapter 3.3.2.

3.3.2. Delineation of Rights of Way (RoW)

The project corridor will generally be well-defined rights of way (RoW), and it is designed on the public easement. However, the RoWs vary from section to section and, in some cases, even within a section. In cases where variations have been observed within a section, the RoW will be indicated with minimum and maximum limits.

RoW minimum and maximum limits will generally be used in this Project for the surrounding area of alignment of raw water pipeline, drinkable water transmission main, feeder mains, water treatment plant site, drinkable water distribution tanks, interceptor sewer, collector sewer, lift stations and wet wells, waste water treatment plant site, and effluent discharge outfall lines (See **Exhibit 3,1**)

The RoW limits inside the settlements are generally confined to the streets' width. Therefore, RoW limits for some impacts (e.g. biological and ecological) will not be given for the Project components inside the settlements.

Intersecting table of the Project components is below (See **Exhibit 3,2, 3,3** and **3,4**);

Table 3,4: Intersecting table for proposed system components

Component	Irrigation Canals & Ditches	Asphalt Paved Secondary Roads	Earthen Road	River and creek	Existing Public Amenities	Existing Private Amenities	Baku Astara Highway
Raw water pipe line	NI	Sim Archivan village Road, INT-1, See Exhibit 3,2 and 3,3	NI	NI		NI	NI
Transmission main	NI	Sim Archivan village Road, Shuvi – Archivan road, Sarak – Shuvi village road, INT-1, INT-2 and INT-4 See Exhibit 3,2 and 3,3	NI	A small creek and Sigaruchay river nearby Sarak village, INT-3 and INT-4, see Exhibit 3,2 and 3,3	Above ground Gas pipe, INT-5, See Exhibit 3.2 and 3.4	NI	In archivan village, INT6, see Exhibit 3,4
Feeder main	NI	Inside the city	Inside the city	NI	Inside the city	NI	Inside the city
Water treatment plant site	No	NI	NI	NI	No	No	No
Distribution Tanks	No	NI	NI	NI	No	No	No
Interceptor sewer	NI	Inside the city	Inside the city	NI	Inside the city	No	South of Shiyakaran village, INT-7, See Exhibit 3,2 and 3,4
Collector sewer	NI	Inside the city	Inside the city	NI	Inside the city	NI	Inside the city
Wastewater treatment plant site	NI	NI	NI	NI	No	No	No
Outfall pipe line for effluent discharge	NI	NI	NI	NI	NI	NI	NI
Access Road for WWTP	NI	NI	NI	NI	NI	NI	No
Access road for WTP	NI	NI	NI	NI	NI	NI	No

¹ – NI means no-intersection

² - NA means no information and spatial data available.

3.3.3. Corridor of Impact

The area of project influence is referred to as the 'corridor of impact' (**CoI**), ie, the width of the corridor that will be impacted, directly or indirectly, by the project during the construction and operation phases. As discussed in Section 3.3.1, major construction activities will remain confined to the existing RoW. However, situations in which construction-related activities will extend beyond the existing RoW include:

- Establishing construction campsites and asphalt plants on temporarily acquired land,
- Borrowing soil material from temporarily acquired land,

- Quarrying aggregate material,
- Constructing haul tracks in order to transport construction material, etc.

3.3.4. Delineating the Col

For the purposes of this study, the **Col** has been divided into two zones, **Col I** and **Col 2**.

Col 1

The **Col 1** marks the limit within which the direct impact of construction activities is expected to take place. This includes the displacement or relocation of people, and the removal of vegetation cover for construction. This limit will vary along the length of the project corridor according to site-specific conditions.

The **Col 1** was delineated as the width required for actual construction. This included the trench alignment, embankment, longitudinal drainage, wayside amenities, and an additional corridor required to facilitate the movement of light construction machinery and ensure the safety of the general public, and for detailed illustration, see **Exhibit 3,1**. The approach followed in delineating the **Col 1** is outlined below.

Table 3,5: Limits of Col 1

Component	Open Areas				Restricted Areas (Residential and its appendages)	
	Construction Limits			Col 1 m	Construction Limit m	Col 1 ¹ m
	Max. m	Min. m	Weighted average m			
Raw water pipe line	30	24	27	30	-	-
Transmission main	30	24	27	30	Street width	50
Feeder mains	30	24	27	30	Street width	50
Water treatment plant site	100	50	75	80	-	-
Distribution Tank	100	50	75	80	-	-
Interceptor sewer	30	24	27	30	Street width	50
Collector sewer	30	24	27	30	Street width	50
Lift station-Wetwell	100	50	75	80	50	50
Wastewater treatment plant site	100	50	75	105	-	-
Outfall pipe line for effluent discharge	30	24	27	30	-	-
Access Road for WWTP	100	50	75	80	50	53
Access road for WTP	100	50	75	80	50	53

* Open Areas : The **Col 1** will extend up to 3-5 m from the construction limit

* Ribbon Development Areas: None

* Open Areas with minor

Ribbon Development :None

¹ – **Col 1** in restricted areas should be accepted at least 50 m because the noise impact.

Col 2

Col 2 marks the limit within which the indirect impact of project activities is expected. This includes the effects associated with noise, vibrations, vehicular emissions, toxic emissions and fugitive dust from batching and mixing plants, and the consumption of natural resources, such as earth fill and water, required during construction. The **Col 2** limit is determined by a number of factors, including environmental setting, types of environmental resources that fall within the zone of impact, and the nature of Project related activities.

The potential induced impact must also be taken into account. For example, game reserve areas located even at relatively large distances from the Project area, and surroundings the Baku - Astara highway may come under stress due to increased numbers of visitors encouraged by the improved condition of the project. Similarly, agricultural lands and an improved area may enhance the attraction of archaeological and recreational sites to tourists. Sensitive areas, i.e., protected areas and archaeological sites, likely to be affected are listed in Chapter 3.5.2. respectively.

For the purpose of this project, two limits of 300 – 500 m from the edge of the construction limits has been adopted as **Col 2** in accordance with the criteria given in Chapter 1.5 (see **Exhibit 1,1**). This is based on the following reasons:

- 1) Noise impact corridor for open spaces is accepted 300 m from edge of the construction limits because of the foreseeing wind effects, and dispersion analysis of vehicular emissions indicates that the concentration of pollutants generally drops to an acceptable level at a distance of about 200 m, and
- 2) 500 m is accepted in respect of ambient air quality, water quality and wildlife species.

3.3.5. Buffer Zones

The term "buffer zone" refers to the area of land adjacent to a wetland or water body. This section addresses the land next to wetlands and water bodies as it pertains to wildlife habitats. Distances and extent of the buffer zones set forth below are patterned in accordance with ESHAs (Environmentally Sensitive Habitat Areas) regulations of USEPA.

When a proposed activity involves work within the riverfront area, the area is presumed to be significant to the protection. The section of Kulerichaychay river's valley in and in front of the Astara city and the section of 3.5 km of Tengerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in or nearby the Project corridor.

Water Body Buffer System

The zones' borders are given in **Exhibit 6,2**. These zone is accepted as the riparian buffer corridors.

Purpose

The intent of the buffer system is to preserve riparian corridors to help protect the physical, chemical and biological integrity of water body from adverse water quality and quantity impacts. Preservation of riparian corridors along water body will help promote streambank stability and prevent increased stream temperature, accelerated loading of nutrients and sediments and other pollutants.

Vegetation in the riparian corridor plays a critical role in the food chain for aquatic organisms. The purpose of the following requirements is to protect these functions of the riparian corridor.

Current scientific research indicates that a "tiered approach" to waterbody buffers is more effective than a single setback. This approach provides more flexibility on the location and nature of disturbance in the riparian zone. The following tiered approach to waterbody setbacks should apply to all activities that require development approvals.

Restrictive Inner Buffer

A setback of 7,5 meters measured horizontally from the typical and ordinary high water mark in average hydrologic years on each side of Kulerichay river in and in front of the Astara city. Earth or vegetation disturbance is restricted within this inner buffer zone. Any construction activities and necessary structures requiring some disturbance within this setback shall not be permitted. The following actions that will not be allowed within the restrictive inner buffer zone;

- Placement of material, including without limitation any soil, sand, gravel, mineral, aggregate, organic material, or snow plowed;
- Construction, installation, or placement of any obstruction or the erection of a building or structure;
- Removal, excavation, or dredging of solid material, including without limitation any soil, sand, gravel, mineral, aggregate, or organic material;
- Removal of any existing live vegetation or conducting any activity which will cause any loss of vegetation, unless it involves the approved removal of noxious weeds, non-native species, dead or diseased trees;

- Lowering of the water level or water table by any means, including draining, ditching, trenching, impounding, pumping or comparable means; and,
- Disturbance of existing natural surface drainage characteristics, sedimentation patterns, flow patterns, or flood retention characteristics by any means including without limitation grading and alteration of existing topography. Measures taken to restore existing topography to improve drainage, flow patterns, flood control, etc. must be approved.

Variable Outer Buffer

Earth and vegetation disturbance within this variable buffer may be limited where necessary to protect the integrity of the waterbody or special site specific features.

For the Kulerichay riverfront area, this variable buffer should range from zero (m) to 25 meters beyond the outer edge of the restrictive inner buffer zone described above (i.e. up to 32,5 meters beyond the high water mark of the waterbody during average hydrologic years).

However, the high water mark is unknown in both sides of the Tengerudchay river. The width of variable outer buffer in the catchment area may undulate in order to provide protection to site specific features.

Site specific features that could trigger the need for either an outer buffer zone, equivalent mitigation, or a combination of outer buffer zone and mitigation include:

- Steep slopes draining into the waterbody;
- Highly erodable soils are present;
- Presence of unstable streambank conditions;
- The proposed use of the property presents a special hazard to water quality (e.g., storage or handling of hazardous or toxic materials);
- The area is needed to protect trees, shrubs, or other natural features that provide for streambank stability, habitat enhancement for aquatic environments, riparian area protection, or to maintain pre-development riparian plant or animal communities;
- The area provides habitat for plant, animal, or other wildlife species;
- The area is within the 100-year flood plain;
- The area is needed to prevent or minimize flood damage by preserving storm and flood water storage capacity;
- The area is needed to protect fish spawning, breeding, nursery and feeding grounds.

The site plan submittal for this area shall include delineation of all applicable buffer zones. These boundaries should also be shown on all clearing, grading and erosion control plans. Because the variable outer buffer zone is flexible and site specific.

The contractor(s) is expected to submit rationale for the size of this buffer zone and identify proposed mitigation measures to be used at the site.

3.4. Physical Environment

This section discusses the following physical features of the corridor surrounding the selected construction limits of the project:

- Physiography
- Water Resources
- Climate
- Soil

3.4.1. Physiography

The rayon is situated in the south-eastern part of Azerbaijan, and surrounded by Lerik and Lankaran rayons in the north and northwest, and Islamic Republic of Iran in the south and west.

The relief terranes on the mid highland of Talish range west of the rayon, Cambrian or pre-Cambrian metamorphic complex was formed at the geosynclinal development stage. The existence of the plentiful hills and lowlands, is a peculiarity of region's relief.

Topography

Approximately one thirds of the rayon area is situated in Lankaran lowland along the coastline of Caspian Sea. Two thirds of the rayon area at the west and northwest is located on the low highlands of the eastern inclinations of the Talish mountains. The relief of the mountainous area varies between 2194 masl (Mardashig Dagh in the border of Astara-Lerik-Islamic Republic of Iran) and 18 masl nearby Shuvash village in the south. The relief of the rayon area in the lowland varies between 17-54 masl and (-) 28 masl towards the coast line easternly from the bottom of the hills. The existence of the plentiful hills and lowlands is a peculiarity of region's relief.

Rayon centre city is settled at about between (-17) and (-) 28 masl along the Caspian seashore.

River valleys are also widespread easternly and northeasterly in the area of Talish east anticlinal. The border-line between the plain and mountainous areas is extended along the normal fault. Its surface is covered with Late Pliocene-Anthropogenic terrestrial clay matrix pebble deposits. Mountain zone has undergone severe dissection caused by the dense transversal relative to the ridge extension drainage network. Marine terraces have evolved within the river valley watercourses trending towards the Lankaran lowland.

The following figure shows the general topographic condition of the Astara region.



Figure 3,1, Topography in the Astara Rayon

Geology and Soil

Tufa alevrolites, tufa sandstone and tufa conglomerates are accumulated in Talish zone in the Palaeocene. Intrusive bodies along the low highland are jugged decreasing towards Astara synclinal depression. The lower levels of the anticlinorium is covered by green grasslands, which form with a thin layer of alpine meadows.

The rocks differ greatly in stratigraphical breaks and territorial distribution in the mountainous region. In some parts of Astara territory, the correlation between rocks is approximately even, in others sedimentary old volcanic rocks prevail. It is formed of palaeocene tuffites, tufas, alaevolities, arquillities, and marls. Forming the stratigraphical section of eocene are basalt and andesite, tufa breccia and sandstones, conglomerates, arquillites, etc. Oligocene stratum is strikingly different.

Neogene system forms an upper part of Cretaceous. Neogene includes tarhan, chockrak, karaqan, and other stratigraphical horizons; sarmat, meotis and pont form stratigraphical levels. As a whole, Talish zone's tectonics is characterised by the development of plicate structures. Plicate structures (north to south) are as follows: Jalilabad (former Astrakhanbazar) sinclinal depression; Burovar anticlinal height; Yardimli sinclinal depression; Lerik sinclinal depression; Astara anticlinal height. Geological sources are indicative that tectonic displacements are different depending on alpine stage of Talish plicate zone. A Cambrian or pre-Cambrian metamorphic complex was formed at the Talish geosynclinal development stage. Tufa alevrolites, tufa sandstone and tufa conglomerates are accumulated in Talish zone in the Palaeocene.

The rayon area consists of some swampy marshland in the east. In the lowland of the Lankaran unfavourable hydrogeological conditions occur. Geologically, these areas are formed of continental-marine and marine deposits of upper Pliocene-Quaternary age, with the continental sediments having a subordinate position. Under ground water are salty, with dry residues of 100-200 g/l in these lowlands. East and southeast of the region are rimmed by a narrow margin of inclined foothill alluvial-proluvial, and partially marine plain (Lankaran lowland).

Artificial watering and irrigation impact upon lowland relief, relief dissection, washout (erosion) and soil salinization processes get more active under Anthropogenic conditions.

The Project corridor section of the settled area of the city falls into the areas are formed of continental-marine and marine deposits of upper Pliocene-Quaternary age. See **Exhibit 3,12**.

Seismicity

The rayon is located in the zone which is exposed to earthquake force of Richter magnitude 6-7. According to the seismological center of the National Academy of Sciences of Azerbaijan. Over the past 20 years, Talish zone suffered earthquakes as follows: Lerik - 12 April 1983 (force 6), 27 January 1986 (force 7), 18 October 1987 (force 5) and 9 June 1998 (force 6-7); Jalilabad region - 12 October 1999 (force 5). See **Exhibit 3,13**.

3.4.2. Water Resources

Talish mountain range is a mountain fold region. There are huge resources of high temperature mineral waters with J, B, Br, H₂S, CH₄ and other microelements content. At present exploitation reserves of fresh and weakly mineralized groundwater including predictions in Talish territory, are 989,35 thousands cubic meter per day. However, a 98.9 thousands cubic meter per day from these reserves are approved by the State Commission on reserves, 6.8 thousands cubic meter per day by areal Commission on reserves, the rest of 883.65 thousands cubic meter per day were taken for balance (State Commission on Reserves of MENR of Azerbaijan).

The district has rich river network. In radius of 10-35 km out of the Astara city, Tengeruchay, Astarachay, Istisuchay, and Penserchay rivers are flowing toward Caspian Sea. For use of irrigation purpose, Lavain Water Reservoir (LWR) was constructed at the northwest of Astara city in a distance of . The LWR is mainly constructed to accumulate the water for irrigation scheme of Astara lowland, and is fed by the water of Lovaysherudchay and few small seasonal creeks.

Natural outcrops of thermal and thermal-mineral water are confined to zones of tectonic dislocations and faults at the low highland of Talish range between 48 – 1000 masl. The temperature of the thermal waters in spring flow within Talish mountains varies from +50°C to +64°C (in wells more than 70°C). According to chemical composition the waters are homogeneous, ions of chlorine and sodium prevail here. Volume of their general mineralization and of the temperature increases by depth.

Some characteristics and forecasted reserves of the thermal waters in the region are given in the following table;

Table 3.6: Some characteristics and forecasted reserves of the thermal waters in the region

Region	Water temperature, °C (numerator - entry, denominator - depth)	Forecasted reserves, m ³ /d
Talish Low highland Zone (400-1000 masl)	31-43 / n.s.	14405
Lankaran Plain (48-400 masl)	44-64 / 42-50	7908

The most important thermal springs of the region are Meshe Thermal Spring, Havzova Thermal Spring, Istisu Thermal Springs and Ibadi Thermal Spring.

Rivers, flowing in hot seasons account for most part of all rivers (60-80%). The surface erosion in the rivers of Talish range is between 0.03 – 0.04 mm.

The flows in the rivers increase in the direction from the west to east. The flow reaches its peak in Tengerudchay and Astarachay river basins in the central part of the region, while it reaches its minimum north of the Vileshchay river, as well as in the Lankaranchay river.

The Project corridor is mainly located between Lomin village and Astara city, and on the city's settled area. The following Figure shows the surface water and artificial waterways (irrigation and drainage canals) hydrography in rayon;

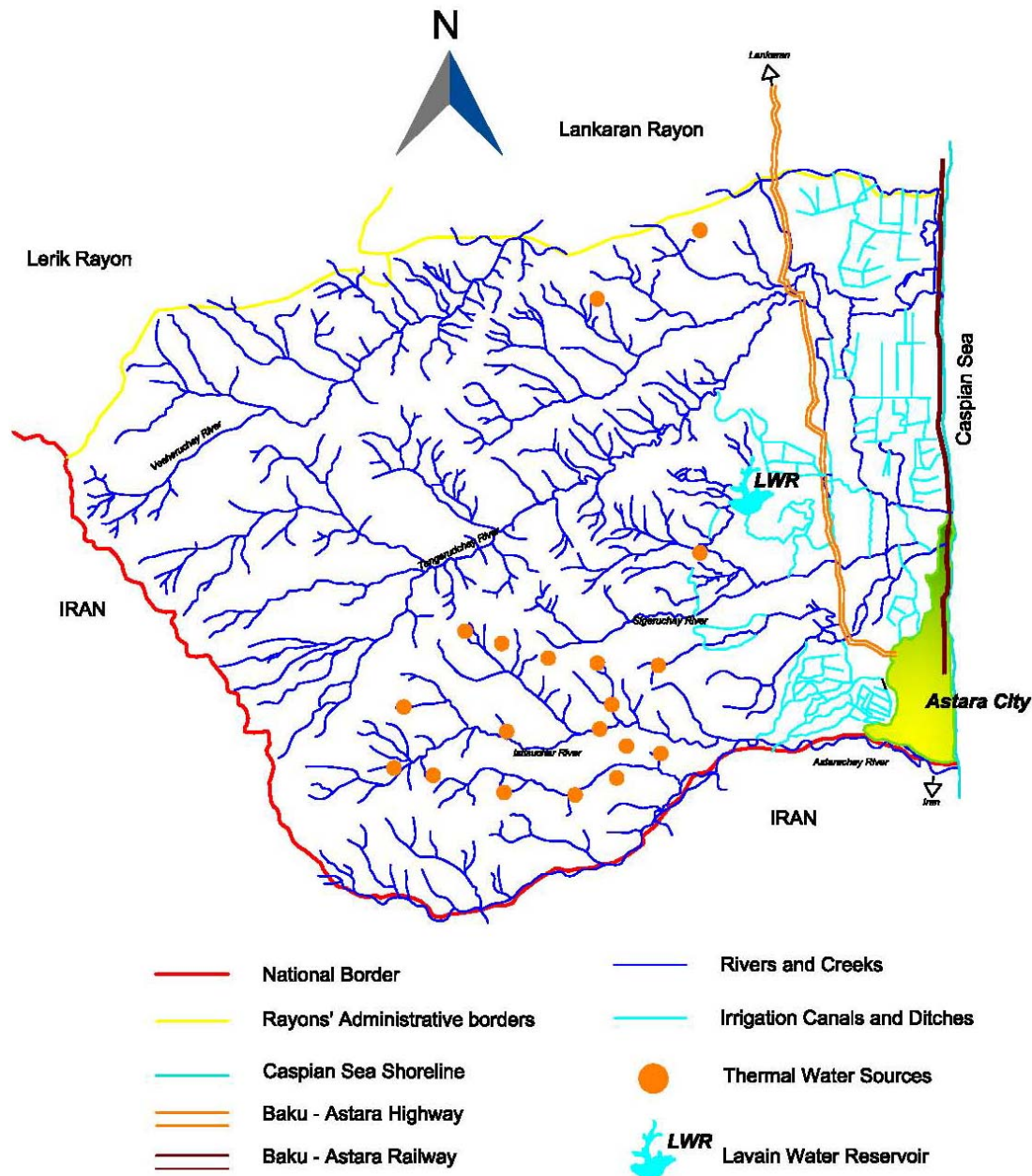


Figure 3,2, Hydrography in Astara Rayon

Caspian Sea

The Caspian Sea is the largest closed inland water body in the World with a current surface of more than 400,000 sq km and avolume of 78,000 cum. The Caspian Sea consists of brakish water. The level of the Sea is currently 27 m under the mean level of oceans. The maximum depth of Sea is 1025 m, and the average 184 m.

The Sea is mainly fed by Volga river in the north and other main river of the western bank, including the Kura river in Azerbaijan. The rainfall contributes only for 20 % of the total water input of the Caspian Sea. The salinity of the Caspian Sea is at about 13 g/l, except in the northern part where the dilution due to discharge of the Volga river reduces the salinity down to 5-10 g/l.

The rayon has approximately 22.3 km coast line of the Caspian Sea.

The Caspian Sea is subject to complex tectonical influences, which result in fluctuating sea levels and regularly changing shorelines. The rayon also suffered severely from the rising level of the Caspian Sea.

Spring Water and Groundwater

The western and southwestern parts of the rayon area are a typical mountainous mid-highland, which is originated from folds uplifted from the Alpine geosyncline. The area, as a part of Talish range, is formed chiefly of deposits laid down about 50 million years ago during the downwarp episode of the geosyncline.

Since the mountain slopes are mainly steep and amount of waters of rainfall and melting snow flow through the surface and create plenty of tributaries, these waters become captured by forests and transferred to grounds. The water appear at the surface like small springs in mid highland and lower elevations of eastern Talish range. Intensive use of ground water is widespread almost in two to three of rayon area both for irrigation and drinking purposes. The most famous spring in the area of rayon is Sim which is sourced from folded structure of the Talish east inclination nearby Sim village. The flow rates of this spring water source varies between 50-60 l/s, and joins Tengeruchay river at the lower levels of Palikash village.

Intensifying land use, lack of sanitation, and the use of agrochemicals are a threat to the quality of groundwater as the soils are highly permeable and the groundwater is directly exposed to infiltration from the surface. This is one of the major concerns in the rayon.

Mineral water sources in the Talish zone have TDS content ranging from 0.5 up to 7.4 g/L. Water temperature in some sources reaches 51-74°C (Alakhbarov, Adishirin B.).

The thermal springs are densed in Astara rayon of Talish range's east inclinations. The mineral water gushes from the ground at 69 degrees Celsius. Mineral baths are used to treat pains in the joints and muscles, and skin, gynaecological and many other problems.

Thermal sulphide, chloride, sodium-calcium waters of the Thermal Springs are situated 60-70 km to the west from the city. The well known thermal springs in the rayon form Istisuchay, which is sourced from the thermal Springs in the Shandanqalasi mountain (1816 masl) nearby Iran border. The river joins Astarchay river nearby Alasha village.

Surface Waters

The surface flows start to decline from the southeastern and eastern slope of the Talish range (1800-2200 masl). Due to the orographic specifications of the Talysh mountains, the flow is inconsistent with the average height. It decreases with the increase of altitude in the mountainous area, it rises with Talish mountains declines.

Accordingly, Astara rayon is rich in respect of spring water and surface water source network at the mountainous area. Fresh groundwater are widely spread, their numerous outcrops are captured and are used for water supply and irrigation both for homestaed of inhabited localities (villages) and irrigation for relatively limited agricultural lots. All rivers are sourced from the highlands and mid-highlands of the Talish ranges.

The main surface water in the rayon is Astarachay, Tengeruchay, Istisuchay, Penserchay, and Veshерuchay rivers, which are born from Peshteser range of Talish mountains and falls to Caspian Sea. However, only Astarachay, Tengeruchay, and Penserchay rivers flow directly to Caspian Sea. Istisuchay is a branch of Astarachay river, and Veshерuchay joins Lankaranchay river in Lankaran rayon. The other surface waters (Sigeruchay and Kulerichay rivers) are sourced from the mid-highland of Talish eastern inclination, and travel relatively in a short distance in the Lankaran lowland. These surface water bodies feed a big part of the Astara irrigation network, and fall to Caspian Sea. Apart from these rivers, few small ones sourced from numerous springs at the bottom of Talish eastern anticlinal highland feed the Lavain Water Reservoir (Lovaysherudchay river).

Surface Water Characteristics in the Rayon

Specifically for the purposes of this Project, Tengerudchay and Istisuchay rivers' hydrographic characteristics are examined. In addition, the rivers' flow characteristics and water quality are assessed in a separate Annex (Annex-3) for helping the decision –making process to the Project proponents.

Tengerudchay River

The Tengerudchay is sourced from the several springs at the highlands of the northwest declivities of Shandanqala mountain (1620 masl). The river travels northeasterly up to Caspian Sea. Its length is 36 km, the basin area 239 square km. A 21 km upstream of the river travels at a mid highland zone up to Vanashikash village. A section of approximately 6.2 km of the river basin falls into the Hirkan National Park from Vovoda to Vanashikash village in the area of Astara rayon. The rest 11 km section of the river travels in the Lankaran lowland northeasterly. The main branches of the river are Siyakuchay and Pelikeshchay rivers which join Tengeruchay nearby Pelikesh and Siyaku villages.

The river has a flooded regime. The Tengeruchay river is fed mostly by several springs (5 %) along its basin, storm water (70 %), partially subsurface (20%), and snow (5%) in its upstreams.

The Tengeruchay flow was routinely measured on four Hydrometeorological Stations (HS), which are Vaqo in Astara rayon, Riqnakesh, and Sim in Astara rayon. Vaqo Hydrometeorological Station is being operated since 1938, Riqnakesh HS was operated from 1963 to 1995, and Sim HS from 1960 to 1962.

The annual average water flow is 37.06 cum/s. Its 30% passes in the spring, 10% in the summer, 40% in the autumn, and 20% in the winter. However, at its low streams in Lankaran lowland, surface run-off from the atmospheric precipitation (70-75 %) and sub-surface lateral inflows (20-25 %) play the main role in its flow volume.

There is no water reservoir on its upstreams for flood control, irrigation purposes, or water supply. However, the huge volume of water of the river is used in Astara irrigation scheme connecting Penserchay – Caladahna canal network after Lelekepeshte village. The river falls into Caspian Sea nearby Shahagach village. Unfortunately, no information exist that how many volume of river's water is diverted for irrigation purpose.

The river's water is being tested routinely by MENR of Azerbaijan. According to the test results obtained from MENR for 2010, the total mineralization of river's water varies between 467.4 (in February) and 684.1 (in June) mg/l in Vaqo level. DO levels vary between 6.94 mg/l (in June) and 7.91 mg/l (between Feb. and April), and TSS between 4 mg/l (in February) and 69 mg/l (in June) at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

A separate water sampling campaign is conducted on the surface waters of Tengerudchay river obtained from this section by the Feasibility Consultant. The water sampling campaign with the surface water of Tengerudchay river has been completed in September 27, 2010.

According to test results of this water sampling campaign, the pH value of the river's water is 7.71. Although, a slight increase is observed in the pH value (7.71) of samples tested, it is between the limits of the standards prescribed by Gost and EU 98 and WHO standards. No undesirable odor and unacceptable taste is detected in the samples. The samples have higher value (4) than the standard (1.5) prescribed by GOST. TSS value of the samples is <1, and the measured hardness value as mg CaCO₃/l is 90. However, the hardness of the raw water is appropriate for drinking water. Detected Iron and Manganese values as mg/l in the samples are 0.0779 mg/l (iron) and 0.0193 mg/l (Mn). These values are well below the standards prescribed by Gost and EU 98. Detected values of the major cations in the river's water are 2.13 mg/l of Mg, 17.25 mg/l of Ca, and 15.4 of Na. These values are well below the standards prescribed by Gost and EU 98. Detected values of Nitrite (NO₂) and Nitrate (NO₃) in the samples are 0.009 mg/l (NO₂) and 5.8 mg/l (NO₃) which are well below the standards

prescribed by relevant standards. Detected values of Sulphate (SO₄), Chloride and Fluoride in the samples are 63 mg/l (SO₄), 1.5 mg/l (Cl) and 0.66 mg/l (F) which are well below the standards prescribed by relevant standards.

Number of colony per each ml at 22°C is 140, and 105 at 36°C. Number of Enterococi per each 250 ml is 20, and Escheria coli per each 250 ml is 11 in the river water. Number of Coliform Pathogenes per each 100 ml is 38, and Clostridium Perfiringens per each 100 ml is 22.

The test results show that the surface water of Tengerudchay river is highly contaminated by the Enterococs and other microbial indicators because of breeding of stocks and grazing activities at the upstreams of river.

The river water tested is fully in compliance with the limit values defined in the EU standards for the other physical, chemical and organic parameters.

The comprehensive information is given in Annex-3 on the Tengeruchay river's flow characteristics.

Istisuchay River

The river is sourced from the several springs at the highlands of the northwest declivities of Almband mountain (1400 masl), and it join Astarachay river nearby Alasha village at about 100 masl. Its length is 18 km, and its basin area 60 square km. It runs through westeast inclination of Peshteser range up to Astarachay river. The average slope of its basin is 7.2 %. The Istisuchay flow is being measured on Istisuchay-Alasha Hydrometeorological Stations (HS) since 1941.

The annual average water flow is 17.12 cum/s. Its 26% passes in spring, 8% in summer, 44% in autumn, and 22% in winter. The Istisuchay river is fed mostly by storm water (76 %), partially subsurface (18%), and snow (6%) at its upstreams.

The river's water is being tested since 2006 routinely by AWM OJSC. According to the test results obtained from AWM OJSC, the total mineralization of river's water varies between 144 and 426 mg/l in Alasha level. BOD₅ levels varies between 0.80 mg/l and 6.78 mg/l, and COD levels between 2.4 mg/l and 14.1 mg/l at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

The comprehensive information is given in Annex-3 on the Istisuchay river's flow characteristics.

Lavain Water Reservoir (LWR)

The reservoir is completed in 1962, this reservoir, which is justified on a seasonal basis, storing 6.3 million cum behind a dam wall height of 7.5 m with crest length of 2 km. The reservoir is mainly fed by Lovaysherudchay river and few springs, and its water is used for irrigation. The reservoir has a surface area of 0.9 sq km. Water is delivered to the irrigated areas with the discharge canals. The reservoir was planned to retain irrigation water for 3,000 – 5,500 hectares irrigated land, however, the actual scheme has rarely reached up to this capacity for several years.

The reservoir's water is being tested since 2004 routinely by AWM OJSC. According to the test results obtained from AWM OJSC, the total mineralization of reservoir's water varies between 151 and 460 mg/l in Astara scheme's right entrance. BOD₅ levels varies between 0.50 mg/l and 6.78 mg/l, and COD levels between 1 mg/l and 14.1 mg/l at the same point. However, the test results show that the reservoir's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

Preferred Raw Water Source and Catchment

The Feasibility Consultant and Beneficiary (AWM OJSC) envisage for using of surface water which will be diverted from Tengeruchay river nearby Sipiypart village, to provide the raw water for the water supply system of Astara city. The surface water diverted from the river will be treated in a WTP to be

located in front of Burzuband village. The treated water will be conveyed to Astara city by a 10.5 km of gravity transmission main.

Water Balance of the Proposed Catchment (Tengerudchay)

In most of the smaller rivers (such as Tengerudchay river), habitat/flow relationships are linear, so that the flow that retained two-thirds habitat at median flow is two-thirds the median flow, or approximately 30% of average flow (Tennant, 1976). 30% of average flow or higher provides average depth and velocity, and is considered to be in the good to optimum range for aquatic organisms.

In Astara case, water planning quantitative evaluations of 'Ecological Flows' considered as minimum instream flows are patterned with limnological and hydrogeological knowledge of the proposed catchment on the course of Tengerudchay river. We generally select as an indicator a large native fish species of the stream reach that is at the top of the trophic pyramid (trout, barbell, salmon, nase). However, this section of Tengerudchay river has the torrential stream; it does not naturally sustain much fish species up to Lankaran lowland. As this situation does not predict fish densities or biomass, we are interested only in the physical habitat that is controlled by instream flows.

Because of this reason, the water balance for this section of Tengerudchay river is examined from the perspective of required minimum ecological flow (30 % of average flow of the river) for the aim of this Project. Quantitative instream flow method is used patterning the results of international investigations for the required ecological minimum flow balance.

The following figures are assumed as the worse case scenario for the section of the proposed raw water catchment on the Tengerudchay river course, and those are as follows;

- Minimum required ecological flow (30 % of average flow of the river) is $1600 \text{ l/s} \times 0.30 = 480 \text{ l/s}$ see Table 4 of this Annex.
- Water Supply Requirement of Astara by 2030 is **65.85 l/s**, see Chapter 2, Table 2.6.
- Surplus flow after meeting the requirement of water supply and minimum required ecological flow is $(480 + 65.85 - 1600) = 1054.15 \text{ l/s}$.

Accordingly, constructing a diversion unit to divert the required raw water at this section of Tengerudchay river will disturb neither the river's ecological environment nor natural flow of the river.

Drinking Water Quality Standards

The National Drinking Water Quality Standards of Azerbaijan will be used as drinking water quality standards for this project. However, the treated water should comply with the EU Directive 98/83/EC, and the parameters is given in Annex-3. EU Council Directive 98/83/EC conducts the frequency of water quality samplings stipulating methods in its annexes (see, Article 6 -Point of Compliance- and Article 7 -Monitoring- and the related Annexes, e.g. Annex II, Table A -Parameters to be analyzed- and Table B1 -Minimum frequency of sampling and analysis for water intended for human consumption supplied from a distribution network).

For instance, according to the volume of water distributed in Astara:

- Check monitoring number of samples per year: 12 (= 1 + 3x4)

Table 3.7: National drinking water quality standards

Parameter	STANDARDS
pH	6.0-9.0
Turbidity	1.5 mg/l
Microorganism (Colonies are formed in 1 ml test water)	<100
Coliform Bacteria (coliform index), intestinal bacteria formed in 1 litre	<3
Nitrates (NO ₃)	45 mg/l
Nitrites (NO ₂)	3 mg/l
Clorides	350 mg/l
Phosphates	1.0 mg/l
Sulfates (SO ₄)	500 mg/l

Total hardness	7 mmol/l
Remained Chlorine	0.3-0.5
Al	0.5 mg/l
As	0.05 mg/l
Fe	0.3 mg/l
Ni	0.1 mg/l
Cr (Cr6+)	0.05 mg/l
Cu (Cr2+)	1 mg/l
Zn	5 mg/l
Cd	0.001 mg/l
Pb	0.03 mg/l
Hg	0.0005 mg/l

The comparative tables from the perspective of National and International standards both for drinking water and effluent discharge quality are given in Annex-3, which is also included comparative data for drinking water quality of existing water resources.

3.4.3. Climate

Its climatic diversity is caused by the complicate geographical location and landscape, the proximity of the Caspian Sea, the effect of sun's radiation, air masses of different origin and etc. The formation of climate in Region is influenced by cold air masses of arctic (Scandinavian anticyclones), temperate (Siberian anticyclones) and maritime (Azores maximum), hot air masses of tropical zones (subtropical anticyclone and southern cyclones), and Central Asian anticyclones and local weather conditions.

Climate of Lankaran lowland is humid-subtropical. A severe snowy winter occurs rarely in the Lankaran Lowland. Summer is dry and hot, and autumn is rainy. Annual average temperature is (+) 14.2 °C. January is the coldest month (+4.3 °C), and July is the hottest month (+24.5 °C) of year. The region is covered with green livery of spring.

Precipitation increases with altitude till a definite height in Talish mountains (200-600) meters then gradually declines. The maximum annual precipitation in the mid highlands area is 1700 – 1800 mm, and the volume of precipitation declines with altitude.

However, in the lowland it varies between 1200 and 1400 mm. While the maximum rainy days are observed in autumn, minimum precipitation occurs from June to July. The Project area falls entirely into this climatic zone.

Plains and foothills are characterized by high solar radiation rates. The sun is bright for 2000 - 2500 hours a year, as registered in June. The total annual radiation equals 125-134 kilo calories per 1 sq. cm. Due to the subtropical climate, there is higher precipitation in Astara than in other parts of the region.

Annual Relative Humidity in Talish region's mountainous area is 50 – 55 % in summer time, and it reaches on the Caspian seashore (70-82%). The relative humidity is minimal through winter months in the highlands of the region. Annual absolute humidity varies between 7.2 and 22.7 mb. Maximum absolute humidity occurs 22.1-22.7 mb in July and August. Minimum absolute humidity occurs 7.2-7.4 mb in January and February.

Possible evaporation is distributed 900-1000 mm depending on the heights 200-800 masl. Annual precipitation is 50-70% of possible evaporation.

The regime and allocation of cloudiness are connected with air circulation and the orography of the area. The cloudiness is maximal in mid highlands and at foothills (200-800 meters). Annual average cloudiness constitutes 7.4 % of a year (27 days).

Table 3,8; Climate in the Rayon

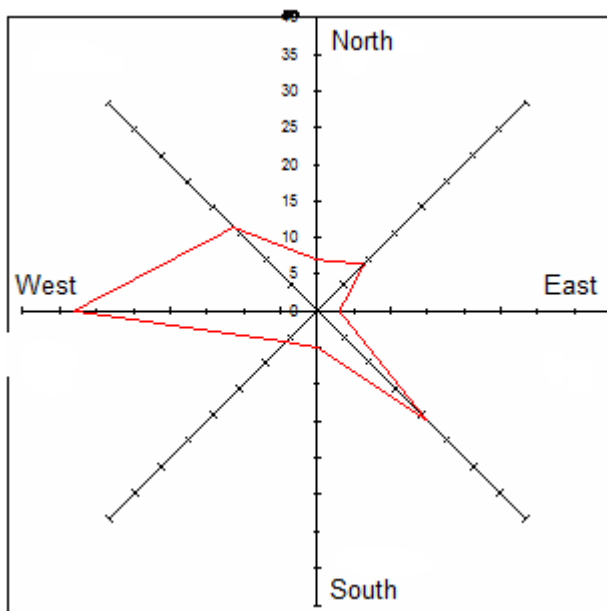
Parameters	Months												Annual Average
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Temperature, C°													
a)Average	5.1	5.1	7.4	12.2	17.7	22.3	25.2	24.6	21.3	16.2	11.6	7.6	14.7
b)Absolute max.	24	29	30	30	33	34	36	36	36	35	32	30	36
v)Absolute min.	-13	-11	-6	0	4	7	12	12	9	1	-3	-11	-13
q)Average max.	7.4	8.2	10.3	14.5	20.9	25.8	28.8	28.5	24.6	19.9	14.2	10.0	17.8
d)Average min.	1.4	2.4	4.3	8.4	13.8	17.3	19.9	19.7	17.2	13.1	8.2	3.9	10.8
Precipitation,mm	98.1	95.2	111.5	63.2	51.0	45.7	33.3	82.5	198.6	274.1	155.2	105.8	1314
Average wind speed,m/s	3.1	3.0	2.8	2.8	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.8
Days (Average wind speed ≥15 m/s)	1.8	2.0	1.3	0.7	0.5	0.5	0.2	0.3	1.0	0.9	0.7	1.1	11
Absolute humidity, mb	7.2	7.4	8.5	11.5	16.4	19.8	22.1	22.7	20.4	15.9	11.5	8.3	14.3
Relative humidity, %	82	83	85	84	81	74	70	73	82	84	86	84	81
Humidity deficiency, mb	1.8	1.7	1.7	2.5	4.2	7.6	10.0	9.1	5.0	3.0	1.9	1.9	4.2

Source: Meteorological Department of Astara.

Winds

Strong winds are less frequent in the rayon and Project corridor. According to information of the Meteorological Department of Astara, average annual wind speed equals 2.8 metres per second in the rayon. The winds in rayon that are the southeasterly (30%) and northwesternly (36%), prevail. The number of days of which are windy more than 15 m/s in speed, varies between 20 and 39 days in a year.

Wind speeds as well as diurnal and seasonal patterns vary considerably along the Project corridor. The following Table and Figure 3 show the speeds and directions of wind systems according to the yearly patterns;

**Table 3,9: Wind Directions**

Wind Direction	%
North	7
North -East	8
East	4
South-East	20
South	5
South-West	6
West	32
North-West	17

Figure 3,3: Wind Rose, Astara Rayon (Source: Astara Meteorological Station)

3.4.4. Soil

The Project corridor section between Astara city and SWDU contains soils that are plain-forest, grey, brown, meadow-salinized grey soils, boggy and sandy soils are widespread. See **Exhibit 3,1 and 3,9**.

A peculiar type of soil, yellowish, is distinguishable in the Talysh and Astara regions. This soil forms in a warm and humid climate and the red and yellow color in this soil comes from iron and aluminum dioxides left behind after rains have washed away other dissolved materials.

The soils at the Project corridor are very heterogeneous. The most important soils in the area are humus carbonate soils (Rendzinas) as well as podzolized yellow, gley and alluvial soils (MENR 2004).

For a summary of soil characteristics, see table below;

Table 3,10: Common Soil Types in the lowland

Group	Soil Type	Density	Salinity	Porosity	Alkalinity	Clay	Gravel
1	Podzolized yellow-gley	Medium	medium	medium	medium	medium	90-120 cm
2	Clay-Marshy Mountain	Medium	weak	medium	medium	medium	70-90 cm
3	meadow-yellow, grey-brown	Low	medium	medium	medium	Low	30-40 cm
4	Pseudo-podzolized yellow meadow	Medium	medium	Very low	Medium	Low	Small gravelit

As the standards and guidelines for the maximum allowable concentrations (mg/kg) of the heavy metals and other pollutants in the soil, National Quality Criteria for Soils and National allowable heavy metal concentration standards will be used for the proposed Project, which are on table below;

Table 3,11: National soil quality criteria

Pollutants	Quality criteria mg/kg	Upper limits mg/kg
As	20	20
Cd 2+	0.52	52
Cl	500	1000
Cr 6	20	-
Cu 2+	500	500
Pb 2+	40	400
Hg 2+	1	3
Ni 2+	30	30
Polyaromatic carbohydrogene	1.5	1.5
Benzyl (a)piren	0.12	0.12
Dibenzyl (a,h)anthrasite	0.12	0.12
Zn 2+	500	1000

Table 3,12: National allowable heavy metal concentration standards in soil

Heavy metal Elements	Max. Allowable Concentrations mg/kg
Pb 2+	10
Mn 2+	1500
Ni 2+	40
Co 2+	10
Zn 2+	50
Cu 2+	20
Cd 2+	0,5
V 5+	150
Cr	200
Sn 4+	10
Mo 6+	3
Hg 2+	2,0
Oil	100

3.5. Ambient Air Quality

Air quality refers to the condition of the atmospheric environment. This is measured through the concentrations of pollutants and the impacts they may have on human health and the environment. An important aspect of air quality for construction operations is dust generated from sources such as empowered construction vehicles using unsealed roads, blasting, and excavation activities.

Dust

Dust particles individually are not visible to the human eye, although a high concentration of fine particles may appear as a haze or smog.

Dust is typically classified as follows;

- TSP - Total Suspended Particulate Matter (TSP) all dust (particles suspended) in the air.
- PM₁₀ - Particles with a diameter less than 10 microns (0.01 mm). Particles in the size range 2.5 µm to 10 µm in diameter are referred to as coarse particles (PM_{2.5-10}).
- PM_{2.5} - Particles with a diameter less than 2.5 microns (0.0025 mm) (a subset of both PM₁₀ and TSP categories). These are referred to as fine particles and are mainly produced from combustion processes such as vehicle exhaust.

Any dust that falls out of suspension in the atmosphere is called deposited dust. Larger or heavier particles are deposited more readily than small or lighter particles.

Dust levels in the air are commonly measured in two ways;

1. **Concentration**, the weight (in micrograms) of dust in one cubic metre of air (µg/m³). Dust as TSP, PM₁₀ and PM_{2.5} can be measured in this manner.
2. **Deposition rate**, the weight (in grams) of dust falling on one square metre over time and is usually expressed as mg/m²/day.

Dust is characterized as encompassing Particulate Matter (PM) with a particle size of between 1 and 75 microns (1 – 75 µm). Deposition typically occurs in close proximity to the source and potential dust impacts may occur within 500 m of dust generating activity as dust particles fall out of suspension in the air. Larger particles deposit closer to the generating source and deposition rates will decrease with distance from the source. Particles which are deposited to ground may raise to problems such as soiling of buildings and other materials and general nuisance. Construction activities are likely to generate some dust emissions, depending on the construction dust mitigation measures adhered to on the particular site.

Nuisance dust usually has a particle size larger than 10 microns and tends to be trapped in the nose, mouth, throat or upper respiratory tract and are typically expelled from the body. However, high levels of nuisance dust may reduce visibility and amenity. The presence nuisance dust can also cause a perceived increase in health risk.

Visible dust is usually due to short-term episodes of high emissions, such as from blasting. Other amenity impacts include dust depositing on fabrics (such as clothes washing), or on household surfaces including roofs.

Particulate Matter less than 10 micrometers in size (PM₁₀) can penetrate deep into respiratory system increasing the risk of respiratory and cardiovascular disorders. PM₁₀ arises from direct emissions of primary particulate such as black smoke and formation of secondary PM in the atmosphere by reactions of gases such as sulphur dioxide and ammonia. The main sources of primary PM₁₀ are incomplete burning of fossil fuels such as coal, oil and peat and emissions from road traffic, particularly, diesel engines. Other sources of particulates include re-suspended dust from roads. Natural PM includes salt and organic materials such as pollens.

3.5.1. Ambient Air Quality Standards

International Air Quality Standards

The EC Directive 1999/30/EC of April 22, 1999 establishes limit values and alert thresholds for SO₂, NO₂, Particulate Matter (PM₁₀) and lead in ambient air intended to "avoid, prevent and reduce harmful effects on human health and environment as a whole". The annual and daily limit values given in the Council Directive 1999/30/EC are in the following table;

Table 3,13: Limit Values of Directive 1999/30/EC

Pollutant	Limit Value Objective	Averaging Period	Limit Value $\mu\text{g}/\text{m}^3$	Basis of Application of the Limit Value
PM ₁₀	Protection of Human health	24 hours	50	Not to be exceeded more than 25 times in a calendar year
	Protection of Human health	Calendar year	40	Annual Mean
SO ₂	Protection of Human health	24 hours	125	Not to be exceeded more than 3 times in a calendar year
	Limit Value for Protection of Eco-system	Calendar year and Winter (October 1 to March 31)	20	Annual Mean
CO		8 hours	10.000	Maximum Daily
		1	200	Hourly
NO ₂	Protection of Human health	Calendar year	40	Annual
Lead	Protection of Human health	Calendar year	0.5	Annual

Air quality standards of USEPA and WHO related to CO, NO_x, SO₂, and PM₁₀ are given in the following table for a comparison.

Table 3,14: Air Quality Standards of USEPA and WHO

Pollutant	USEPA		WHO	
	Standard	Averaging Time	Guideline	Averaging Time
CO	35 ppm	1 hour	35 ppm	1 hour
NO _x	53 ppb	1 hour	106 ppb	1 hour
SO ₂	140 ppb	1 hour	134 ppb	1 hour
PM ₁₀	150 $\mu\text{g} / \text{m}^3$	24 hours	70 $\mu\text{g} / \text{m}^3$	24 hours

Notes:

'ppm': Parts per Million equals to $\text{mili g}/\text{m}^3$

'ppb': Parts per Billion equals to $\text{micro g}/\text{m}^3$

' $\mu\text{g}/\text{m}^3$ ': Micro gram per cubic meter equals to micro gram per square meter for PM.

National Air Quality Standards of Azerbaijan

National Ambient Air Quality Standards of Azerbaijan is given on the table below;

Table 3,15: National Ambient Air Quality Standards

Pollutants	Maximum Allowed Concentrations (mg/m^3)	
	Maximal Concentration for a given moment	Average daily concentration
Dust	0.15	0.06

3.25

Carbonic Oxides (CO)	5.0	3.0
Sulphur Dioxide (SO ₂)	0.5	0.05
Nitrous Oxides (NOx)	0.085	0.04
Benzole	1.5	0.8
Fluoride Compounds	0.02	0.005
Phenol	0.01	0.01
Non-toxic Dust	0.5	0.15
Soot	0.15	0.05
Formaldehyde	0.035	0.012
Chlorine	0.1	0.03
Hydrogene Sulphide	0.008	0.008
Nitrobenzene	0.008	0.008
Ammonia	0.2	0.2
Acetone	0.35	0.35
Methanol	1.0	0.5
Ozone (O ₃)	0.16	0.03
Hydrocarbon	1.0	-
Lead and its compound (except tetraethyl lead)	0.0010	0.0002

* Source: Maximum allowable concentrations of toxic elements in the working area GOST 12.1.005-88; Ministry and Ecology and Natural Resources of Azerbaijan, 2003.

Criteria applicable to Total Suspended Particulate (TSP)

The annual criterion for Total Suspended Particulate (or TSP) is 90 µg/m³, as recommended by the USEPA Medical Research Council. The construction activities as dust-producing sources, PM₁₀ emission factors borrowed from other industries are generally found to be inapplicable to construction sources. In addition, the observed PM_{2.5}:PM₁₀ ratios (USEPA, AP-42) often fall outside the range of those published for most fugitive dust emission source categories, that is, typically between 0.15 and 0.25.

Alternately, a more conservative value of 6 g/vehicle can also be used for emissions inventory purposes (USEPA, AP-42).

The PM₁₀ particle size fraction is typically of the order of 50% of the TSP mass. The annual TSP criteria is seen to be achieved if the annual PM₁₀ criteria is satisfied.

Criteria Applicable to Particulate Matter less than 2.5 microns (PM_{2.5})

The USEPA references the following criteria for PM_{2.5}:

- A 24 hour maximum of: 25 µg/m³
- An annual average of: 8 µg/m³

Nuisance Impacts of Fugitive Emissions

Nuisance impacts with respect to air quality generally relate to deposited dust. There is no National or EU guidelines for dust deposition.

The Australian National Park and Wildlife Act 1974, impact assessment criteria can be recommended for the Project to avoid nuisance impact from dust fallout are;

- Maximum deposited dust level: 4 gr/m²/month annual average, and
- Maximum increase in deposited dust level: 2 gr/m²/month annual average.

Criteria Applicable to Odor Emissions

The odour threshold defines one odour unit (OU), hence an odour criterion of less than 1 OU would theoretically result in no odour impact being experienced. The following criteria is given as a design criteria, and it should be expressed that there is no individual be exposed to ambient odor levels of greater than 7 OU.

As the population in and surrounding the Project Corridor is predominantly rural and sparsely populated, the Project Odor Performance goal adopted, is;

- 99th percentile 6.0 odour units (OU) expressed as a nose response average (1-second) value.

Table 3,16: Criterion Applicable to Odor Emissions

Population of Affected Community	Odor Performance Criteria (OU)
Urban Area (>2000)	2.0
500 - 2000	3.0
125 - 500	4.0
30 - 125	5.0
10 - 30	6.0
Single Residence (<2)	7.0

Source: USEPA

Dust Deposition

Deposited dust or 'nuisance' dust issue is complex and preception of dust nuisance (e.g. as observed settling on clean surfaces such as window sill and a car body) tends to be subjective. Nevertheless, guideline standards have been adopted as indicated in the following table. The wide variation of in values illustrates the difficulty in assigning meaningful standards for compliance, however, there appears to be general agreement that 'Nuisance' may be experienced at deposited dust levels of about 130 – 200 mg/m²/day.

Table 3,17: Dust Deposition Nuisance Tresholds

Country of Origine	Monthly Mean Value mg/m ² /day	Interpretation
Washington State, USA	187	Residential area treshold for nuisance
Western Australia	133 - 333	Loss of amenity first perceived Unacceptable reduction in air quality
Germany, TA Luft, Vol. 27.2.1986	350 - 650	Below this value, no significant nuisance can be expected (Annual average based on monthly collection – long term), Maximum of the 12 monthly collections - short term
Azerbaijan	150 - 500	Average Daily Maximum allowable concentrations of toxic elements in the working area GOST 12.1.005-88; Ministry and Ecology and Natural Resources of Azerbaijan, 2003.

Emission characteristics depend on several parameters such as vehicle age, engine speed, working temperature, ambient temperature, pressure, type and quality of fuel. The following table lists the emissions of pollutants of leaded fuel and diesel oil, measured for an average vehicle in 1977 by USEPA.

Table 3,18: Emissions from Vehicles

Pollutants	Emissions (g/km/vehicle)	
	Leaded Fuel	Diesel Oil
Nitrogen Oxides, NO _x	1.20	9.2
Carbon Monoxide, CO	39.00	15.0
Sulphur Dioxide, SO ₂	0.08	1.50
Hydrocarbons, HC	2.60	2.90
Particulate Matter, PM	0.40	0.80
Lead, pb ¹	0.064	-

Source: USEPA, 1977.

¹ Diesel Oil does not contain lead.

The Environmental Quality Standards for motor vehicles exhaust and noise are given in the following table;

Table 3,19: Environmental Quality Standards for Motor Vehicles Exhaust and Noise

Parameter	Standart (maximum permissible limit)	Measuring Method
Smoke	40 % or 2 on the Ringleman scale during engine acceleration mode	To be compared with Ringleman chart at a distance of 6 meters or more
Carbon Monoxide	New Vehicle = 4.5 % Used Vehicle = 6 %	Under idling conditions: no dispersive infra red detection through gas analyzer
Noise	85 db(A)	Sound meter at 7.5 meter from the source

Project Air Quality Criteria - Summary

In summary, the specific goals being applied to the Project, which conform to current air quality targets, are as follows;

Table 3,20: Summary Project Air Quality Criteria

PM₁₀	: A 24 hour maximum of 50 µg/m ³ An annual average of 40 µg/m ³
PM_{2.5}	: A 24 hour maximum of 25 µg/m ³ An annual average of 8 µg/m ³
Dust¹	: A maximum average of 4 g/m ² /month Maximum increase in deposited dust level: 2 g/m ² /month annual Average
Odor (OU)	: 99 th percentile 2 OU for Astara city, 6 OU along the pipeline route (1 second value)
TSP (total Suspended Particulate)	: 90 µg/m ³

¹ Dust: Nuisance expected to impact on residential areas when annual average dust deposition levels exceed 3.8 g/m²/month.

Data for the full period of a day or a year could not be collected within the constraints of this study.

3.5.2. Sensitive Receivers in the Project Corridor

Within the Corridor of Impact 1

The domestic premises, hotel, hostel, hospital, clinic, nursery, school, educational institution, office, factory, shop, shopping centre, place of public worship, library, court of law, sports stadium or performing arts centre are considered to be an Air and Noise Sensitive Receiver (ANSR). Any other place with which, in terms of duration or number of people affected, has a similar sensitivity to the air pollutants as the afore listed places are also being considered to be a sensitive receiver, for example, playground, sitting area of parks and promenade.

The identified representative ANSRs are listed in the following tables and the corresponding locations are shown in **Exhibit 3.5**.

Table 3,21: Details of representative Air and Noise Sensitive Receivers in Astara city

Item	ASRs	Nos	Use	Distance from Project boundry (m)
1	Schools	13	Educational Institution	2-20

2	Handicraft Apprentice School	1	Educational Institution	5
3	Music Conservatory	1	Educational Institution	30
4	Day Care	7	Educational Institution	5-20
5	Worship	4	Praying	10-25
6	Administrative buildings	24	Administration	2-20
7	Commercial Buildings	310	Shop, shopping centre, small workshops, restaurants	0-50
8	Clinics	1	Medical Facility	10
9	Hospital	1	Medical Facility	40
10	Hotel	6	Accommodation	10-20
11	Public Hall	1	Conference, Movie theatre	40
12	Museum	2	Exhibition	15-30
13	Cultural Facilities	19	Libraries-Art centers, Cultural house	10-50
14	Movie Theatre	2	Cinema, theatre stage, and conference hall	20-40
15	Sport Hall	1	Sports	25
16	Terminal Building	1	Land Transportation	15
17	Railway Station	1	Railway	30
18	Court of Law	1	Court	35
19	Domestic premises*	3400	Houses-Apartments block	20-90
		3796		

*Source: Feasibility Report

Within the Corridor of Impact 2

There are no domestic premises, hotel, hostel, hospital, clinic, nursery, school, educational institution, office, factory, shop, shopping centre, place of public worship, and cultural and historical heritage is considered to be an Air and Noise Sensitive Receiver (ANSR) in the Corridor of Impact 2 (**Col 2**), see **Exhibit 3.1**.

3.6. Noise Levels

Noise pollution is an environmental and workplace problem. Excessive noise can cause permanent or temporary loss of hearing. Loud sounds affect the circulatory and nervous systems, although the effects are difficult to assess.

The locations included residences, schools, and hospitals in the urbanized areas, situated at a distance between 0 m and 100 m from the edge of the embankments of the trenches, see Table-3,21.

However, noise effected area for open areas is given 300 m from the point source for terrestrial wildlife and immigrant and non-immigrant birds.

Human Response to Noise

Studies have shown that under controlled conditions in an acoustics laboratory, a healthy human ear is able to discern changes in sound levels of 1 dBA. In the normal environment, the healthy human ear can detect changes of about 2 dBA; however, it is widely accepted that changes of 3 dBA in the normal environment are considered barely detectable to most people. A change of 5 dBA is readily perceptible and a change of 10 dBA is perceived as being twice as loud.

A USEPA report identified a 24-hour exposure level of 70 dBA as the level of environmental noise that will prevent any measurable hearing loss over a lifetime. Levels of 55 dBA outdoors and 45 dBA indoors are identified as preventing annoyance and not interfering with spoken conversation and other activities such as sleeping, working, and recreation.

Ground Attenuation

Most often, the noise path between the noise source and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation. Traditionally, the excess attenuation has also been expressed in terms of attenuation per doubling of distance.

For acoustically “hard” sites (i.e., sites with a reflective surface, such as a parking lot or a smooth body of water, between the source and the receiver), no excess ground attenuation is assumed. For acoustically absorptive or “soft” sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), an excess ground attenuation value of 1.5 dBA per doubling of distance is normally assumed. When added to the geometric spreading, the excess ground attenuation results in an overall drop-off rate of 4.5 dBA per doubling of distance for a line source and 7.5 dBA per doubling of distance for a point source.

WHO guideline values for environmental noise in specific environments are given in the following table;

Table 3,22: Noise Environment

Specific Environment	Critical health effect(s)	LAeq (dBA)	Time Base (hours)	LAmx (dBA, fast)
Outdoor living area	Serious Annoyance, daytime and evening,	55	16	-
	Moderate Annoyance, Daytime and evening	50	16	-
Dwelling Indoors	Speech intelibility and moderate annoyance, daytime and evening	35	16	-
Inside Bedrooms	Sleep disturbance, night time	30	8	45
Outside bedrooms	Sleep disturbance – window open, night time	45	8	60

Blasting Criteria

The ground vibration and airblast levels that cause concern or discomfort to residents are generally lower than the relevant building damage limits.

The US EPA nominates building damage assessment criteria as presented in the following table;

Table 3,23: Building Damage Assessment Criteria

Building Type	Vibration Level	Airblast Level (dB re 20 uPa)
Sensitive and Heritage Residential	PVS* 5 mm/s	133 dB (Linear) Peak
Commercial / Industrial	PVS 10 mm/s	133 dB (Linear) Peak
	PVS 25 mm/s	133 dB (Linear) Peak

* PVS: Peak Vector Sum

Typical Noise Environment

Typical noise levels that can be applicable for the Project environment, are shown in the following table;

Table 3,24: Typical noise levels that can be applicable for the Project environment

Common Outdoor Noise Source in the Project Area	Noise Level (dBA)	Common Indoor Noise Source in the Project Area
Large truck pass by at 15 meters	80	Noisy Restaurant and
Chainsaw nearby		

		Garbage disposal at 1 meter
Gas lawn mower at 30 meters and Commercial urban area daytime	70	Vacuum cleaner at 3 meters and Normal speech at 1 meter
Suburban daytime Highway Traffic	60	Active Office environment
Urban Area night time Busy Local traffic Strong Wind in the trees	50	Quiet Office environment
Suburban Night time Distant Suburban Traffic Light Wind in the trees	40	
Quiet Rural Areas Light Wind in the Grass Far Distant Traffic	30	Library Quiet Bedroom at night
Wilderness Area	20	
Most Quiet Remote Areas	10	Quiet Recording Studio
Threshold of Human Hearing	0	Threshold of Human Hearing

Source: CEQA

According to State Ecological Expertise, SEE, 1996, the National Maximum Allowable Noise Levels as indoor criteria will be used in this Project and the corresponding with the international applications in Chapter 6 (Impact Assessment), and those are in the table below;

Table 3,25: National Maximum Allowable Noise Levels

Land Use	Noise Standard (max) in decibel (dbA)	
	Daytime (07:00-23:00)	Nighttime (23:00-7:00)
Residential Areas	40	30
Commercial Areas	55-60	55-60
Hotels and Dormitories	45	35
Industrial Areas		
a) Highly qualified workplaces	50	50
b) Permanent workplaces within territory or buildings of plants	80	80
c) Workplaces of track drivers and service	70	70
d) Workplaces of drivers and service for tractors and other equivalent agricultural and melioration mechanisms	80	80
Sensitive Areas		
a. Hospitals and sanatoriums	35	25
b. Schools, libraries and conference halls	40	40

* Source: Noise Standards GOST 12.1.003-83 UDK 534.835.46:658.382.3:006.354; Gost 12.1.036-81 ST SEV 2834-80

3.7. Ecological Resources

Azerbaijan can be divided into the following seven ecosystem complexes, all of which contribute to the large diversity of this small country;

1. Forest ecosystems,
2. High mountain ecosystems,
3. Dry mountain scrubland ecosystems,
4. Steppe ecosystems,
5. Semi-desert ecosystems,
6. Wetland and

7. Coastal ecosystems.

The official data indicate that forests covered about 12% of the country's territory. The distribution of forested areas is very uneven. The Minor Caucasus 34.2%, the Talish Mountains 14.5%, the Kura Araz lowlands 2.5%, and the Nakhchivan Autonomous Republic 0.5%. The forests have been under serious pressure as a source of fuel for heating, timber products and as forest pastures for the numerous privately owned herds of cattle and other livestock.

A separate biological investigation in and nearby the Project corridor has been conducted by two local Ecological NGO's experts (Ilyas Babayev, the Chairman of the Protection and Ecology of Birds Society (PEBS), Local NGO, and Sujaadin Guliyev, Dr. on Biology) specific for the Project. According to result of this investigation, no endemic species, including aquatic and terrestrial, have been identified in or nearby the Project corridor, see Annex-5.

3.7.1. Vegetation

Marshy territories are widely spread in the territory of the Talysh plain. There are marshes with predominant *Potamogeton pectinatus*, *Myriophyllum spicatum*, *Trapa hyrcana*, *Ceratophyllum demersum*, *Iris pseudocorus*, *Sparganium erectum*, *Heleocharis eupalustris*, and others. Short plants in drying marshes scattered all over the plain are typical. Among them the most widely spread are *Ranunculus ophioglossifolius*, *Buschia lateriflora*, *Lippa nodiflora*, *Mentha aquatica*, *Polygonum minus*, *Alisma plantago*, etc.

The littoral and sandy coastal soils are habitats for *Artemisia arenaria*, *Artemisia scoparia*, *Convolvulus persicus*, *Melilotus caspius*, *Astragalus hyrcanus* and ephemeral plants.

Landscape Characteristics

The Talish Mountains were folded up primarily during Tertiary time. The relief was formed entirely by erosion processes without any signs of glaciation. The Lankaran plain and the adjacent terraces are the result of the abrasive-accumulating activity of the Caspian Sea, due to past sea level changes.

The landscape rises slightly over several lower ridges up to the high mountain region near the Lerik and Iran borders. Numerous rivers run down to the Caspian Sea by crossing the folded structures and cutting deep, narrow valleys. River dynamics are characterized by two discharge peaks: one in autumn and one in spring, after snowmelt. The highest peak is Qizyurdu mountain at 2455 masl in the region.

The vegetation represents a relict of the arcto-tertiary forests and comprises, in comparison to other European deciduous forests, a very rich flora of woody. Farther uphill, the colline to montane belt is dominated by hornbeam (*Carpinus betulus*) and Chestnut-leaved Oak (*Quercus castaneifolia*), partly interspersed with Velvet Maple (*Acer velutinum*), *Parrotia persica*, *Zelkova carpinifolia*, Date Plum and *Gleditsia caspica*.

Despite the forests being very diverse in composition broadleaf forests are generated mainly by pistachio, oak and hornbeam (also called ironwood). Eldar pine (*Pinus eldaricas*) growing in xerophite conditions, mainly in new and humid pistachio forests consisting of *Taxus baccata* in combination with broadleaf species or in the form of small forests exist around Hamazat village of the Lerik.

The foothill plains of Talish ranges are mainly covered with annual and perennial xerophytic plants and bushes at a height from 200 meters up to 600-700 and sometimes even 1200 meters. Among relict and rare trees of Tertiary period iron-tree, Lankaran acacia, chestnut-leaved oak, zelkova, Caucasus date palm, box-tree, wing nut, Hirkan fig-tree, Hirkan birch-tree, etc are rare patterns of nature.

The montane belt, starting at about 800 masl, is dominated by Oriental Beech (*Fagus orientalis*), which is accompanied by alder (*Alnus subcordata*) and maple (*Acer velutinum*), mainly on slopes with northern exposure.

Forests

The Forestry Code (established in 1997) defines the State ownership of forests. Per definition, the Forestry Development Department of the MENR is the central authority for forest management.

The mountain forest occurs at elevations between 500 and 2,500 m and generally consists of Oriental Beech (*Fagus orientalis*), hornbeam (*Carpinus orientalis* and *Carpinus betulus*) as well as several species of oak. There is a 37,000 hectares forestry land in the mid-highlands of Talish mountains at about 200-800 masl west and southwest of the rayon. However, no part of the Project corridor falls into the forest zone.

High Mountain Ecosystems

The greatest diversity of plant species is found in the subalpine areas between 1,900 and 2,500 m. The herbaceous vegetation of the high subalpine meadows shows a unique species composition and diversity in this section of Talish Range. The upper treeline of this subalpine zone is dominated by shrub birches, the preferred habitat of e.g. the Caucasian Black Grouse. Interspersed with woody scrubland can be found on the high mountain range, such as species of Aconitum, Cicerbita, Delphinium, Heracleum and Senecio.

However, no part of the Project corridor and rayon area fall into the high mountain eco-systems area.

Dry Mountain Shrubland Ecosystems

There is no dry mountain shrubland section within the rayon area.

Steppe Ecosystem

In the glades of the middle and upper mountain belts (i.e. treeless areas) and in the east of Burovar and Peshteser inclinations, there are steppes and stopped meadows characterized by various composition and formation under biological conditions in the west and southwestern slopes of glades. However, no part of the Project corridor and rayon area fall into the Steppe Eco-system area.

Semi-Dessert Ecosystem

Semi-dessert eco-system mainly appears along with the highest hills of Peshteser (Zuvand) and Burovar ranges dominating in northern belt, and this belts do not reach up to westernly highlands of Astara rayon.

Wetland

Wetland functions are the physical, biological and chemical processes occurring within a wetland, including:

- nutrient cycling,
- maintaining the local and regional ground and surface water regime (hydrological balance), through regulating water quality and quantity,
- removing nutrients, pollutants, sediment and some pathogens (wetland plants and sediments have this ability, though finite),
- storing rain and flood waters,
- mitigating climate change by absorbing carbon.

Rayon's eastern part lies along the Caspian Sea, which is the largest inland water body of the World. The rayon has approximately 22.3 km coast line of the Caspian Sea. Astara city has a 9.6 km of coastal ecosystem along the shoreline of Caspian Sea.

Only, this shoreline in front of the city falls into the Corridor of Impact 2 (**Col 2**), however, no part of the Corridor of Impact 1 (**Col 1**) falls into this zone.

Waterlands and riverine ecosystem in this region track with a narrow strip along the main rivers and numerous creeks at the western and southwestern parts of the rayon.

The section of approximately 546 m of Kulerichaychay river's valley (see **Exhibit 6,2**) in the northern part of the Astara city and the section of 3.5 km of Tengerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in the Project corridor. This section of the Project corridor refer to the area of land adjacent to a water body, and is called 'riverfront area' for the assessment. This zone is accepted as the riparian buffer corridor, and indicated in **Exhibit 6,2**.

The Project corridor section of approximately 3.5 km of Tengerudchay river valley falls into the area of Hirkan National Park. The river valley in this section provides Hircanian habitats for plant, animal and other wild life species. According to Feasibility Concept, the raw water will be supplied from the Tengerudchay flow channel in the lower levels of Lomin village, and the raw water pipeline will be aligned with the Sim – Astara asphalt paved road up to WTP. Only, catchment facility will be constructed nearby the flow channel of the river, and indicated in **Exhibit 6,3**.

Cultivated Garden Plants

The Astara rayon is an important producer of spring and winter vegetables. Rice, grapes, tobacco, citrus trees and oak woods thrive in the warm climate.

Mainly, irrigated agricultural lots within the Project corridor spread around Astara city, along the treated water transmission main and interceptor sewer.

No agricultural lot falls into the Project impact corridor 1 (**COI 1**), however, 1228 hectares of agricultural land fall into the Project impact corridor 2 (**COI 2**) around the Astara city, along the treated water transmission main and interceptor sewer. See **Exhibit 6,1**.

3.7.2. Nature Protection and Protected Areas

These include the National Parks, wildlife sanctuaries, and game reserves under the control of the Forest Department of Azerbaijan and MENR. Hirkan National Park, and protected Hircanian forest zones are the protected areas in the rayon. See **Exhibit 3,8**.

The region has a vast area of national parks, where a varied fauna and flora is preserved.

Hirkan National Park

The Hirkan National Park which was established in 2004 on the basis of the Hirkan State Reserve which it superseded, on a surface area of 29,760 hectares (297.6 km²), was enlarged in 2008 to 42,797 hectares (427.97 km²). It was enlarged by presidential decree on April 23, 2008 from 29,760 hectares (297.6 km²) to 42,797 hectares (427.97 km²). The Hircanian Forest is regarded as bearing the potential for the recognition as World Natural Heritage Site. Yet, the relevant cluster can only be submitted for approval to UNESCO, together with Iran, where the majority of this forest type remains. For the purpose of including the Hirkan National Park and the Caspian Hyrcanian (Girkan) forests respectively into UNESCO's World Heritage Site list of cultural and natural heritage and Biosphere Reserves Programme, documents substantiated from the scientific point of view have been prepared and introduced to the UNESCO Secretariat by MENR of Azerbaijan.

The ecological and species potential does makes it highly valuable to establish cross-border environmental protection and conservation programmes.

There is a reforestation program of the lowland on a designated non-forested lot which is the only non-cultivated land on the plain, in order to restore the ecology to its previous forested state.

This area preserves many endemic plants species, relicts of the Tertiary period which were not affected by Pliocene and Pleistocene glaciations.

The Caspian Hyrcanian (Girkan) forests account for 150 endemic species of trees and bushes out of 435 species of them. Some endemic tree species are, the Hyrcanian Box Tree (*Buxus hyrcana*), Caucasian Pear (*Pyrus communis subsp. caucasica*), Lenkoran Acacia (*Albizia julibrissin*), Chestnut-Leaved Oak (*Quercus castaneifolia*), Caucasian Oak (*Quercus macranthera*), Caucasian Ash (*Fraxinus angustifolia subsp. oxycarpa*), European Ash (*Fraxinus excelsior*), European Hornbeam (*Carpinus betulus*), Oriental Hornbeam (*Carpinus orientalis*), Oriental Beech (*Fagus orientalis*), Caucasian Persimmon (*Diospyros lotus*), Caspian Locust Tree (*Gleditsia caspica*), Caucasian Alder, (*Alnus subcordata*), Black Alder (*Alnus glutinosa subsp. barbata*), White Poplar (*Populus alba*) Caucasian Wingnut (*Pterocarya fraxinifolia*), Persian Ironwood (*Parrotia persica*), Caucasian Zelkova (*Zelkova carpinifolia*), Butcher's Broom (*Ruscus aculeatus*), Velvet Maple (*Acer velutinum*), Cappadocian Maple (*Acer cappadocicum*), Wych Elm (*Ulmus glabra*), Caucasian Lime Tree (*Tilia dasystyla subsp. caucasica*), Wild Cherry (*Prunus avium*), Wild Service Tree (*Sorbus torminalis*), Sweet Chestnut (*Castanea sativa*), among many others.

Shrub species occurring in the area include the Poet's Laurel (*Danae racemosa*), Hyrcanian Holly (*Ilex hyrcana*), Greenbrier (*Smilax excelsa*), Common Ivy (*Hedera helix*), etc.

Only, a small part of the Hirceanian forest zone (3.5 km) falls into the Corridor of Impact 2 (**Col 2**) along the raw water pipeline between Lomin and Vanashikash villages. However, in this section, the raw water pipeline will be aligned within the RoW of the Sim – Astara asphalt paved road up to WTP. Only, catchment facility will be constructed nearby the flow channel of the river.

3.7.3. Terrestrial Wildlife and Endangered Species

Terrestrial Fauna

Similar to their flora, the Talish Mountains also boast an abundant fauna with 200 species of vertebrates and countless invertebrates, among them many Tertiary relicts and endemics.

Fauna is characterized by several species of reptiles, such as the steppe racerunner (*Eremias arguta*), several endemic subspecies of the lizards (*Agama caucasica* and *Helcioscopus*), and in particular, the sunwatcher lizard (*Phrynocephalus persicus*) and snakes and Large Whip snake (*Eumeces Schnalider Coluber Coluber juglaris*).

Mammalian diversity is mainly made up of small animals such as Caspian White-toothed Shrew, Lesser Horseshoe Bat or the endemic Hirkan Wood Mouse, which are all included in the IUCN or National Red Data Book. Brown Bear, Lynx and Wildcat are common species in the area. The voices of Golden Jackal can be heard all over the territory.

The breeding season of the most terrestrial habitats is from May to June.

The fauna includes Mammals comprised of Lesser whitetoothed shrew (*Crosidura Suaveolens* and *Sorex Mumutus*), eterin hedgehog (*Erinaceus concolor*). See **Exhibit 3,10**.

However, only lesser shrews, fox, golden jackal, water snakes around the water bodies, and caucasian viper, can be seen nearby and around the Project corridor, see **Exhibit 3,10**.

No endemic species occur within the Project corridor, see Annex-5.

Birds

To a large extent, the avifauna of the lower Talish Mountains resembles that of any European broadleaved forest. About 83 species, which include Caspian Tit, Black Stork, Lesser spotted eagle and Ring-necked Pheasant, breed in the forest of Talish mountains.

Many species known from the Great and Minor Caucasus occur here, as well as additional local specialities. In areas with oldgrowth forests, Booted and Lesser Spotted Eagles, Goshawk, Hobby, Honey Buzzard and Black Kite occur. A brood of Shikra was re-discovered here. Where Caucasian Wingnut, ash and maple flank the sides of river valleys at lower altitudes, Black Storks could be recorded. Lesser Spotted Woodpecker is rather scarce and Black Woodpecker only occurs in old and undisturbed stands of beech and oak forests.

Among the birds, Goshawk, Golden eagle, Falcon, and Black Vulture occurs rarely around the project corridor. Goshawk, Golden eagle, and Falcon are included into Red Book of Azerbaijan, and Black Vulture is included into the Red List of International Nature Protection Union. Although, they are encountered around the project area, they occasionally land for feeding. See Annex-5.

No migration path of the migratory bird species gets across the project corridor, see Annex-5.

The breeding season for most bird species is from September to December and April to June. Specifically for the migrating birds, this season is from the end of March to the end of June.

The levels of disturbance along the RoW should be decreased with the mitigation measures.

Endangered species

The Talish subspecies of the Pheasant has strongly declined due to poaching and is now very rare in dense thickets in the lower valleys. Most interesting among songbirds is the Sombre Tit, which is an uncommon breeder along forest edges and in woods at the mid-highlands of Burovar east inclinations.

While the Turanian Tiger became extinct only during the last century, a small number of Caucasian Leopards still inhabit the Hirkanian Forest. Threatened by poachers, the protection of this species is one of the most important conservation tasks in this region.

The leopard is listed in the Red Data Books of Rare and Endangered Species (Red Book) in all countries in the Ecoregion (Turkey, Armenia, Iran and Azerbaijan, *from the Ecoregional Plan for the Caucasus, 2003*).

Triturus cristatus is listed in the Red Data Book as endangered in Azerbaijan. The herpetofauna of the Hirkan Forest is represented by 22 species, two of which – Mediterranean tortoise (*Testudo graeca*) and Aeskulapian snake (*Elaphe longissima*) are listed in the Red Data Book of Azerbaijan.

The government of Azerbaijan has several acts to stop and check for hunting and poaching this species (i.e., leopard, mouflon and waterfowl).

Recognizing that sturgeon stocks have declined strongly in recent years, the states bordering the Caspian Sea agreed to reduce the combined catch quotas for the six sturgeon species native to the Caspian Sea. The quotas now allow for a 20% lower catch than in 2005, with reductions of one third for some of the species. The Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) banned the sturgeon export in 2005 and published decreased export quotas in 2007 (UNEP 2008).

Overfishing by poachers is threatening the survival of Caspian sturgeon stocks, the source of most of the world's supply of caviar. The Convention on International Trade in Endangered Species (CITES) has listed all sturgeon species as threatened, including all commercial Caspian varieties.

However, no rare, endangered, and threatened population recorded in the Red Data Book of Azerbaijan inhabit in or nearby the Project corridor, see Annex-5.

3.7.4. Aquatic Biology

Together with four other countries (Russia, Iran, Turkmenistan and Kazakhstan), Azerbaijan shares the largest inland body of water in the world, the Caspian Sea. The Caspian Sea is a remnant of the historical ocean Paratethys (*the "European Part of Tethys"*), dating back to the Jurassic period – to the formation of the continents and the alpine rise of the mountains. Due to this fact, a unique fauna and flora has been preserved.

The Caspian Sea has about 450 species, varieties, or forms of phytoplankton, 87 species of benthic algae, 718 known fauna species, and 315 species and subspecies of zooplankton.

This not only includes the Caspian Seal, an isolated species of brackish water seal, but also 90% of the world's population of sturgeon, a group "*archaic*" fish species, " five of which are common in the Caspian Sea. Affected by the fluctuating sea level, the coastal regions are very dynamic and contain important habitats for numerous nesting, wintering, and migratory bird species.

The Caspian Sea supports the entire world population of the Caspian Seal as well as many endemic fish species, including the economically important but almost extinct sturgeon species Beluga.

The upstreams of the rivers in rayon are very weak potential of the aquatic- terrestrial species. However, green toad (*buto viridis*) commonly occurs in or nearby the Project corridor. For a list of terrestrial aquatic species (amphibians) living nearby the Project corridor, see Annex-5.

The breeding season for most amphibians is winter period from the end of the December to the end of the February with the exact date depending on local climatic conditions (Nyman, 1991).

Fish and Fisheries

The upstream of the rivers in rayon is not rich in fish species. Only, the brown trout (*saloma fario*) occurs in the upstream of rivers, see Annex-5.

Astarachay and Istisuchay rivers' waters are being tested since 2006 routinely by AWM OJSC. According to the test results obtained from AWM OJSC, the total mineralization of river's water varies between 144 and 426 mg/l in Alasha level. BOD₅ levels varies between 0.80 mg/l and 6.78 mg/l, and COD levels between 2.4 mg/l and 14.1 mg/l at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

DO levels (between 7.23 and 8.51 mg/l by 2010) in Tengerudchay river Vaqo level, Istisuchay and Astarachay rivers Alasha level are measured by MENR (2010). Adequate oxygen levels are necessary to provide for aerobic life forms which carry on natural stream purification processes. The aquatic life is put under stress if dissolved oxygen levels in water drop below 5.0 mg/l.

3.8. Cultural and Historical Environment

Astara rayon has a very ancient history. There are 81 cultural heritage sites and 21 archeological sites in the rayon. Archeological sites dating back to bronze age exist, and some of those are ruins of Dashkutu necropolis in Azerrud village, Miki dolmen necropolis in Miki village, and Siyaku ancient settlement. Many tumulis, and barrow areas are also located in rayon area, and the famous ones are Tengerud, Baba Cabbar, Seyidcamal, Vaqo, Siyaku, Axicabal in Artupa village, Alasha, Binebey, and Lavain barrow areas.

Many cultural and historical heritage sites are also located in rayon area. The well known ones are tomb (XII century) and public bath (XIX century) in Shahagach village, Hadji Teymur mosque (XIX century) and Mashadi Abu Talib bath (XIX century) nearby Siyakesh village, Tomb of Ahmad ibn Karim (1472) in Mashkan village, and Piyacenapar bridge (XIII century) nearby Palikash village. See ***Exhibit 3,5 and 3,6.***

However, only three historical heritage buildings exist in the city's settled area, and those are Pravoslav Church, Qum and Gilakaran mosques. No archeological site falls into the Project corridor. Architectural memorials, cultural, and archeological importance located along the Project corridor is given in the following table;

Table 3,26: Cultural and Historical Heritages along the Project corridor

Settlement	Type	Nos	Name of the site	Distance from the construction Site (m)
Astara city	Architectural Memorial	3	Statues and Martyr Graves (Patriotic war)	25-60
	Historical Heritage	3	Mosques and church	20-40
Archivan Village	Historical Heritage	1	Remnants of mausoleum - XII century	700
		1	Karbalai Hamid Abdullah bath - XIX Century	650
		1	Remnant of minaret - XIX century	600

3.9. Construction Camps and other Contractor(s)' Facility

3.9.1. Construction Camp

Campsite will be located keeping in view the availability of an adequate area for establishing camps, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final location will be selected by the contractor with the approval of AWM OJSC and/or Rayon executive Power. The construction contractor camp(s) will be temporarily established for the construction period, and land will be leased for setting up campsites and for acquiring earth fill.

Contractor's Workforce

The following table gives the typical workforce requirement for the construction contract;

Table 3,27: Estimated workforce requirement for the construction contract

No	Contractor's Staff	Workforce
1	Key Personnel	20
2	Skilled Labor	50
3	Semi-skilled Labor	50
4	Unskilled Labor	120
Total		240

An estimated workforce of 220 will be required for the contract, of which, apart from managerial staff and engineers, about 50 will be skilled labor, 50 semi-skilled, and 120 unskilled.

3.9.2. Contractor(s) ' Equipments and Plants

Contractor(s) Equipments

The following table gives the number of different types of machinery likely to be deployed.

Table 3,28: Estimated machinery requirement for the construction contract

No	Type of Machinery	Quantity
1	Buldozer	2
2	Backhoe Excavator	8
3	Trench Excavator	6
4	Scraper	4
5	Mobile Pump	8
6	Concrete Mixer-Truck	6

7	Mechanical Workshop-Mobile	6
8	Mechanical Workshop-Central	2
9	Dumptruck	18
10	Mobile Crane	4
11	Compressor-with trailer	4
12	Diesel Gen.sets	6
13	Roller-Vibrating-110	4
14	Roller compactor-90-without vibrating	4
15	Tanker Truck-with pump	8
Total		90

The construction contract will require about 90 different types of machinery and plants.

The area requirement for the construction camp will depend upon the workforce deployed and the type and quantity of machinery mobilized. In view of the area required, it will not be possible to locate the camp within the RoW and the contractor will have to acquire land on lease from the private landowners or Rayon Executive Power.

3.9.3. Construction Materials

The materials to be used for the construction include coarse aggregates, fine aggregates (sand), earth, water, asphalt and cement. Almost all these raw materials are locally available in Lankaran economic region. The earth and water required for construction are available in Astara rayon. Coarse aggregates and fine aggregates (sand) are available in Astara in and around the Project corridor.

Standards and Organizations

BS	British Standards
ASTM	American Standard for Testing Materials
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ANSI	American National Standard Institute
ISO	International Standard Organisation
IEC	International Electrotechnical Commission
DIN	German National Standards
USBR	United States Bureau of Reclamation

Coarse and Fine Aggregates

The aggregate material required is mined from specified existing quarries. Few quarries, crusher plants and concrete batching plant exist in the rayon.

The Design and Build contractor shall transport the required aggregate from these facilities or out of rayon, earmarked by the AWM OJSC and/or the relevant department of Rayon Executive Power.

A list of possible sources of aggregate and sand for construction is given in the following table;

Table 3,29: Possible sources of aggregate and sand for construction

Possible Quarry Area	Location with Reference to Project
A) Coarse Aggregate	
From Astara Rayon, Astara Crusher Plant, south of city, on the Genchler Street	10 km
From Mashkhan crusher plant, Mashkhan village	15 km
B) Fine Aggregate/Sand for Cement Concrete Works	
From Astara Rayon, Astara Crusher Plant, south of city, on the Genchler Street	10 km

From Mashkhan crusher plant, Mashkhan village 15 km

All required permits and approvals shall provide by AWM OJSC, and the contractor will lease the quarry from the Rayon Executive Power to supply the aggregate material needed.

Solid Materials for Backfill

Earth fill material of desired specification is also locally available nearby the Project area. The '**borrow areas**' earmarked by the AWM OJSC and/or the local authorities for earth material shall be surveyed by the Design and Build Contractor, and will be leased to the contractor by the relevant department of Rayon Executive Power. In most cases, the contractor will lease another land in the vicinity on short-term basis for the purposes of acquiring earth material. The existing layer of topsoil will be scraped and stockpiled to be used later to restore the borrow area for agricultural use.

Water Requirements for the Construction

The contractor will obtain permission from the rayon irrigation departments for acquiring surface water from open canals and/or groundwater from the sub-artesian wells, if required.

All surface water diversion structures and/or sub-artesian well construction will be restored or hand over to the rayon irrigation department according to directions of AWM OJSC and/or Rayon Executive Power after the completion of the Project by the contractor.

3.10. Encroachments and Structures within the RoW

3.10.1. Encroachments

The agricultural plantations located along the RoW fall to **Col 2**, and may be affected from the Project activities on account of productivity. The situation of these lots is studied in Chapter 6.2.7.1. Any potential resettlement issues and issues related to loss of access to farm land should be handled in accordance with the provisions of the Resettlement Policy Framework.

3.10.2. Structures within the RoW

Normally, such developments occur on proprietary lands outside the RoW. However, during the field survey, no-squatters, no-shops, no-kiosks, thatched, and mobile vendors established within the RoW were found with the permission and/or protection of village notables and local administration.

Several intersections with other public utilities indicated in Table 3,4 occur on the alignment of the treated water pipeline, see **Exhibit 3,2, 3,3 and 3,4**.

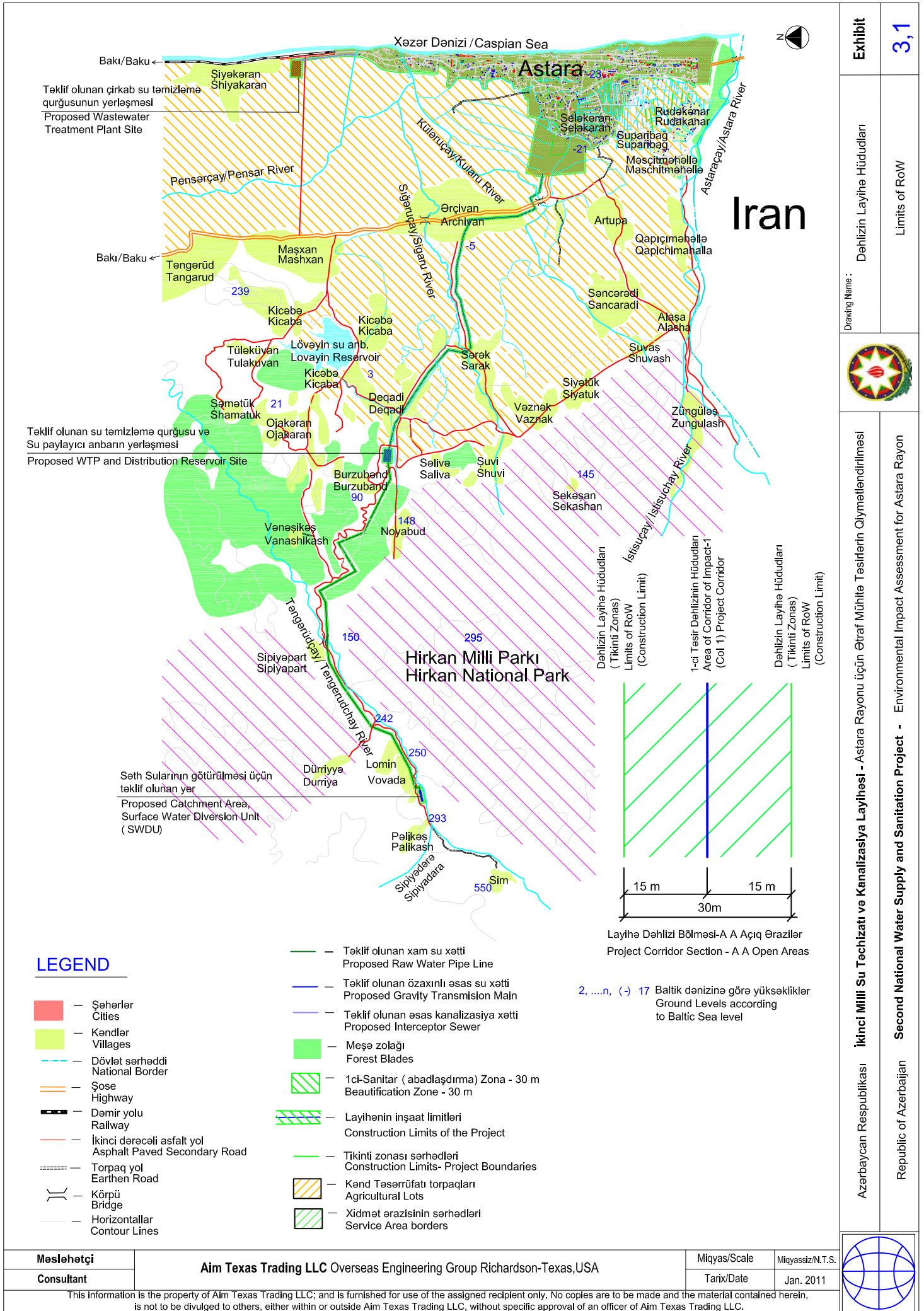
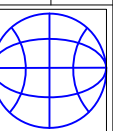


Exhibit 3,1

Dehizlin Layihə Hüdudları
Limits of RoW

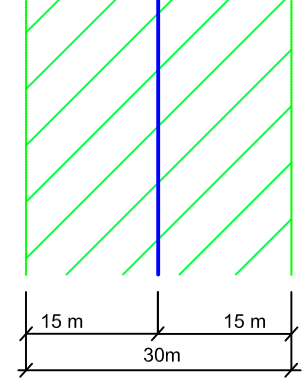


Drawing Name :
İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Azerbaijan Respublikası
Republic of Azerbaijan



LEGEND

- — Şəhərlər
Cities
- — Kəndlər
Villages
- — Dövlət sərhəddi
National Border
- — Şose
Highway
- — Demir yolu
Railway
- — İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- — Torpaq yol
Earthen Road
-) — Köprü
Bridge
- — Horizontallar
Contour Lines
- — Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- — Təklif olunan özaxınını əsas su xətti
Proposed Gravity Transmission Main
- — Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
- — Meşə zolağı
Forest Blades
- ▨ — 1ci-Sanitar (abadlaşdırma) Zona - 30 m
Beautification Zone - 30 m
- ▨ — Layihənin inşaat limitləri
Construction Limits of the Project
- — Tikinti zonası sərhədləri
Construction Limits- Project Boundaries
- ▨ — Kənd Təsərrüfatı torpaqları
Agricultural Lots
- ▨ — Xidmət ərazisinin sərhədləri
Service Area borders



Layihə Dəhlizi Bölməsi-A A Açıq Ərazilər
Project Corridor Section - A A Open Areas

2, ...,n, (-) 17 Baltik dənizinə görə yüksəkliklər
Ground Levels according to Baltic Sea level

Məsləhətçi
Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA

Miqyas/Scale
Tarix/Date
Miqyassız/N.T.S.
Jan. 2011

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Exhibit
3,2

Drawing Name :
Layihə Dehlinizin Açıq Ərazidəki
Kömlə Təsirlərlə Kəsişməli Yerlər 1
Intersections on the RoW 1



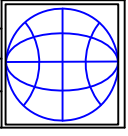
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Azerbaijan Respublikası
Republic of Azerbaijan
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

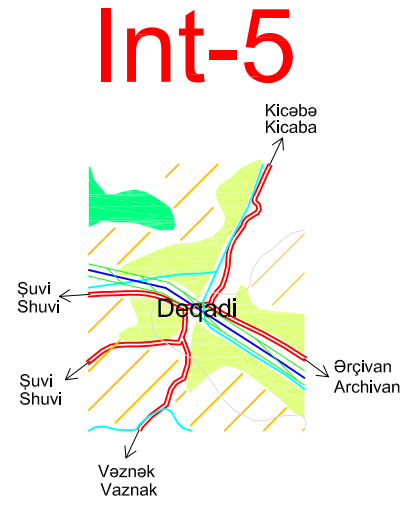
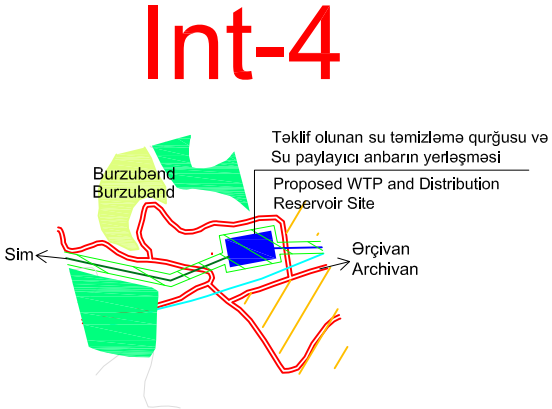
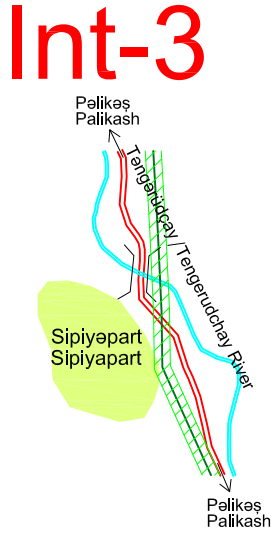
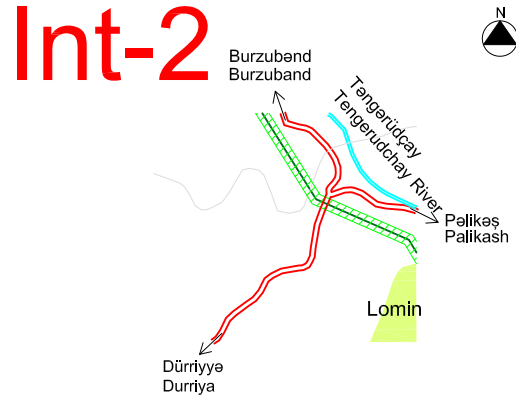
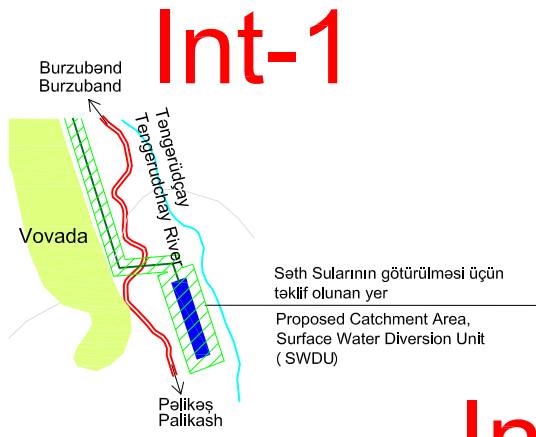
LEGEND

- Şəhərlər
Cities
- Kəndlər
Villages
- Dövlət sərhəddi
National Border
- Şose
Highway
- Dəmir yolu
Railway
- İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- Torpaq yol
Earthen Road
- Köprü
Bridge
- Horizontallar
Contour Lines
- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınılı əsas su xətti
Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
- Mövcud Yerüstü Qaz xətti
Existing above Ground Gaz Line
- Meşə zolağı
Forest Blades
- 1ci-Sanitar (abadlaşdırma) Zona - 30 m
Beautification Zone - 30 m
- Layihənin inşaat limitləri
Construction Limits of the Project
- Tikinti zonası sərhədləri
Construction Limits- Project Boundaries
- Kənd Təsərrüfatı torpaqları
Agricultural Lots
- Xidmət ərazisinin sərhədləri
Service Area borders

2, ...,n, (-) 17 Baltik dənizinə görə yüksəkliklər
Ground Levels according
to Baltic Sea level

Məsləhətçi Consultant	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA	Miqyas/Scale Tarix/Date	Miqyassız/N.T.S. Jan. 2011
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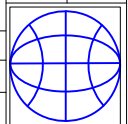
- Kəndlər Villages
- Dəmir yolu Railway
- İkinci dərəcəli asfalt yol Asphalt Paved Secondary Road
- Köprü Bridge
- Horizontallar Contour Lines
- Təklif olunan xam su xətti Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti Proposed Gravity Transmission Main
- Suvarma arxı Irrigation ditches
- Meşə zolağı Forest Blades
- 1ci-Sanitar (abadlaşdırma) Zona - 30 m Beautification Zone - 30 m
- Layihənin inşaat limitləri Construction Limits of the Project
- Tikinti zonası sərhədləri Construction Limits- Project Boundaries
- Kənd Təsərrüfatı torpaqları Agricultural Lots
- Xidmət ərazisinin sərhədləri Service Area borders

Exhibit
3,3

Drawing Name :
Layihə Dəhlizinin Açıq Ərazidəki
Kömlə Təsərrüfatı Kəşifçiyi Yerlər 2
Intersections on the RoW 2



Azərbaycan Respublikası
İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Republic of Azerbaijan

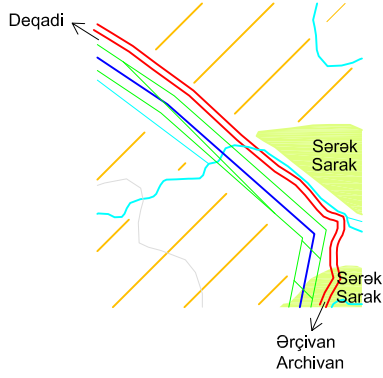


Məsələhətçil	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA	Miqyas/Scale	Miqyassız/N.T.S.
Consultant		Tarix/Date	Jan. 2011

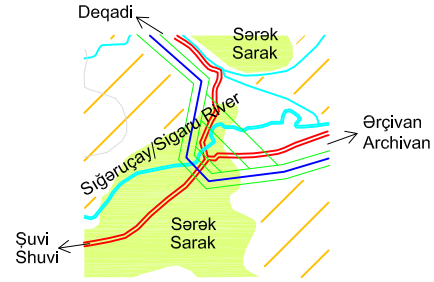
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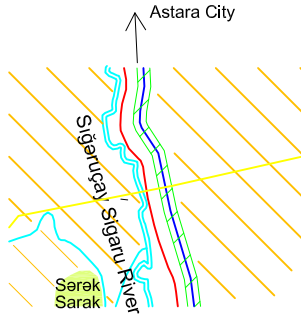
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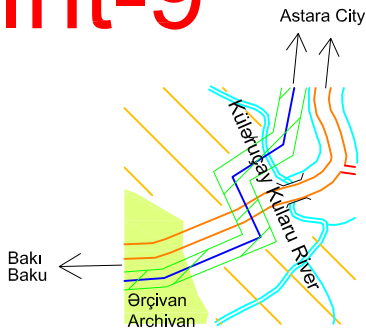
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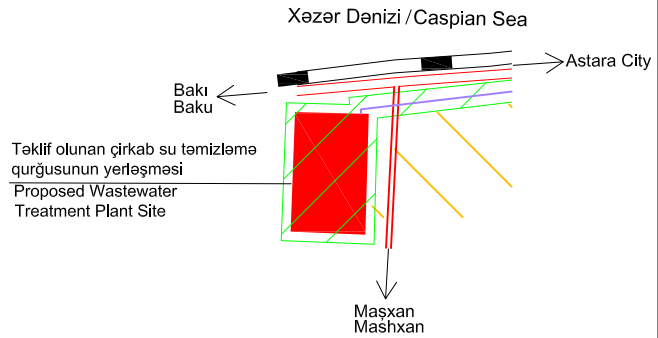
Int-8



Int-9



Int-10



LEGEND

- Kəndlər Villages
- Şose Highway
- Demir yolu Railway
- İkinci dərəcəli asfalt yol Asphalt Paved Secondary Road
- Körpü Bridge
- Təklif olunan özaxınlı əsas su xətti Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti Proposed Interceptor Sewer
- Mövcud Yerüstü Qaz xətti Existing above Ground Gaz Line
- Suvarma arxı Irrigation ditches
- 1ci-Sanitar (abadlaşdırma) Zona - 30 m Beautification Zone - 30 m
- Layihənin inşaat limitləri Construction Limits of the Project
- Tikinti zonası sərhədləri Construction Limits- Project Boundaries
- Kənd Təsərrüfatı torpaqları Agricultural Lots
- Xidmət ərazisinin sərhədləri Service Area borders

Exhibit

3,4

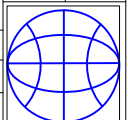
Drawing Name: Layihə Dəhlizinin Açıq Ərazidəki Kominal Təsirlərlə Kəsişdiyi Yerlər 3

Intersections on the RoW 3



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi

Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon



Məsələhətçi

Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA

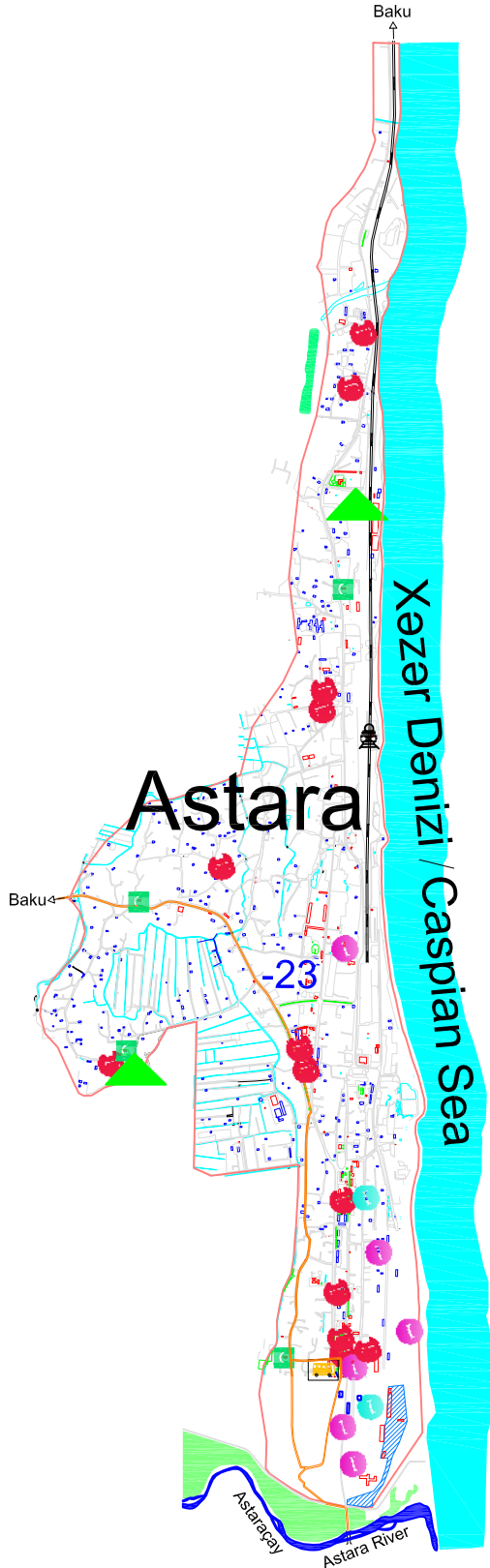
Miqyas/Scale

Tarix/Date

Miqyasız/N.T.S.

Jan. 2011

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LEGEND

- | | | | |
|--|---|--|--|
| | Şose
Highway | | Meşə zolağı
Forest Blades |
| | Demir yolu
Railway | | Həssas Qəbuledicilər,
Dövlət idarələri,
kommersiya binaları
Sensitive Receivers,
Governmental Offices,
Commercial Buildings |
| | Torpaq yol
Earthen Road | | Yaşayış binaları
Residential Buildings |
| | Kanallar
Canals | | Yaşılıq əraziləri
Greenary Recreational Areas |
| | Həssas Qəbuledicilər, Məktəblər
Sensitive Receivers, Schools | | Həssas Qəbuledicilər, Qəbiristanlıq və
arxitektura abidələri
Sensitive Receivers, Cemetery and
Architectural Monuments |
| | Həssas Qəbuledicilər, Tibb Müəssisələri
Sensitive Receiver, Medical Facilities | | Məscid
Mosque |
| | Həssas Qəbuledicilər, Mehmanxanalar
Sensitive Receiver, Otels | | |
| | Gömrük keçid məntəqəsi
Customs and Freight Terminal Area | | |

Exhibit

3,5

Drawing Name :
Astara Şəhərində Həssas Qəbuledicilər

Sensitive Receivers in Astara City



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi

Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Məsləhətçi

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

Miqyas/Scale

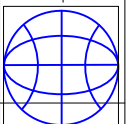
Miqyasız/N.T.S.

Consultant

Tarix/Date

Jan. 2011

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Exhibit

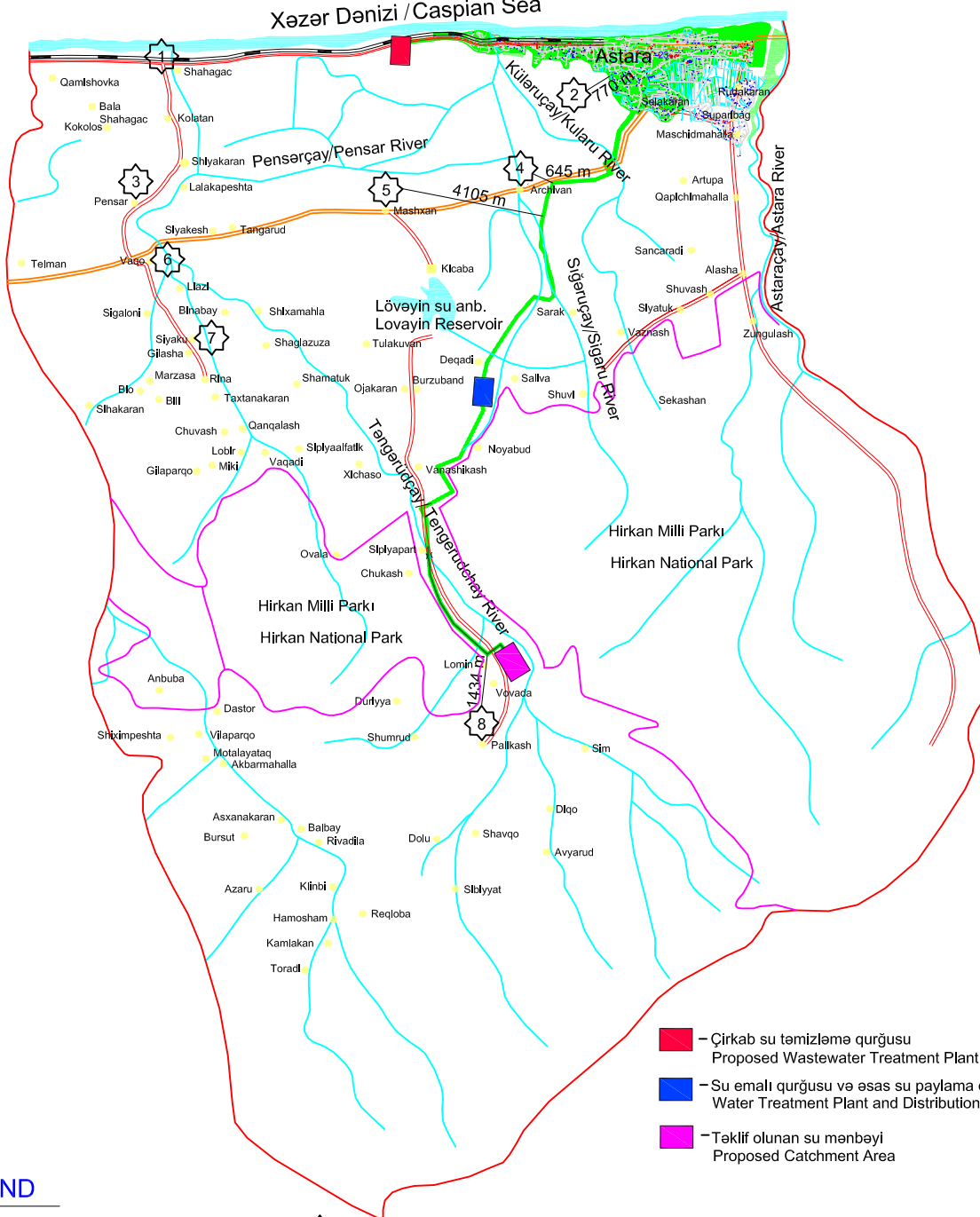
3,6

Drawing Name :
Dahlizin Layihə hüddürlər ətrafında
həssas arxeoloji abidələr
Sensitive Archeological Receivers nearby the
Project Corridor



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Xəzər Dənizi / Caspian Sea



- - Çirkab su təmizləmə qurğusu
Proposed Wastewater Treatment Plant
- - Su emalı qurğusu və əsas su paylama qovşağı
Water Treatment Plant and Distribution Tank Site
- - Təklif olunan su mənbəyi
Proposed Catchment Area

LEGEND

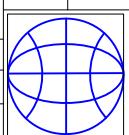
- - Şəhər
City
 - - Şose
Highway
 - - Dəmir yolu
Railway
 - - İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
 - - Hirkan Milli Parkı
Hirkan National Park
 - - Körpü
Bridge
 - - Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
 - - Təklif olunan özaxınlı əsas su xətti
Proposed Gravity Transmission Main
 - - Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
 - - Layihənin inşaat limitləri
Construction Limits of the Project
 - - Tikinti zonası sərhədləri
Construction Limits- Project Boundaries
- 1 Türbə, XII əsr; məscid, XIX əsr; hamam 1910-cu il
The mausoleum, XII century; a mosque, XIX century; bath, 1910
 - 2 Türbə, XII əsr; məscid, XIX əsr
The mausoleum, XII century; a mosque, XIX century
 - 3 Hacı Teymur məscidi, XIX əsr; Məşədi Abu Talib hamamı, XIX əsr
Haji Teymur mosque, XIX century; Mashadi Abu Talib bath, XIX century
 - 4 Türbə və minarə qalıqları, XIII əsr; məscid, XIX əsr; Kərbəlayi Həmid Abdulla hamamı, 1806-cı il
Remnants of mausoleum and minaret, XIII century; mosque, XIX century;
Kerbalayi Hamid Abdulla's bath, 1806 year
 - 5 Maşxan yaşayış yeri, XIV-XVII əsrlər; Əhməd ibn Kərim türbəsi, 1472-ci il; məscid, 1905-ci il
Mashkhan settlement, XIV-XVII centuries; the mausoleum of Ahmed ibn Karim, 1472; a mosque, 1905
 - 6 Məscid, 1905-ci il
Mosque, 1905
 - 7 Qırıxtürbə şəhər yeri, X-XII əsrlər
Remnants of the city of Girkhturba, X-XII centuries
 - 8 Piyacənapar körpüsü, XIII əsr
Piyachenapar bridge, XIII century

Məsləhətçi
Consultant

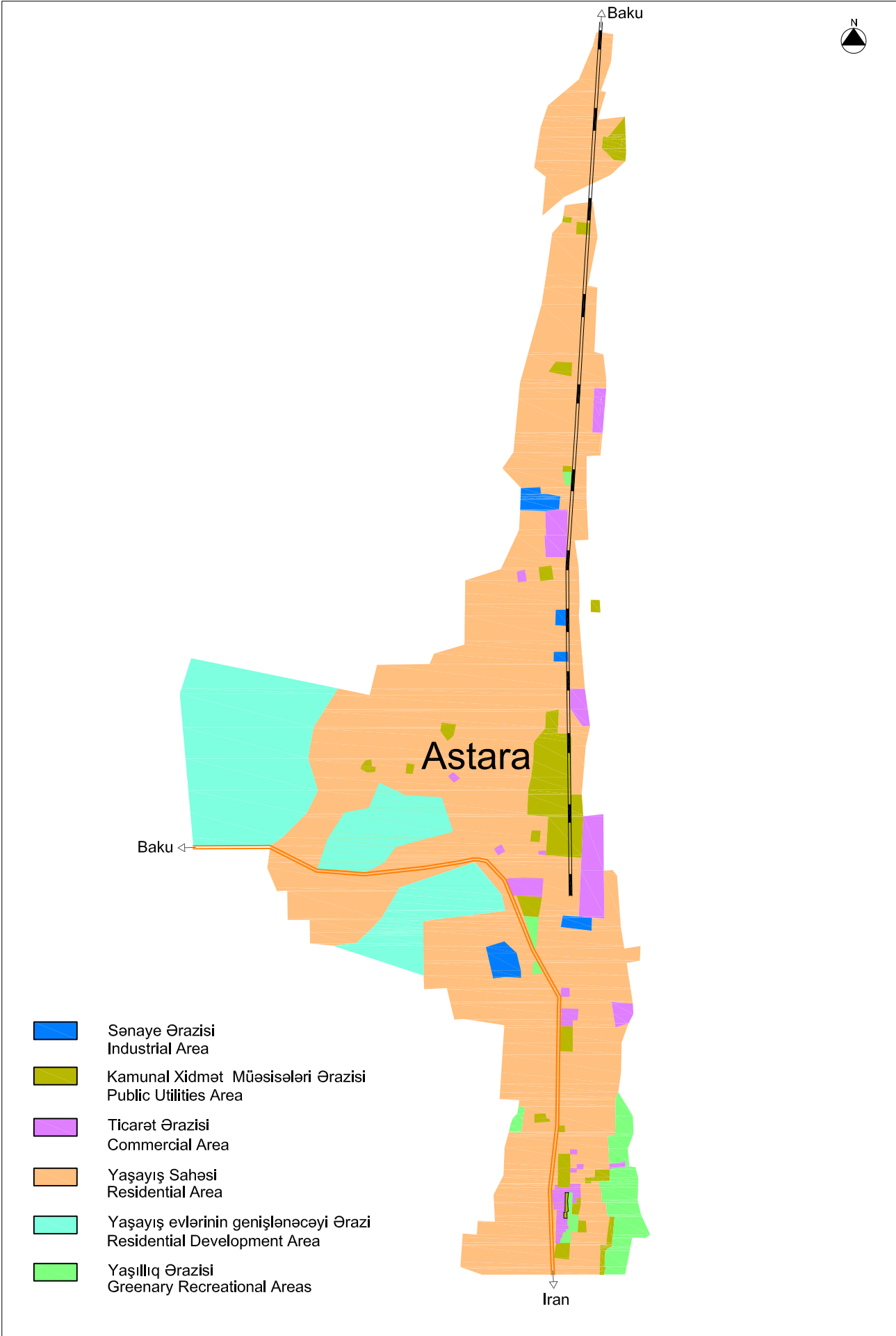
Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA


Miqyas/Scale
Tarix/Date

Miqyasız/N.T.S.
Jan. 2011



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Azərbaycan Respublikası Republic of Azerbaijan	İkinci MİHİ Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirinin Qiymətləndirilməsi Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon		Drawing Name : Astara Şəhərində və Ətrafında Torpaq İstifadəsinin Tipləri Typical Land Use in and around Astara city	Exhibit 3,7

Məsləhətçi
Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

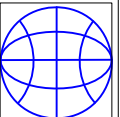
Miqyas/Scale

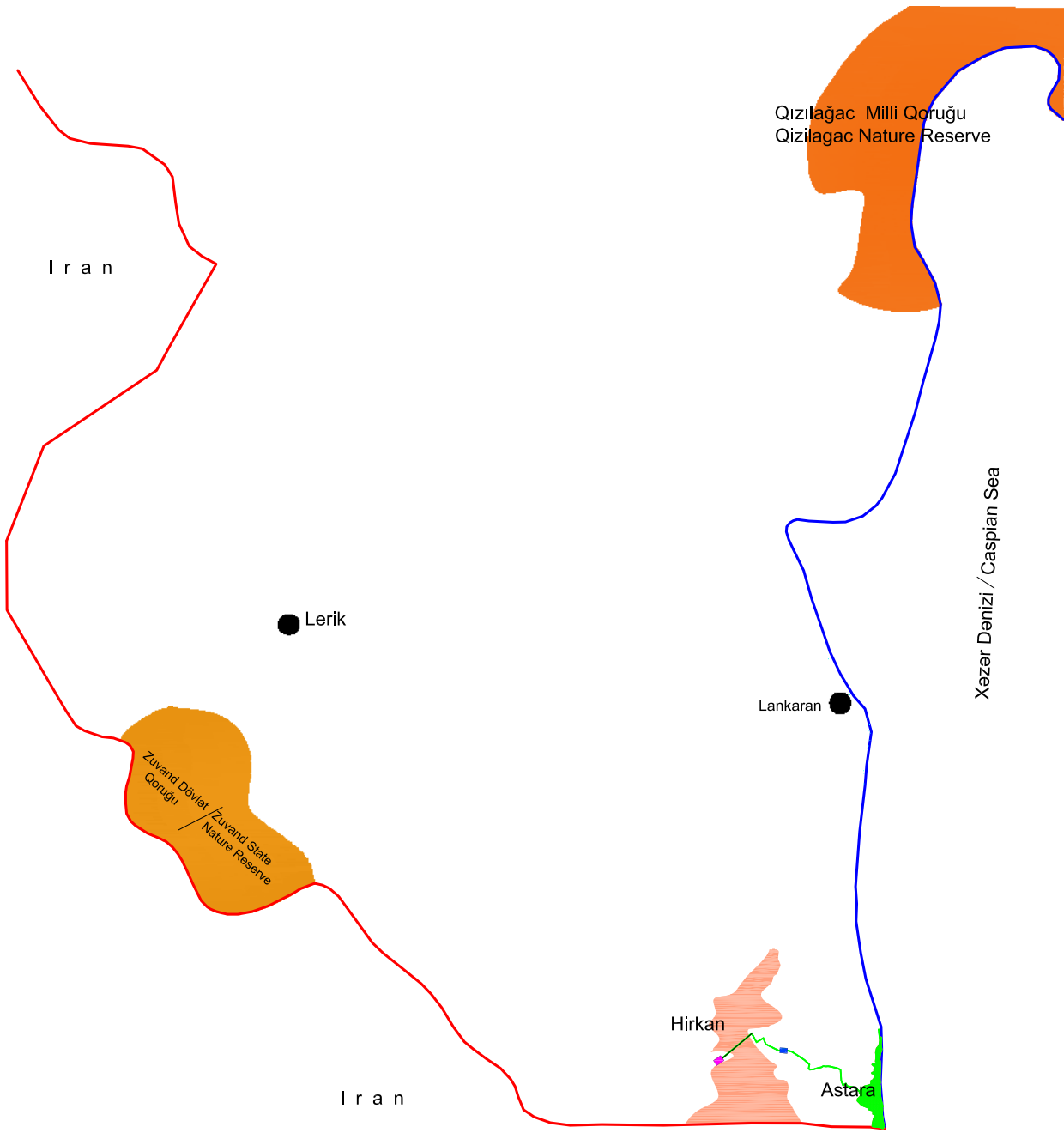
Miqyasız/N.T.S.

Tarix/Date

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LEGEND



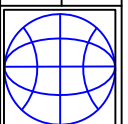
-  Milli Park
National Park
-  Dövlət Qoruğu
State nature reserve
-  Milli Qoruq
Nature reserve
-  Layihə Dəhlizi
Project Corridor

Exhibit
3,8

Drawing Name :
Layihə Dəhlizi ərazisinə yaxın Milli qoruqlar və Dövlət qoruqları
Nature Protection and Protected Area nearby the Project Corridor

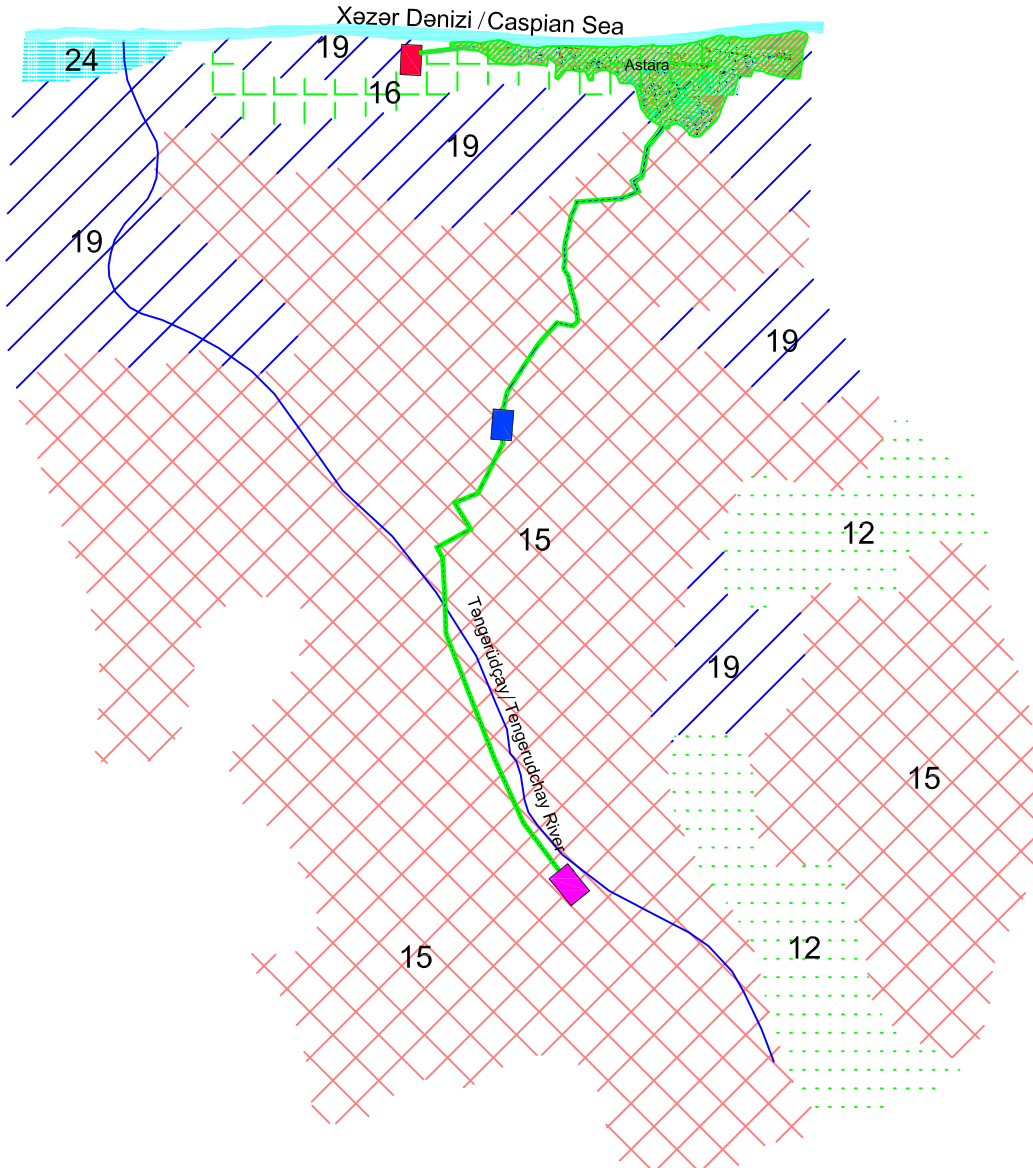


Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirərin Qiymətləndirilməsi
Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon



Məsləhətçi Consultant	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA	Miqyas/Scale Tarix/Date	Miqyassız/N.T.S. Jan. 2011
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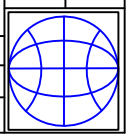
LEGEND

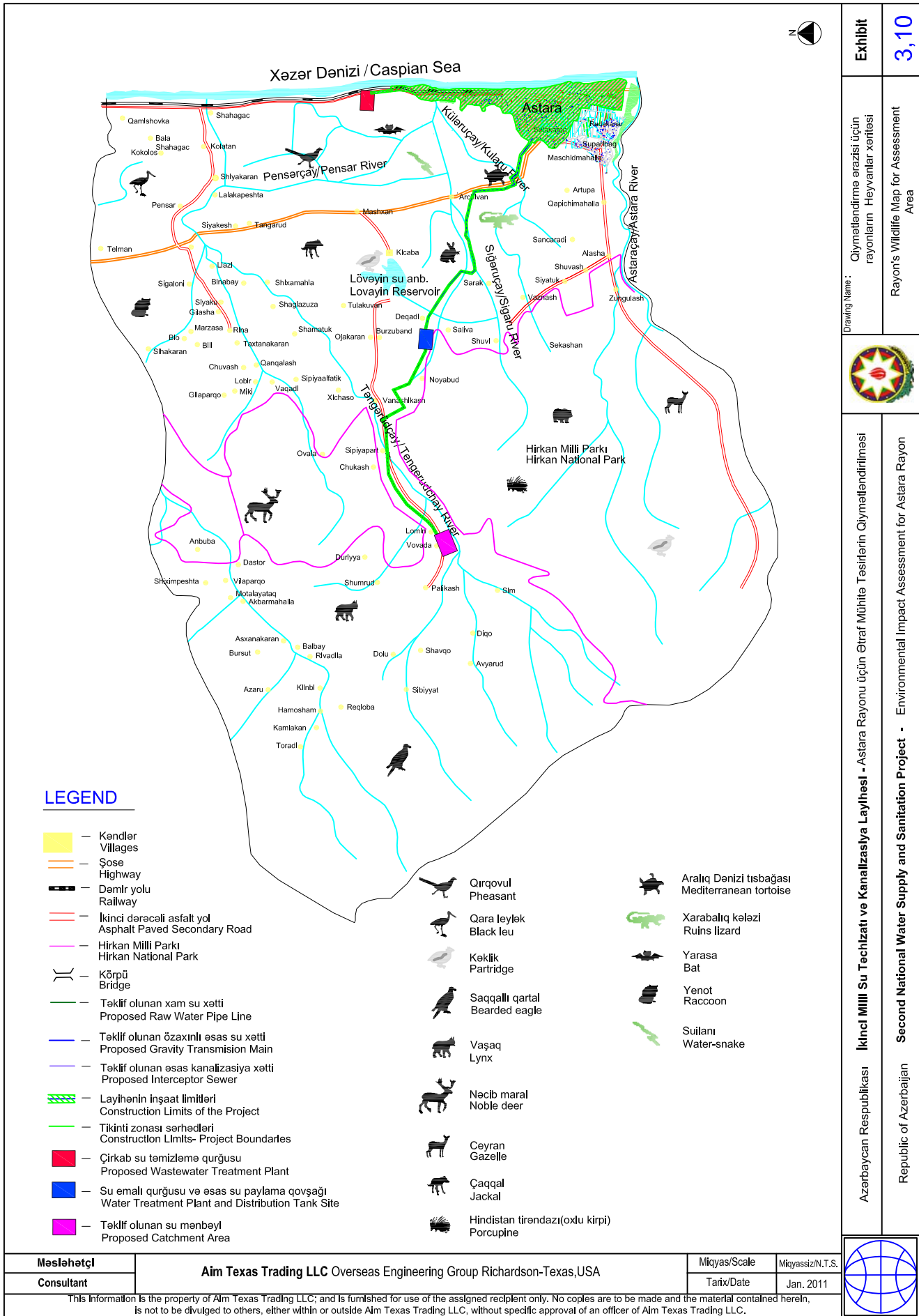
- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti
Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
- Çirkab su təmizləmə qurğusu
Proposed Wastewater Treatment Plant
- Su emalı qurğusu və əsas su paylama qovşağı
Water Treatment Plant and Distribution Tank Site
- Təklif olunan su mənbəyi
Proposed Catchment Area

- 12 Dağ (şərq fıstığı, Gürcü palıdı, Qafqaz vələsi) meşələri
Mountain (Carpinus orientalis Georgian brownCaucasian hombeam) forests
- 15 Xeyli hissəsi mədəni subtropik bitkilərlə əvəz olunmuş Hirkanın (şabalıdyarpaq palıd, vələs, dəmirağacının azat ilə qarışığı və Lənkəran akasyası) relik meşələri
Hirkanian substituted subtropical plants considerable parts mine (Oak cheesnuteleafy, Hornbeam, Azat tree mixture of iron tree, Acacia) relik forests
- 16 Düzenliyin palıd meşəliyi (uzunayaqlı palıdın, qızılağacın, başqalarının bolluğu ilə qarışık meşələr)
Oak of the plain forest (long-legs your brown, mixed forests of the Gizilaghaj with abundance of the so on)
- 19 Kənd təsərrüfatı bitkiləri üçün mənimşənmiş kollarla qarışık, əsas hissəsi dağlıq, düzən meşə və kol olan meşəyanı çəmə bitkiləri
Village mixture with bushes appropriated for agriculture plants upland plain basic part or forest and bush forest and forest being meadow plants
- 24 Qurbagaottu qamışlı, qarğılı, qamışlı bataqlıqlaşmış çəmən və otluqlar
Frog grassy reedy, reed reedy bog meadow and grass

Exhibit	3,9
Drawing Name : Olymetlendirme ərazisi üçün rayonların Bittki xəritəsi Rayon's Vegetation Map for Assessment Area	
Azerbaycan Respublikası	İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirinin Olymetlendirilməsi
Republic of Azerbaijan	Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

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LEGEND

- Kəndlər Villages
- Şose Highway
- Dəmir yolu Railway
- İkinci dərəcəli asfalt yol Asphalt Paved Secondary Road
- Hirkan Milli Park Hirkan National Park
- Köprü Bridge
- Təklif olunan xam su xətti Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti Proposed Interceptor Sewer
- Layihənin inşaat limitləri Construction Limits of the Project
- Tikinti zonası sərhədləri Construction Limits- Project Boundaries
- Çirkab su təmizləmə qurğusu Proposed Wastewater Treatment Plant
- Su emalı qurğusu və əsas su paylama qovşağı Water Treatment Plant and Distribution Tank Site
- Təklif olunan su mənbəyi Proposed Catchment Area

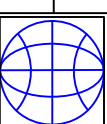
- Qırqovul Pheasant
- Qara leylik Black leu
- Kəklik Partridge
- Saqqallı qartal Bearded eagle
- Vaşaq Lynx
- Nəcib maral Noble deer
- Ceyran Gazelle
- Çaqqal Jackal
- Hindistan tirendəzi (oxlu kirpi) Porcupine
- Aralıq Dənizi tısbağası Mediterranean tortoise
- Xarabalıq kələzi Ruins lizard
- Yarası Bat
- Yənot Raccoon
- Suilanı Water-snake

Exhibit
3,10

Drawing Name: Qiyəməndirəme ərazisi üçün rayonların Heyvanlar xəritəsi
Rayon's Wildlife Map for Assessment Area

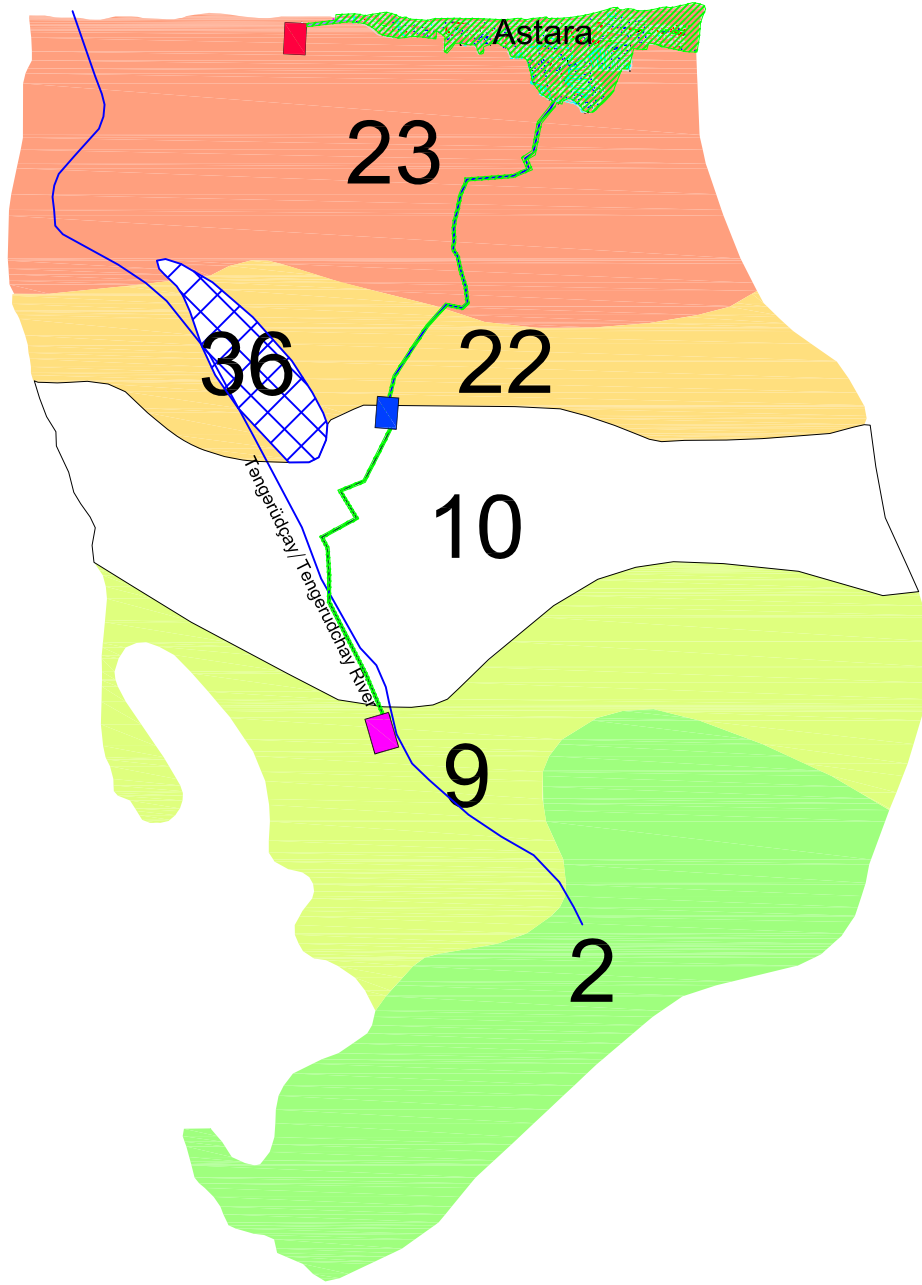


Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirinin Qiyəməndirəməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Republic of Azerbaijan



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LEGEND

- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti
Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti
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- Layihənin inşaat limitləri
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- Təklif olunan su mənbəyi
Proposed Catchment Area
- Çirkab su təmizləmə qurğusu
Proposed Wastewater Treatment Plant
- Su emalı qurğusu və əsas su paylama qovşağı
Water Treatment Plant and Distribution Tank Site
- Təklif olunan su mənbəyi
Proposed Catchment Area

- 2 Çimli dağ-çəmən
Fatty mountain meadow
- 9 Tipik sarı dağ-meşə
Typical yellow mountain forest
- 10 Podzollu sarı dağ-meşə
Podzosheet yellow land, mountain-forest
- 22 Podzollu sarı
Podzosheet-yellow land
- 23 Podzollu-qeyli-sarı
Podzosheet-the gley-yellow land
- 36 Subasar-allüvial-çəmən
Inundated-alluvial the meadow

Exhibit
3,11

Drawing Name : Qiyətləndirmə ərazisi üçün
rayonların Torpaq xəritəsi
Rayon's Land Structure and Soil Map for
Assessment Area



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiyətləndirilməsi
Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Məsləhətçi

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA

Miqyas/Scale

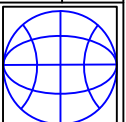
Miqyassız/N.T.S.

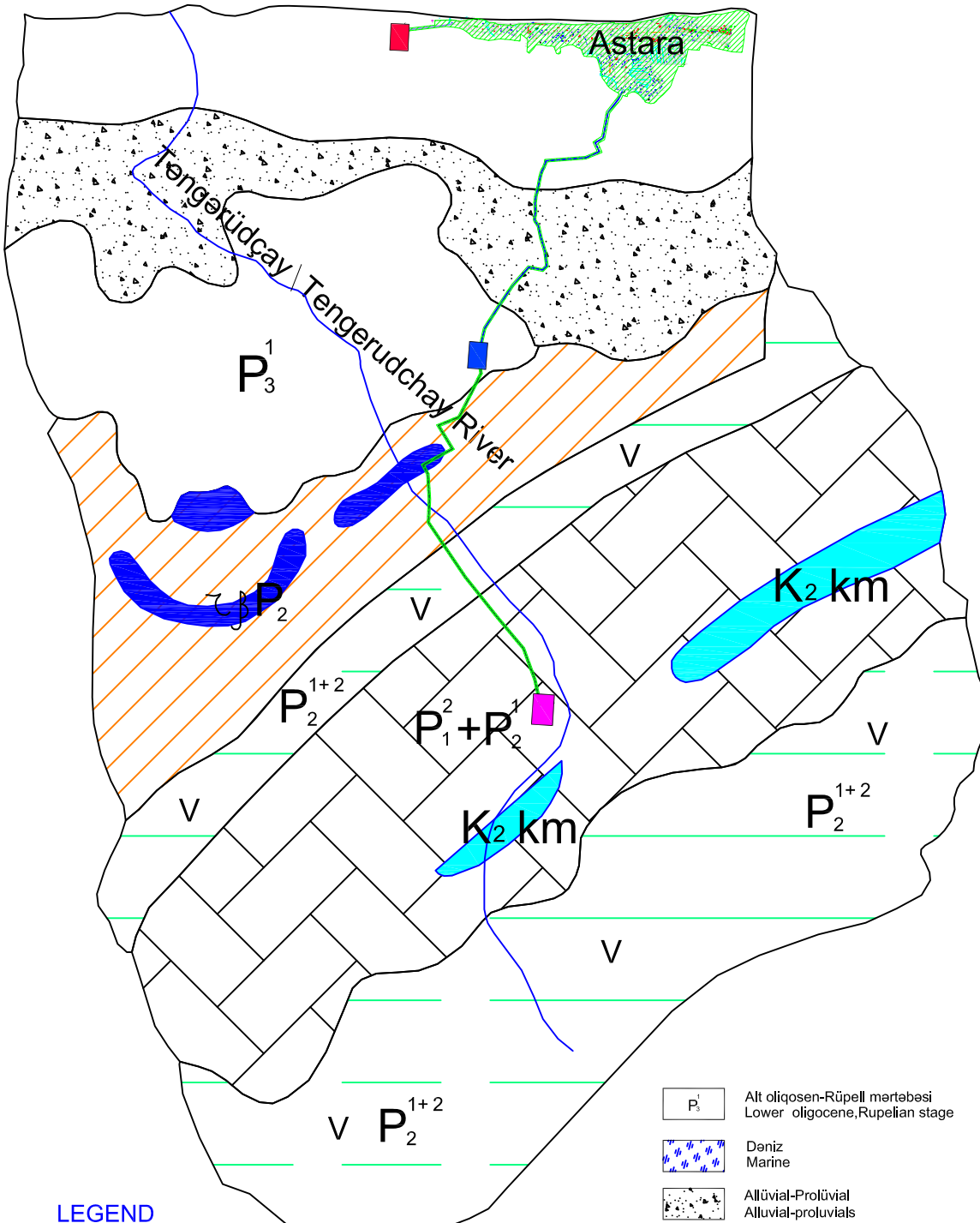
Consultant

Tarix/Date

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LEGEND

- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınlı əsas su xətti
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Water Treatment Plant and Distribution Tank Site
- Təklif olunan su mənbəyi
Proposed Catchment Area

- P₁ Alt oligosen-Rüpell mərtəbəsi
Lower oligocene, Rupelian stage
- Deniz
Marine
- Allüvial-Prolüvial
Alluvial-proluvials
- Üst paleosen və alt eosən
Upper Paleocene and lower Eocene
- V Orta tərkibli; andezitlər, andezibazaltlar, traxitlər, traxiandezitlər
Average composition; andesites, andesibasalts, trachytes, trachyandesites
- P₂ Alt və orta eosən, ipr və lütet mərtəbələri
Lower and middle eocene, Ypresian and Lutetian stages
- K, km Kampan mərtəbəsi
Campanian stages
- Traxibazaltlar, Eosən
Trachybasalt, Eocene
- P₂ Üst eosən, priabon mərtəbəsi
Upper Eocene, Priabonian stage

Exhibit
3,12

Drawing Name : Qiymətləndirmə ərazisi üçün rayonların Geoloji xəritəsi
Rayon's Geological Map for Assessment Area

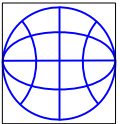


Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

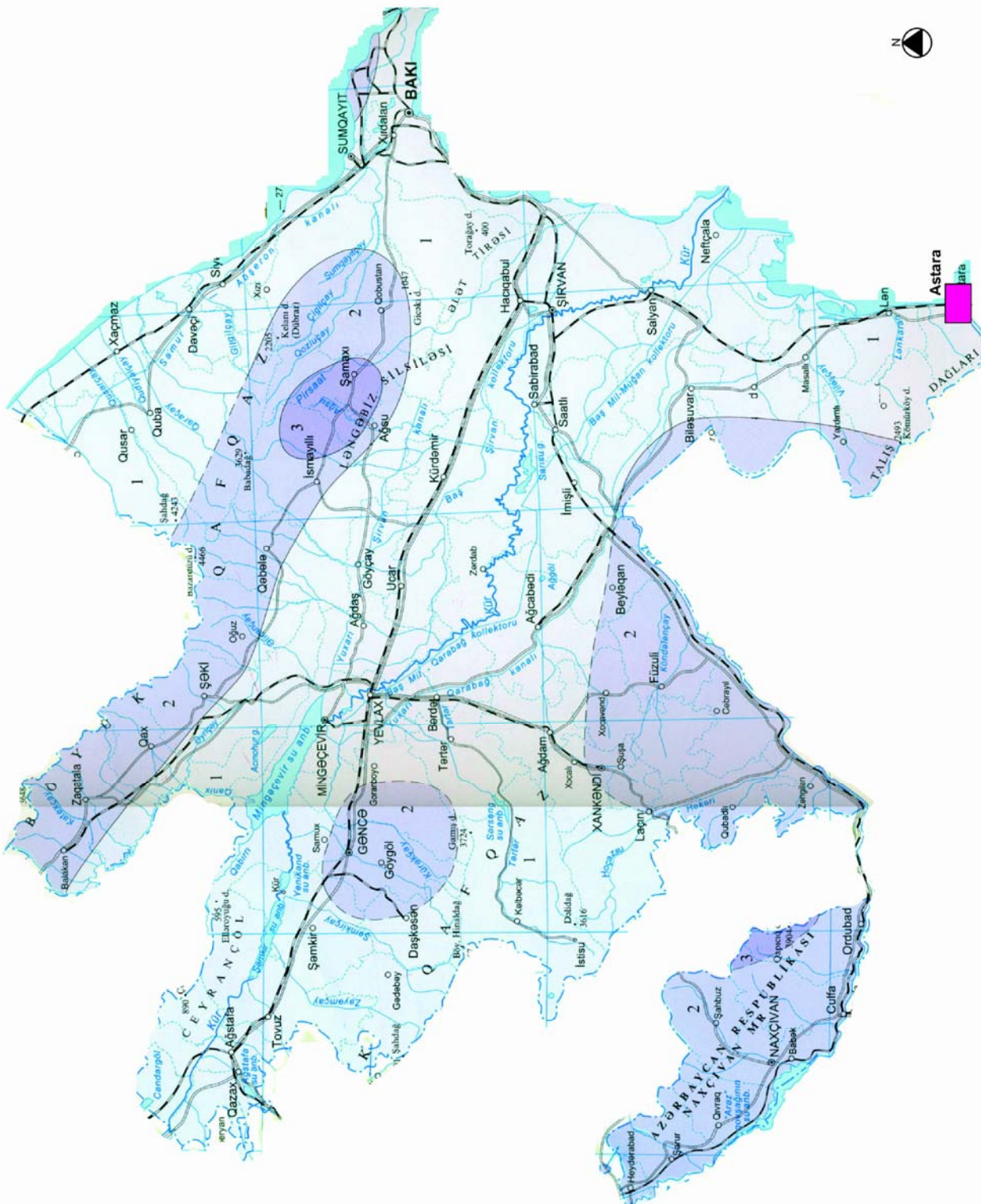
Məsləhətçi
Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

Miqyas/Scale
Tarix/Date
Miqyasız/N.T.S.
Jan. 2011



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LEGEND

SEYSMİK ZONALAR, ball SEISMIC ZONES		ZONALARIN SƏRHƏDLƏRİ BORDERS OF SEISMIC ZONES	
1	- > 7	~	Çox müəyyən edilmiş Low Magnitude Zones
2	- > 8	-	Az müəyyən edilmiş High Magnitude zones
3	- > 9	-	
	- Layihə ərazisi Project area		

Exhibit
3,13

Drawing Name :
Azerbaijan seismicoloji xəritəsi
Seismicity Map of Azerbaijan



Azerbaijan Respublikası, İkinci Milli Su Təchizat və kanalizasiya layihəsi - Astarajayonu üçün Ətraf Mühitə Təsirərin qiymətləndirilməsi
Republic of Azerbaijan, Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astarajayon

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Consultant		Tarix/Date	Jan.2011

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Chapter 4

ANALYSIS OF ALTERNATIVES

This Chapter provides a project rationale for the proposed Construction of the Water Supply and Sanitation infrastructure in Astara rayon; an overview of the investment alternatives considered in this study and description of the design alternatives considered for the project corridor.

During the project development, various alternatives have been proposed, screened and their technical, economic and environmental criteria have been compared in the previous sections of this study. In terms of environmental criteria, the primary objective was to identify and adopt the options on at least the cost basis, giving full consideration to environmental impacts and benefits in accordance with the Project objectives identified in Chapter 1.

The Project options considered are,

1. No-project option,
2. Alternative of investment options,

These are discussed in more detail below.

4.1. No-Project Option

Presently, only one tenth of required water demand can be met without needing of healthy life for the population of targeted service area (e.g. no drinkable water quality, no treatment facility or disinfection on the existing systems).

The rise in the drinking water demand for Project horizon 2030 of Project service area, both for residential and non-residential, will be associated with the insufficient water release, decentralized, and unhygienic conditions (See Chapter 3.2.5, Water Supply and Sanitation Utilities).

The continuation on this situation will limit the development of public health and social-economic growth in the rayon.

No project option is not desirable as it would impede the Project objectives (*the overall aim of the Project is to improve access to safe, reliable and sustainable water supply and sanitation services in the urban centres etc, see Chapter 1*), contribute to the environmental degradation, and lead to deterioration of the public health and safety conditions.

Under the No-Project alternative the following environmental impacts would be expected;

- The structures associated with the Project would not be built and the visual landscape of Project area would remain unchanged,
- Temporary degradation of Tengerudchay river riparian zone nearby the Sipiyapart village for the construction of the raw water catchment facility, along the alignment of transmission and the interceptor sewer, and on the proposed WWTP site, would not occur.
- The inhabitants (human and other species) in the Project corridor would not experience the temporary impact of the proposed Project.
- Potential temporary impacts to birds, fish, and other resources as a result of the Project would not occur,
- Development of public health and social-economic growth would be limited,
- Insufficient water release for Astara city would continue,
- Maintenance requirements of the existing obsolete and insufficient facilities would continue,

- The use of untreated drinking water in the proposed service area would continue,
- The use of existing private septic pits, and the disposal of domestic gray sewage to the natural environment along the open channels in the city would continue, and
- This would continue to contaminate the natural and human environment,
- Leakages and seepages from the existing septic pits in the city would continue to contaminate and degrade the soil in the human environment,
- Breaking the cycle of disease transfer would not be provided on the human and other species in the environment,
- Protection of groundwater and other resources on the environment of the human community from the pollution of faecal contamination would not be possible,
- The existing sewage water of Astara city would continue to dispose to Caladahna marshland south Shiyekaran village, and
- Contamination of the biodiversity in the marshland would continue,
- The appropriate use and disposal of domestic water would not be provided to the Project area,
- Leakages and spills from the existing public tap network in Astara city would continue to ground, and soil contamination and degradation would continue,
- The wastewater leakages and spills directly to human environment would continue, because of the some parts of existing sewage network is dilapidated and dispersed in the earth,
- The householders in the Project area would continue to store the extra water to any storage mean to keep for future, because of the insufficient water release,
- The householders in the Project area would continue the use of the extra pumps to rise the distributed tap water to the upper floors, because of the insufficient pressure in the existing water supply network,
- As there is no sufficient drinking water release to the city, householders would continue to exploit the extensive ground water from the upper aquifer beneath the Lankaran lowland,
- They would continue to use the untreated and possibly contaminated ground water for domestic purposes,
- Demand-side efficiency on the water sector in the Project area would not be provided, and therefore, supply-side efficiency would not be provided.

On account of the reasons listed above, no-project alternative cannot be considered.

The feasibility study prepared by the feasibility team demonstrates the need for the proposed improvements based on the drinkable water demand and network studies and significant benefits that can accrue in the form of reduced public health and environmental problems. Thus there is a clear and immediate future need for this project.

There are two project options available for improving the Water Supply and Sanitation infrastructure in order to meet the increasing drinkable water demand against the growing population and the growing economy in the rayon.

One option is to develop a new Water Supply and Sanitation System, while the other option is to renovate and rehabilitate the existing network.

According to the present Project Objectives, the first option is considered more viable, because of the conditions of the unhygienic, dispersed, and insufficient water release in the rayon.

4.2. Water Supply

Drinkable water supply may be achieved either by combination existing water supply system's components with the new additional components like new raw catchment facility and raw water pipeline, new transmission main, water treatment facility, new drinkable water distribution tank, additional pipe network, and a new metering system (installaion the water meters to the customers) in rayon center city, or by using a new water supply system.

The proposed Project provides a new water supply system for the service area. The EIA study team is agreed on this opinion because of the following reasons according to environmental and socioeconomical indicators;

- The water distribution system in the rayon centre is not in hygienic condition, and complies with no recent national and international edition of rules and regulations. This situation can create a negative induced impact for public health, and likewise, the environmental indicators (e.g., soil contamination by the leakage and seepage of sewage from the existing sewage system, private septic pits and from the corroded water supply pipes pipes).
- Replacing the dilapidated and corroded old metal distribution pipes, and adding new junction box and control structures would be an exhaustive Work, and would not be cost effective when compared with the construction of the new distribution network.
- There is a scattered and dispersed partial sewage network, which serves only some institutional, commercial, and residential buildings located on the routes of main internal transportation axes inside the city.
- It is unknown how extensive the damage remained on the existing water supply network by the untreated water used.

4.2.1. Alternatives of Raw Water Capture

There is no spring water source which has sufficient water release in or nearby the Project service area. The Feasibility Consultant and Beneficiary (AWM OJSC) envisage for using of surface water of Tengerudchay river in the rayon, to provide the raw water for the water supply system of Astara city.

The Feasibility Consultant and AWM OJSC envisage to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement. Total length of the raw water pipeline will be 14.4 km to WTP in this alternative.

The treated water will be conveyed to Astara city with an approximately 11 km of gravity transmission main.

Proposal Development for Raw Water Sources

On account of this situation, comparison on the alternatives for raw water source is conducted according to environmental parameters (see **Exhibit 4,1**), and are below;

1. If the ground water for the project's raw water requirement would have been requested to be selected, an area which has an unconfined or confined aquifer could be selected in or nearby the Project corridor.
2. If the surface water diversion for the project's raw water requirement would have been selected, constructing of a surface water diversion unit (SWDU) on the flow channels of Tengerudchay or Astarachay rivers or in front of the Lavain Water Reservoir (LWR) could be considered.
3. If the sub-surface lateral ground water or river bank filtration methods for the project's raw water requirement would have been selected, a section of the alluvial accumulative basin of Astarachay river (between Alasha village and Astara city) or Tengerudchay river (between Shixamahla and Pensar villages) could be determined. The alluvial accumulative river basins in the region can be found only in the said above section of the rivers.

Evaluating the proposals for the Raw Water Sources

1. On account of the following reasons, this selection can not be considered.

- The rayon area is almost divided entirely into two parts from north to south; with the first half being located in the west-eastern synclinalorium of Talish mountains toward Caspian Sea. The second half is located in Lankaran lowland which is accumulative fluvial-deltaic fan mixed with the partial marine coastal plain. The confined aquifers are met at the folded structures of Talish east anticlinal ranges, and they are rarely formed along the river flood plains as semi, micro and/or confined basins. This type of aquifers are mostly fed by the river flows and small amount of run-off from the thin layer of upmost watersheds of mid highlands. Large amount of ground water does not occur within these aquifers.

The unconfined aquifers, which have large amount of water bearing horizon, are met beneath Lankaran lowland in the eastern part of the rayon area including the area of Astara city. Geologically, these areas are formed of continental-marine and marine deposits of upper Pliocene-Quaternary age, with the continental sediments having a subordinate position. Under ground water are salty with dry residues of 100-200 g/l in this lowland.

- Conclusively, the under ground water beneath the Lankaran lowland would have been selected as the raw water source for the Project, a comprehensive water treatment train including softening process and chemical treatment processes would be required. In addition, a series of deep wells (at least 10 - 12 wells furnished with the submersible pumps) would be required to meet the raw water in an amount of approximately 65.85 l/s (2.077 ml cum/year) for the water supply system. Currently, it is unknown how many sub-artesian wells are used for irrigation and drinking purposes in the lowland. This means that the aquifer beneath Lankaran lowland is heavily drained, and this process currently continues. Significant degradation can occur on the aquifer system beneath the Lankaran lowland, if this source is used as raw water source.
2. This option offers few alternative places, which may provide sufficient flow on the course of the Astarachay or Tengerudchay rivers or Lavain Water Reservoir (LWR) for the required surface water diversion. The first alternative water body is Astarachay river. However, this alternative cannot be considered, because the river is an international waterway between Azerbaijan and Islamic Republic of Iran. This situation is arranged in WB operational policy OP 7.50 – *Projects on International Waterways*. According to WB OP 7.50, article 3, ‘*Projects on international waterways may affect relations between the Bank and its borrowers and between states (whether members of the Bank or not). The Bank recognizes that the cooperation and goodwill of riparians are essential for the efficient use and protection of the waterway*’. This WB policy doesn’t say anything about the prohibition of any activity on the riparian zone of the international waterway, but it is notifying that many agreements and discussions are required between the Bank and borrower, and between the borrower and riparian state.

The second alternative water body is Tengerudchay river. There is no water reservoir on its upstreams for flood control, irrigation purposes, or water supply. Additionally, the location of this alternative would have been sufficiently high to provide the gravity flow of water, which will be conveyed to WTP by a raw water transmission main 14.4 km in length. We generally select as an indicator a large native fish species of the stream reach that is at the top of the trophic pyramid (trout, barbell, salmon, nase). However, this section of Tengerudchay river has the torrential stream; it does not naturally sustain much fish species up to Lankaran lowland. As this situation does not predict fish densities or biomass, we are interested only in the physical habitat that is controlled by instream flows.

The sustainability of this source is comprehensively examined from the perspective of the water balance in Annex-3. Constructing a diversion unit to divert the required raw water at this section of Tengerudchay river will disturb neither the river’s ecological environment nor natural flow of the river. See Annex-3.

3. This selection offers the flood plains of the rivers and creeks in the region to exploit the sub-surface lateral groundwater for the water supply system. The alluvial accumulative flood plains would be found on the course of the Astarachay river basin between Alasha village and Astara city, or Tengerudchay river between Shixamahla and Pensar village. Astarachay river's flood plain cannot be considered because of the reasons explained in above paragraphs (Evaluating the proposals # 2). On the other hand, its north banks in Azerbaijan is mostly covered by riparian forest from Alasha village to Caspian Sea. If this part of river banks (approx. 7.9 km in length) would be used for constructing a HIGDU (horizontal infiltration gallery diversion unit), significant degradation on this forest zone would occur. The second alternative location for this selection is the alluvial accumulative basin of Tengerudchay river from Shixamahla to Pensar village. This section of river's accumulative basin is only 5 km in length. Its flood plain's width varies between 70 m and 40 m in this section, and provides no sufficient land required for construction of a HIGDU. Its banks are also covered by the crop canopies which are used as agricultural lots currently cultivated by private ownerships. Because of the above reasons, this selection is eliminated.

Conclusion:

- Proposal one and three are eliminated because of the reasons explained in section above 'evaluating the proposals for raw water sources'.
- Proposal two would be most environmentally sound alternative on account of the following reasons.
 - Gravity supply of the treated water from WTP site would be possible in this alternative.
 - The sufficient raw water release would be possible.
 - No complicated treatment train in the proposed WTP would be required.
 - Because that the RoW of the existing secondary road network is sufficient, no additional service road and tracks would be required in this alternative.

This result supports the Beneficiary (AWM OJSC) and Feasibility Consultant's concept for raw water capture.

Conclusively, the EIA study team accepts this alternative (see **Exhibit 1.1** and **2.3**) with the provision of taking all mitigation measures foreseen in Chapter 6, and strictly applying the environmental management rules recommended in Chapter 7 during the construction and operation phases to protect the natural environment and aquatic ecology of the Reservoir and its surrounding.

4.2.2. Alternative Alignments of Treated Water Pipeline

A treated water transmission main is required from the new WTP to Astara city. According to feasibility study team, this pipeline's length will be approximately 10.5 km up to Astara city. The measurement and surveying works conducted by the EIA study team supports this measurements with small differences.

The proposed alignment of pipeline has been foreseen entirely along the existing RoW of the secondary road network among the villages between WTP and Astara city.

The proposed transmission main will intersects a few public amenities (above ground power lines, and asphalt paved connection roads) only in six points, see **Exhibit 3,2, 3,3** and **3,4**. No part of the pipeline travels on the agricultural lots.

Proposal Development of Alignment of Pipeline

As there is no appropriate alternative route alignment for the new transmission main, it would be illogical to determine another alternative route alignment just for comparison.

On account of this situation, an assessment only for this alternative route is conducted according to environmentally parameters, and are below;

Evaluating the proposal for Raw Water Pipe Line Alignment**Table 4,1: Evaluation of the Raw water pipeline Alingment**

Item	Factors	Route Alignment	Assessment	
			positive	negative
1	Gravity flow up to the city (Engineering-Planning)	Yes	X	
2	Pipe Length	10.5 km	X	
3	Degradation on the Terrestrial Vegetation	No		
4	Effects on the Terrestrial Wildlife	No		
5	Tree felling and re-planting	No	X	
6	How many km would the pipe route lie nearby the river side riparian zone?	None	X	
7	Agricultural lots to be affected	314 ha		X
8	Intersecting the asphalt paved secondary roads	Yes, in four point		X
9	Intersecting the under ground power lines	No	X	
10	Intersecting the under ground power communication lines	No	X	
11	Intersecting the under ground natural gas pipe lines	No	X	
12	Intersecting the irrigation ditches and canals	No	X	
13	Would the pipe line work need a separate earthen service track? If yes, how many km?	No	X	
14	Would the pipe line route encroach on a private easement or amenity? If yes, how many?	No	X	
15	Would the pipe line route cause to relocation of any private or public amenity? If yes, how many?	No	X	

ha: Hectare, 10,000 sq. m

- Environmentally Negative Effects
- Environmentally Positive Effects
- Positive from the Engineering Perspective
- Negative from the Engineering and Cost-effectiveness

Conclusion:

The negative impacts on the environment to be caused by the construction of pipe line will be 'less than significant' in the proposed route alignment: similar to the Project.

On account of above reasons, the EIA study team has accepted this route, and this alternative route has been assessed in this EIA report.

4.2.3. Water Treatment Plant

A water treatment plant has been foreseen to treat the amount of water required for Astara city by the Feasibility Consultant and AWM OJSC.

The preliminary concept obtained from the Feasibility Consultant team for the WTP, is as follow;

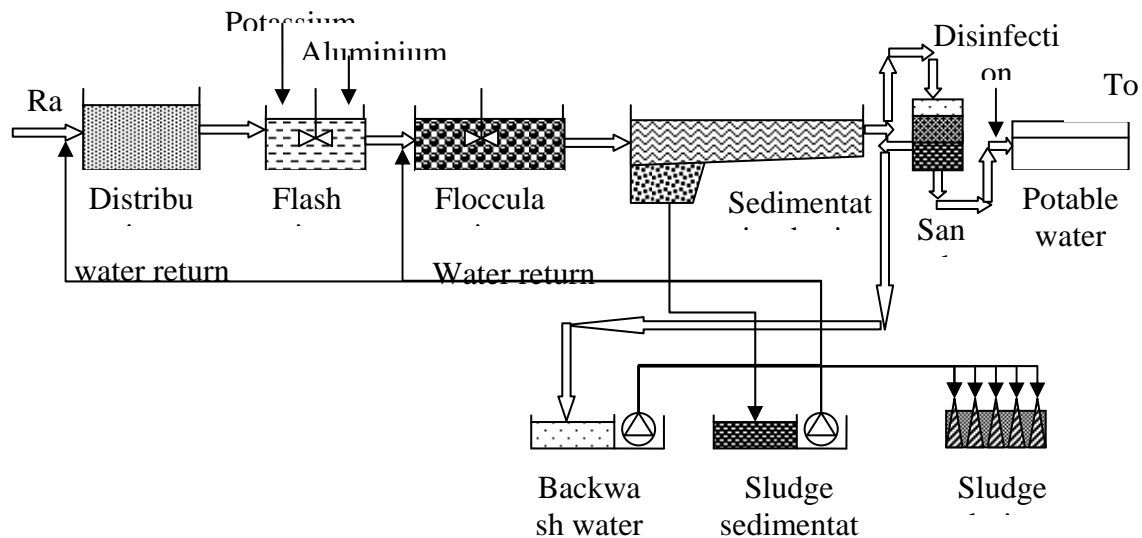


Figure 4,1: Treatment process proposed by the Feasibility Consultant

Various treatment processes can be considered, taking into account of the reliability of the technology, the existing characteristics of the raw water, and the capacity of the WTP and other site conditions.

Alternatives of Treatment Processes

The proposed processes should be selected for their ease of operation, reliability, and ability to meet the required effluent standards. The first criteria for the treatment of raw water into drinking water is to meet the requirements of European Council Directive 98/83 EC, November, 1998 (see Annex-3).

Alternative 1, Only Disinfection

Chloramination:

This process is supplied by only chloramination (Chlorine Gas and Anhydrous Ammonia) of the raw water conveyed from the Surface Water Diversion Unit (SWDU). A clearwell will be provided to ensure adequate contact time and mixing for the chloramines before discharge to the distribution systems, as well as an adequate storage volume for distribution pumping. Chloramination aids in the prevention of taste and odor problems. Chloramination residual lasts longer than chlorine residuals, thus eliminating the need for re-chloramination stations.

Ultraviolet (UV) Disinfection Units:

After filtration, disinfection can be supplied by the state-of-the art "flow through" UV disinfection units. Each unit consists of a stainless steel chamber containing 2 UV lamps, an automatic cleaning system, an UV monitoring system, and a control cabinet.

Alternative 2, Individual Process Types with Multiple Treatment Barriers

Regardless of the raw water test results performed by the Feasibility Consultant, surface water diverted by Surface Water Diversion (SWD) Unit that will be used for potable consumption must be treated to comply with Surface Water Treatment Rules (SWTR), which is promulgated by USEPA. The filtration and disinfection requirements under the SWTR protect consumers against the potential exposure to such diseases causing pathogens as Giardia, Cryptosporidium, viruses, Legionella, and heterotrophic bacteria. Other reasons for treatment requirement of raw water would be fertilizers and

high nitrate concentrations from agricultural run-off. Although, no agricultural lots on the upstream of the raw water catchment area exist in this case, intensive grazing activities are common. The water test results show that the reservoir water is highly contaminated by the Enterococci and other microbial indicators because of the intensive breeding of stocks and grazing activities at the upstreams of Veshcheruchay river.

The SWTR requires 99.9 % inactivation of Giardia and 99.99 % removal of viruses. The reduction and removal of potential pathogens is accomplished by the use of the USEPA's best available technologies (BAT) for filtration and disinfection. Newly adopted USEPA regulations to address the risk of disinfection by-products (DBPs) include: the Disinfectants/Disinfection By-Products Rule (D/DBP) and the Interim Enhanced Surface Water Treatment Rule (IESWTR). These Rules require continual monitoring of filtered water turbidity and routine DBP monitoring in the distribution system.

The D/DBP will be applied to all community water systems and includes a Maximum Contaminant Level (MCL) of 80 µg/l for Total Trihalomethanes (TTHM), 60 µg/l for the five Haloacetic Acids (HAA₅), 10 µg/l for Bromate, and 1.0 µg/l for Chlorite.

The treatment process to remove the contaminants from drinking water should be arranged in a treatment train.

Pre-filtration, enhanced coagulation (rapid mix and coagulation), settling ponds are required in the treatment process.

This process will increase removal of organic matter thus reducing DBP (Disinfection by-products) formation. This pretreatment process will use a chemical coagulant. Rapid mix of the chemical will be designed with a 40-second detention time and enhanced coagulation will be designed with a 5-minute detention time, providing optimum conditions for the reduction of turbidity to the acceptable limits.

The secondary filtration in the process can be supplied by the media filters with high rise pumps.

A clear well should be provided to ensure adequate contact time and mixing for the chloramines before discharge to the distribution system, as well as an adequate storage volume for distribution pumping.

The treated water will discharge to the clearwell where chlorine gas followed by anhydrous ammonia will be injected. This chloramination process provides a chlorine residual in the treated water distribution system and storage facilities. Chloramination reduces the potential for DBP formation that can occur during extended contact times in the distribution system and storage facilities when free chlorine is applied. Chloramination aids in the prevention of taste and odor problems. Chloramination residual lasts longer thus eliminating the need for re-chloramination stations.

Chlorine gas will be drawn from the containers under vacuum and injected in the filtered water piping before entering the clearwell. Due to the risks involved with the use of chlorine gas, a continuous chlorine gas monitor should be provided in the chlorine storage room and operators will be required to have special training.

The ammonia will be withdrawn from the tank and injected through the clearwell into a manifold as a gas.

Wastewater Polishing Ponds

Wastewater generated during the routine cleaning cycles in the system is discharged to the polishing ponds. Two ponds should be provided in series.

Sediment Drying Bed

A sediment drying area is provided for placing individual systems of modified roll off-type dewatering box. This area should be graded and asphalted.

A Pump Station located above the clearwell withdraws water from the treated water clearwell and pumps the water to the clear water reservoirs. Fixed speed pumps may be selected to meet the varying flow requirements, and due to the lower operating costs.

The above process type is an enhanced process for treatment the raw water into drinkable water quality. However, a micro filtration unit may be added to the system instead of media filters to be used for removing of the Protozoa group viruses.

Evaluation of the Process Alternatives

Only Disinfection:

Only disinfection by chloramination and/or UV units cannot kill the protozoa (Giardia, Cryptosporidium, and Legionella), which will be contained by the raw water. The protozoa group viruses are common in the raw water, which will be diverted from the surface water diversion units. The single-celled protozoa (Giardia and Cryptosporidium), which can cause severe intestinal illness, are more resistant to traditional disinfectants than bacteria or viruses.

With the rapid sand filtering process, only particles greater than 1-5 microns (approximately) can be removed from the raw water, resulting in treatment system feed water with varying amount of turbidity and microbial concentrations.

The use of *only disinfection method* providing the drinkable water would cause many ill effects on the consumers and on the environment that cannot be foreseen predictably. This type choice would not be environmentally sound.

Multiple Treatment Barriers:

In the multiple treatment barrier system above explained (Alternative 2), secondary filtration by the media filters can remove the particles greater than 1 to 5 microns (approx.) from the raw water. However, targeted turbidity limits cannot be met with this scheme. If media filter units change with the micro filtration units, targeted results may be obtained.

Conclusion:

The above assessments show us that a multiple treatment barrier system process type is required to provide the adequately treated drinkable water for the service area.

Because of this reason, the EIA team supports the selection of the Feasibility Consultant.

4.2.4. Alternatives Locations of WTP Sites

All alternative locations, which will be evaluated and assessed in this section, will be selected according to adopted raw water route alignment in this study.

Alternative Location 1 (preferred Option proposed by the Feasibility Consultant and Beneficiary)

This alternative location is determined by the Feasibility Consultant and AWM OJSC of Azerbaijan that the proposed WTP will be located at the lower levels of Burzubend village. The Astara city's drinkable water reservoir will be constructed in the WTP site. This alternative site has been sufficiently high (45 masl) to provide the gravity flow of water which will be conveyed to Astara city. The length of the gravity transmission main will be approximately 11 km.

There is no appropriate site for alternative location of WTP within the Project corridor from the raw water catchment area to Astara city. If the raw water would be transferred without treatment to Astara, a WTP and several pump stations would be required in or nearby the city. This would increase the

costs of the Project in respect of Operation/Maintenance and the construction of additional pump stations.

It would be illogical to determine another alternative WTP site just for comparison. Because of this reason, only Alternative Location 1 has been examined according to environmental indicators in this report.

Alternative 1 would generally achieve the project's basic objective since it would provide gravity flow of treated water to be conveyed to entire service area.

Briefly, analysis of the impacts of Alternative 1 compared with the impacts of the proposed project follows:

- *Aesthetics*: No impacts; similar to the projects.
- *Agricultural resources*: Less than significant impact with mitigated incorporation. Similar to the Project. Degradation of ambient air and dust effects during the construction period would cause the loss of productivity of adjacent agricultural lots. .
- *Air Quality*: Construction related emissions for Alternative 1 would be the same with the proposed Project. Most construction emissions are associated with site preparation and grading, both of which would occur to similar degrees in the project and in the Alternative. This effect would come into being in the medium level, and it has *high mitigatory potential*.
- *Biological resources*: Less than significant impact: similar to the Project. The noise effect on the terrestrial wildlife in close proximity of the construction site would come into being in medium level, and has *high mitigatory potential*. Such construction would require additional mitigation measures to avoid the noise effects on the terrestrial environment.
- *Cultural Resources*: No impact; similar to the Project. There is no archeological site and cemetery monument nearby the alternative location.
- *Geology and Soils*: Less than significant impact; similar to the Project, and *high mitigatory potential*.
- *Solid Waste and Hazardous waste disposal* would come into existence in the medium level and this alternative has *high mitigatory potential*: similar to the Project. None of the hazards associated with the operation of the WTP are associated with the design or location of the facility.
- *Hydrology and Water Quality*: Less than Significant impact; similar to the Project. Waste Discharge Requirements and similar regulations would apply to the alternative.
- *Land Use and Planning*: The land degradation would mostly come into existence in the *medium level*. This alternative has *high mitigatory potential*; similar to the Project. No need to purchase the private and/or agricultural land for this alternative location. All area to be used is public easment.
- *Mineral Resources*: No impact related mineral resources; similar to the Project.
- *Noise impact*: Less than significant impact; similar to the Project. This alternative has high mitigatory potential. Construction equipment, hours of operation, etc., will be similar to the proposed project.
- *Population and Housing*: No impact; similar to the project.

- *Public Services*: No impact; less than the project. Any impact on services would be temporary and nothing in the project scope would contribute to the need for an increased level of public services.
- *Recreation*: No impact; similar to the Project.
- *Transportation and Traffic*: No impact; Less than the project.

Conclusion:

A comparison of the alternative can be found in the following table. The No Project Alternative is the environmentally superior alternative; however, it does not achieve the project objective of ensuring adequate infrastructure to accommodate planned growth in Astara rayon, nor it does maintain the requirements of the proposed project compliance with the regulations of the National and International water quality.

If the No Project Alternative is the environmentally superior alternative, the EIA identifies an environmentally superior alternative among the other alternatives. The proposed project is the next most environmentally superior project alternative.

Table 4.2: Environmental impacts of location Alternative compared to Project for WTP location

Alternative	Meets Project Goals	Aesthetic	Agricultural Resources	Air Quality	Biological resources	Cultural Resources	Geology and Soils	Solid Waste and Hazardous waste disposal	Hydrology and Water Quality	Land Use and Planning	Mineral Resources	Noise Impact	Population and Housing	Public Services	Recreation	Transportation and Traffic
Project	Yes	Level 4	Level 2	Level 2	Level 3	Level 4	Level 3	Level 3	Level 3	Level 3	Level 4	Level 3	Level 4	Level 3	Level 4	Level 3
No Project Alternative 1	No	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less
Alternative 1	Yes	Same	Same	Same	Same	Same	Same	Same	Same	Same	Same	Same	Same	Less	Same	Less

Impact Level 1 : Potentially Significant Impact
 Impact Level 2 : Less than Significant Impact with mitigation incorporated
 Impact Level 3 : Less than Significant Impact
 Impact Level 4 : No Impact

Since the alternative would have less impacts than the project's environmental impacts in two items and it would generally achieve the project's basic objective, this alternative is an environmentally superior alternative.

On account of the above reasons, the EIA team supports this alternative location.

4.3. Wastewater Collection and Treatment

Presently, there is a scattered and dispersed partial sewage network, which serves only some institutional, commercial, and residential buildings located on the routes of main internal transportation axes inside the city. The current practice of sewage disposal at the remaining part of the city is in the manner of use of private septic and latrines. The septic pits are commonly located at the kitchen gardens of the houses. Some houses and institutions dispose their grey sewage to nearby open

channels and ditches along the main axis road of the city. The wastewater is evacuated to the natural environment according to local relief.

The proposed project provides a new sewerage system for the proposed service area. Because there is no sewage system which covers the entire city area.

The provision of sanitation is primarily a dual imperative of public health and environmental protection, with improved amenity as other important factor. A variety of critical issues need to be considered including;

- The appropriate use and disposal of water,
- The protection of groundwater and other sources of water from pollution and faecal contamination,
- Breaking the cycle of disease transfer,
- Reduction of insect vectors, and
- Sustainable recycling of nutrients back to the soil.

Because of the reasons mentioned above, alternative of the new sewage collection system is the environmentally superior alternative.

4.3.1. Wastewater Treatment

The Environmental pollution problems are exacerbated dramatically by a range of following factors;

- Lack of sewerage systems and sewage treatment capacity,
- Lack of appropriate on-site sanitation facilities, and
- Open drains and lack of garbage disposal facilities.

There is no active WWTP in the rayon. Construction of WWTP was stopped in 1980s. However, the area of approximately 6 ha is still dedicated by Astara Executive Power as future WWTP Site. As there is no WWTP in the rayon, constructing a full Wastewater Treatment Plant (WWTP) is the environmentally superior alternative.

4.3.2. Alternatives of Treatment Processes

For the WWTP, various treatment processes can be considered, taking into account of the reliability of the technology, the expected characteristics of the wastewater, the capacity of the WWTP and other site conditions.

The proposed processes should be selected for their ease of operation, reliability, and ability to meet the required effluent standards.

Process Proposed

The wastewater treatment plant that is to be constructed for Astara city will be considered a mechanical-biological '*Custom Build Continuous Flow*' type with extended aeration-activated sludge technology, which is the beneficiary concept.

An extended aeration process with sludge drying beds for the proposed WWTP is selected by the Feasibility Consultant as project proposal.

The required parameters of the municipal wastewater treatment process with the effluent quality standards are specified and framed in the EU Council Directive of May 21, 1991 concerning the urban wastewater treatment (UWWT).

As well known, this process type is a single sludge nitrification-denitrification process utilizing the biodegradable organics in the influent by recycling nitrates from a single aerobic zone to a single

anoxic zone, and by physically separating the anoxic zone from the aerobic zone. This process is capable of reducing total nitrogen (TN) to the 10-15 mg/l range.

The process incorporates dual environment of both oxic (aerated) and anoxic (non-aerated, mixed) conditions in separate areas of the plant to first accomplish nitrification then denitrification. Nitrification occurs in the aeration tanks of the 'Extended Aeration Process'. A recirculation system will be implemented to pump the nitrate-rich contents in aeration to the anoxic zone at the head of the plant. At this strategic location, the anoxic tank receives all the energy rich BOD of the influent wastewater as well as the recycled nitrate rich contents of the aeration process. The biological culture within the anoxic zone utilizes a portion of BOD as a carbon food source, and utilizes the nitrates as a source of oxygen, as no oxygen is added in the anoxic zone.

The nitrates will be converted to a harmless nitrogen gas in the process. Mixers in the anoxic tank provide the necessary suspension and mixing of the wastewater, and facilitate the release of the nitrate gas bound within the wastewater to the atmosphere.

However, the Feasibility Consultant stated in the Feasibility Report that the '*Intermittent denitrification which means that nitrification and denitrification phases alternate in time in one reactor has been chosen because control and steering of this process is not complicate and also offers big operational flexibility. The duration of the different phases will be determined by measuring the break in the redox potential. The activated sludge tanks will be equipped with fine bubble panel aerators which allow for a good oxygen transfer capacity and therefore provide an advantageous efficiency. Oxygen input into the wastewater will be steered by the flexible capacity of the blowers equipped with frequency converters. The blowers will be accommodated in an adjacent blower station.*

Alternative Option to Mechanical-Biological 'Custom Build Continuous Flow' type Extended Aeration-Activated Sludge Process

In Germany, various oxidation ditches using fill and draw technology were installed in 1960. Two decades later, Sequencing Batch Reactor (SBR) process technology was introduced. Presently, more than 150 WWTP are under construction or in operation in Germany. During the use of SBR technology, many questions of the consultants addressed to research institutions caused the German Association for Water Environment (ATV) to install a task group in 1995. ATV prepared a guideline for the design of activated sludge plants in SBR technology (ATV-M 210, published in 1997).

ATV guidelines represent the state of the art for designing wastewater treatment plants. They are commonly used for design purpose, at least as a basis for comparing the different technical solutions or design approaches. The authorities normally check the basic design by comparing it with ATV guidelines.

Assessment of Process Alternatives

- Fundamental biological principles governing the activated sludge system for wastewater treatment do not depend on whether the plant is operated as '*a batch*' or '*a continuous flow system*'.
- The main difference between designing '*a continuous flow plant*' and '*an SBR plant*' is the importance of the flow pattern for SBR plants.
- All activated sludge plants may produce foam under special conditions. Normally, the decanters of SBR plants do not remove this foam, which protects the effluent from the fraction of COD.
- Accumulating foam and enrichment of foam producing bacteria must be strictly avoided.
- Larger sized SBR plants very often use digesters for the treatment of primary sludge.
- An SBR plant normally can be effectively applied for small catchment areas as an alternative to nature-like systems. However, low qualified staff and/or lacking measuring devices (e.g. for

excess sludge withdrawal to control sludge age) make it sometimes very difficult to operate the SBR plants in case of significant changes in the influent conditions.

- In many cases, when an SBR plant is operated, it turned out to be nearly impossible for the operators to influence the process due to excess limitation of the computer timer settings.
- An operator trained to run a continuous flow plant might get lost when transferred to an SBR plant unless he receives specific instructions.
- For both systems, the sludge age (SRT) is the key parameter to define the biological system required to achieve the particular treatment goal.
- A continuous flow extended aeration treatment plant is the most commonly used treatment system, and the technology best understood by operators.

Conclusion:

This assessment ensures that a comparison of *SBR plant* and *a continuous flow plant* is based on similar biological systems.

On the other hand, the receiving water body must be capable of receiving the short time high hydraulic load from the SBR during the decant phase (Water Science and Technology, Vol 43, No 3 pp 323-330, IWA Publishing, Authors; B. Teichgraber, D. Schreff, C. Ekkerlien and P.A. Wilderer). Because of this reason, *a custom-built-continuous flow plant* is more environmentally sound than an SBR plant.

An SBR plant has no manual interaction, thus sensors and computer timers should be applied for automatic control of the processes. The performance of SBR plants in Germany was studied by a survey conducted in 1998. Almost all plants are subjected to advanced requirements according to European standards. However, in some plants, nitrogen removal was also significantly higher than required by effluent standards. This is caused by the operators trying to minimize the energy consumption (longer anoxic phase duration). A negative aspect of this strategy is that the treatment goal '*aerobic stabilization*', which requires high energy input, can not always be met. Insufficient sludge stabilization leads to odor problems. It is well known that the short filling phases and high exchange rates improve the settling characteristics of the sludge (Wilderer *et al.*, 1997).

The major advantages of '*a continuous flow extended aeration plant*' are the relatively low capital cost, and its technology is the best understood by the operators.

Therefore, the EIA study team recommends that the designation of *a custom-build continuous flow wastewater treatment plant* will be an appropriate solution both for more environmentally sound and easy operation.

4.3.3. Alternatives of Sludge Dewatering and Disposal

Sludge production is unavoidable problem arising from the treatment of municipal wastewater. This sludge contains considerable amounts of organic matter, pathogenes and chemical contaminants, which if not properly handled and disposed, may produce extensive health hazards. Sludge disposal is now recognized to be as one of the most important problems by all environmentalists and in this regard new standards have been established by USEPA in 1989.

Process Proposed

The onsite sludge drying beds are recommended by the Feasibility Consultant in consultation with the Beneficiary AWM OJSC).

The EIA team also recommends the sludge drying beds and mono-landfill process is to be taken into consideration for sludge stabilization process because of the following evaluation and assessments.

Alternatives of the Process

The sludge will be pumped from the secondary clarifier to the sludge thickeners (possibly more than one). Second step of the sludge stabilization is to dewater of the thickened sludge in the tanks before disposal in any way. Because of this, a sludge dewatering system is required in the wastewater treatment process. There are many means for dewatering the sludge, however, most are highly mechanical and expensive. The common dewatering processes are;

1. Centrifugation,
2. Belt filter press, and Filter Press
3. Composting, and
4. Natural processes.
 - o Sludge Drying Beds,
 - o Reed Beds.

Because of the economy and easy operation, sludge drying beds are used mostly in developing countries, but also in some industrialized countries (e.g., sludge drying beds are most widely used method of sludge dewatering in the United States).

There is no process which completely eliminates the requirements for disposal of biosolids.

When a liquid sludge is produced, further treatment may be required to make it suitable for final disposal. Typically, sludges are thickened (dewatered) to reduce the volumes transported off-site for disposal. Processes for reducing water content include lagooning in drying beds to produce a cake that can be applied to land or incinerated. There are two options for disposal of the sludge cakes, which are;

- A. Landfilling,
- B. Incineration.

1. Centrifugation

The wet sludge is dewatered in a centrifugal rotor, which has the separate peripheral channels serving as outlets for separated sludge, and the separating chamber of the rotor contains means located between the sludge outlets to form funnel-shaped pockets each converging radially outward toward a corresponding sludge outlet. Sludges can be disposed of by liquid injection to a land or by disposal in a landfill.

2. Belt filter Press and Filter Pres

The belt filter presses use a chemical flocculent to separate the water from the solids. The dewatered solids are then squeezed between two belts to further dewater them. The resulting solids are in the range of 18-20 percent solids. These solids are applied to agricultural land, and can also be taken to a landfill.

3. Composting

Composting is an aerobic process that involves mixing the wastewater solids with sources of carbon such as sawdust, straw or wood chips. In the presence of oxygen, bacteria digest both the wastewater solids and the added carbon source and, produce a large amount of heat. Thermal depolymerization uses hydrous pyrolysis to convert reduced complex organics to oil. The premacerated, grit-reduced sludge is heated to 250C⁰ and compressed to 40 MPa. The hydrogen in the water inserts itself between chemical bonds in natural polymers such as fats, proteins and cellulose. The oxygen of the water combines with carbon, hydrogen and metals.

4. Natural Processes

o Sludge Drying Beds :

Sludge drying beds provide to allow surplus that is withdrawn from the process to dry for easier handling. Sludge drying relies on an under ground drainage system as well as sunshine. Liquid from the under drains is returned to the treatment process for further treatment. Drying beds consist of a gravel sand filter equipped with a drainage system. Thickened sludge is loaded on the bed and the water is evacuated mainly by percolation (50-80 %) through the filter and the minor part by evaporation.

o Reed Beds:

Simply, it is a vegetated drying bed with reeds.

Evaluation of the Dewatering Process

Option 1 and 2 are typically first treatment stage of the sludge dewatering and disposal process. In these two options, a second stage is required for final disposal. Generally, the second stage is a landfill application, and using agricultural fertilizer of the biosolids.

On these methods, extra energy is required for sludge dewatering. The two methods are anaerobic processes.

A separate aeration and exhaust gas management for stabilization, pathogen reduction and odor control are required for this process.

A back-up facility is required for this process.

3 Composting

Many composting sites require the high level of technical sophistication, staff capability, and community relations efforts. Controlling odor is the most essential feature for the success of any sludge composting facility.

The composting facility must be designed so that the bulking, mixing, conveying, and composting operations can be readily adjusted to meet changing conditions. When modifications occur in sludge processing and dewatering at the wastewater treatment plant, the volatile solids content of the arriving sludge may vary significantly.

Sludge is almost always delivered from the treatment plant wetter than expected, and the moisture content may often vary from load to load. The moisture content and condition of both new and recycled bulking agents can also vary considerably depending on the source, the season, the extent of cover, and the extent of drying obtained during composting.

The key feature of successful composting is operating flexibility, serviceability, producing a stable disinfected product, and having a back-up for sludge disposal. An aeration and exhaust gas management for stabilization, pathogen reduction and odor control is required for a composting facility.

The extra energy is required for sludge dewatering with a composting facility.

4. Sludge Drying Beds

Dewatering of Sludge on the sludge drying beds is an anaerobic process. Sludge drying beds can be used as first treatment stage and/or as the second stage for dewatering of the settled sludge removed from the facilities such settling or thickening tanks or sedimentation

ponds.

In determining the area of sludge drying beds, given to climatic conditions, the character and volume of the sludge to be dewatered the method and schedule of sludge removal, and other methods of sludge disposal. In general, the sizing of the drying bed may be estimated on the basis of 0.18 m² / capita when the drying bed is the primary method of dewatering, and 0.1 m² / capita if it is to be used as a back-up dewatering unit.

This process do not require high qualified operators, and complicated technical sophistication. Controlling odor is one of the most important feature for the process.

Extra energy is not required for this process. It is not effective on the results, whether the sludge delivered from WWTP is wetter or not.

A separate aeration and exhaust gas management for stabilization, pathogen reduction and odor control is not required for this process.

A back-up facility is not required for this process.

Alternatives of Sludge Cakes (Dried Solids)' s Disposal

1. Agricultural Use,
2. Co-disposal of dewatered sludge with solid wastes,
3. Disposal of dewatered sludge at a separate mono-landfill in WWTP site,
4. Incineration of dewatered or dried sludge,

Evaluation of Alternative Design of Sludge Cake's Disposal

1. The use of sludge in agriculture will be most probably unfeasible because of heavy metal concentration and effects of toxicity of dried sludge. The following table shows the maximum permissible concentrations in sludges considered on agricultural land;

Table 4.3: Max. permissible concentrations in sludge considered on agricultural land

<i>Element</i>	<i>EC (mg/kg dry wt)</i>	<i>USEPA (mg/kg dry wt)</i>
Cd	20-40	39
Cu	1000-1750	1500
Ni	300-400	420
Pb	750-1200	300
Zn	2500-4000	2800
Hg	16-25	17
Cr	-	1200

Source: EC Directive 86/278, and USEPA

2. Dewatered sludge (sludge cake) can be co-disposed with solid waste at a landfill site (sanitary landfills for municipal solids). The lack of sufficient experience will result controversial views concerning the environmental reliability even of a modern sanitary landfill for municipal solids with or without co-disposal of sludge. The international experience do not lead to optimistic conclusions for the possibility of compost disposal.
3. Disposal of dewatered sludge at a separate mono-landfill in WWTP site is defined as disposal sites that are used exclusively for the disposal of biosolids. The application of the biosolids can either be in the dewatered or liquid state. However, the biosolids are usually applied in the dewatered state. The biosolids are applied to the surface of the land on a routine basis where

the objective is disposal rather than use. The site normally employs annual application rates of 150 to 300 dry tons per hectare per year. This landfill will be operated as a bioreactor is also a process to optimize the natural degradation of waste.

4. There are concerns about sludge incineration because of air pollutants in the emissions, along with the high cost of supplemental fuel, making this a less attractive and less commonly constructed means of sludge treatment and disposal. It is significantly more expensive and would very possibly meet with strong public opposition. Finally, problems could also arise from the need for ash disposal.

Conclusion:

On account of easy operation, needing no high qualified operators, having no technical sophistication, and needing no back-up facility, sludge drying beds are selected the best appropriate option for sludge dewatering process.

Disposal of dewatered sludge at a separate mono-landfill site is selected best appropriate option because of the negative environmental effects of other options. It is also required that below the deposit a water tight (e.g. clay) layer should be established to prevent infiltration into the ground water.

Establishment of the water insulation layer should start with the formation of a protective fine layer (sand) below the plastic foil layer. Foils should be welded together on site. Above these layers the drainage layer should be established consisting of a system of drainage pipes, with appropriate slope (for gravitational water drainage). Then a protective layer of sand follows, protecting the underlying drainage foil system from mechanical damage and consequent leakage.

The remaining water content of the dewatered sludge usually does not reach the bottom of the deposit as a result of the microbiological activity. Leachate water is generated from rain water and it is removed by the help of the built-in drainage system. Leachate water is highly polluted, therefore its treatment is indispensable. Leachate water should be forwarded to the treatment plant's inlet. Deposit site has not only to be fenced, but a protective forest range (beautification zone, see **Exhibit 6,5**), has to be established around it as well.

4.3.4. Reuse Alternatives

Reuse of Drinking Sludge

The drinking sludge will be generated in WTP as the result of water Works (coagulation-flocculation-filtration).

The main disposal method for these residuals is to return them into surface waters without any further treatment. Anyway, experiments made with the aim of evaluating the possibility of reusing drinking sludge in agriculture, were substantially positive (Lucas et al. 1991; Navazio et al., 1990, Croker et al., 1995). Although, reusing the drinking sludge in the agricultural land could present an environmentally sound proposal, it is not clear that intensive land application of drinking sludge according to some environmental experts. They concluded that these residuals may be effectively applied to land for agricultural purposes, as they have no pathogens, heavy metals concentrations less than law limits for land application, and high concentrations of lime, which improve physical-structural properties of the soil, increasing its fertility (Forzini, 1990).

Because of this situation, the reuse of drinking sludge in the land application is not considered in this study.

Reuse of treated wastewater

Reuse of treated wastewater can represent a potential new water source in the rayon. This alternative can be possible in the Astara case. The treated wastewater will be discharged into an irrigation canal

nearby the proposed WWTP. This irrigation canal is connected with Astara irrigation scheme. See, **Exhibit 2,4**.

4.3.5. Treatment of Industrial Water

The following approaches for treatment of industrial wastewater are possible:

1. Constructing full industrial wastewater treatment facilities for major industries, so that environmental discharge standards are met and allow construction of smaller municipal wastewater treatment plant for treatment of domestic wastewater only;
2. Constructing pretreatment facilities at individual industrial sites to meet sewer discharge standards and constructing municipal wastewater treatment plant capable of receiving all domestic and pretreated industrial wastewater; or
3. Constructing municipal wastewater treatment plant, capable not only of receiving the total volume of industrial and domestic wastewaters but also of treating potentially high levels of industrial effluents.

The first alternative is the most environmentally reliable and has the least negative impact. Professionally-managed municipal WWTP would be more reliable than an industry-operated WWTP discharging their untreated effluents into proposed sewage system.

4.3.6. Alternative Locations for Wastewater Treatment Plant Sites

Selection of the proposed sites takes account of existing and proposed land use, the ease of connection to the wastewater collection system, the possibility of odor and other nuisance to the community, and the availability of a suitable watercourse for discharge of treated effluent.

Alternative Location 1 (foreseen as preferred Option in the Feasibility Study)

This alternative location has been selected by the feasibility study team in consultation with AWM OJSC of Azerbaijan, and it is the existing WWTP site south of Shiyakaran village (see **Exhibit 2,4**). This alternative location is at about (-) 26.5 masl. According to Feasibility Concept, the sewage water raised by few lift station will be pumped to the WWTP through a force main (interceptor sewer) due to the topographic conditions. The area is a public easement, and provides an approximately 6 hectares land for the new WWTP. The proposed WWTP site can be reached directly from asphalt paved Astara – Lankaran coastal road.

It would be illogical to determine another alternative WWTP site just for comparison. Because of this reason, only Alternative Location 1 has been examined according to environmental indicators in this report.

Assessment of Alternative Locations

Among the factors that may be taken into account in addressing the alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, and jurisdictional boundaries. The identification of alternatives is also guided by the need to address any unmitigated environmental impacts related to the project.

Alternative 1

Briefly, analysis of the impacts of Alternative 1 compared with the impacts of the proposed project follows:

- ***Aesthetics***: No impact; similar to the project. The site is located along asphalt paved Astara – Lankaran coastal road South of Shiyakaran village.

- *Agricultural resources*: Less than significant impact with mitigation incorporated; similar to the Project. There is a number of agricultural lots which fall into Col 2 west of the proposed site. These lots will likely be affected by the construction activities in respect of the loss of productivity because of the fugitive dust and excessive emission. However, this impact would come into existence in the medium level, and has *high mitigatory potential*.
- *Air Quality*: Less than significant impact with mitigation incorporated; similar to the Project. Most construction emissions are associated with site preparation and grading, both of which would affect the aquatic species more than the project. This effect would come into being in the medium level, and it has *high mitigatory potential*.
- *Biological resources*: Less than significant impact: similar to the Project. There is no trees for felling and replanted in or nearby the property. However, the noise effect on the terrestrial wildlife in close proximity of the construction site would come into being in medium level, and has *high mitigatory potential*. Such construction would require additional mitigation measures to avoid the noise effects on the terrestrial environment.
- *Cultural Resources*: No impact; similar to the Project. There is no archeological site and cemetery monument or the sensitive receivers nearby the alternative location.
- *Geology and Soils*: Less than significant impact; similar to the Project, and *high mitigatory potential*.
- *Solid Waste and Hazardous waste disposal*: *Less than Significant impact, and this impact would come into existence in the medium level and this alternative has high mitigatory potential*: Similar the Project. None of the hazards associated with the operation of the WWTP are associated with the design or location of the facility.
- *Hydrology and Water Quality*: No impact; less than the Project. Waste Discharge Requirements and similar regulations would apply to the alternative.
- *Land Use and Planning*: The land degradation would mostly come into existence in the *medium level*. This alternative has *high mitigatory potential*; similar to the Project. No need to purchase the private and/or agricultural land for this alternative location. All area to be used is public easment.
- *Mineral Resources*: No impact related mineral resources; similar to the Project.
- *Noise impact*: Less than significant impact; similar to the Project. This alternative has high mitigatory potential. Construction equipment, hours of operation, and etc. will be similar to the proposed project.
- *Population and Housing*: No impact; similar to the project.
- *Public Services*: No impact; Less than the project.
- *Recreation*: No impact; similar to the Project.
- *Transportation and Traffic*: No impact; Less than the project.

Conclusion:

A comparison of the alternatives can be found in the following table. The No Project Alternative is the environmentally superior alternative; however, it does not achieve the project objective of ensuring adequate infrastructure to accommodate planned growth in Astara rayon, nor it does maintain the requirements of the proposed project compliance with the regulations of the National and International water quality.

If the No Project Alternative is the environmentally superior alternative, the EIA identifies an environmentally superior alternative among the other alternatives. The proposed project is the next most environmentally superior project alternative.

Table 4,4: Environmental impacts of location Alternatives compared to Project for WWTP location

Alternative	Meets Project Goals	Aesthetic	Agricultural Resources	Air Quality	Biological resources	Cultural Resources	Geology and Soils	Solid Waste and Hazardous waste disposal	Hydrology and Water Quality	Land Use and Planning	Mineral Resources	Noise Impact	Population and Housing	Public Services	Recreation	Transportation and Traffic
Project	Yes	Level 4	Level 2	Level 2	Level 3	Level 4	Level 3	Level 3	Level 3	Level 3	Level 4	Level 3	Level 4	Level 3	Level 4	Level 3
No Project Alternative	No	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less	Less
1	Yes	Same	Same	Same	Same	Same	Same	Same	Less	Same	Same	Same	Same	Less	Same	Less

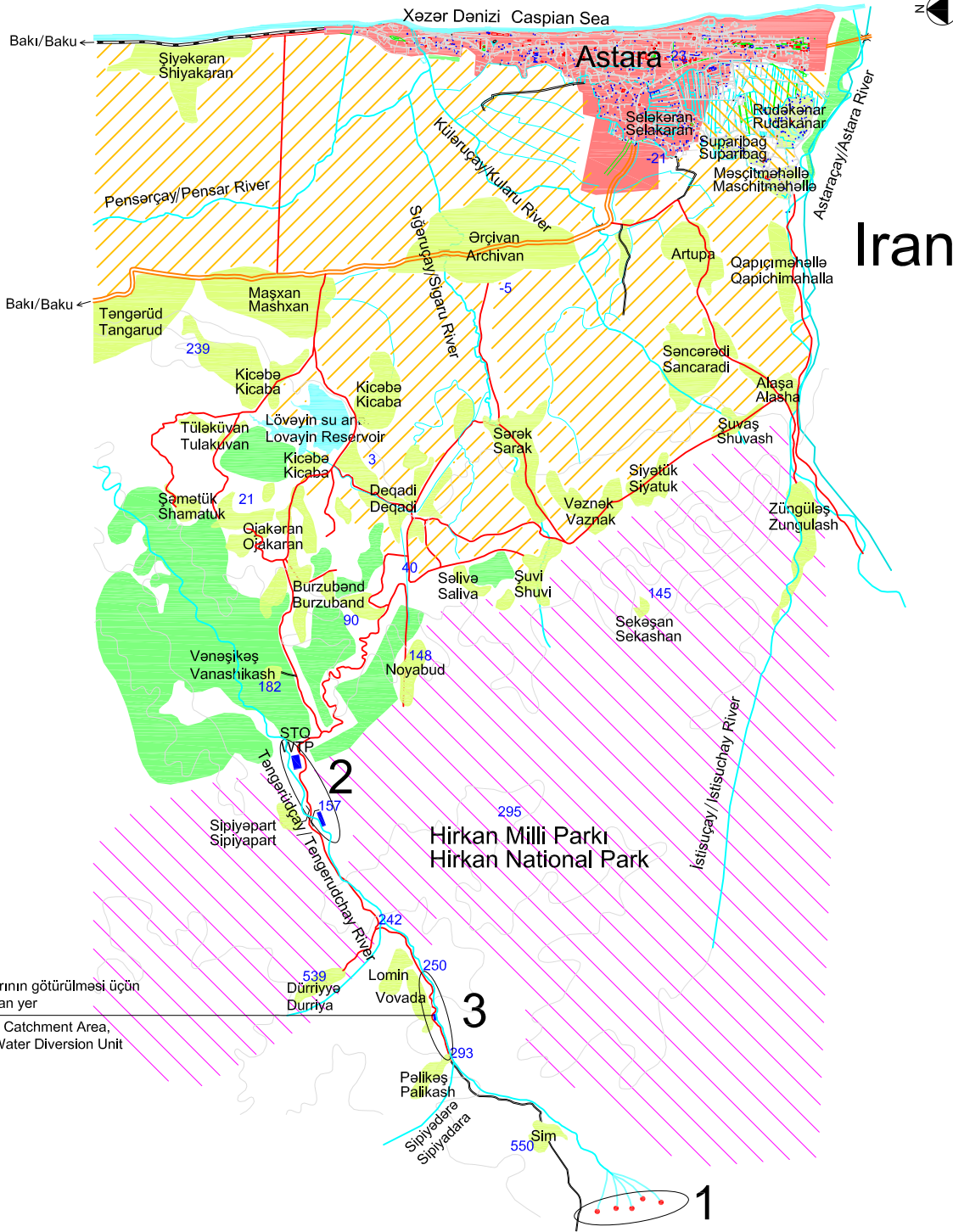
Impact Level 1 : Potentially Significant Impact
 Impact Level 2 : Less than Significant Impact with mitigation incorporated
 Impact Level 3 : Less than Significant Impact
 Impact Level 4 : No Impact

Since the alternative would have less impacts than the project's environmental impacts in three items and it would generally achieve the project's basic objective, this alternative is an environmentally superior alternative. Therewithal, this alternative needs no additional land acquisition.

On account of the above reasons, the EIA team supports this alternative location.

4.4. Location Alternatives for Construction Contractor's Camp Site

As it is studied in the Chapter 3.9.1, total amount of Construction Contractor's staff can increase up to 250 to execute the work including subcontractors' staff. An adequately designed camp site is required for the contractor to use both to accommodate his staff and to park and maintenance his machinery, equipments and plants. Estimated required land for this purpose will approximately be 3-4 Ha. As such, this facility will significantly affect the environment in its surroundings. However, any alternative Construction contractor camp place is not discovered within the period of EIA study. The final location of the contractor(s) camp site should be determined with the approval of AWM OJSC and/or Rayon Executive Power within the period of pre-construction phase, and the most environmentally sensitive location should be selected.



LEGEND

- Şəhərlər
Cities
- Kəndlər
Villages
- Dövlət sərhəddi
National Border
- Şose
Highway
- Demir yolu
Railway
- İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- Torpaq yol
Earthen Road
- Köprü
Bridge
- Bulaq
Spring

- Horizontallar
Contour Lines
- Meşə zolağı
Forest Blades
- 1ci-Sanitar(abadlaşdırma) Zona - 30 m
Beautification Zone - 30 m
- Kənd Təsərrüfatı torpaqları
Agricultural Lots
- 2, ...,n, (-)17
Baltik dənizinə görə yüksəkliklər
Ground Levels according
to Baltic Sea level

Xam suyun götürülə biləcəyi qaynaqların
Alternativləri, Bax fəsil 4.2.1
Alternatives of Raw Water Capture, See Chapter 4.2.1

- 1 — Bulaq Suyunun götürülməsi
Proposal for Spring Water
- 2 — Səthi su mənbəyi təklifi
Proposal for Surface Water Diversion
- 3 — Səthi su mənbəyi təklifi (üstünlük verilən alternativ)
Proposal for Surface Water Diversion (Preferred Alternative)

Exhibit
4,1

Drawing Name: Xam suyun götürülə biləcəyi
qaynaqların Alternativləri
Alternatives of Raw Water Capture



İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlerin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon
Azerbaijan
Republic of Azerbaijan

Məsələtəçi

Consultant

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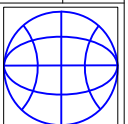
Miqyas/Scale

Tarix/Date

Miqyasız/N.T.S.

Jan. 2011

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Chapter 5

REGULATORY FRAMEWORK

5.1. Environmental Laws, Regulations and Institutions in Azerbaijan

5.1.1. Institutions

The following institutions and Ministries will be involved to the Project in accordance with the current legislations and regulations of Azerbaijan, and those are;

Table 5,1; Principle Environmental Institutions / Ministries in Azerbaijan

INSTITUTIONS / MINISTRIES		
Name	Leading Exercise	
1	MENR, Ministry of Ecology and Natural Resources	This ministry upholds all natural resource protection laws. The State Ecological Expertise (SEE) acts within this agency on the Program level in reviewing Environmental Impact Assessments (EIAs).
2	MoH, Ministry of Health	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 by legal and physical persons through application of laboratory and sampling controls.
3	MES, Ministry of Emergency Situation	This agency implements construction safety supervision and standards.
4	State Urban Development and Architecture Committee	The Committee has authority to conduct studies on population distribution, on planning the usage of nature regional, on general plans and detailed planning of inhabitant areas, etc.
5	Tariff Council of Republic of Azerbaijan	Tariff Council acts under Azerbaijan Republic Economic Development Ministry, and he responsible for definition of tariffs, service fees which are applied in nationwide.
6	AWM OJSC Amelioration and Water Management Open Joint Stock Company of Azerbaijan	He is a stock company which provides State services for amelioration and water farm, and stocks of which belong to the State. The Company's activities focus on irrigation, for which it sets water-use norms and handles user relations. . In addition, it is in charge of land improvement on irrigated land, and the operation and maintenance of the irrigation infrastructure.
7	Azersu OJSC, Joint SuKanal LLC, and Rayon SuKanal Departments (RSKD)	The AzerSu OJSC's main water supply activities in rural areas are comprised of establishment of policies, project planning, and functioning as an intermediary between central government and international donor organizations. However, AzerSu OJSC has its own potential to plan projects in cooperation with Joint SuKanal Limited Liability Company (LLC) and Rayon SuKanal Departments (RSKDs).

5.1.2. Laws

Laws affecting water and wastewater infrastructure which have been incorporated into the Environmental Management and Monitoring Plan include the followings.

Table 5.2; List of Laws and Regulations to be incorporated into the EMMP

LAWS AND REGULATIONS		YEAR ADOPTED
1	Environmental Protection and Utilization of Natural Resources	1992
2	Environmental Protection	1999
3	State Ecological Expertise, SEE	1996
4	Environmental Safety	1999
5	Water Code of the Azerbaijan Republic	1997
6	Water Supply and Wastewater	2000
7	Health Protection	1999
8	Sanitary - Hygienic State, part of GOST	1992
9	Water quality, air and noise standards: GOST (various years)	-
10	Program on Strengthening Financial Discipline in the Water Sector	2002
11	Improvement of Water Supply Management	2004
12	Construction Norms and Regulations: SNiP	-
13	Rule for Use, Protection and Preservation of Trees and Bushes, No 173	2005
14	The Land Code	1999
15	EU Council Directive, 91/271/EEC, UWWTP directive	-
16	EU Council Directive, 98/83/EC, Drinking Water Standards	-

The most pertinent laws to be applied for this Project are explained below:

Table 5.3: The most pertinent Laws of Azerbaijan with respect to environmental aspects

LAWS AND REGULATIONS	MOST PERTINENT ASPECT
1 Law on Environmental Protection, 1999	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, EIA is subject to SEE. This also explains that the MENR is responsible for the review and approval of EIA reports submitted by developers. Furthermore, in Articles 81 and 82 of the Law on Environmental Protection (1999), <i>the Law specifically provides for the application of international agreements in case of an international institute or body has provisions that are different from those of the Azerbaijani legislation.</i>
2 State Ecological Expertise, SEE, 1996	The State Ecological Expertise (SEE) mandates an 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 stand-alone check of compliance of the proposed activity with the relevant environmental standards (e.g. for pollution levels, discharges, and noise).
3 The Law on Sanitary – Hygienic State, 1992	The Law on Sanitary and 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.
4 The Water Code, 1997	The Water Code (1997) 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: <ul style="list-style-type: none"> • 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.
5 SNIP, Construction Norms and Regulations	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. Annex 9 contains standards on maximum concentrations of toxic substances in the air of working zones. Annex 11 specifically claims that workers need to be informed and trained about sanitation and health care issues and the specific hazards of their work.																						
6	Rule for Use, Protection and Preservation of Trees and Bushes, No 173, 2005	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.																						
7	Article 22 of the Land Code, 1999	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.																						
8	EU Council Directive, 91/271/EEC, Urban Wastewater Treatment Plants-UWWTP directive*	Wastewater treatment shall meet effluent quality discharge Standard according to European Council Directive 91/271/EEC on Urban Wastewater Treatment Plants (UWWTP), but phased in be compared the developing regulations and conditions in Azerbaijan. Plant design shall meet EU Member State Standards (comparable with the smallest settlement/treatment plant size category) for,																						
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9	EU Council Directive, 98/83/EC, Drinking Water Standards	Water quality sampling must be conducted to meet the frequency and methods stipulated in European Council Directive 98/83/EC and article 7(monitring) and the related Annexs, e.g. Annex II, Table A (parameters to be analyzed) and Table B1 (minimum frequency of sampling and analysis for water intended for human consumption supplied from a distribution network). The treated water should comply with the EU Directive 98/83/EC, and parameters are below:																						
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* As there are no specific wastewater discharge sampling requirements and limits specified under Azerbaijan regulations, the EU Directive 91/271/EEC (UWWTP- Urban Wastewater Treatment Plants), has been adopted by the Ministry of Health (MoH) of Azerbaijan to regulate the urban wastewater treatment.

5.2. Government's Environmental Assessment and Review Procedures

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 more than minor potential impacts, a full EIA is automatically required. Since categorization is absent under Azerbaijan environmental regulations, the WB guidelines will be adopted for project categorization under the Investment Program.

To accord a SEE by the MENR, an EIA is mandatory. The basic procedures for the conduct of the EIA are laid down in the 1996 *Handbook on the EIA Process in Azerbaijan*. The purpose of this document is to establish the level of ecological danger resulting from prospective and/or actual economic activities which may have an impact on the state of the natural environment and people's health. It also must assess compliance of planned economic or other activity with the demands laid down in

environmental protection legislation, in water and wastewater quality regulations and with standards of hygiene. It establishes the sufficiency and justification of the envisaged measures for nature protection as well.

The procedure for EIA in Azerbaijan includes the following:

- A. During the first stage of the EIA process, which takes about one month, 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.
- B. The second stage of the EIA process lasts 3 months, during which the EIA documentation submitted by the EAs is investigated by SEE. At this stage, an environment review expert group of 5-11 skilled and experienced members (e.g. members of the Academy of Science, university staff or officials from other ministries) is formed. There are no firm requirements on group composition, but MENR has a roster of experts and composes each commission based on case specific considerations. This environment review expert group, chaired by MENR, carries out the public submissions, investigations and consultations. Finally, a written review of documentation together with recommendations is submitted by the environmental review expert group to the SEE.
- C. At this stage, the SEE decides on whether to refuse or approve the application with or without conditions. Conditions for the approval that might typically be considered in the present context mainly relate to the construction phase and may include site management, noise, dust, discharges to the land, subsurface or water and solid waste management. If the application is approved with conditions, either the activity starts or the PMO decides to appeal against the conditions. If the application is accepted, the PMO must provide a report to SEE on progress within 12 months of the SEE decision. After approval is given, the construction works must begin within one year otherwise it will be necessary to conduct another EIA.
- D. During construction in the Program, the PMO through CMF must monitor parameters as indicated by the SEE. If the Program designs change significantly from those studied in the feasibility study, additional reports on the impacts of the changes may be requested by the SEE. Controls are made by the SEE on the accuracy and the reliability of the developer's monitoring results. If it appears that there is a risk of the conditions being breached, the SEE will issue a warning to the developer. If the conditions are breached, the developer is obliged to stop whatever activity is causing the breach of the conditions.

5.3 Environmental Categorization & World Bank Policies

This Project is classified as a category A Project in accordance with the requirements of the World Bank Operation Policy 4.01 on “**Environmental Assessment**”, and its Annexes A, B, C. The Project was rated under Environmental Category A in view of the nature of water supply and sewerage, together with some building investments anticipated under the Project in the Terms of Reference of this assignment (See Annex-1).

According to WB OP/4.01, Paragraph 8; “*The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.*”, and for a Category

A Project “ the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the other instruments referred to in para. 7.”.

According to WB OP/4.01, Paragraph 14 (Public Consultation); “ the borrower consults project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account. The borrower initiates such consultations as early as possible. For Category A projects, the borrower consults these groups at least twice:

- a) shortly after environmental screening and before the terms of reference for the EA are finalized; and
- b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.”

This EIA will examine the project's potential impacts by comparing all possible alternatives, selecting the best alternatives, and preparing an environmental management plan in accordance with the requirements of WB operation policy 4.01 and other relevant WB policies, such as;

- WB OP 7.50, Projects on International Waterways,
- WB OP 4.07, Water Resources Management,
- WB OP 4.37, Safety of Dams.

Chapter 6

Impact Assessment and Mitigation Measures

Overview

This Chapter identifies the potential impacts of the project on the physical, biological, and socio-economic environment of the Project service area, see **Exhibit 1,1**. This section also identifies measures that will help to mitigate the project's adverse environmental effects.

This project will involve the construction of a 11 km treated water transmission main from WTP up to Astara city for providing the drinkable water to the public in the targeted service area.

The potential impacts of the Project will be assessed and evaluated in design, construction and operational phases. However, this Chapter will discuss the impacts in construction and operational period. The Impacts in Design and Pre-construction phases will be approached in Chapter 7 (Environmental Management).

Where impacts are significant enough to exceed accepted environmental standards, mitigation is proposed in order to reduce the residual impact to the acceptable levels and achieve the expected outcomes of the project.

The criteria for assessment are the national environmental approaching and standards and the guideline criterion standards given in World Banks publication Pollution Prevention and Abatement Handbook.

6.1. Methodology and Assessment Criteria

This Chapter sets out the methodology for undertaking the EIA. In particular, it details the process of identifying the likely significant environmental effects of the proposed project and the method of assessing the significance of the impacts.

The content and conclusions of the EIA are based on an assessment of the application drawings as detailed documentation, baseline surveys and series of technical studies.

6.1.1. General Approach

The EIA has been prepared in accordance with the EIA Regulations which implement the frameworks detailed in Chapter 5.

As summarized in Chapter 1 and 2, the proposed project consists of a number of the elements, which require a single planning approval. As a consequence, the environmental assessment has assessed the significant environmental effects arising from the followings:

For Water Supply System in the rayon;

1. Construction of a SWDU at the lower levels of Lomin village nearby Tengerudchay flow channel.
2. Construction of a raw water transmission main approximately 9 km in length along the Astara city – Sim village asphalt paved secondary road.
3. A treated water reservoir in the WTP site.

4. Construction of a gravity treated water transmission main, approx. 11 km in length.
5. Construction of a Water Treatment Plant (WTP) in the WTP site, including administrative buildings, maintenance facilities, back-up power facilities, control and test unit (laboratory) and access Road.
6. Construction of a Drinkable Water Distribution Tank (DWDT) for Astara city in the WTP site,
7. Construction of the Feeder Mains within the piped networks in the city,
8. Construction of the Distribution Mains in the city.

And for Sewage Network;

- Interceptor Sewer,
- Collector Sewers,
- Pump Stations (Lift Stations),
- Lateral Mains, and
- Wastewater Treatment Plant.

In line with both the EIA Regulations and best practice guidances, a Scoping Study was carried out at the beginning of the assessment process. This identified the environmental issues to be addressed in the EIA and was subject to consultation with the AWM OJSC of Azerbaijan.

The EIA considers both positive and negative effects during the construction and operation phases of the proposed project. In line with the legislative and best practice requirements, direct, indirect, secondary and cumulative, short, medium and long term, permanent and temporary, positive and negative effects are also addressed where applicable.

6.1.2. Scoping the EIA

'Scoping' is a fundamental component of the EIA process, and focuses the study on those issues of the greatest potential significance. It is important in identifying all of the likely significant effects of a proposed project through the design, construction and operational phases and ensures that appropriate mitigation options are considered. A Scoping Study document for the proposed project was produced using a combination of:

- Feedback from AWM OJSC of Azerbaijan,
- Reference to the 'Environmental Checklist to be considered for inclusion in an environmental statement',
- Review of technical studies completed as part of the proposed project,
- A systematic in-house review in conjunction with the AWM OJSC of Azerbaijan and EIA Team,
- Expert opinion from the EIA Team and relevant external sources.

6.1.3. Scoping Report

Purpose of the Scoping Report:

The principal aim of the Scoping Report is to provide information to the competent authorities, stakeholders and consultees to enable them to understand the characteristics of the development such that they can provide a scoping opinion for the purposes of undertaking an Environmental Impact Assessment (EIA) on the proposals. The manner in which scoping fits into the EIA process is shown in the flow diagram below.

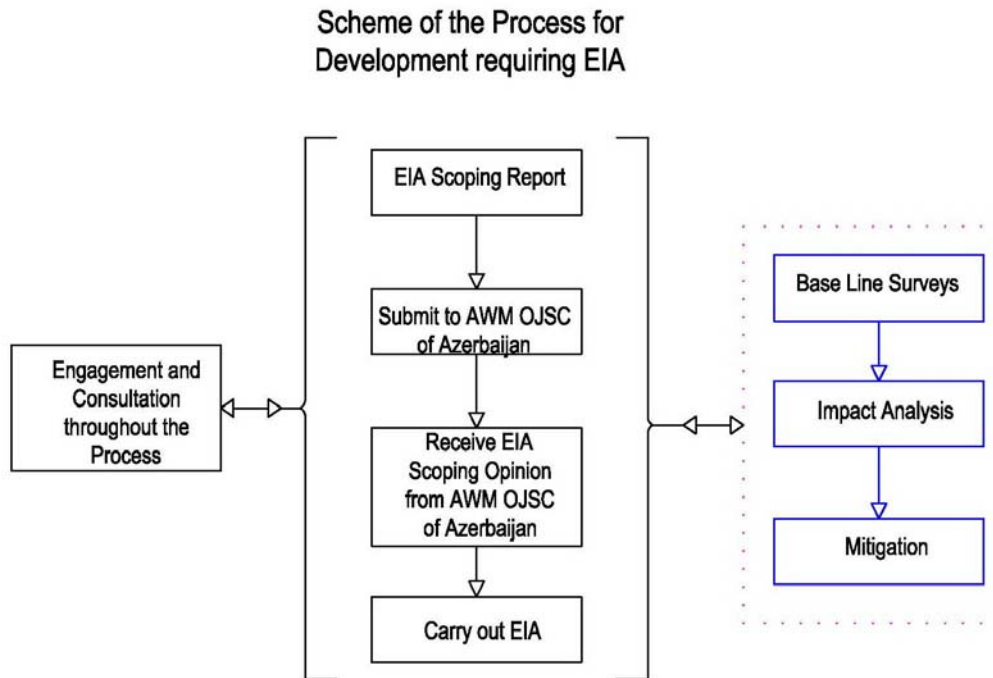


Figure 6,1: Scheme of Process for Development requiring EIA

The scoping of an EIA by which these main or significant effects are identified is, therefore, an important preliminary procedure, which sets the context for the study.

The scoping exercise identifies key potential environmental effects related to the proposal at an early stage, which permits subsequent work to concentrate on the relevant environmental topics.

This Scoping Report has been generally informed by the following:

- Desk-top studies and site visits,
- Work undertaken to date including further survey work,
- Discussions / meetings with a number of key statutory bodies who would later be responsible for commenting on the EIA as part of any future planning applications,
- Review of relevant websites,
- Review of documents including planning policy, consultation papers and EIA assessment Guidance,
- Information contained within the Feasibility being studied, data obtained from AWM OJSC of Azerbaijan and Rayon's Public Utility Departments, Ministry of Ecology and Natural Resources (MENR) of Azerbaijan, Road Patrol of the rayon, General Directorate of Road Patrol of Azerbaijan, State Land and Cartography Institute, State Statistical Committee (SSC) of Azerbaijan and experience of other large infrastructure projects,
- Meetings with other stakeholders, including staff at the existing rayon Public Utility Departments.

6.1.4. Objective of the Scoping Report

This scoping report has the following objectives:

- To provide a brief description of the Project,
- To identify key environmental constraints and sensitivities,

- To identify the likely key impacts, both positive and negative, and to identify associated preliminary opportunities for mitigation and enhancement,
- To identify gaps in information and proposed further surveys,
- To outline the strategic back ground, for example proposed and existing legislation/planning guidance and required consents,
- To identify the way forward for further stages of the EIA and the consultation process.

The Scoping Report was submitted to AWM OJSC of Azerbaijan in March 25, 2010 for a formal opinion and indicated that the following environmental issues associated with the proposed project.

1. Aesthetics,
2. Agricultural Resources,
3. Air Quality,
4. Biological Resources,
5. Cultural Resources,
6. Geology and Soils,
7. Hazards and Hazardous Materials,
8. Hydrology and Water Quality
9. Land Use and Planning,
10. Mineral Resources,
11. Noise,
12. Population and Housing,
13. Public Services,
14. Recreation,
15. Transportation and Traffic,
16. Systems Utilities,
17. Mandatory Finding of Significance,

Pursuant to discussions and correspondence with Rayon Public Utility Departments and the AWM OJSC of Azerbaijan, it was concluded that the following environmental issues associated with the proposed project were addressed in detail in the EIA.

1. Land Use and Planning (construction camp, soil erosion, soil contamination and surface run-off),
2. Solid Waste, Hazardous Waste Disposal,
3. Water Resources,
4. Ambient Air Quality, Dust and Odor,
5. Noise,
6. Temporary Traffic Management,
7. Ecological Environment (vegetation, terrestrial wildlife, aquatic biology and fisheries),
8. Cultural Environment,
9. Systems' Utilities,

Statutory Consultation Process

Since the Study Areas consist of 12 rayons, two information meetings, each for six rayons, have been planned conducted for scoping consultation process. The first information meeting for the southern six rayons (Lankaran, Astara, Lerik, Yardimli, Masalli, and Jalilabad) were held at seventh of September, 2010 in Astara. The second information meeting for other six rayons (Imishli, Zardab, Kurdamir, Ujar, Gadabay, and Dashkasan) have been held at September 17, 2010 in Ujar.

The following statutory and non-statutory organizations have been consulted regarding the proposed Project for the rayon:

- AWM OJSC of Azerbaijan and EMU of AWM OJSC,
- Representative of Rayon SuKanal department,
- Representative of MENR of Azerbaijan,
- Astara Water User Associations (NGOs),

- Road Exploitation Office of Astara rayon,
- Representative of Ecology and Natural Resources Department of Lankaran.

The process of engagement and consultation will also be widened to take account of the public and other interests in the Rayon.

As a result of these meetings and discussions the Proposed Project has been amended to ensure that issues raised are reflected in the composition of uses where possible and practicable / viable.

Specific comments raised by AWM OJSC of Azerbaijan are provided in the table below;

Table 6,1: Comments Raised by AWM OJSC of Azerbaijan

CONSULTEE	ISSUE RAISED	CHAPTER ADDRESSED	WHERE
AWM OJSC/EMU of AWM OJSC, Environmental Health and Safety Officer of AWM OJSC	The important focus of the assessment should be on the vulnerable riparian habitats within sections of the Project corridor at the riverfront area of Astara city, and Tengerudchay river valley (i.e. along Kulerichaychay river in and in front of the city and the section of Tengerudchay river valley between Lomin and Vanashikash villages).	Chapter 3, 6, 7 and 8.	
	AWM OJSC would like us to consider the effect of the proposed development on the route of the terrestrial and avian native residents along the treated water transmission main.	Chapter 3, 6, 7 and 8.	
	And other important focus of the assessment should be on dust releases and emissions of PM ₁₀ involving the use of equipment and materials. Because the treated drinkable water transmission main coming from WTP site, will travel a long distance (at about 11 km) following a path along the villages' connection roads and Baku-Astara highway to Astara city.	Chapter 3, 6, 7 and 8.	
	Also AWM OJSC raised his concerns on the heavy equipment activities along the Project corridor during the construction period. During this period, large piles of sediment, construction fencing, various signs, and heavy equipment should be visible along the pipeline routes. After construction ceases, all equipment, fencing, and signs should be removed and the Project area should revert to its natural condition.	Chapter 3, 6, 7 and 8.	
	The participants, generally agreed with the proposed dispersion model, pollutants to be assessed and met data were acceptable.	Chapter 3, 6, 7 and 8.	

6.1.5. Assessment Methodology

The methods used in undertaking this study are outlined in this section, with references to published standards, guidelines, best practice and relevant significance criteria. Legislation is also identified where applicable.

6.1.5.1. Criteria for Assessment of Significance

Significance as a concept is at the core of impact identification, prediction, evaluation and decision-making in Environmental Impact Assessment (EIA) processes. Evaluating the significance of environmental impacts is linked to all the phases of the EIA process. It is used throughout the process and formal or intuitive evaluations can be made at different stages.

"Significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment. A social or

economic change related to a physical change may be considered in determining whether the physical change is significant.

6.1.5.2. Impact Identification

A number of methods can be used to identify the major impacts of a proposed project. Methods for impact identification have been divided by Munn (1979) and Canter (1996) into the generic classification of matrices, networks and checklists. Shopley and Fuggle's (1984) classification include both methods and techniques. The categories for impact identification listed by Shopley and Fuggle (1984) include:

1. Ad hoc approaches (e.g. project, sector or environment specific guidelines);
2. Checklists (i.e. the listing of potential impacts);
3. Matrices (e.g. the Leopold Matrix);
4. Networks (i.e. the presentation of higher order impacts and linkages using directional diagrams);
5. Overlay Maps (e.g. the McHarg technique); and
6. Modelling procedures (i.e. computerized, mathematical, physical scale models or descriptive models).

The following technics are used in this study;

1. Checklist,
2. Interaction Matrix,
3. Descriptive Models supported with the maps, figures, and graphs.

6.1.5.3. Impact Prediction

Once potential impacts have been identified, further investigation is required to predict the nature of the impact. Predictions are based on simplified conceptual models of how natural processes function. Models range in complexity from those that are very intuitive to those based on explicit assumptions about environmental processes (Munn, 1979). Criteria that can be used to describe the nature of an impact include:

1. Spatial extent;
2. Duration of the impact;
3. Intensity or severity of the impact;
4. Status of the impact (i.e. either positive (a benefit) or negative (a cost) or neutral);
5. Reversibility (i.e. reversible or permanent);
6. Degree of certainty; and
7. Mitigatory potential.

6.1.5.4. Impact Evaluation

Once the impacts have been predicted and described, the significance of the impacts should then be assessed. Significance can be described in terms such as:

- Legal requirements; and
- Acceptability

6.1.6. Definitions of the Concept of Significance

Deciding whether a project is likely to cause significant environmental effects is central to the practice of EIA. Whatever environmental effects are addressed and whatever methods are used, the focus of EIA always narrows down to a decision about whether the project is likely to cause significant *adverse environmental effects* (Canadian Environmental Assessment Agency, 1992). Despite this, the concept remains largely undefined and there is no international consensus on a single definition.

Selected examples of definitions or interpretations are given below;

Table 6,2; Selected examples of the definitions or interpretations of the concept of significance

Canter and Cauty (1993)	Significance can be considered on three levels: (1) significant and not mitigatable, (2) significant but mitigatable, and (3) insignificant. Significance is sometimes based on professional judgement, executive authority, the importance of the project/issue, sensitivity of the project/issue, and context, or by the controversy raised.
US Environmental Protection Agency (1993)	Determination of significance requires predicting change. These impact predictions are along with societal values, the major input to significance determination. Ideally, change should be compared against thresholds of concern, some of which may be legally mandated and others, which may be levels or states of valued components determined by the public, authorities or the EIA team.

6.1.7. Generic Approaches and Criteria

The use of generic approaches and criteria is sufficiently broad enough for stakeholders holding opposing views to relate to and accept. The main challenge would be to ensure that the environmental impact reporting recognizes that different impacts have varying levels of significance for different stakeholders.

The three broad categories of determining impact significance are summarized in Table-6,3.

Table 6,3; The three broad categories of determining impact significance

CATEGORIES	CRITERIA
Legal	: The importance of an environmental resource is acknowledged in the government policy, law or plans
Public	: Segments of the public recognize the importance of an environmental resource. Recognition may take the form of support, conflict or opposition.
Technical	: The importance of an environmental resource is based on scientific knowledge or judgement of critical resource characteristics.

Source: Adapted from Canter, 1996.

The following generic criteria can be used to describe magnitude and significance of impacts in a systematic manner. The criteria are:

- Extent or spatial scale of the impact;
- Intensity or severity of the impact;
- Duration of the impact;
- Mitigatory potential;
- Acceptability;
- Degree of certainty;
- Status of the impact; and
- Legal requirements.

Describing the impacts in terms of the above criteria provides a consistent and systematic basis for the comparison and application of judgements. Ratings should be assigned for each criterion. The significance of impacts of the proposed project should be assessed both with and without mitigation action. The descriptors for the ratings are given in Table-6,4 below.

Table 6,4: Categories for the rating of impact magnitude and significance.

IMPACT MAGNITUDE AND SIGNIFICANCE RATING	
High	: Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time consuming or some combination of these.
Medium	: Impact is real but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible.
Low	: Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both.
No impact	: Zero impact

Specific examples are given below of the type of impact criteria that can be used and adapted for a variety of contexts and projects.

The three levels of significance by the generic matrix are;

Table 6,5: The sensitivity (value of) of receptors

Sensitivity	Magnitude of Effect		
	High	Medium	Low
High (National)	Major	Major/Moderate	Moderate
Medium (Regional)	Major/Moderate	Moderate	Moderate/Minor
Low (District)	Moderate	Moderate/Minor	Minor

Major : An effect which in isolation could have a material influence on the decision-making process.

Moderate: An effect which on its own could have some influence on decision-making, particularly, when combined with other similar effects.

Minor : An effect which on its own is likely to have a minor influence on decision-making but when combined with other effects could have a more material influence.

6.1.7.1. Extent or Spatial Scale of the Impact

A description should be provided as to whether impacts are either limited in extent or affect a wide area or group of people (Table-6,4 and 6,5). For example, impacts can either be site specific, local, regional, national or international.

Table 6,6: Examples of criteria for rating the extent or spatial scale of impacts.

RATING	
High	: Widespread Far beyond site boundary Regional/national/international scale
Medium	: Beyond site boundary Local area
Low	: Within

6.1.7.2. Intensity or Severity of the Impact

A description should be provided as to whether the intensity of the impact is high, medium, low or has no impact, in terms of its potential for causing either negative or positive effects (Table-6,7). When country specific legal or scientific standards are not available, international standards can be used as a measure of the intensity of the impact.

Table 6,7: Examples of criteria for rating the intensity or severity of impacts

RATING	
High	: Disturbance of pristine areas that have important conservation value. Destruction of rare or endangered species.
Medium	: Disturbance of areas that have potential conservation value or are of use as a resource. Complete change in species occurrence or variety.
Low	: Disturbance of degraded areas, which have little conservation value. Minor change in species occurrence or variety.

6.1.7.3. Duration of the Impact

It should be determined whether the duration of the impact will be short term (0 to 5 years), medium term (5 to 15 years), long term (more than 15 years, with the impact ceasing after the operational life of the development), or considered permanent (Table-6,8).

Table 6,8: Examples of criteria for rating the duration of impacts.

RATING	
High (Long term)	: Permanent Beyond decommissioning Long-term (More than 15 years)
Medium (Medium term)	: Reversible over time Lifespan of the project Medium-term (5 – 15 years)
Low (Short term)	: Quickly reversible Less than the project lifespan Short-term (0 – 5 years)

6.1.7.4. Mitigatory Potential

The potential to mitigate the negative impacts and enhance the positive impacts should be determined (Table-6,9). For each identified impact, mitigation objectives that would result in a measurable reduction in impact should be provided. The rating both with and without mitigation or enhancement actions should be recorded.

Table 6,9: Examples of criteria for rating the mitigatory potential of impacts.

RATING	
High	: High potential to mitigate negative impacts to the level of insignificant effects.
Medium	: Potential to mitigate negative impacts. However, the implementation of mitigation measures may still not prevent some negative effects.
Low	: Little or no mechanism to mitigate negative impacts.

6.1.7.5. Acceptability

Establishing the acceptability of a potential impact is as important as determining its significance. An impact identified as being non-significant by a specialist may be unacceptable to a particular section of the community. On the other hand, a significant impact may be acceptable if, for example, adequate compensation is given. The level of acceptability often depends on the stakeholders, particularly those directly affected by the proposed project. Ratings that can be used for acceptability are given below.

Table 6,10: Examples of criteria for rating the acceptability of impacts.

RATING	
High (Unacceptable)	: Abandon project in part or in its entirety. Redesign project to remove impact or avoid impact.
Medium (Manageable)	: With regulatory controls. With project proponent's commitments.
Low (Acceptable)	: No risk to public health.

6.1.7.6. Degree of Certainty

A description should be provided of the degree of certainty of the impact actually occurring as either unsure, possible, probable, or definite (impact will occur regardless of prevention measures) (Table-6,11).

Table 6,11: Examples of criteria for rating the degree of certainty of impacts.

RATING	
Definite	: More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.
Probable	: Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	: Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
Unsure	: Less than 40% sure of a particular fact or the likelihood of an impact occurring.

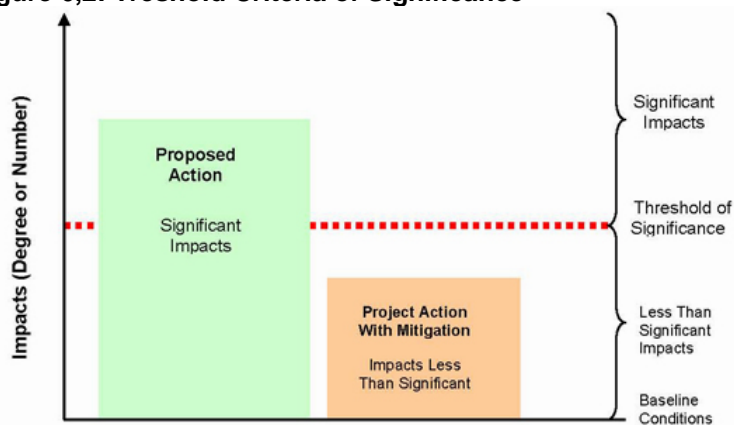
The following additional categories can also be used:

- Status of the impact: Specialists should describe whether the impact is positive (a benefit), negative (a cost) or neutral.
- Legal requirements: Specialists should identify and list the specific legal and permit requirements, which potentially could be relevant to the proposed project.

6.1.7.7. Criteria for Treshold of Significance

The criteria are expressed as thresholds which the project would have a significant effect on the environment. Thresholds may be quantitative or qualitative, or they may be based on agency standards or legislative or regulatory requirements as related to the impact analysis.

The following criteria (Figure 6,2) presents the criteria used to define significant effects on the environment.

Figure 6,2: Treshold Criteria of Significance

Relevant legislative, regulatory and professionally judged thresholds related to the baseline conditions for the environmental settings have been set forth in Chapter 3.

6.1.8. The Use of Significance at Different Stages of the EIA Process

Evaluating the significance of environmental impacts is a critical component of impact analysis. The stages in the EIA process where the concept of significance is used are indicated in Table-6,12.

Table 6,12: Stages in the EIA process where the concept of environmental significance*

STAGE IN THE EIA PROCESS	OBJECTIVES	APPROACHES AND METHODS
Screening	Process, which determines whether a project should be subject to an EIA because of its associated potential significant impacts.	Approaches used at this stage include: 1. Checklists of projects, activities or impacts; and/or 2. Predefined criteria.
Scoping	Process in which key (significant) issues are raised and the focus is on determining the specific issues or significant impacts that need to be addressed in the EIA.	Approaches used at this stage include: 1. Facilitation; 2. Stakeholder engagement; 3. Negotiation; and 4. Mediation.
Specialist studies	This stage involves the identification and prediction of project impacts by specialists and the evaluation of their significance.	Approaches used at this stage include: 1. Numerical calculations or modelling; 2. Experiments of tests; 3. Physical or visual simulations 4. Mapping; and 5. Professional judgement.
Environmental Impact Report	This stage involves the preparation of a report by the EIA practitioner. The EIA practitioner integrates different forms of information and uses impact description and significance criteria to present the results to the decision-maker.	Approaches used at this stage include: 1. Predefined criteria for evaluating impacts 2. Professional judgement 3. Verbal description 4. Visualisation 5. Mapping; and 6. Matrices.
Decision-making	The decision-maker uses judgement to rate, determine the significance and acceptability of impacts.	Approaches used at this stage include: 1. Professional judgement; and 2. Predefined criteria for evaluating, rating and weighting significant impacts.

- *The concept of significance has different meanings at different stages of the EIA process (i.e., in screening, it is used to determine whether an EIA is required or not. In the decision-making stage, significance is used to weigh and rank impacts (positive and negative) and make compromises or trade offs).*

6.2. Analysis of Impacts and Mitigation

This section will cover the **'Impact Assessments'** spanning the Project service area, and suggested **'Mitigation Measures'** are discussed subsequently in each sub-section. Each positive and negative consequence has been assigned a level of impact in the form of **'high'**, **'medium'**, and **'low'**.

Impact assessment is an important tool for incorporating environmental and biodiversity considerations into the planning and implementation of infrastructure development. Environmental Impact Assessment (EIA) is used to identify likely significant adverse effects of individual project proposals, and to suggest ways in which these can be avoided or otherwise minimised or reduced to acceptable levels (*'mitigation measures'*).

A detailed discussion follows each impact statement and includes information to support the stated conclusion. This discussion also provides mitigation measures to reduce significant or potentially significant effects of the proposed project to the extent feasible.

This defines mitigation as;

- a) Avoiding the impact altogether by not taking a certain action or parts of an action.
- b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation.
- c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- d) Reducing or eliminating the impact over time by preservation and maintenance operation during the life of the action.
- e) Compensating for the impacts by replacing or providing substitute resources or environments.

This discussion also describes the status of all significant impacts following application of mitigation measures. Either the impact would be reduced to a level below the significance threshold (*mitigated to a less-than-significant level*) or it would be concluded that feasible mitigation is not available or is insufficient to reduce an impact to *less than significant*. This would be a “*significant unavoidable effect on the environment*.”

Evaluation of the Impacts in accordance with the Environmental Checklist

According to Initial Study performed by AWM OJSC of Azerbaijan within the Environmental Checklist and summary evaluation of impacts were conducted in the Scoping Report;

From the Scoping Report Chapter 4,17;

Findings of Significance

- a) Potentially significant adverse impacts to the natural environment resulting from the proposed project and related activities were evaluated. The proposed project would not involve activities in and near sensitive habitats that contain a diverse array of wildlife species, including some endangered, threatened, and rare species. Therefore, no impact exists.
- b) The proposed project could not potentially to affect important prehistoric and historic examples of Azerbaijan/Astara history; therefore, **no impact** exists.
- c) Because the mission of the MENR of Azerbaijan and ENRD (Environmental and Natural Resources Department) of Lankaran Rayon as it pertains to the natural resources, is to “protect and preserve the natural resources of the area. No additional projects other than routine maintenance are planned for the proposed project area in the foreseeable future. Impacts from other known projects do not overlap with potential impacts from the proposed project; therefore, **no impact** exists.
- d) Environmental effects from the proposed project would generally not have substantial adverse effects on humans. However, possible impacts from construction accidents, noise, and other safety hazards do exist. With the incorporation and implementation of the proposed mitigation measures, impacts to humans from the proposed project would be reduced to **a less than significant level**.

Impact Significance Matrix

Assessing the potential environmental impacts of the Project will be presented pursuant to discussions sequenced in the impact significant matrix is given below. Each project component/activity is screened separately with regard to its construction and operation phase, and according to various physical, biological and environmental parameters undertaking the adequate consultations with the Rayon Public Utility Departments and AWM OJSC of Azerbaijan.

In undertaking field surveys mentioned in Chapter 1.6, particular attention is given on the relation between the ecological function of the whole protected area and the area which will be affected by the

proposed Project. All impact assessments and impact evaluations is bounded by the borders of assessment area given in Chapter 1,5 and **Exhibit 1,1**.

Assessments will also be detailed in accordance with the criteria identified in Chapter 6,1, and have been formulated according to the impact significance matrix, which is given below. The matrix of Impact significance helps identify the potential areas of impact screening the project for environmental and social soundness.

Table 6,13: Matrix for Assessment of Significance Level of Impact and Magnitude of Impact

Impact	Spatial Scale of Impact	Intensity-Severity of Impact	Duration of Impact	Mitigatory Potential	Acceptability	Degree Certainty	Status of Impact	Magnitude of Impact	Significance Level of Impact
1 Land Use and Planning									
a) Construction Camp	L	L	L	H	L	Possible		Minor	3
b) Soil Erosion	L	L	L	H	L	Possible		Moderate / Minor	3
c) Soil Contamination and Surface Run-off	L	L	L	H	L	Possible		Moderate / Minor	3
2 Solid Waste-Hazardous Waste Disposal	L	L	L	H	M	Probable		Moderate / Minor	3
3 Water Resources	L	L	L	H	M	Probable		Moderate / Minor	3
4 Ambient Air Quality									
a) Dust and Emissions	M	L	L	H	M	Probable		Moderate	2
b) Odor	L	L	L	H	L	Possible		Minor	3
5 Noise	L	L	L	H	L	Possible		Moderate / Minor	3
6 Temporary Traffic Management	L	L	L	H	L	Possible		Minor	3
7 Ecological Environment									
a) Vegetation	L	L	L	H	L	Possible		Moderate	3
b) Terrestrial Wildlife and Birds	L	L	L	H	L	Possible		Moderate	3
d) Aquatic biology and Fisheries	L	L	L	H	L	Possible		Minor	3
8 Cultural Environment	-	-	-	-	-	None	Neutral	None	4
9 System's Utilities									
a) New WWTP	H	-	M	-	M	Definite		Major / Moderate	4
b) New WTP	H	-	M	-	M	Definite		Major / Moderate	4
c) New Drinkable Water Distribution Tank	H	-	M	-	M	Definite		Major / Moderate	4

H: High, M: Medium, L: Low,

Definite : More than 90 % sure of a particular fact
 Probable : Over 70 % sure of a particular fact
 Possible : Only over 40 % of a particular fact
 Unsure : Less than 40 % sure of a particular fact
 Significance Level 1 : Potentially Significant Impact
 Significance Level 2 : Less than Significant with mitigation incorporated
 Significance Level 3 : Less than Significant
 Significance Level 4 : No Impact

 Negative Impacts

 Positive Impacts

 Neutral

The source of the construction impacts will mainly be from removal of structures and vegetation, construction of access, earthworks to construct system components, re provisioning and repairing nearby pedestrian tracks.

The potential impact of construction works is outlined below.

- The loss of the fertile plough layer at campsites and concrete batching plant, and a drop in the elevation of borrow areas will decrease land productivity.
- Potential conflicts may emerge with landowners regarding the restoration of borrow areas.
- Borrow pits and other landscape depressions if left open, may prove hazardous to human beings, livestock and wildlife.
- Sewage Works, water treatment plant and drains often cause eutrophication which can increase food resources for wild habitats at low levels.
- Wetland Fragmentation from pipe laying Works and their access roads, may result in the loss of species that require large areas.
- Open pits containing water are potential sources of mosquito breeding if left stagnant, and can create health problems.
- Surface run-off from the impervious surface of the carriageway and side streets can further aggravate the flooding of embankment sides during the operation phase.
- Ambient Air Quality Degradation nearby the Project corridor.
- Historic and Archeological sites may be affected from the digging and excavating activities.
- Residents and wildlife communities may be affected from the noise generated by the powered mechanical construction machineries.
- A significant increase may occur in visitation to the Project corridor.
- Temporary and intermittent interruption may occur within the Project area.
- Some Public Services may be interrupted temporarily within the Project corridor.

6.2.1. Land Use and Planning

6.2.1.1 Analysis of Impact

This section explains how the Project corridor within the borders of assessment area will be affected by the project activities in terms of land use, soil erosion, soil contamination, and surface run-off.

Land Use

The land use classification system has not yet been developed in Azerbaijan. However, according to inspection and investigations in the Project corridor 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 rayon's general land use plan including specific plans or zoning ordinances. No part of the Project corridor falls into the State Nature Reserve Areas, Preserved National Parks and private amenities. Therefore, **no impact** will occur.

No part of the Project corridor falls into the forest zone, and therefore, **no impact** will occur.

No agricultural lot falls into the Project impact corridor 1 (**COI 1**), however, 1228 hectares agricultural land fall into the Project impact corridor 2 (**COI 2**) along the gravity transmission main and around the city.

In general, the areas that will be used to acquire borrow material will be impacted most significantly, followed by those used to install concrete batching plant (and asphalt pant, if required). 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.

Temporary impacts during the construction in the urbanized and rural area within the Project corridor will be sourced from the following activities, but not limited to;

- Trenching and excavation works for pipe laying and jointing,
- Earth Works for pipe bedding, encasing and trench backfilling,
- Cut and fill and grading activities,
- Transportation of the materials from the excavation,
- Reinstating the road and sidewalk profile,
- Activities for ancilliary works,

The line alignment and location of the Project components are critical in determining the environmental impacts. The land degradation will mostly come into existence in the **Medium** level (as Moderate/Minor is indicated in table 6,13, and has '**High Mitigatory Potential**') at the **Col 1** (Corridor of Impact 1).

Construction Contractor(s) Camp Site

The contractor(s) will require land for:

- Contractors' camps and facilities, ie, storage, equipment parking and washing areas,
- Sources of borrow material and earth-fill,
- Aggregate quarries,
- Concrete Batching Plant,
- Asphalt plant, if required,
- Access roads for haulage,
- Disposal sites and procedures for the safe disposal of surplus construction and waste material.

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

- Excavation activities,
- Trenching and construction of water pipelines for connecting the water to the facilities,
- Elevated water tank,
- Erection of the site buildings,
- Construction of fuel facility,
- Connections the electrical conduits and cabling,
- Perimeter fencing,

Soil Erosion

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.

Soil erosion may occur;

- In workshop areas as a result of unmanaged runoff from equipment washing-yards.
- Once the project returns to normal operation, it will be subject to a natural depreciation as high embankments become increasingly prone to soil erosion, causing increase in dust emissions and a fall in land productivity.

The soil erosion will come into existence in the **Low** level (L-level is indicated as Minor in table 6,13, and has '**High Mitigatory Potential**') at the **Col 1** (Corridor of Impact 1).

Mitigation measures to obviate these impacts are developed in the subsequent chapter 6.2.1.2 and Chapter 7 (Environmental Management).

Soil Contamination and Surface Run-off

- Scarified/scraped asphalt and concrete materials, if not disposed of properly, may contaminate soil resources.
- The possible contamination of soil by construction chemicals, i.e. oils and chemicals at concrete batching plant (asphalt plant) sites, workshop areas, and equipment washing-yards may limit the future use of the land for agricultural purposes.
- Possibly, the spill of wastewater contained in sewer lines during the construction Work will be very high.
- 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 curing 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.

The soil contamination and surface run-off will come into existence in the **low** level indicated as Moderate/Minor in table 6,13, and has **'high mitigatory potential'** at the **Col 1**. A **less than significant** impact will occur.

Mitigation measures to obviate these impacts are developed in the subsequent chapter 6.2.1.2 and Chapter 7 (Environmental Management).

6.2.1.2. Mitigation

Contractor's Orientation

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.

Contractor tenders shall be required to identify separately the resources and funds to be applied to the training and mitigation measures, and the contractor tenders 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, traffic management, materials management, noise and dust control, waste management.

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.

The Project will be designed not to interfere with the drainage on adjacent lands and paths and to prevent soil erosion and retain the existing irrigation system in the operational phase.

There are several irrigation and drainage channels that cross or are affected by the project. The plans to avoid and retain such drainage and irrigation works shall be included in the Drainage Management Plan, and the contractors will include plans for any necessary temporary drains to cater for worst case flow. The designs will also provide for protection of the works that are in progress and for redistributing flash flows from prepared surfaces during heavy rain to reduce erosion and other impacts.

The drainage designs for the Project should be cleared with the local drainage and irrigation authorities prior to commence the works.

The contractor(s) will be required to have a drainage engineer / erosion control officer to check the implementation of the temporary drainage mitigation on the site and make modifications on a daily basis as necessary.

To protect the drainage and irrigation system in the Project corridor that may be affected by the construction activities; Contractor will incorporate the following design features to minimize alterations in the surface drainage in the Project corridor:

1. Contractor will review the irrigation systems and irrigation structures potentially affected by construction of the Project. If the irrigation cannot be maintained, contractor will provide and maintain alternative temporary irrigation structures in the Project corridor. At the completion of construction, the contractor(s) will re provision the irrigation structures disturbed by construction and agree with EMU if redesign is required or if new structures will be constructed or if the original irrigation structures will be repaired.
2. Re provisioned irrigation channels will be capable of supply all the fields previously supplied with at least the volume of water supplied before the construction of the project.

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

Land Use and Productivity

- 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.
- As far as possible, waste/barren land (i.e, areas not under agricultural or residential use), and natural areas with a high elevation will be used for setting up Project facilities.
- Where the use of agricultural land is unavoidable, the top 30 cm of the plough layer will be stripped and stockpiled for redressing the land after the required borrow material has been removed.
- 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.
- 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, which should carry the nature of inert, and then leveled with the stockpiled topsoil to make it even with the rest of the area.
- Ditches or borrow pits will be restored back to nature conducting reinstatement applications after the Project is completed to minimize erosion and to avoid creating hazards for people and livestock.

Soil Erosion and Surface Runoff

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

The contractors will be required to include appropriate measures for the slope protection, ie, vegetation cover and stone pitching, in the detailed construction drawings and implement them accordingly.

These will include the following measures:

It is recommended that sedimentation facilities be set up at rivers where all working stations are within 100 m of streams and rivers, to trap and settle out runoff from the works. Where wet works have to be pumped dry, the waste water should first be passed through a proprietary sedimentation tank (or similar) to remove suspended particles before discharge at a location agreed with EMU. The contractor shall be required to have a dedicated drainage engineer and erosion control officer. Where works cross streams and rivers the preliminary designs for sedimentation facilities such as sediment traps, filter fabric fences, or straw bale barriers should be included as a line item before those new areas are cleared and opened up for construction works.

It is recommended that preliminary designs for sedimentation facilities are included in the contracts and subsequently in the Erosion Control and Temporary Drainage plans. Combinations of alternative methods should be considered including but not necessarily limited to:

- Schedule work so that 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 calendar days of site disturbance.
- Locate potential area pollutant sources away from steep slopes, water bodies, and other critical areas.
- Highly erodible soils should be avoided.
- Route construction traffic to avoid existing works or newly planted vegetation.
- Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.
- Minimum widths of buffer zones should be 15 m for low-order headwater streams with expansion to as much as 60 m or more for larger streams.
- Stockpile topsoil and reapply to re-vegetate the site.
- Cover and stabilize topsoil stockpiles.
- Use wind erosion controls.
- Intercept runoff above disturbed slopes. Convey to permanent channel or storm drain.
- On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.
- Use retaining walls, if necessary.
- Use check dams, if necessary.
- Install bioengineering in line with AWM OJSC manuals and seed and fertilize.
- 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 60 m of the water courses and there should be an intervening vegetated buffer to control any un-expected run-off. As a long-term benefit of the project, the drainage infrastructure may be able to be modified as water harvesting structures to collect water for irrigation and other uses and such options should be discussed and investigated at the detailed design stage.

Soil Contamination

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.
- During the construction phase, the spill of wastewater contained in the sewer lines shall be stored in the temporary pits dug in the ground in sewer line level, then they will be sucked up and taken out of the settlements by septic vacuum trucks and disposed to dedicated sewer ponds.
- The temporary pits should be constructed not to infiltrate the soil and contaminate the ground water. The pits' bottoms can be covered with waterproof traps, heavy-duty plastics, or rubber matting equipped with berms to prevent wastewater from running into discharge off-sites. Whatever containment material is used, it must seal tightly to the ground so that no wastewater can pass under or over the berms.
- In addition, the temporary pit shall be cleaned regularly as needed to prevent odor and safety hazards associated with H₂S.
- 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 AWM OJSC of Azerbaijan 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
 - ✓ Containing any liquid,
 - Special attention should be paid for construction of contractor's fuel facility, and those are;
 - ✓ Fuel tanks (diesel or oil) should be placed in a concrete pool which its perimeter walls will be at least 1.20 m high with the concrete or plastered masonry wall,
 - ✓ 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,
 - ✓ The area of the fuel facility should be covered with a shed for the protective measure against the sunshine and rain.
 - ✓ A proper floor drain should be installed on the slab of the concrete pool for safely discharging the leakages,
 - Nutrients: The fertilizer and liming materials into the soil to depths of 10-15 cm.
- Washouting from concrete trucks and mixers should be disposed into a designated area that can later be backfilled.

- 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.
- 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 AWM OJSC and agreed with the local authority / community.
- 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.
- Oily residues and fuel should be captured at source and refueling and maintenance should take place in dedicated areas away from surface water resources.
- Debris generated by the dismantling of existing structures will be recycled subject to the suitability of the material in line with the MMP.

6.2.2. Solid Waste and Hazardous Waste Disposal

6.2.2.1. Analysis of Impact

Solid wastes will be generated during the drilling operations, removal of asphalt surface, dumping base, sub-base and fine sand for 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.

Solid wastes include wood and paper from packaging and building materials, sanitary wastes, rubber, plastic, glass as well as masonry and asphalt products. Food containers, cigarette packages, leftover foods, and aluminium foil also contribute solid wastes on the construction sites.

Construction chemicals, chemical compounds, such as paints and acids, cleaning solvents 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.

These impacts will be temporary, and its magnitude will be in the **medium level** indicated as Moderate/Minor in the table 6,13, and high mitigatory potential. These impacts will discontinue once the construction is completed. A **less than significant level of impact** will occur during the construction phase. These impacts will discontinue once the construction is completed. However, 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 phase.

Total of 6 km collector sewers is constructed by asbestos cement pipes in the city. Asbestos cement (AC) water and sewer mains, generally considered as non-friable asbestos containing materials, are not believed to represent a significant hazard to public health in normal use. However, repair, rehabilitation and removal of AC pipes involve cutting, polishing and demolition can release asbestos fibers into the air, posing risks to public health, particularly when pipes are mishandled or damaged. Once the asbestos becomes airborne, it poses risks to Project workers and general public that are nearby the work area.

Replaced AC pipes can be either abandoned in place or collected and disposed in designated sites. Abandonment in place may cause health risks related to future construction activities at this site. However, some disposal practices can create current public health risks, and the hazard can also extent to future generations. Generally, replacement methods break the AC pipes into pieces and leave the AC material in a zone around the new pipe after replacement. Disposal of broken AC pipes in designated sites (such as municipal hazardous waste disposal site) provides better monitoring and control for future assessments and follow-ups.

Protection measures for this hazard are given in the subsequent section (mitigation).

6.2.2.2. Mitigation

Constructor's Equipment will be cleaned and repaired (other than emergency repairs) in the dedicated

facility or an 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 lawful permitted or authorized destination.

- Construction chemicals, chemical compounds, such as paints and acids, cleaning solvents will not be disposed at any place of a construction site, and dumped in a stream nearby the site.
- All solid wastes identified in chapter 6.2.2.1 will properly be packaged, and disposed at a lawfully area.
- Contractor's workers 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.
- All hazardous materials will 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 approved by the ECO.
- Hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure.
- Thinners or solvents should not be discharged into sanitary or storm water system when cleaning the machinery.
- Any accidental chemical / fuel spills to be corrected immediately.
- Exercise extreme care with the handling of diesel and other toxic solvents so that spillage is minimized.

Work with Asbestos Cement Pipes during the Removal, Demolition and Replacing Activities

The following preparatory Works should take place prior to commence the construction activities in the excavation site to avoid the hazard to public health during the work with asbestos, and those are;

- Posting a warning sign at the entrance to the excavation area.
- Restricting Access to the site, restricting to the work area using barricades.
- Providing hand/face washing facility at the site.
- Establishing a waste-load area at the site.
- Informing the workers about the nature of the job.
- Collecting air testing for asbestos testing.

Similarly, for staff protection, most personal protective equipment (PPE) used for work with AC pipe, are also typically required for other construction activities (e.g. steel-toed boots, hard hats, safety glasses, musks and rubber/leather gloves).

Disposal of broken AC pipes

After the excavation and exposure of AC pipes;

- The condition of the pipes should be visually inspected.
- An on-site decision should be made to replace the pipes.
- AC pipes materials should be allowed to be left in the ground in certain circumstances, such as for AC pipes located under a building.
- Leaving broken AC pipes in place or burying them on site are the most convenient and cost effective means of disposal.
- Pipe bursting disposal should be avoided.

Additionally, Asbestos Convention (C162) established by International Labor Organization (ILO) in 1986, outlines aspects of the best practice;

- Scope and definitions,
- General principles,
- Protective and preventive measures,
- Surveillance of the working environment, and
- Workers' health.

The above mentioned ILO asbestos convention requirements should be met during the work with asbestos cement pipe replacement and disposal within this project.

However, as there is no Hazardous Waste Disposal facility in the rayon, the only practicable course of action to avoid environmental damage caused by hazardous waste is for the material to be stored on site properly and securely by the contractor and then transfer this material to a specially designed storage facility in Astara city. This new facility will be operated by the Municipality of Astara and a cost allowance has been made in the EMP accordingly. AWM OJSC of Azerbaijan (will) consult and agree with the Astara Municipality for building and operating this facility.

6.2.3. Water Resources

6.2.3.1. Analysis of Impact

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

The Surface Water Diversion (SWD) from Tengerudchay river flow channel at the lower levels of Lomin village at about 290 masl, has been selected for the raw water requirements of the project by the Feasibility study team in consultation with the AWM OJSC and relevant Public Utility Departments of the rayon.

In most of the smaller rivers (such as Tengerudchay river), habitat/flow relationships are linear, so that the flow that retained two-thirds habitat at median flow is two-thirds the median flow, or approximately 30% of average flow (Tennant, 1976). 30% of average flow or higher provides average depth and velocity, and is considered to be in the good to optimum range for aquatic organisms.

In Astara case, water planning quantitative evaluations of 'Ecological Flows' considered as minimum instream flows are patterned with limnological and hydrogeological knowledge of the proposed catchment on the course of Tengerudchay river. We generally select as an indicator a large native fish species of the stream reach that is at the top of the trophic pyramid (trout, barbell, salmon, nase). However, this section of Tengerudchay river has the torrential stream; it does not naturally sustain much fish species up to Lankaran lowland. As this situation does not predict fish densities or biomass, we are interested only in the physical habitat that is controlled by instream flows.

Because of this reason, the water balance for this section of Tengerudchay river is examined from the perspective of required minimum ecological flow (30 % of average flow of the river) for the aim of this Project. Quantitative instream flow method is used patterning the results of international investigations for the required ecological minimum flow balance.

The following figures are assumed as the worse case scenario for the section of the proposed raw water catchment on the Tengerudchay river course, and those are as follows;

- Minimum required ecological flow (30 % of average flow of the river) is $1600 \text{ l/s} \times 0.30 = 480 \text{ l/s}$ see Table 4 of this Annex.
- Water Supply Requirement of Astara by 2030 is **65.85 l/s**, see Chapter 2, Table 2,6.
- Surplus flow after meeting the requirement of water supply and minimum required ecological flow is $(480 + 65.85 - 1600) = 1054.15 \text{ l/s}$.

Accordingly, constructing a diversion unit to divert the required raw water at this section of Tengerudchay river will disturb neither the river's ecological environment nor natural flow of the river.

The water is a critical resource for the local community and resources will be protected during construction. The local water supply system shall not be tapped to meet the campsite and the construction requirements.

The surrounding land's drainage system and water resources will be affected by construction activities as follows:

- Surface and subsurface water resources in the Project corridor may be contaminated by fuel and chemical spills, or by solid waste and effluents generated by the kitchens and toilets at construction campsites.
- Natural streams and irrigation channels may become silted by borrow material (earth) in the runoff from the construction area, workshops and equipment washing-yards.

Surface water resources will be affected by the operation of increased traffic as follows:

- If cross-drainage structures are not adequately maintained, culverts and water channels tend to become choked with debris and eroded soil, adversely affecting the quality of surface water.

These impacts will be temporary, and its magnitude will come into existence in **medium** level indicated as Moderate/Minor in the table 6,13. A **less than significant level** will occur during the construction phase, and has **high mitigatory potential**. These impacts will discontinue once the construction is completed. 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 activities on the water sources.

6.2.3.2. Mitigation

Measures to mitigate the adverse impact on water resources and surface drainage patterns have been incorporated into the outline project design and are discussed below.

The contractor will incorporate the following design features into the detailed design to minimize alterations in the project corridor's surface drainage patterns as far as possible:

- 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 100 m 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 100 m to water bodies.
- Borrow sites will not be close to sources of drinking water in case of runoff.
- If complaints are received, the incidents and possible sources of water supply disruption will be investigated by the contractor and the EMU/ECO of AWM OJSC of Azerbaijan and where the complaint can be substantiated;
 - Water samples will be taken and analyzed based on the baseline monitoring results obtained in the preconstruction stage.
 - Samples will be taken as soon after the complaint as possible and analyses immediately and again two weeks after the complaint to determine if water quality has been restored.
- The contractors will be required to maintain close liaison with local communities to ensure that any potential conflicts related to common resource utilization for project purposes are resolved quickly.

- Camps will be located at least 100 m away from the nearest local settlement to prevent the contamination of community-owned water resources.
- 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 one month 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.
- Wetland: If there is a wetland in the vicinity of the pipeline route; these are areas of great ecological importance, and the measures that need to be employed include;
 - Avoid disposal of wash water, solid waste and discarded packing etc. on wetlands,
 - Piling up of loose material should be done in segregated areas to arrest washing out of soil,
 - These materials should not be tipped or stockpiled near wetlands,
 - Leftovers from concrete works should not be dumped close to wetlands,
 - Avoid temporary structures or stockpiling within banks of river and on wetlands.

Contamination of Water Resources

Good management practices will be adopted to ensure that fuels and chemicals, raw sewage, wastewater effluent, and construction debris/scarified material is disposed of in controlled conditions to reduce the risk of contamination. These measures are described below;

- Construction camps will be established in areas with adequate natural drainage channels in order to facilitate flow of the treated effluents.
- Wastewater effluent from contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging it into natural streams.
- Borrow pits and natural depressions with pre-laid impervious liners will be used to dispose of scarified/scraped asphalt and concrete wastes, and then covered with soil.
- The AWM OJSC of Azerbaijan will work with local Public Utility Departments to better manage ribbon development liable to cause traffic hazards, and to prevent the accumulation of solid waste and impoundment of wastewater during the operation.

Waste Management and Spoil Disposal

There may be some surplus rock and soil based materials. The waste management plan (WMP) will be required to ensure waste from construction is managed properly and to reduce, reuse and recycle waste wherever possible. Contractor will initially review and assess the options for stockpiling and disposal locations for cut surface materials and reconfirm or propose alternative disposal locations for agreement with AWM OJSC of Azerbaijan and local authorities. The contractor will prepare the WMP one month before the commencement of construction with disposal sites identified for agreement by project supervision consultants. The WMP will cover all aspects of construction waste disposal. It is preferred that government land is used for dumping of material. If private land is to be used for the purpose of dumping it shall commence only after written permission from the land owner is checked by the EMU/ECO in AWM OJSC of Azerbaijan.

The mitigation measures in the waste management plan (WMP) will include but not necessarily be limited to:

- Spoil will not be disposed of in rivers and streams or any other natural drainage path.
- Spoil will not be disposed of on fragile slopes, flood ways, wetland, farmland, forest, religious or other culturally sensitive areas or areas where a livelihood is derived.

- Use surplus spoil for local repair works to fill eroded gullies and depression areas and degraded land in consultation with local community.
- Dispose of spoil will be to disused quarries and abandoned to borrow pits.
- Disposed spoil will be spread in 15 cm and compacted to optimum moisture content, covered with topsoil, landscaped and provided with drainage and vegetation to prevent erosion.

6.2.4. Ambient Air Quality

6.2.4.1. Analysis of Impact

This section discusses the impact of construction and subsequent operation on the ambient air quality in and around the Project corridor direct impact area (**Col 1, and Col 2**), and mitigation measures to manage these impacts will be described in subsequent Chapter 6.2.4.2.

The tables (Table 3.13, ...n, 20) in Chapter 3.5.1 constitute the reference points for the construction related emissions, and mass emission thresholds for construction generated NO_x, CO₂, and Particulate Matters (PM).

Nature of Emissions

In evaluating the air quality impacts of the proposed project upon air sensitive receivers, contributions from three classes of emission sources depending on their distance from the site should be considered. These are:

1. **Primary contributions:** project induced,
2. **Secondary contributions:** pollutant-emitting activities in the immediate neighbourhood,
3. **Other contributions:** pollution not accounted for by the previous two (Background contributions).

Primary Contributions

The project-induced emissions are fairly well defined and quite often the major contributor to local air quality impacts, see Chapter 3.5.1, (i.e, increasing the emissions due to the construction activities and traffic load of the empowered construction machinaries).

Secondary Contributions

Within the immediate neighbourhood of the project corridor, there are usually pollutant emitting activities contributing further to local air quality impacts. For most local scale projects, any emission sources in an area within 500 m radius of the project corridor with notable impacts are identified and included in an air quality assessment to cover the short-range contributions. In the exceptional cases where there are one or more significant sources nearby, the study area may have to be extended or alternative estimation approach employed to ensure these impacts are reasonably accounted for. However, there are no other notable emission sources other than those that will be inside the Project corridor during the construction period.

Background Contributions

The above two types of emission contributions should account for, to a great extent, the air quality impacts upon local air sensitive receivers. However, a background air quality level is prescribed in Chapter 3.5.1 to indicate the baseline air quality within and nearby the project corridor, which would account for any pollution not covered by the two preceding contributions. The emission sources contributing to the background air quality would be located further afield and not easy to identify. In addition, the transport mechanism by which pollutants are carried over long distances (ranging from 1 km up to tens or hundreds of kms) is rather complex and cannot be adequately estimated by any of the air quality assessment models.

The Project affected areas will be most likely the immediate adjacent to the proposed Works and Access roads.

Odor Emissions

Odor impacts are generally nuisance related as opposed to health related. Odor performance criteria (see Chapter 3.5.1) guide decisions on odor management, but are not specifically intended to achieve 'no odor'.

The detectability of an odor is a sensory property that refers to the theoretical minimum concentration that produces an olfactory response or sensation, i.e. the odor threshold.

Dust and Emissions

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.

The emissions generated from common construction activities include;

- Exhaust emissions of particulate matter (PM) and of nitrogen oxides (NO_x) from fuel combustion for mobile heavy-duty diesel- and gasoline-powered equipment, portable auxiliary equipment, material delivery trucks, and worker commute trips,
- Fugitive PM dust from soil disturbance and demolition activity,
- 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,
- Exhaust emissions of greenhouse gases (GHG) such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O),

Air quality will be affected by fugitive dust and emissions from construction machinery, concrete batching/asphalt plants, and vehicular traffic during the construction phase. Emissions may be carried over long distances, depending on wind speed and direction (see Chapter 3, Table 3,9), the temperature of the surrounding air, and atmospheric stability.

The location of the residences, places of work shops, schools, hospitals and the civic cultural and other heritage sites has been reviewed in Chapter 3 (see table 3,21, 3,22 and 3,27). Some of the residences are close enough to be disturbed by dust. Water is available in the study area although surplus water may not always be available to suppress dust at many locations in the dry season.

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.
- Traffic-diversion routes marked along dirt tracks that generate fugitive dust when in use by vehicular traffic.

General Conformity for Vehicle Emissions

General conformity for total NO_x and VOC emission to be discharged to the atmosphere by the group of construction machineries of the Contractor is calculated including employee vehicles. The data used in the calculation is derived from the Chapter 3.9.1, Table 3.28 and Table 3.29, and from the reports of the Port Authority of New York and New Jersey. The analysis is performed as a worse case scenario, and results are given below;

Table 6,14: General Conformity Review and Emission Inventory for the Proposed Project (Worse Case Analysis)

Equipment / Engine Category	Project Emission Sources and Estimated Power						NOx Emission Estimates		VOC Emission Estimates		
	# of Engines	hp	LF	h/day	Days of Operation	hp-hr	NOx EF (g/hp-hr)	NOx Em. (tons)	VOC EF (g/hp-hr)	VOC Em. (tons)	
Buldozer	2	330	1	6	45	178.200	9,2	1,81	1,3	0,26	
Trench Excavator	6	110	1	9	110	653.400	9,2	6,63	1,3	0,94	
Backhoe Excavator	8	140	1	9	110	1.108.800	9,2	11,24	1,3	1,59	
Scraper	4	180	1	6	80	345.600	9,2	3,50	1,3	0,50	
Mobile pump	8	130	1	6	105	655.200	9,2	6,64	1,3	0,94	
Concrete Mixer Truck	6	110	1	9	120	712.800	9,2	7,23	1,3	1,02	
Dumptruck	18	100	1	9	90	1.458.000	9,2	14,79	1,3	2,09	
Mobile Crane	4	110	1	6	45	118.800	9,2	1,20	1,3	0,17	
Tanker truck	8	90	1	9	90	583.200	9,2	5,91	1,3	0,84	
Air Compr. 375 CFM 100 PSI	4	115	1	9	30	124.200	9,2	1,26	1,3	0,18	
Roller compactor, Vib.	8	180	1	9	30	388.800	9,2	3,94	1,3	0,56	
							NOx Total	64,16	VOC Total	9,07	
Total emissions including employee travel (see table 6,16)								0,41		0,36	
							NOx Total	64,57	VOC Total	9,43	

Horsepower Hours: hp-hr = # of engines * hp*LF*hrs/day*days of operation.

Load Factors: Load Factor (LF) represents the average percentage of rated horsepower used during a source's operational profile. For this worse case estimate, LF is held at 1 for all equipment. Typical is 0.4 to 0.6.

Days of Operations: 334 days, see table 6,15.

Emission Factors: NOx Emissions Factor (EF) for Off-Road Construction Equipment is 9.20 g/hp-hr.

VOC Emissions Factor (EF) for Off-Road Construction Equipment is 1.30 g/hp-hr.

Emissions (g) = Power Demand (hp-hr)* Emission Factor (g/hp-hr).

Emission (tons) = Emissions (g) * (1 ton/907200 g).

Pollutant Emissions from Employee Vehicles

Assumptions;

1. Average trip distance (1 way) is 30 km
2. Average NOx vehicle emission factor is..... 0.60 g/km
3. Average VOC vehicle emission factor is..... 0.53 g/km
4. Work crew comprised of..... 12 people
5. Total crew number is..... 19 team
6. No member of the work crew drives their own vehicle. They will use the Contractor's shuttle services.
7. Managerial staff who can drive their own vehicle..... 12
8. Project Actual Construction Period is..... 18 months
9. Project construction occurs 5 days per week.....

- 10. Holidays in a calendar during the construction period are 12
- 11. Number of Weather days (no-work) during the construction period..... 90

Actual Work Days during the Construction Period;

Table 6,15: Actual work days during the construction period

Construction Duration	Weekend Days Off	Holidays	Weather Days Off	Actual Days	Work
540	104	12	90	334	

Actual work days = Construction duration (days) – [weekend days off + holidays off + weather days off]

NOx and VOC Calculation

Table 6,16: NOx and VOC Calculation for Employee Vehicles

	Workers	Trips / work day	Work Days	km/trip	Average NOx vehicle emission factor	Average VOC vehicle emission factor	Emission Estimates
NOx	31	2	334	30	0,60	-	0,41
VOC	31	2	334	30	-	0,53	0,36

Total NOx (VOC) Calculation: 31 Vehicle per day * 2 trips/work day * 334 work days * 30 km/trip * vehicle emission factor for NOx or VOC.

Total direct and indirect emission from the proposed Project/action are estimated at less than 100 tons for Ozone, and are below the conformity threshold value established at US Clean Air Act, 40 CFR 93.153(b) of 100 tons/year of Ozone.

The proposed Project is not considered regionally significant from the perspective of Emission Levels.

Health Impacts of Dust

Health impacts of dust vary depending on the nature of the particles (where they are from) and the size of particles. Exposure to inhalable and respirable dust can have potential health impacts on the respiratory system.

- **Inhalable Dust:** Inhalable dust is less than 10 microns and greater than 2.5 microns in size. These particles may be deposited in the nose, throat, and upper sections of the lungs.
- **Respirable Dust:** Respirable dust refers to those dust particles that are less than 2.5 microns in diameter and may be deposited in the lower sections of the lungs, including the alveoli.

People who may be more susceptible to the health effects from inhalable and respirable dust are;

- Infants and children,
- Elderly people,
- People with respiratory condition,
- People with heart disease,
- People with diabetes.

Provided that the proposed Project is operated with proper dust controls, it is unlikely that a healthy adult would suffer serious health effects from the dust occurred by the Project activities.

Nevertheless, emission and dust effects of the construction activities are temporary, and will come into existence in **medium** level indicated as Moderate in table 6,13. This impact will discontinue once the

construction is completed. A **less than significant impact with mitigation incorporated** will occur on the agricultural lands from the perspective of loss of productivity during the construction phase. It has **high mitigatory potential** with the provision of compensation.

The rayon has 8,200 ha cultivated land, however, 1228 hectares of agricultural land fall into the **Col 2** surrounding the Astara city, along the treated water transmission main, and interceptor sewer, see **Exhibit 6.1**.

The agricultural lands which fall into the **Col 2** will likely be negatively affected by the excessive fugitive dust and emissions from the perspective of loss of productivity during the construction period.

No negative impact will come into existence in the operation phase of the Project, unless odor effects which will be sourced from Wastewater Treatment Plant. See the following Chapter and Chapter 6.2.9.2. for mitigation measures to minimize the odor effects which will be sourced from the WWTP.

6.2.4.2. Mitigation

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 ancillary equipments (welding equipment, pumps etc), construction mechanisms and lorries on atmosphere will be minimal;

Emissions and Dust Control Measures

- Quarry areas and asphalt plants will be located at least 500 m downwind from populated areas, wildlife habitats, and contractors' camp, 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 and Summary air Quality Criteria given in Chapter 3.5.1 Table 3.15 are applicable to gaseous emissions and dust generations by construction vehicles, equipment, and machinery, will be enforced during construction works.
- Heavy construction vehicles should perform 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 EMU/ECO of AWM OJSC of Azerbaijan.
- 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 11 km/s.
- Transported loads should be overlaid with tarpaulin or another suitable material, if there is any people and dwellings at 300 m or closer distance.
- If the working surfaces become dry and dusty, water will be sprinkled on exposed surfaces when work is carried out within 50 m of the side Sensitive Receivers.
- 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 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.

- The use of conventional cutback asphalt for paving to restrict the maximum VOC content of asphalt emulsion, shall be prohibited. Diesel portable generators less than 50 horsepower shall not be allowed at the construction site, except for those used by welders.
- Dust deposition gauges will be deployed on site throughout the construction stage by the contractor. Dust deposition will be calculated routinely in a laboratory and will be expressed as 'mg/m³/day'.

As a general approach, it is recommended that if works are within 15 m of any sensitive receivers, the contractor should install segregation between the works at the edge and the sensitive receivers. The segregation should be a proper and easily erectable sheet in 2.5 m high, and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base.

Using of Alternate Carriageways and and Tracks

- As far as possible, construction work will be coordinated,
- Where dust emissions are high, diversion tracks will be overlain with tarpaulin,
- Where necessary, and subject to the availability of water, dust - emissions will be reduced by the regular sprinkling of water at least twice a day,
- Haul-trucks carrying asphalt-concrete mix and/or aggregate fill materials will be kept covering with tarpaulin to help contain construction material being transported between sites,
- Traffic diversion routes will be required, which if extended onto dirt tracks in the RoW or even onto proprietary land will create traffic congestion and dust pollution.

Compensation for Loss of Productivity on the Agricultural Lands nearby the Project Corridor

Although, this impact will be short term, the loss of the productivity during the construction period should be compensated. Compensation issues will be handled in accordance with the project RPF.

Recommended odor Screening Distances

The following odor screening distances to sensitive receivers should be used as absolute thresholds of significance for the odor impacts;

Table 6,17: Recommended Odor Screening Distances

Land Use/Type of Operation		Screening Distance (m)
1	Wastewater Treatment Plant	750
2	Wastewater Pumping Facilities/Lift Stations	500
3	Sanitary Landfill	1000
4	Asphalt Bathcing Plant	3 000
5	Concrete Batching Plant	2 000

Sources: Bradley, R, "Buffer Zones; Newsletter of ASEP, 1987, and Sacramento Metropolitan Air Quality Management District, CEQA Guide, 2009.

6.2.5. Noise

6.2.5.1. Analysis of Impact

Potential noise impact arising from the Project would be construction noise and operational traffic 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. Appropriate noise mitigation measures are recommended under the study in subsequent Chapter 6.2.5.2.

Powered mechanical equipment such as generators, excavators, piling rigs, 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.

Noise sources from the areas greater than 300 m of given Noise Sensitive Receivers are excluded from this assessment.

Impact on Noise levels

Excavation and Project construction would temporarily increase noise and possibly vibration in the Project corridor and may be considered an annoyance by occupants of nearby properties. The closest sensitive noise receptors in the Project corridor are the residential dwelling units located directly next door in many streets in Astara city. There would be times when noise and vibration could interfere with indoor activities in nearby residences, including the residences at on either side of the Project corridor, and other businesses near the Project corridor.

The noisiest construction activities associated with the Project would likely be exterior finishing, which can generate the noise levels upto 89 dBA (see Table below). Noise generally attenuates (decreases) at a rate of 6 to 7.5 dBA per doubling of distance. Therefore, the exterior noise level at the sensitive receptors identified above could be greater than 80 dBA during the noisiest construction activities.

Table 6,18: Typical Construction Noise levels

Phase	Noise levels (dBA)
Ground Clearing	84
Excavation	89
Foundation	78
Erection	85
Exterior Finishing	89
Pile Driving	90-105

Source: U.S. Environmental Protection Agency, Noise from Construction Equipment and operations, 1971

As shown above, noise sources during the construction period are mainly the cause of engineering machinery and vehicles. They are featured by their intermittent nature with mobility and high noise level (which is 80~90 dB(A) from a distance of 5 meters). We have, through applying the attenuation of point source method and without taking into account of such attenuation by sound barriers or atmospheric absorptions, calculated out the geometric divergence of sound attenuation, and the formula is as follows:

$$* Lr = Lr_0 - 20lg (r / r_0)$$

Where ;

Lr	: A weighted sound pressure level at place r away from noise source in dB(A)
Lr₀	: A weighted sound pressure level at place r₀ away from noise source in dB(A)
r	: The distance between the point of estimation and noise source in meters
r₀	: The distance between the monitoring point and noise source in meters
20lg	: 20 log

* Engineering Acoustics, Michael Moser.

See table below for estimated results for noises at the construction site;

Table 6,19: Noise levels generated by the powered construction machinery

Equipment	5 m	10 m	20 m	40 m	50 m	100 m	150 m	200 m
Loader-rubber tired	90	80	78	72	70	64	60	58
Crane	85	79	73	67	65	59	55	53
Bulldozer	86	80	74	68	66	60	56	54
Excavator	84	78	72	66	64	58	54	52
Truck	90	80	78	72	70	64	60	58
Electric saw	81	75	69	63	61	55	51	49

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 m of the Project corridor direct impact area (Col). However, this impact will be temporary, the impact will disappear upon completion of the Project.

Prediction of Combined Noise Levels

The prediction of the noise levels due to combined activities is given in the following table for each significant stage of Works using the individual plant noise levels, and the resulting impacts at varying distances from the activities are shown.

Table 6,20: Typical Combined Construction Noise Levels

Activity	Combined Construction Noise Levels dBA																
	5 m	10 m	15 m	20 m	40 m	50 m	100 m	150 m	200 m	250 m	300 m	350 m	400 m	450 m	500 m	1000 m	2000 m
Site clearance and preparation of working width	90	89	88	84	78	74	67	64	61	59	57	56	55	54	53	43	39
Topsoil Stripping	89	88	87	83	77	72	66	63	60	58	56	55	54	53	52	42	38
Pipeline route excavation and preparation	91	90	89	85	79	75	68	65	62	60	58	57	56	55	54	44	40
Road Works	85	84	83	79	73	69	62	59	56	54	52	51	50	49	48	38	34
Landscaping	75	74	73	69	63	59	52	49	46	44	42	41	40	39	38	28	-

Source: USEPA, 1971, and Barnes et al., 1979

Based on the predicted impact levels, it is anticipated that construction noise levels will exceed the existing ambient noise level at properties closest to the site. The extent of this impact at any property will vary depending on the specific plant being used, the distance or range of distances to the property, the "on time" of each activity, and any localized screening.

However, it is recognized that construction activity is typically temporary in nature, with a requirement to use plant with high noise levels at specific locations. Therefore, the ability to control construction noise levels relates primarily to the duration and time of construction activity in any one day. In this regard, National Standards of Maximum Allowable Noise Levels of Azerbaijan (see. Chapter 3.6, Table 3.26) typically recommend maximum allowable noise levels at a construction site. However, the thresholds recommended in the standards are the maximum allowable indoor noise levels.

As there is no National specific range of outdoor (outdoor wall) noise level threshold criteria, the requirements of the United States Quiet Communities Act of 1978 have been patterned for the margin of sound power levels for this Project. This Act has established the criteria of 70 dbA equivalent steady state for residential areas, schools, parks, hospitals, and 75 dbA for other sensitive receptors and for commercial land use.

The exterior noise levels given in the following table have been agreed by U.S. Department of Transportation for public health and welfare;

Table 6,21: Land Use Category of U.S. DoT for Noise Levels

Noise Levels (dbA)	Description of Land-Use Category
60 (exterior)	Areas such as amphitheatres, certain parks, or open spaces in which local officials agree serenity and quiet are of extraordinary significance
70 (exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, recreational areas
75 (exterior)	Developed land, properties, or activities not included in above two categories

Source: U.S. Department of Transportation, Policy Procedure Memorandum 90-2 Appendix B, Transmittal 279, Feb. 1973.

When data in the above two tables are reviewed, sound power levels within the 50 m from the noise resources (powered mechanical equipment) will expose the human beings alongside the construction activities. The sensitive receptors beyond 50 m from the noise resources will be affected gradually *moderate* and *low*. As there is no sensitive ecosystems, wildlife community (fauna) in or nearby the Project corridor, they are excluded from this assessment.

In determining the overall noise level at the receptor(s), consideration should also be given to a number of factors that increase and/or decrease the noise level by affecting the propagation of sound. In principle, these can be summarized as;

- Increase due to multiple reflections from vertical surfaces – hard sites (e.g. from high buildings on both sides of a road, bare rock surfaces),
- Decrease due to air absorption,
- Decrease due to absorptive ground cover – soft sites (such as grass or cultivated land),
- Decrease due to trees and woods – soft sites, and
- Decrease due to barriers of all types (e.g. due to topography).

The simulations given in following figures (graphs) are prepared using the data given for combined construction noise levels in Table 6.20, to illustrate the impacts of noise sources in the vicinity of the noise sensitive receivers. First graph illustrates the impacts of noise sources combined for a group of activity '**as worse case scenario**' (pipeline excavation and preparation to be worked inside the rayon centre city - for a hard site). Second graph illustrates the impacts of noise sources combined for a group of activity '**as worse case scenario**' (topsoil stripping to be worked along the treated water pipeline alignment between WTP and Astara city - for a soft site). Third graph illustrates the impact of noise sources combined for a group of activity '**as worse case scenario**' (construction activities in WWTP site south of Shiyakarn Village – for a soft site).

In addition, the set of machinery assumed in the calculations seldom operate at the same place and at the same time (worst-case), and it is physically impossible that all machinery can actually be present at the same place. Hence even under the worst case scenario assumptions, as unlikely as they are, the noise generated is within the allowable limits. Furthermore, the actual overall noise level will be lower due to the attenuation of noise by air, vegetation and other natural noise barriers that were excluded from the modeling.

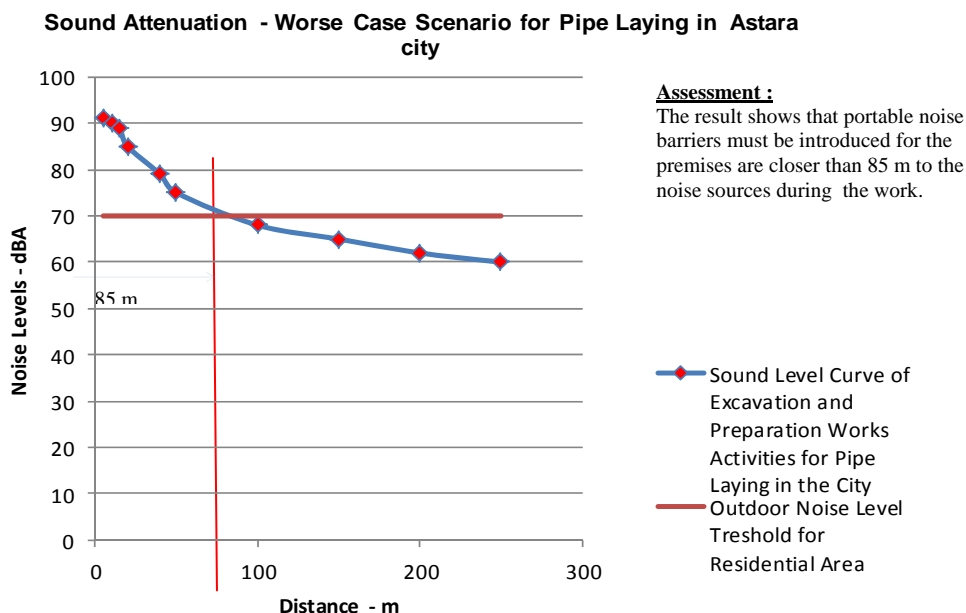


Figure 6.3: Sound Attenuation – Worse Case Scenario for Pipe Laying in Astara City

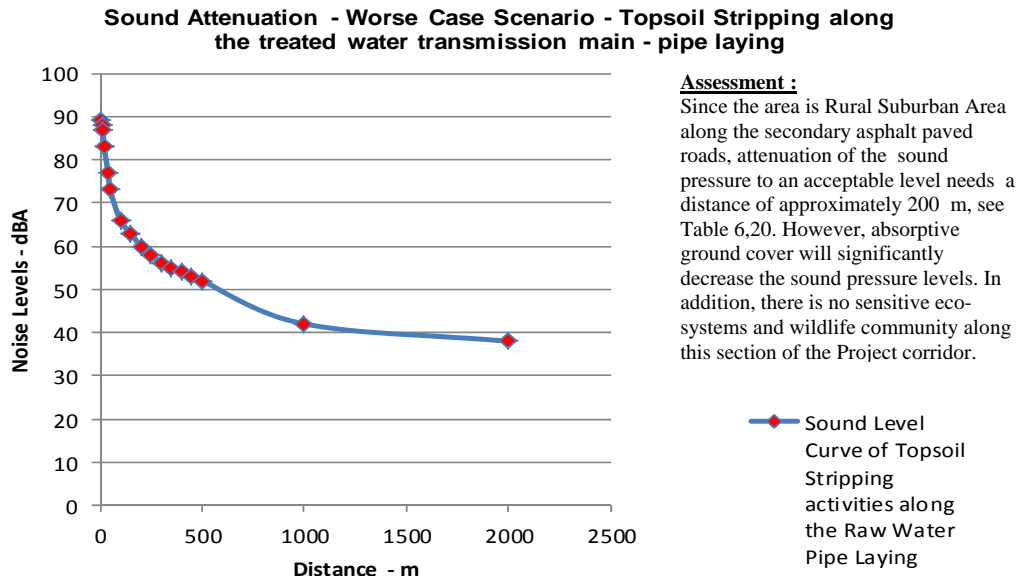


Figure 6.4: Sound Attenuation – Worst Case Scenario for Topsoil Stripping Activities along the treated water pipeline alignment between WTP and Astara city

The threshold sound pressure level for the Rural Suburban Area is 60 dBA which is given in Chapter 3.6, Table 3.25.

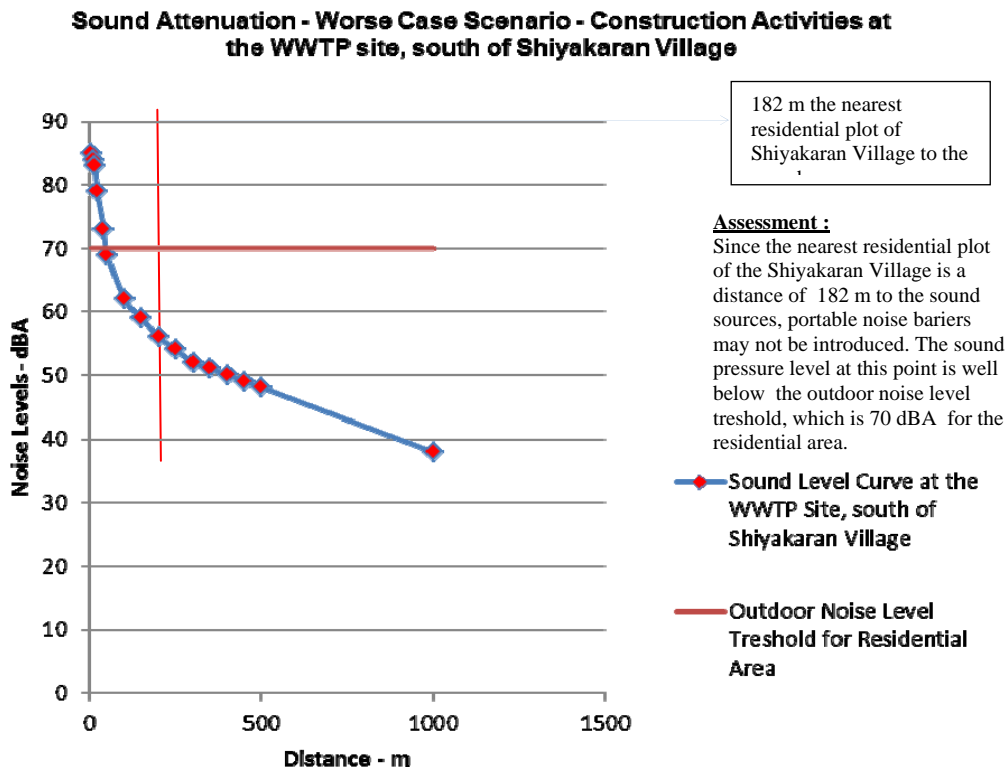


Figure 6.5: Sound Attenuation – Worst Case Scenario for Construction Activities in the WWTP site, south of Shiyakaran village

However, the noise effects of the construction activities are temporary, and its magnitude will be in **Medium** level indicated as Moderate/Minor in table 6,13. A **less than significant level** of impact will

occur during the construction phase, and has **high mitigatory potential**. This impact will discontinue once the construction is completed.

6.2.5.2. Mitigation

The Project is scheduled to commence in the second half of 2011 and to be completed at the end of the first half of 2013 (30.06.2013). All construction tasks will be carried out during unrestricted hours (09.00 to 18.00 hour Monday to Saturday, excluding general holidays). The following construction activities will not take place concurrently to minimize the adverse effects of the noise to be generated by the powered mechanical equipments while working in or nearby the downtown of the settlements;

- Trench excavation, slope works, and realign the kerbs,
- Loading activities by loaders,
- Pouring concrete by pump,
- Road paving,

There are a few schools and hospitals in the Project Corridor (see **Exhibit 3,5** and Chapter 3.5.2 Table 3,21). Where schools are nearby, the contractor shall discuss with the EMU/ECO and the school principals about the agreed time for operating these machines, and completely avoid machine use near schools during examination times. Where noise is a major consideration (say outside temples) construction should be avoided at sensitive times.

Mitigation measures to protect existing sensitive locations from high noise levels in the construction phase, include:

- Monitoring noise levels and facilitating USEPAs in enforcing vehicle noise standards as prescribed in the National Ambient Air Quality Standards.
- To minimize impacts the contractor shall have a unit to;
 - Maintain and service all equipment to minimize noise levels,
 - Locate equipment to minimize nuisances,
 - Install acoustic insulation or use portable noise barriers where practicable to limit noise at sensitive receivers.
- Insulation should be provided for the noise levels given in the Maximum Allowable Noise Levels (see Chapter 3,6, Table 3,26) as indoor criteria, to minimize noise impact.
- As a back-up option to control noise, portable barriers can be introduced using heavy thick ply-board or corrugated metal sheet.
- Nearby people and institutions should be warned about the high noise daytime.
- 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.
- Monitoring and controlling noise exposure at the Project corridor should be provided using;
 - A sound level meter,
 - A noise dosimeter.
- All noise measurements in the Project corridor should be thoroughly documented. The records should contain at least the following indicators;
 - Exposure monitoring,
 - Audiometric testing,
 - Training of operators of Contractor.
- Audiometric testing must be offered to the employees by a physician, audiologist, or qualified technician under the direction or supervision of a physician or audiologist.
- The noise limits should be defined as follows;
 - Action level,
 - Permissible exposure limit.
- A hearing conservation programme should be developed by the Contractor for his employees.
- Any operation by such equipment as percussion piling machine or pneumatic hammer shall be prohibited in the work closer than 50 m to a structure registered as a culturel heritage.

6.2.6. Temporary Traffic Management

The Main access to the proposed project area is by way of Baku - Astara highway.

The regional access to the Astara city is southeasterly by way of M. Azizbeyov street, and northerly by way of Astara – Lankaran coastal road. The other main vehicle traffic routes in the city are H. Aliyev Avenue, Azerbaijan and Nizami streets.

6.2.6.1. Analysis of Impact

There are also concerns about blocking the existing roads and many other footpaths and tracks in or nearby the Project corridor. The Project will also need alternative service roads and footpaths which will be constructed temporarily in or nearby the Project corridor. Needs to use of alternative service roads, footpaths, and tracks, and blocking the existing roads will create the temporary impacts which cause physical discomfort in or nearby the physical environment, which are;

- increasing the traffic which is substantial in relation to the existing traffic load and capacity of the street system,
- resulting in a substantial increase in the number of vehicle trips,
- resulting in a substantial increase in the volume of capacity ratio on roads, or congestion at intersections,
- resulting in adequate emergency Access.

A significant increase in visitation to the Project area will not occur as a result of the proposed project. All project activities will be confined within the boundaries of working sections and would not severely restrict access to or block any major public road. The addition of worker vehicles entering and leaving during daylight hours will not constitute a substantial or long-term increase in traffic volume or congestion at the city entrances or restrict the public's access to their property.

Temporary and intermittent interruption of traffic flow may occur within Baku – Astara highway, M. Azizbeyov Street, H. Aliyev Avenue, Azerbaijan and Nizami streets due to trucks hauling and depositing sediment. The mitigation measures would help reduce impacts to less than significant.

The impact on congestion resulting from project-generated vehicles on normal traffic on Baku -Astara highway or internal roads would be minimal and have no impact on the acceptable Level of Service for this area.

None of the activities associated with the project that will occur within the boundaries of the Project area and work will contain a design feature that will substantially increase hazards; therefore, no impact exists.

Work associated with the proposed project will not substantially restrict access to or block any public road during the weekday. Detours will be implemented if necessary. With the implementation of the mitigation measures, impacts to emergency access will be reduced to a **less than significant level**.

Project activities will generate a temporary demand for construction worker vehicle parking. This parking demand will not be substantial and will likely be accommodated in the staging/sorting area and at park administration or maintenance facilities. There will be no impact on parking capacity emanating from the proposed project.

There are no policies, plans, or programs supporting alternative transportation that apply to the proposed project area; therefore, **there would be no impact**.

The temporary negative impacts will come into existence in the **less than significant level** because of the traffic congestion and road blockins during the construction period. Impact magnitude will be in **Low** level indicated as Minor in the table 6,13. This impact has **high mitigatory potential**. These impacts will discontinue once the construction is completed.

6.2.6.2. Mitigation

The traffic load which will be increased after starting the Project should be demonstrated with supporting details that the works should be carried out on a lane-by-lane basis according to existing traffic flow pattern.

The contractor should conduct a separate '*Traffic Impact Analysis*' report to submit for approval of AWM OJSC of Azerbaijan and local Traffic Management Department. Construction vehicle trips in and out of the immediate construction zone shall be coordinated and scheduled away from "rush-hour" periods, to minimize general traffic disruption.

The following measures should be developed;

- Banning of movements,
- Temporary parking restrictions,
- Pedestrian and cyclist diversion routes where construction prevents Access,
- Widening of carriageway,
- Maintaining footways where possible
- Temporary traffic signal,
- One way scheme,
- Maintaining local residential access at all times,
- New temporary pedestrian crossing facilities,
- General traffic diversion routes where roads are closed,
- Conducting a study on pedestrian and vehicular flow,
- Improving the capacity of affected road sections in order to maximize the number of new niches allowed without seriously affected the neighborhood.
- The circulation and liaison works should also be handled by the contractor.

The mitigation measure below will help reduce impacts to less than significant level:

- Notice posting project hours of operation and duration, along with a map of the aerial extent of activities and potential access closures should be posted at all Project area and trail access points leading into the project vicinity,
- Project traffic control monitors should be posted at the north and south ends of the city with the authority to turn road users away during periods of high activity. However, reasonable attempts should be made to keep as much of the project area open to access as is deemed safe during project implementation; and
- Traffic control and alternate access route information should be provided, including alternate service trails. Where pedestrian trails must cross truck haul routes, traffic control will be provided to ensure safety to pedestrians.

6.2.7. Ecological Environment

6.2.7.1. Analysis of Impact

Impacts on Vegetation

Forests

Only, a small part of the Hircanian forest zone falls into the Corridor of Impact 2 (**Col 2**) along the water transmission main between Lomin and Vanashikash villages.

However, no part of the Project corridor falls into the Hircanian forest zone. Therefore, there will be **no impact** of the Project on the forests and forest blades.

Dry Mountain Shrubland and Semi-desert Eco-systems

There is no dry mountain shrubland section within the rayon area, and therefore, no impact exists.

High mountain Grassland (eco-system)

No part of the Project corridor falls into the Steppe Eco-system, and therefore, **no impact** exists.

Watersheds and Wetlands

Rayon's eastern part lies along the Caspian Sea, which is the largest inland water body of the World. The rayon has approximately 22.3 km coast line of the Caspian Sea. Astara city has a 9.6 km of coastal ecosystem along the shoreline of Caspian Sea.

Only, this shoreline in front of the city falls into the Corridor of Impact 2 (**Col 2**), however, no part of the Corridor of Impact 1 (**Col 1**) falls into this zone. Therefore, **a less than significant impact** occurs on the aquatic and coastal eco-systems of Caspian Sea.

Waterlands and riverine ecosystem in this region track with a narrow strip along the main rivers and numerous creeks at the western and southwestern parts of the rayon.

The section of approximately 546 m of Kulerichaychay river's valley (see **Exhibit 6,2**) in the northern part of the Astara city and the section of 3.5 km of Tengerudchay river valley between Lomin village and Sipiypart bridge are the wetland area in the Project corridor. This section of the Project corridor refer to the area of land adjacent to a water body, and is called 'riverfront area' for the assessment. This zone is accepted as the riparian buffer corridor, and indicated in **Exhibit 6,3**.

The Project corridor section of approximately 3.5 km of Tengerudchay river valley falls into the area of Hirkan National Park. The river valley in this section provides Hircanian habitats for plant, animal and other wild life species. According to Feasibility Concept, the raw water will be supplied from the Tengerudchay flow channel in the lower levels of Lomin village, and the raw water pipeline will be aligned with the Sim – Astara asphalt paved road up to WTP. Only, catchment facility will be constructed nearby the flow channel of the river, and indicated in **Exhibit 6,3**.

Therefore, **a less than significant impact** will occur on the wetlands.

Tree Felling

There are no trees necessary to be felled and replanted within the Project corridor. Therefore, **no impact** exists.

Impacts on Terrestrial Wildlife and Birds

Mining for obtaining the aggregate to use in the construction activities also affects the bio diversity living along the water bodies. Mining directly disturbs terrestrial resources by disturbing the land surface, even with appropriate safeguards, mining will have negative environmental impacts.

A walk-through research was carried out on October 23-24, 2010 by Ilyas Babayev (Head of SPEB, Local NGO) and Sujaaddin Guliyev (Head of AMS, Local NGO) along treated water transmission main, at and around the proposed WTP site, and at the both side of the river-front area of Tengerudchay river basin up to Vanashikash village. The research corridor roughly comprised of the settled areas of Sim, Palikash, Vovoda, Lomin, Sipiypart, Vanashikash, Noyabud, Barzuband, Degadi, Sarak, and Archivan villages. The Research Corridor also comprised of the coastline of Caspian Sea in front of Astara city, and along the basins of the Kulerichay, Astarachay rivers from Alasha village to Caspian Sea, and surrounding the city.

A visual surveillance method has been attempted to detect, determine, recognize and track the biological communities along the project corridor and in and around the said above districts. The

results of the research are given in Annex-5.

According to biological survey report; only Brown trout and Goshawk living in the area of the proposed project corridor are included into the Red Book of Azerbaijan, and Black Vulture is included into the Red List of International Nature Protection Union. These species are occasionally encountered in the project area for feeding. No migration path of the avian and terrestrial species gets across the project corridor. Therefore, no endemic or common avian and/or terrestrial biological community is vulnerable to hazard during the construction period.

All animal species, except the woodcock indicated in Annex-5, Table-6, have a fixed mode of life in Astara Natural area. It has been determined that the forests and shrubberies have been under serious pressure as a source of fuel for heating and timber products, and as forest pastures for the numerous privately owned herds of cattle and other livestock.

The breeding season for most bird species is from September to December and from April to June.

However, no endemic bird species occur in or nearby the Project corridor, and no migration path of the migratory bird species gets across the project corridor, see Annex-5.

The Brown Bear, Lynx and Wildcat are the common species in the area. The voices of Golden Jackal and Wolf can be heard all over the territory.

No rare, endangered, and threatened population recorded in the Red Data Book of Azerbaijia inhabit in or nearby the Project corridor, see Annex-5.

The breeding season of the most terrestrial habitats is from May to June.

The impacts to wildlife and birds will be **less than significant**. The appropriate measures are recommended in Chapter 6.2.7.2 and Chapter 7 (Environmental Management Plan).

Impact on Aquatic biology and Fisheries on the Waterlands

The decrease of fish stocks and water vegetation has influenced the entire ecosystem of the region. Only, the brown trout (*saloma fario*) occurs in the upstream of rivers, see Annex-5. The upstream of the rivers in rayon has very weak potential of the aquatic- terrestrial species. However, green toad (*buto viridis*) and common toad (*bufo bufo*) commonly occurs in or nearby the Project corridor, see Annex-5.

The breeding season for most amphibians is winter period from the end of the December to the end of the February with the exact date depending on local climatic conditions (Nyman, 1991). The timing of breeding evolves as a response to the presence of other species in the community.

Therefore, no impact occurs on the breeding of the amphibians nearby the Project corridor from the construction activities will be off in winter season.

Some established native resident or migratory fish may be temporarily and intermittently disturbed by Project generated noise in the fluvio-marine delta of Astarachay river south of the city.

These impacts can be considered **less than significant** with the provision of planning the construction activities out of the breeding season and recommended mitigation measures in the following Chapter. Impact's magnitude will be in **medium** level indicated as Minor in the table 6,13.

6.2.7.2. Mitigation

Vegetation

Mitigation Measures – Short Term (Construction Phase)

Impacts on vegetation should be prevented in accordance with the following measures:

- Indigeneous vegetation should be preserved to the greatest extent possible.
- All maintained landscapes should be properly managed to avoid water quality impacts.
- By siting development away from erodible soils, it is possible to significantly reduce the amount of erosion, although soil type, topography, and climatological conditions affect the degree of erosion resulting from land disturbance activities both during and after construction.

Measures to mitigate this loss of vegetation cover are outlined below:

- A tree plantation and grassing program should be incorporated into the outline project design to compensate for the anticipated loss of vegetation during construction activities, and to help abate pollution caused by emissions, dust, and noise during the construction phase.
- Contractors will be required to establish their campsites, asphalt plants (if required), crusher plants and concrete batching plant on waste/barren land rather than on forested or agriculturally productive land. While clearing away shrub and bushes may be unavoidable, the cutting of trees will be minimized.
- The contractor will ensure that there is minimal disruption to the area's vegetation. Trees or shrubs will be felled only if they impinge directly onto sites demarcated for permanent works or necessary temporary Works (i.e, wastewater plant site), and with prior approval from the supervision consultant of AWM OJSC of Azerbaijan and/or the forest department.
- 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.

In addition, vegetation clearing measures indicated in Chapter 7.2.2.3 will take place with the measures above.

Long-Term Measures

Disturbed areas that will not be built upon;

- for one (1) year shall incorporate a temporary cover crop to promote soil stability.
- Areas exposed for two (2) or more years must be revegetated with a perennial, native grass mix (or other grass mixtures as recommended by the local Natural Resources Conservation Service Office, if there is, or related any department).
- Within two (2) full growing season of project completion, vegetative site coverage shall have a perennial herbaceous component equal to or greater than seventy percent (70%) of the adjacent undisturbed areas.

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. On steeper cut and fill slopes, stabilization may be attained by utilizing a combination of retaining walls, rock walls, up slope runoff diversions, terracing, slope drains, soil nailing, mulch binders, erosion control blankets, vegetation or other measures appropriate for the specific situation. Retaining walls over 1.2 m in height or steep retaining walls shall be designed by a qualified individual.

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 other plants in and/or out of the rayon.

Terrestrial Wildlife and Birds

Special measures will be adopted to minimize impacts on the wild birds, such as avoiding construction activities during the critical periods of breeding and feeding. No construction activity should be involved within the breeding season, which is from September to December and from April to June in or nearby the Project corridor.

Staff working on the project should be given clear orders, not to shoot, snare or trap any bird.

Educational materials will be in the form of interpretive panels designed to raise awareness about the needs of the area wildlife and deter the workforce of the Contractor(s) from leaving the established user trails.

User trails in the sensitive wetland area should be monitored by daily photographing the condition and extent of user trails in the area.

If it is determined that the Contractor's workers are not respecting the voluntary "closure" of the wetland area, the representative of Ecology Department of Lankaran reserves the right to establish a seasonal closure of the area through appropriate legal mechanisms.

However, the contractor will coordinate with the ecology (for wildlife) department of rayon to ensure that there is minimal disturbance to the area's wildlife during construction.

Aquatic Biology and Fisheries

Contractor will prevent the workers from hunting and fishing for water birds and fish resources, etc.

During the spawning season (November through December) of the trout, the construction activities (if necessary) in the riverfront areas of Astarachay and Kuleruchay rivers should be banned to protect these species.

6.2.8. Cultural Environment

6.2.8.1. Analysis of Impact

Astara rayon has a very ancient history. There are 81 cultural heritage sites and 21 archeological sites in the rayon. Archeological sites dating back to bronze age exist, and some of those are ruins of Dashkutu necropolis in Azerrud village, Miki dolmen necropolis in Miki village, and Siyaku ancient settlement. Many tumulis, and barrow areas are also located in rayon area, and the famous ones are Tengerud, Baba Cabbar, Seyidcamal, Vaqo, Siyaku, Axicabal in Artupa village, Alasha, Binebey, and Lavain barrow areas.

Many cultural and historical heritage sites are also located in rayon area. The well known ones are tomb (XII century) and public bath (XIX century) in Shahagach village, Hadji Teymur mosque (XIX century) and Mashadi Abu Talib bath (XIX century) nearby Siyakesh village, Tomb of Ahmad ibn Karim (1472) in Mashkan village, and Piyacenapar bridge (XIII century) nearby Palikash village. See **Exhibit 3,5 and 3,6**.

However, only three historical heritage buildings exist in the city's settled area, and those are Pravoslav Church, Qum and Gilakaran mosques. No archeological site falls into the Project corridor.

Although, a less than significant impact will occur on the archeological and cultural heritage site indicated in Chapter 3, Table 3,27 closer than 1 km to the construction limits, this impact will be minimized with strictly applying of the following mitigation measures.

6.2.8.2. Mitigation

- Any proposed ground disturbance in areas identified as having archaeological potential should be undertaken in conjunction with or preceded by appropriate archaeological investigation and recording by a suitably qualified archaeologist.
- Protective barriers are to be installed around all heritage and architectural memorial buildings located on the site to ensure protection during the Works.

- If any artifact on site is uncovered, work in the immediate vicinity shall be stopped immediately.
- Work may only resume once clearance is given in writing by the archaeologist.
- Ministry of Culture and Tourism shall be contacted such that an archaeological consultant can be appointed to excavate and record the site.

6.2.9. System Utilities

6.2.9.1. Analysis of Impact

Water Treatment Plant

This facility will likely generate a positive effect from the perspective of public health. The impacts of "drinking sludge" disposal and low level noise generated by the pumps etc. on the environment will be insignificant. Effluent resulted from the sludge treatment has no hazardous effect on the receiving body.

Drinking sludge contains colloidal iron and alum hydroxides (alum and iron are the most used coagulant), colloidal or dissolved organic matter, clay, silt and microorganisms.

Wastewater Treatment Plant

This facility will likely generate a positive effect on biodiversity of the proposed service area.

Presently, there is a small scale sewage collection system which serves to ten percent of the city. The other 90 % has indirect connections via the use of the drainage channels in the streets which are often cross-connected to the sewers. The waste water generated by the institutional and multistorey buildings is collected in few wetwells, and conveyed out of the city by the lift stations and force mains to the area of existing WWTP South of Shiyakaran village. However, the existing interceptor sewer seems that it has never reached to the WWTP site. It disappears in the Caladahna marshland, and is disposed to the natural environment. Rayon SuKanal department reports that construction of the WWTP was stopped in the early 1980s, and there is no access to the site presently. However, the existing site provides a six hectares land, which is sufficient to construct a new WWTP.

The current practice of sewage disposal at the remaining part of the city is in the manner of use of private septic and latrines. The septic pits are commonly located at the kitchen gardens of the houses.

However, a negative effect will be expected in the operation phase from the WWTP. Offensive odor effects of WWTP will be minimized with the mitigation measures explained in Chapter 6.2.9.2.

6.2.9.2. Mitigation

Water Treatment Plant

There is no negative impact on the environment. Nevertheless, a protective forest range (beautification zone, see **Exhibit 6,4**), has to be established around it as well.

Wastewater Treatment Plant

Wastewater Treatment plant should be constructed at 750 m far to the nearest settled area, see **Exhibit 6,4** to provide appropriate odor screening distance.

Mitigation measures to minimize the odor effects which will be sourced from the WWTP in the operation phase are below;

- An at least 30 m beautification zone from the perimeter fence of the WWTP is required, see **Exhibit 6,4**.
- Installing activated carbon filters/carbon adsorption in the aeration basin influent channel, and /or all waste gas exhaust systems,
- Installing biofiltration/bio trickling filters for all waste gas exhaust systems,
- Installing fine bubble aerators to wastewater treatment tank or ponds to increase treatment efficiency and dissolved oxygen to prevent odor-generating anaerobic activity,
- 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 energy efficient blower system to increase treatment efficiency and dissolved oxygen levels,
- 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,
- Installing SolarBee or similar Technologies on storage basins and anaerobic ponds to avoid fugitive release of odorous compounds.

Sludge Drying Beds in WWTP Site

The following list provides current, in-practice mitigation measures and management practices for sludge drying beds of WWTP;

- Installing a cover or cap over the beds that can be used to cover the beds after operation cease.
- Installing a negative and/or positive aeration system to control moisture and temperature and provide oxygen for microbial decomposition.
- Installing a flare for treatment of methane gas prior to release.

Mono-landfill Area in a separate Site

The following list provides current, in-practice mitigation measures and management practices for mono-landfill area;

- Determining the appropriate frequency of turning and mixing of the piles, which may be a function of ambient temperature,
- Installing vegetation growth on landfill facility to cover intermediate and final portions of the landfill,
- Providing a water tight (e.g. clay) layer below the deposit to prevent infiltration into the ground water.
- Providing a drainage layer above the water tight layer consisting of a system of drainage pipes, with appropriate slope (for gravitational water drainage).
- A protective layer of sand should follow, protecting the underlying drainage foil system from mechanical damage and consequent leakage.
- Leachate water infiltrated from the drainage system should be forwarded to the treatment plant's inlet, if possible.
- A protective forest range (beautification zone, see **Exhibit 6,4**, has to be established around it as well.

6.2.10. Summary of Impact Levels

The following matrix summarize the levels of impacts sequentially identified in the assessment period in light of the environmental checklist.

Table 6.22: Impact levels matrix

Item No	Impacts		Impact Levels			
			Potentially Significant Impact	Less Than Significant with Mitigation incorporated	Less Than Significant Impact	No Impact
			Level 1	Level 2	Level 3	Level 4
1	Aesthetics					✓
2	Agricultural Resources			✓		
3	Air Quality			✓		
4	Biological	Terrestrial			✓	
		Aquatic			✓	
5	Cultural Resources					✓
6	Geology and Soils				✓	
7	Hazards and Hazardous Materials	Vectors				✓
		Contamination			✓	
8	Hydrology and Water Quality				✓	
9	Land Use and Planning				✓	
10	Mineral Resources					✓
11	Noise				✓	
12	Population and Housing					✓
13	Public Services				✓	
14	Recreation					✓
15	Transportation and Traffic				✓	
16	Systems' Utilities					✓

The potential impact of the proposed Project generally seems '**less than significant impact**', only two item appear likely to affect the environment *less than significant incorporated with the appropriate mitigation measures*.

6.2.11. Cumulative Impact

The impact durations are limited in the Proposed Project for most environmentally indicators by the construction timescale.

The proposed Project have impacts that are individually limited, therefore, they are not cumulatively considerable.

6.3. Environmental Benefits of the Project

Based on the achieving of the drinkable water supply, adequately designed sewage network, and technologically improved wastewater treatment in rayon, a series significant benefits can accrue in the form of increased public health and reduced environmental problems.

For instance;

- Water borne disease will decrease and health status will improve,

- Timely and sufficient supply of quality water,
- Control on leakages, loss, wastage, pilferage will make water availability with pressure,
- Environment, sanitation improvement,
- Better hygienic condition and health status of people,
- Interceptor sewer and collector sewer reconstruction will prevent pollution on road and near human settlements,
- Breaking the cycle of disease transfer can be provided on the human and other species of environment,

6.4. Socio-economic Benefits of the Project

6.4.1. Construction Phase Economic Benefits

The Project's construction phase activity will generate a two year burst of economic benefits because of the high temporary levels of Project employment and local purchasing. For example, peak employment will exceed 300 – 350 workers in a project year. By contrast, the operations phase will employ perhaps 20 % of this peak number.

- Rayon's people will earn an estimated 5.6 % of the Construction Costs in wages during the construction phase.
- AWM OJSC of Azerbaijan and its contractors will spend roughly 23 % of the construction costs on goods, services and supplies obtained in the rayon and its surroundings over the approximately two year construction period.
- Considering spinoff effects generated by these wages and purchases, the construction phase will boost the gross domestic product of the rayon by a projected approx. 10 % per year of the construction period.

6.4.2. Operations Phase Economic Benefits

The employment and the procurement of goods and services from rayon's suppliers during the operations phase will be a fraction during the construction phase. The tariff payments to the SuKanal Department of the rayon for the supply of hygienic and sufficient drinkable water and well-designed wastewater and treatment services will begin.

These tariff payments will continue during the Project economic lifespan. The result will be a much more sustained, consistent and significant total economic benefit versus the construction phase.

- Rayon's people will earn an estimated 13 % of the investment cost in wages during the estimated 20 year operational life of the Project.
- Rayon SuKanal Department (subsidiary of Azersu) and its contractors will spend roughly 14 % of the investment cost purchasing goods, services and supplies from rayon's vendors over this 20 year period.
- Considering the spinoff effects generated by this economic activity, the operations phase of the Project will boost the gross domestic product of the rayon by 2 % per year.

6.4.3. Wider Economic Benefits

The Project also identified a number of Project elements that will also have important economic benefits in the rayon.

- Upgraded water supply and sanitation infrastructure will remedy rayon's health and public safety infrastructure. This improvement will augment access to potential markets for an array of the rayon businesses.


- Association with the Project will improve the skills of rayon's workers and help to develop its businesses, preparing them to take better advantage of future economic opportunities.

As part of these analysis, the project will acknowledge the full range of typical impacts associated with any similar large scale development project, including some that can have negative consequences (e.g., inflation effects, labor supply effects, etc.). For this Project, however, this study shows that these potential effects will be relatively minor in comparison to the Project's overall positive economic impacts.



Exhibit
6,1

Drawing Name :
Layihə Ərazisi yaxınlığında təsire
menüz qalan əkin sahələri
Affected Agricultural Areas nearby the
Project Corridor

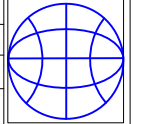


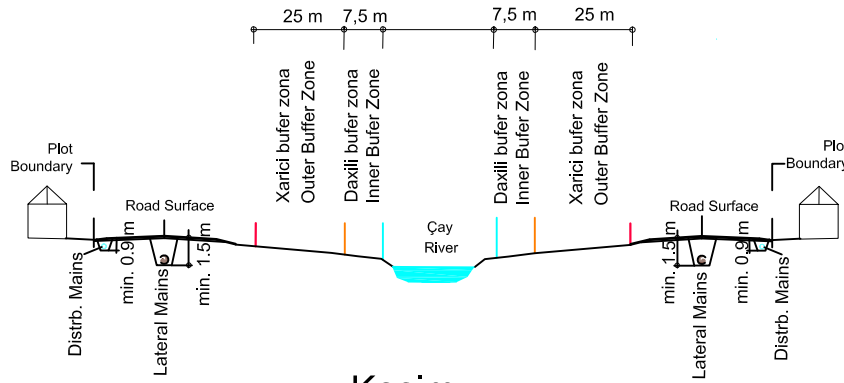
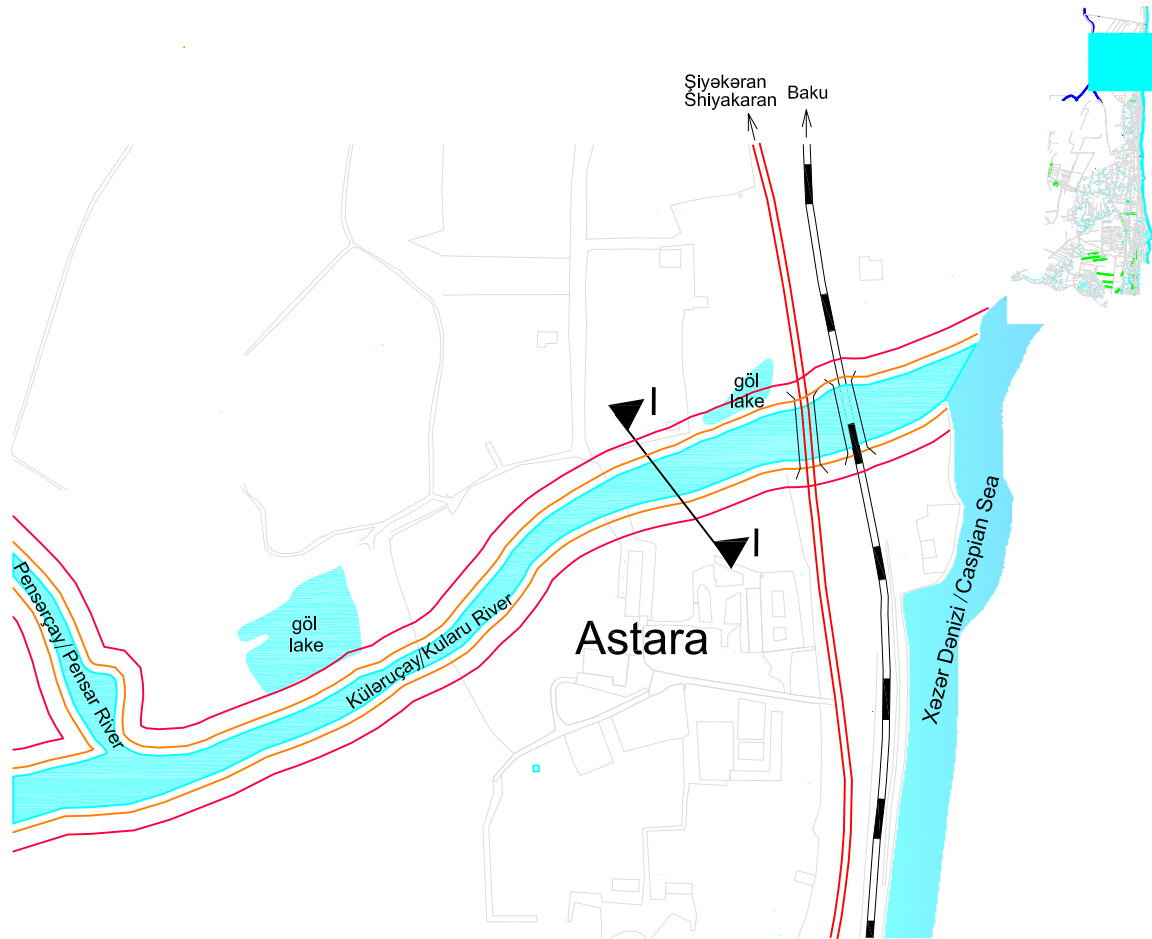
İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Azerbaijan Respublikası
Republic of Azerbaijan

LEGEND

- Şəhərlər
Cities
- Kəndlər
Villages
- Dövlət sərhəddi
National Border
- Şose
Highway
- Dəmir yolu
Railway
- İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- Torpaq yol
Earthen Road
- Köprü
Bridge
- Horizontallar
Contour Lines
- Təklif olunan xam su xətti
Proposed Raw Water Pipe Line
- Təklif olunan özaxınılı əsas su xətti
Proposed Gravity Transmission Main
- Təklif olunan əsas kanalizasiya xətti
Proposed Interceptor Sewer
- Meşə zolağı
Forest Blades
- 1ci-Sanitar(abadlaşdırma) Zona - 30 m
Beautification Zone - 30 m
- Təsir zonasına düşən kənd təsərrüfatı torpaqları
Affected Agricultural Lots
- Layihənin inşaat limitləri
Construction Limits of the Project
- Tikinti zonası sərhədləri
Construction Limits- Project Boundaries
- Kənd Təsərrüfatı torpaqları
Agricultural Lots
- Xidmət ərazisinin sərhədləri
Service Area borders
- Səs-küyün təsirinin qiymətləndirilməsi
hüddulları
Noise Impact Assessment Limits
- Suyun keyfiyyətinə təsirin qiymətləndirilməsi
hüddulları,
Atmosferə təsirin qiymətləndirilməsi hüddulları,
Ekoloji təsirin qiymətləndirilməsi
hüddulları
Water Quality Impact Assessment Limit
Ambient Air Quality Impact Assessment Limit
Ecological Impact Assessment Limit
- 2, ...,n, (-)17 Baltik dənizinə görə yüksəkliklər
Ground Levels according
to Baltic Sea level





Kəsim
Section | - |

LEGEND

- — İkinci dərəcəli asfalt yol
Asphalt Paved Secondary Road
- () — Köprü
Bridge
- — Xarici Bufer Zona
Outer Buffer Zone
- — Daxili Bufer Zona
Inner Buffer Zone
- — Çay
River

Exhibit
6,2

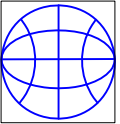


Drawing Name :
Astara şəhərində və yaxınlığında
çay qrağı ərazilər
Riverfront Areas in and nearby the
Astara city

Azərbaycan Respublikası
İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlerin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Məsələhətçi Consultant	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas,USA	Miqyas/Scale Tarix/Date	Miqyassız/N.T.S. Jan. 2011
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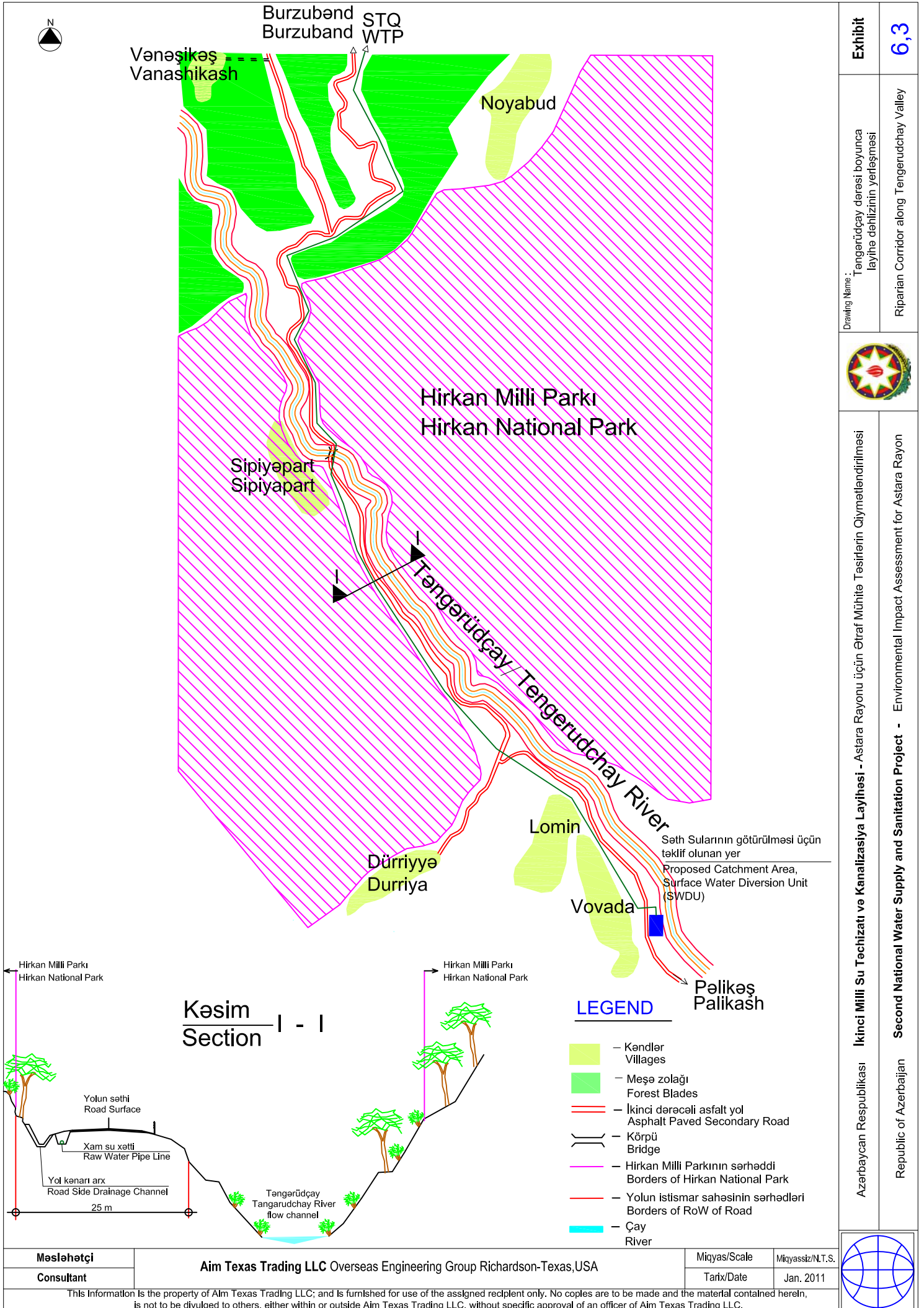


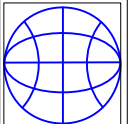
Exhibit
6,3

Drawing Name :
Tengerudchay dərəsi boyunca
layihə dəhlizinin yerləşməsi
Riparian Corridor along Tengerudchay Valley



Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Republic of Azerbaijan



Məsləhətçi Consultant	Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA	Miqyas/Scale Tarix/Date	Miqyassız/N.T.S. Jan. 2011
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Yaşayış və ya
Ticarət ərazisi

Residential and /or
Commercial Area

Ərazinin sərhəddi
Plot Boundary

Əhliyyət ərazisi
Reserve Zone

Abadlaşdırılmış ərazi
Beautification Zone

ÇSTQ və ya STQ ərazisi
WWTP or WTP Site

Aeroasiya Hovuzu
Aeration Basin

Məftil hasar
Fencing

Məftil hasar
Fencing

Daxili
Yol
Internal
Road

Giriş / Access
Zolağı / Strip
Min. 6 m.

Ən azı 700m
At least 700 m.

Ən azı 30 m.
At least 30 m.

Ən azı 20 m.
At least 20 m.

Ən azı 750m.
(ÇSTQ-dan minimum
məsafənin göstərilməsi)
At least 750 m.
(minimum odor screening
distance for WWTP)



Drawing Name :
Su və Çirkab Su təmizləmə Qurğularının ətrafında
məcburi minimum bufer zonası
Minimum Mandatory Buffers around the
Water and Wastewater Treatment Plant

Azərbaycan Respublikası İkinci Milli Su Təchizatı və Kanalizasiya Layihəsi - Astara Rayonu üçün Ətraf Mühitə Təsirlerin Qiymətləndirilməsi

Republic of Azerbaijan Second National Water Supply and Sanitation Project - Environmental Impact Assessment for Astara Rayon

Exhibit

6,4

Məsləhətçi

Consultant

Aim Texas Trading LLC Overseas Engineering Group Richardson-Texas, USA

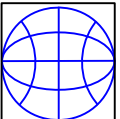
Miqyas/Scale

Tarix/Date

Miqyassız/N.T.S.

Jan. 2011

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Chapter 7

ENVIRONMENTAL MANAGEMENT & MONITORING

Overview

In accordance with the World Bank's safeguard policies and procedures, including **OP/BP/GP 4.01 Environmental Assessment**, the rehabilitation and reconstruction of the water supply and sanitation systems are classified as a Category A project for environmental assessment purposes.

Environmental due diligence for Category A World Bank financed activities advises the Borrower to prepare the present document, called "Environmental Management Plan" (EMP), and to implement it in order to prevent, minimize or mitigate site-specific environmental impacts. The present EMP has been prepared to protect the environment from risks such as improper waste disposal, noise, soil erosion on slopes, pollution of rivers and other water sources, etc.

The main objective of the environmental management is to mitigate the negative environmental and social impacts, minimize environmental risks adhering to the safety rules and following all current and strategic measures intended for the health protection during the pre-construction-design phase, construction phase, and operation phase of the Project.

The proposed work will have some short-term adverse impacts on the environment during the construction period. The potential impacts on the Valued Environmental Components are assessed on the basis of a review of literature, consultation with experts and professional judgment.

Based on the impact analysis, mitigation measures have been developed as required to minimize or reduce the potential impacts of the Project (see Chapter 6).

7.1. Environmental Management Plan (EMP)

This '*Environmental Management Plan*' (EMP) has been developed for the construction of each major project component addressing specific activities that interact with the environment. The EMP is the prime vehicle for implementing mitigation programs, monitoring programs and other environmental protection procedures throughout the life of the project.

Definition of '*Environmental Management Plan*'

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.

The EMP will address the environmental impacts during the design, 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.

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 AWM OJSC of Azerbaijan / Environmental Management Unit (EMU) and Environmental Control Official(s) (ECO) with the Supervisory Engineer (or an

Environmental Specialist of Construction Management Firm) will monitor the implementation of the procedures.

Objectives of the EMP

This Environmental Management Plan (EMP) covers the principles, responsibilities and requirements applicable in order to implement effective environmental management during preconstruction, construction and operation phases of the project.

The EMP has the following goals:

- Identifying those construction activities that may have a detrimental impact on the environment;
- Detailing the mitigation measures that will need to be taken, and the procedures for their implementation;
- Establishing the reporting system to be undertaken during the construction.

The EMP also serves to highlight specific requirements that will be monitored during the development and should the environmental impacts not have been satisfactorily prevented or mitigated, corrective action will have to be taken. The document should, therefore, be seen as a guideline that will assist in minimizing the potential environmental impact of activities.

Definition of “mitigation measures”:

Mitigation seeks to find better ways of doing things, by the implementation of practical measures to reduce, limit, and eliminate adverse impacts or enhance project benefits and protect public and individual rights.

The EMP also defines the arrangements that will be put in place to ensure that the mitigation measures are implemented by including recommendations of the roles and responsibilities of the project proponent, environmental management team and contractors.

7.1.1. Components of the EMP

This EMP adopted a precautionary approach, or in the case of management recommendations, a philosophy of ‘*best practice*’. Mitigation measures may then be of a more generic nature without compromising its importance to be implemented.

The EMP will outline environmental monitoring programs to be undertaken to determine the actual environmental effects of the project. The cost estimates for the monitoring and mitigation programs have also been included. Further field studies will also be recommended where more detailed information is required in order to develop a meaningful management plan.

Identified environmental impacts relate to the construction activities during the performance of the work, and should be managed through supervision of environmental aspects and use of adequate technical construction standards.

- Specific valid environmental permits including condition and operations of the coarse material products (i.e, crushed, sieved and washed materials for concrete and asphalt works), proper storage and application of materials, and implementation of air pollution monitoring through constant emission testing are required during performance of works. Contractor(s) shall be responsible to provide the copies of certificates. These certificates will be kept on file at the AWM OJSC of Azerbaijan.
- *Construction related waste materials*; Technical specifications shall require the collection and containment of all waste materials in specific landfills. The Contractor shall be required to conform to the environmental regulations and practice relating to proper disposal. The identification of the disposal site to be used and the appropriate quantities for each site shall be included as part of the reporting documentation.

- *Increased pollution loads into the surface water;* Water pollution may be caused by contamination of the surface waters (e.g. rivers) by accidental spills, pollution of the rivers with organic materials used as migrating corrosion inhibitors and water repellent agents.

Short-term impact from noise, dust, and traffic diversions during the execution of the work is inevitable. Additional dust pollution and noise in the Project corridor will be generated by machinery performing transportation of waste materials, excavation works on the pipe line route, construction water and wastewater treatment plants, pipelaying works, and other auxiliary works. These impacts will be minimized under the Project by;

- Specifying in the contracts the responsibility of contractor(s) to undertake appropriate work site mitigation actions as a part of their management of work sites,
- The supervision of compliance of contractor(s) by the Supervision Engineer (or a consulting company). Mitigation measures may include use of sprinklers to wash the specific areas and suppress dust emissions during soil/materials transport;
 - cover vehicles to prevent spills and transport borrow materials during daytime only;
 - provide workers with ear plugs and helmets where necessary and generally preventing from prolonged exposure to the high noise levels, etc.
- The contractor(s) should require to prepare and submit a detailed Environmental Management Plan (CEMP), including his own policies for approval of the Employer (AWM OJSC of Azerbaijan), such as;
 - Safety and Health Policy and Accident Prevention Plan,
 - Quality Assurance Policy,
 - Personal Protective Equipment (PPE) Policy,
 - Environmental Policy,
 - Drug and Alcohol Policy,
 - Equal Employment Opportunities and Anti-Discrimination Policy,
 - Audit Policy

These Policies will be displayed in prominent locations in the Project facilities. All Project personnel, including contractor employees, will be made aware of these Policies through the induction process. The EMP supports these Policies through the processes and activities described in this Plan and its associated Sub Plans.

Therefore the purpose of this EMP is to draft and maintain a detailed management plan that, if put into practise, will effectively prevent/minimize environmental degradation.

7.1.2. The EMP in Context

This EMP will form a part of the project tender and contract. Pre-construction and construction phase mitigation guidelines and clauses should be written into the construction contract documents as specifications. The contents of this EMP shall be deemed to be included in the rates tendered to execute and complete the works.

7.1.3. Flexibility

The EMP is a dynamic and flexible document subject to review and updating. During the implementation of a project there is always the possibility that unforeseen issues could arise, this EMP should therefore be revised where necessary to mitigate unanticipated impacts.

7.1.4. EMP Implementation Period

The EMP will focus on and operate during the whole implementation / construction period, defects liability period and maintenance phase of the project.

Review of Impact Assessment, Mitigation Measures and EMP

The EMP will be reviewed during the implementation phase at the detailed design stage in line with best practice as required by WB. A check will be made at the detailed design stage that the alignment and the locations of the Project components have been designed as planned to ensure the locations are as described in the EIA.

It is based on the analysis of impacts, primarily to document the key environmental issues likely to arise from project implementation, to prescribe mitigation measures to be integrated in the contract documentation, project design, to design monitoring and evaluation schedules to be implemented during project construction and operation, and to estimate costs required for implementing mitigation measures.

This Environmental Management Plan establishes objectives and targets for environmental aspects. This EMP should be reviewed annually and submitted to the MENR of Azerbaijan and World Bank by AWM OJSC of Azerbaijan and its PIU. Progress on the achievement of the plan should also be reported in Azerbaijan's annual public Environment, Health, Safety and Community report by MENR of Azerbaijan.

Preliminary Design

The line alignment and location of the components of the project and construction are critical in determining the environmental impacts. There are also a number of other matters that will require detailed designs that Contractor's design engineers will prepare, and it is assumed that the detailed designs will avoid construction impacts by a comprehensive design and minimize operational environmental pollution impacts as far as practicable.

The preliminary design shall be disclosed by PIU/EMU of AWM OJSC to the MENR of Azerbaijan, and Ministry of Health (MOH) of Azerbaijan, and public consultations shall be conducted based on the preliminary designs. The environmental clearances which will be required by MENR and MOH of Azerbaijan shall be identified (in principle) subject to confirmation at the Detailed Design Phase.

It is common for the alignment of water mains/sewage collectors and for the locations of other system components of the project to undergo some or fine tuning during the detailed design phase. The final alignments and locations shall be disclosed to AWM OJSC of Azerbaijan, MENR, and MOH of Azerbaijan at the detailed design stage and the EMP must be reviewed.

Detailed Design

During the detailed design phase and in preparation for the construction phase, the Construction Management Firm (CMF) shall prepare the tender documents to make sure that future Contractor(s)' Design Team (CDT) shall be prepared and primed to cooperate with the implementing agency, project management, supervising consultants and local population in the mitigation of environmental impacts.

In order to introduce this process as early as possible in the Project, the contractor shall be required to submit his Method Statement and Schedule of environmental mitigation measures in response to EMP.

The CDT in cooperation with the PIU/EMU of AWM OJSC of Azerbaijan shall provide in the work statements that will also include but not necessarily limited to the followings:

1. Minimize acquisition of agricultural land for temporary facilities (if needed) by selecting preferred locations in detailed designs for construction yards and asphalt plant on barren or marginal land and agree terms with local community.
2. Potential solution spaces will be identified in advance by the CDT and approved by AWM OJSC of Azerbaijan/EMU in consultation with the local community to ensure sufficient storage and disposal space for cut surface materials and to avoid fly-tipping.
3. Include plans in detailed designs and programming that avoid community severance and minimize disturbance of pedestrians and vehicular traffic during construction. Detailed designs shall also retain passageways along all footpaths, tracks and access ways near the project during the construction.
4. Designs shall require hydrological and drainage impacts during construction to be minimize by early phasing of replacement of culverts and other infrastructure. These plans and designs shall be included for in contracts.
5. Extensions and improvements to drainage culverts that fall under embankments of the project shall be designed to account for increased runoff from rain due to climate change and included in detailed designs.
6. Avoid disruption to and retain or re-provision current facilities for irrigation before construction works commence; the provisions is made to preserve the operation of current facilities for irrigation in sufficient quantity in agreement with the local community.
7. Aim to provide some enhancements in line with WB guideline on environmentally responsible procurement and avoid negative impacts due to unnecessary removing of trees.
8. All Water Utility Facilities no intended for private ownership and maintenance shall be located in dedicated public Right of Way (RoW) or in a waterline easement dedicated to Rayon Public Utility Departments (RPUDs) under directions of AWM OJSC of Azerbaijan.

The EMP must be reviewed in the inception phase by the project management when the detailed designs are complete. The EMP will be approved by PIU of AWM OJSC and EMU before any construction activity is initiated to take account of any changes and fine tuning of the design proposals.

Environmentally Responsible Procurement

In order to comply with best international practice and WB guidelines, all new or used equipments shall not contain Polychlorinated biphenyl (PCB) or other hazardous or persistent polluting chemicals.

Therefore, in procurement documents, it always shall be specified that transformers, transformer oil and other equipment are to be free from PCB and other petroleum fractions that may be injurious to environment or equipment.

Preparing the Contractor(s) to Address the Mitigation Measures

The contractor shall be primed by including the EMP and environmental assessments in the bidding and contract documentation. The contractor(s) will be informed that he will be required to produce method statements and plans in advance as required in the EMP that those are the followings, but not limited to;

1. Drainage Management Plan, (DMP)
2. Temporary Pedestrian and Traffic Management Plan, (TP-TMP)
3. Erosion Control and Temporary Drainage Plan, (EC-TDP)
4. Waste Management Plan, (WMP)
5. Noise and Dust Control Plan, (NDCP)
6. Safety Plan, SP

7. Material Management Plan, (MMP)

Furthermore the contractor must be primed by the EMP in the contract documentation. The contracts must require full implementation of the EMP and the contractor must be ready to engage capable and trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds.

The effective implementation of the EMP should be audited as part of the loan conditions. In this regard, the AWM OJSC of Azerbaijan will also prepare resources to fulfill the requirements of the law and guidance on the environmental aspects of projects and any updated recommendations in the EMP as the mitigation measures are rolled out and updated as necessary.

The method statements and plans will subsequently become part of the contract documentation. The contractor will also be required to engage capable and trained staff or site agents to take responsibility for the environmental management at the working level and to monitor and report on the effectiveness and review mitigation measures as the project proceeds.

7.1.4.1. Construction Environmental Management Plan (CEMP)

The purpose of the CEMP is to address the specific environmental requirements of the Local Planning Authority, Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan.

The comprehensively designed CEMP describes the Contractor's system for minimizing and managing environmental risks associated with the Project construction activities as required by the Contractor. The Construction Environmental Management Plan (CEMP) is a stand alone document to be prepared by the Contractor.

The key objectives of the CEMP are to:

- Provide certainty of delivery of the prescribed environmental outcomes during all phases of the project work in the Project corridor.
- Implement a system for compliance with applicable legislative and non-legislative requirements and obligations and commitments for the Project including:
 - Relevant Legislative Requirements;
 - Licences and Approvals;
 - Obligations and commitments from the EIA process;
 - Minister's Conditions of Approval;
 - Regional Road and Traffic Authority (RRTA or Road Patrol) requirements including Technical Criteria; and
 - Non-legislative requirements and commitments (e.g. International Standard for Environmental Management Systems - ISO 14001:1996, and National/International guidelines).
- Ensure that project design processes incorporate best practice environmental design and sustainability principles to minimize potential impacts of construction and operation on the environment and community.
- Ensure that the construction work procedures minimize potential impacts on the environment and community.
- Develop, implement and monitor measures that minimize pollution and optimize resource use.

The CEMP consists of a suite of environmental planning and management instruments (e.g. Management Sub Plans, Construction Method Statements (CMS)) that will be implemented during the Project to minimize and manage environmental and community risks and impacts. The suggested scope and interaction of these documents, is described in Figure 7,1.

Environmental Management Sub Plans

The Sub Plans should identify potential impacts of each significant risk / aspect as it relates to the Project, and outlines the physical and management safeguards, mitigation measures, responsibilities and monitoring requirements to be implemented to prevent or minimise potential impacts on the environment.

Various environmental management Sub Plans should be prepared to document Contractor's management approach to significant risks or aspects of the Project.

Sub plans should be developed and approved as a part of CEMP are listed below;

- Dust Management Plan,
- Construction Flora and Fauna Management Plan,
- Construction Heritage Management Plan,
- Construction Noise and Vibration Management Plan,
- Construction Riparian Management Plan,
- Construction Traffic Management Plan,

Other sub plans outside the CEMP are listed below;

- Bush Fire Management Sub Plan,
- Construction Soil and Water Management Sub Plan,
- Construction Waste and Reuse Management Sub Plan,
- Flooding and Drainage Management Sub Plan,
- Groundwater Management Sub Plan,
- Hazards and Risk Management Sub Plan,
- Landscape and Rehabilitation Management Sub Plan,
- Spoil and Fill Management Sub Plan,
- Community Communication Strategy,
- Biodiversity Offset Strategy and Package,
- Compliance Tracking Program,
- Construction Complaints Management System,
- Construction Water Management Strategy,
- Threatened Species Monitoring Program,
- Operational Environmental Management Plan.

Project Organization and Responsibilities

The contractor should demonstrate how the environmental aspects of the project will be organized in relation to the Contractor's project team, sub-contractors, supply chain and the Employer's Project Manager and Site Supervisor.

This section may include:

- Project/site office address & contact details,
- Responsibilities for environment of each project stakeholder,
- Project Manager and Site Supervisor,
- Sub Agents,
- Site Environmental Manager,
- Section Environmental Representative,
- Supply Chain (sub-contractors, suppliers, manufacturers, specialists etc),
- Who has overall responsibility for ensuring that the provisions of the CEMP are fully implemented for the duration of the Project,
- How the contractor will take responsibility for the environmental management of all works under their jurisdiction and should ensuring supply chain members are aware of their duties in relation to environmental protection.

Responsibilities of the Environmental Manager:

The contractor should highlight the responsibilities of his Environmental Manager, and should amend and supplement as required the followings;

- Provision of expert support to the project team,
- Co-ordination of environmental aspects of the Project,
- Review of aspects and impacts and setting objectives and targets,
- Liaison with environmental regulators over consent applications, permits and other specific environmental issues,
- Identification of environmental training needs, including management training and toolbox talks,
- Site and work inspections, audits and reviews to ensure compliance with the CEMP and to assess working practices e.g waste management,
- Issue of corrective action requests,
- Coordination of the investigation and response to environmental incidents and complaints,
- Provide recommendations for amendment to the CEMP or working practices; coordinate updates to the CEMP.

Supply Chain

The contractor should provide the details of all members of the supply chain. They should demonstrate how all members of their supply chain are held responsible for ensuring that the provisions within the CEMP are relevant to their particular activities, and how they are to be successfully implemented and maintained during their work.

CEMP Review and Updating

The contractor should demonstrate how he intends to keep the CEMP as a 'live' document, capable of modification during the construction process and as circumstances dictate. He should also indicate who would regularly review, update and develop it as the scheme progresses. The contractor should also timetable regular progress reports for the client and for meetings.

Meetings

The contractor is required to hold monthly Site Progress Meetings during the construction. Issues relating to environmental design, mitigation and implementation in general, and implementation of the CEMP in particular, will be an agenda item at these progress meetings.

Sub-Contractors and Supply Chain

The contractor should demonstrate how they aim to ensure that all sub-contractors are aware of and buy into project environmental management. They should show how the selection, control and review of performance of sub-contractors are to be managed. The contractor should also ensure that all sub contractors understand the external communications strategy and maintain effective methods of communication.

Training

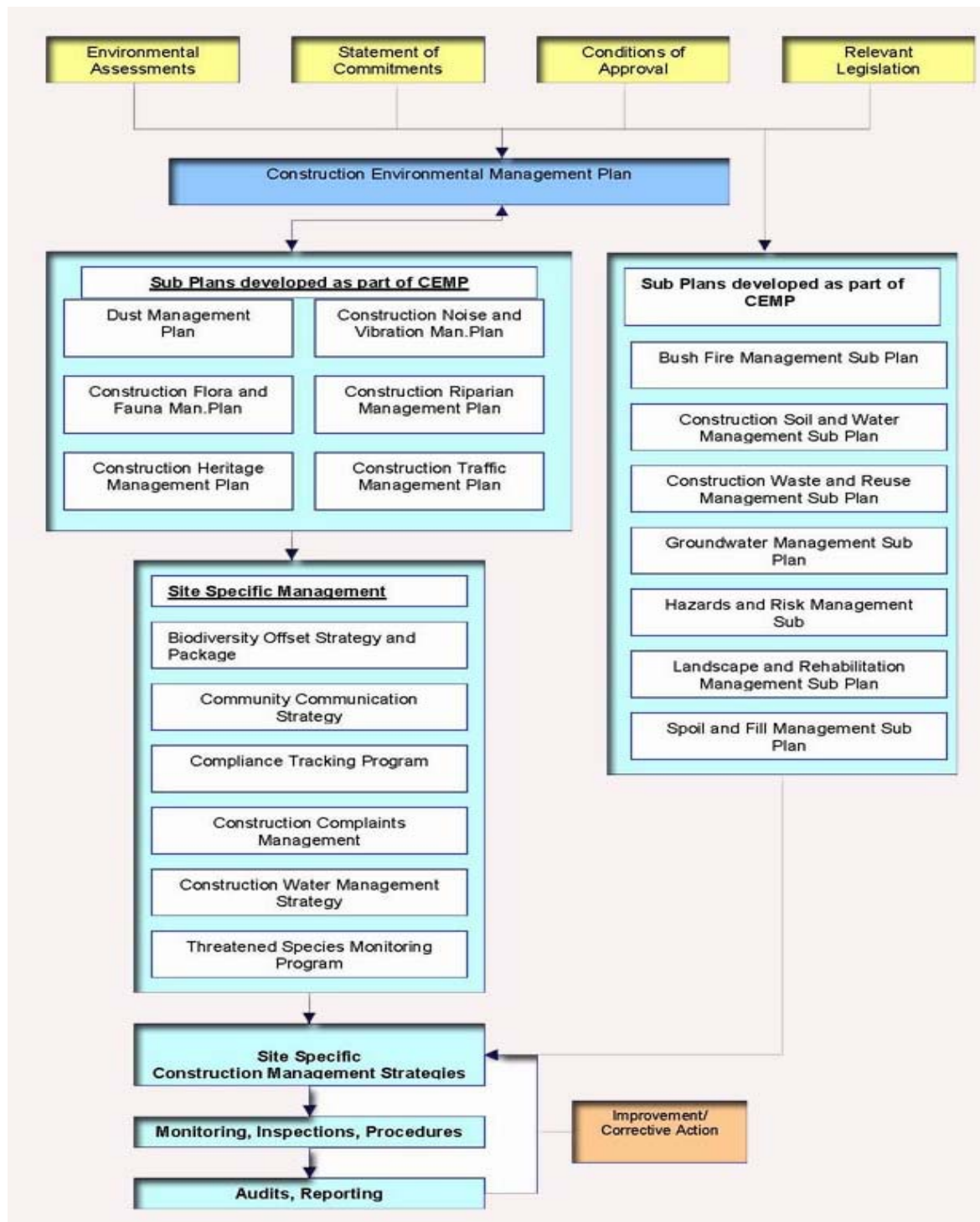
The contractor shall identify (and record attendance at) any training they propose to carry out related to environmental issues including making staff aware of ecological issues. This section may include:

- *Named persons responsible for environmental training, including site induction, toolbox talks, specific technical training.*

Environmental Records

The contractor should demonstrate what records are to be kept as part of this environmental management process. This information should also identify where the documents are to be kept, and who will be responsible for maintaining them. This documentation should include: training, monitoring, project reviews; minutes of meetings; method statements, procedures; consents/licences etc.

Figure 7,1: Suggested Scope and Interaction of CEMP



7.1.5. Roles and Responsibilities

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

All of the issues described and discussed in this document will require monitoring, and it will be the responsibility of AWM OJSC of Azerbaijan to undertake this monitoring according to the specifications of this EMP.

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

7.1.5.1. Institutional Strengthening & Capacity Building

The organizational structure for project management is often chosen to mitigate risk in a weak capacity environment, but it may also reflect internal incentives that focus on speed of project processing and disbursement, and perceived stigmas in low implementation performance ratings.

When establishing project management arrangements, however, in all cases it is essential to maximize the use of existing staff and institutions, and integration into the country's structures and processes. It is also important to agree on a strategy for full integration, and for phasing out any enclave units as rapidly as possible, by preparing a time-bound action plans for necessary capacity development, such as training.

PIU of AWM OJSC of Azerbaijan

The SNWSS Project Implementation Unit (PIU) of AWM OJSC of Azerbaijan 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, 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 AWM OJSC 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 World Bank financed projects).

The use of technical assistance may help address the short term needs for capacity and ensure continuity during the transition period. Consultancy assistance is financed by the Project. The operational fund is set up with initial financing from the government.

Environmental Management Unit (EMU) of PIU

The PIU of AWM OJSC of Azerbaijan 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. There will be a net increase in staffing in the EMU for monitoring all stages of the project from pre-construction to commissioning, and for the first year of the operation and maintenance. An international environmental specialist should also be engaged to support the EMU at least for two years from pre-construction until the operation phase. An auditing methodologies will be established by the EMU.

Appointment of an Environmental Control Officer(s)

The position of Environmental Control Official(s) will be created to ensure that the mitigation measures and other requirements set forth in the EMP are adhered to.

It was discussed and agreed that AWM OJSC of Azerbaijan will appoint the Environmental Control Official(s) (ECO) during the construction phase of the project. The ECO will be a Section Ranger.

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, audit and implement the EMP. This is his most important function.
- The ECO must then give feedback of the audits to PIU/EMU of AWM OJSC of Azerbaijan 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 audit.

Suggested Environmental Management Team for AWM OJSC of Azerbaijan

An environmental management team should be constituted under the PIU of AWM OJSC of Azerbaijan in the Project implementation period. The following 'Environmental Management Team' composition and its budget were discussed and agreed with AWM OJSC of Azerbaijan.

The team suggested in Table 7,1 and Figure 7,2 is to manage and monitor all environmental issues and to provide full control on the terms of EMP for 12 rayons of Azerbaijan; Imishli, Kurdamir, Ujar, Zardab, Lankaran, Astara, Jalilabad, Masalli, Lerik, Yardimli, Dashkasan, and Gadabay. An expat EMP manager should be employed in the pre-construction and construction period 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.

Table 7,1: Suggested Environmental Management Team for AWM OJSC of Azerbaijan

Staff	Local	Expatriate	Project Total
EMP Manager (EM), head of EMU	1	1	2
Environmental Control Official(s) –ECO Section Ranger- 1 official for two rayons	6	0	6
Socio-economic Team	3	0	3
Compensation Team	3	0	3
Env. Specialists (Health and Safety, environment, archeology)	3	0	3
Environmental and Community Officials	3	0	3
Data Management/Clerical	2	0	2
Total	21	1	22

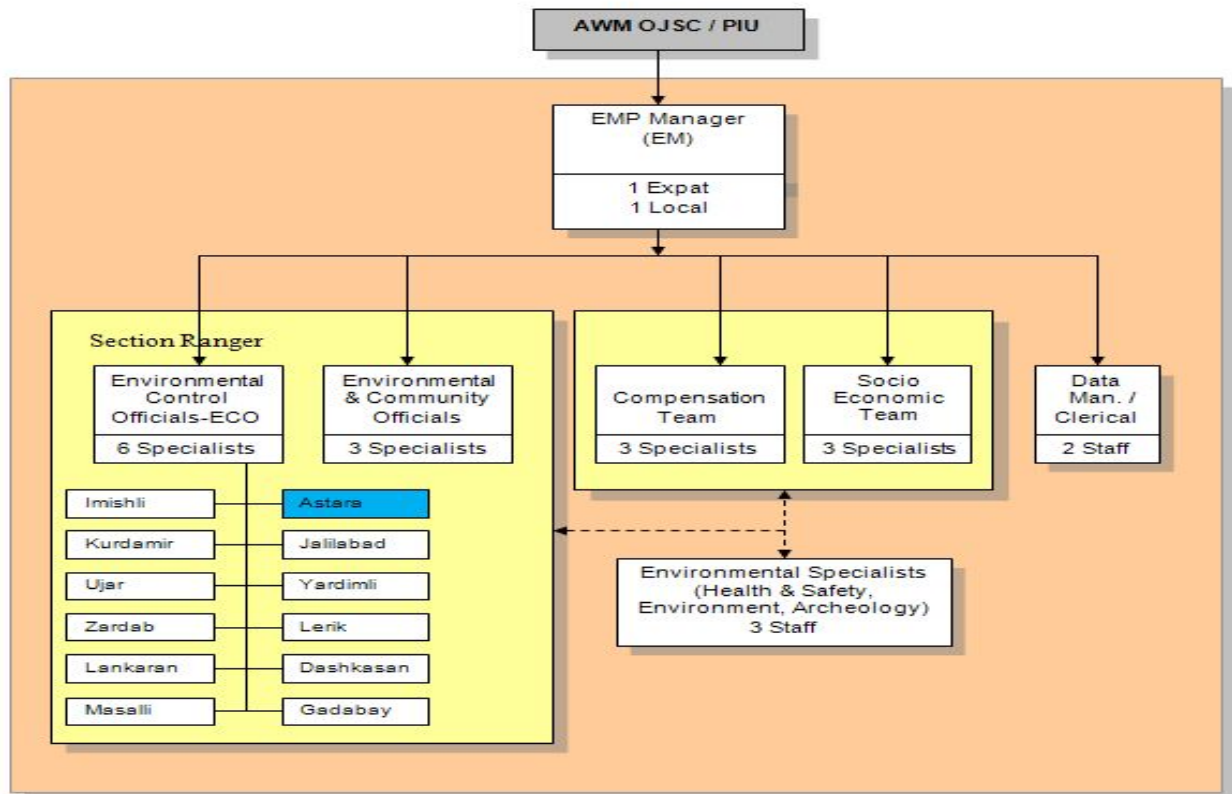


Figure 7,2: Environmental Management Team Composition for AWM OJSC of Azerbaijan,

7.1.5.2. Estimated Costs for Environmental Management

Estimated costs of Environmental Management for rayon Astara will be as follows;

Table 7,2: Summary of administrative cost estimates for EMP implementation of EMU/AWM OJSC of Azerbaijan* in 12 rayons

1	Staffing Audit and Monitoring in EMU/AWM OJSC	1 international Expert for 24 months	\$	9.000,00	\$	216.000,00
		20 local specialist for 18 months (\$ 2.400 per month per person)	\$	48.000,00	\$	864.000,00
2	Monitoring Activities	Lab. Charges for testing	LS		\$	220.000,00
3	Transport	7 Vehicles for 18 months	\$	7.000,00	\$	126.000,00
4	Sub-total	-	-		\$	1.426.000,00
5	Contingency	3 %	-		\$	42,780,00
6	Total	-	-		\$	*1,468,780,00
Each rayon's share of administrative costs					\$	122,398.33

* This cost is for 12 rayons of Azerbaijan, it will be divided into 12 to find the each rayon's administrative costs.

2; Lab. Charges for : testing for construction materials, water quality tests, ambient air tests, emissions measurements, and noise measurements.

3; \$ 1.000 per month rental charges including daily fuel and operation cost.

Total EMP Implementation Cost for Astara Rayon**Table 7.3: Summary cost estimates for EMP implementation of Astara rayon**

1	No tree felling and re-planting is required within the Project..	\$0.00
2	Compensation of loss of productivity for agricultural lots affected from the dust impact – estimated for approx. 1228 ha. It will likely be in-kind compensation , and compensation issues will be handled in accordance with the Project Resettlement Policy Framework (RPF).	\$0.00
3	Hazardous Waste Disposal Facility to be constructed in Astara city, See Chapter 6.2.2	\$105.000,00
4	Routine monitoring and site visit expenses including allowance for RPUDs and AWM OJSC/EMU local experts- for 18 months estimated	\$60.000,00
5	Awareness Workshop or training/orientation for environmental specialist and short –term training for construction machinery operators-estimated	\$30.000,00
6	Share administrative costs for Astara rayon	\$122,398.33
7	Sub-total	\$317,398.33
8	Contingency 3 %	\$9,522.95
9	Estimated Environmental Management and Monitoring implementation costs of Astara rayon	\$326,921.28

7.1.6. Feedback to PIU and EMU of AWM OJSC of Azerbaijan

Reporting to the PIU and EMU of AWM OJSC of Azerbaijan 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.

Reporting on the status of implementation of the EMP and the results of the environmental monitoring programme must be recorded and summarised in a monthly report by the EM/ECO and submitted to the PIU of AWM OJSC of Azerbaijan.

7.1.7. Failure to comply with EMP

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 AWM OJSC of Azerbaijan may institute against the contractor.

The financial compensation for nuisances is not the best international practice to accept payment for environmental impacts. It shall be noted by AWM OJSC of Azerbaijan that the approach of some contractors has been to pay money for nuisances rather than control impacts at source. If say erosion impacts are not controlled properly there could be serious environmental consequences such as landslides or runoff could cause fish kills in the rivers. Therefore, the practice of paying financial compensation for impacts should not be allowed and financial compensation will not be allowed as mitigation for environmental impacts or environmental nuisance.

A schedule of costs for environmental mitigation measures (including maintenance where applicable) should be agreed with the contractor before the construction commences. The implementation of mitigation measures shall be tied to payment milestones or a performance bond for an amount agreed with the contractor and AWM OJSC of Azerbaijan shall be deposited by the contractor. The bond shall be forfeited in the event that environmental mitigation measures required in the EMP are not fully implemented.

7.2. Environmental Mitigation/Management Plan

Specifically, the contract for the proposed project will include the Mitigation Plan will be attached to the Technical Specifications.

This section of the report serves to prescribe mitigation measures to reduce, limit, eliminate or compensate for impacts, to 'acceptable/insignificant' or 'less than significant' or 'less than significant with mitigation incorporated' levels (see Chapter 6). In setting mitigation measures, the practical implications of executing these measures must be borne in mind. With early planning, both the cost and the impacts can be minimized.

Environmental aspects addressed in this EMP include;

For the Pre-construction Environmental Management Plan (see **Exhibit 7,1**),

1. Environmentally Related Authorizations, Permits and Licenses,
2. EMP Training,
3. Contract Areas,
4. Sensitive Ecology,
5. Heritage Areas,
6. Roads,
7. Site Establishment,
8. Materials Handling, Use and Storage,
9. Water Supply,
10. Power Supply,
11. Liquid Waste,

For the Construction Management Plan (see **Exhibit 7,1**),

1. Vehicular Access and Movement of Construction Vehicles,
2. Movement of Construction Personnel, Labors and Equipments,
3. Vegetation Clearing,
4. Protection of Fauna,
5. Heritage and / or Archeological Sites,
6. Soil Management,
7. Erosion Control,
8. Slope Protection,
9. Access Roads,
10. Excavating, Backfilling, and Trenching,
11. Levelling,
12. Sand Extraction,
13. Stockpiling, Handling, Storage of Building Materials,

14. Servicing and Re-fueling of Construction Equipments,
15. Solid Waste Management,
16. Hazardous Material,
17. Run-off from Construction Camp,
18. Fire,
19. Ambient Air and Dust,
20. Noise,
21. Crossing at Rivers, Streams and Wetlands
22. Visual,
23. Site Clean-up and Rehabilitation.

The stipulations of this report should be conveyed to the contractors prior to the commencement of construction.

7.2.1. Pre-construction Mitigation/Management Plan

The pre-construction or planning management plan is to be used as a guide during the planning, design and detailing of the development components. This part of the plan is to be referenced by all involved in decision making during the planning and design phases, and for the detailed plan see **Exhibit 7,1**.

7.2.2. Construction Mitigation/Management Plan

The Construction Management Plan forms part of the contract documentation. The plan must be read in conjunction with the contract documents including the relevant Bill of Quantities and Specifications, and for the detailed plan see **Exhibit 7,1**.

When carrying out the Works during the construction phase, 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.

7.2.3. Emergency Procedures

Emergency services will be informed of the location and nature of the works and the nature of potentially hazardous materials encountered at the site during the demolition and recycling works. Emergency procedures on site will cover actions to be taken if a catastrophic event occurs. Catastrophic events may include but not be limited to:

- Oil or other contamination spillage,
- Collapse or potential collapse of a structure,
- Fire and explosion,
- Failure of any control structures,
- Industrial accident.

In order to ensure that the environmental impact of catastrophic events is minimized, emergency procedures are to be followed. These include:

- The first priority is the safety of any persons either workers or others involved in the events. Whatever reasonable actions necessary to protect safety will be taken. The site Occupational Health and Safety Plan will outline actions to be taken in relation to safety of persons, if these circumstances eventuate.
- The second priority is to quickly minimize the environmental damage. All emergency action should take place as soon as possible after the event. Actions to be taken may include:
 - The containment of any pollution by booms, silt fences or other means. Supplies of silt fences are to be kept on-site.
 - The temporary re-establishment of the control structure.

- The taking of appropriate samples to assess the extent of the problem.

In the event of an emergency situation arising, the Constructor's PM and/or the ECO or their representative(s) will be contacted immediately after all persons are accounted for and all possible immediate actions to control the pollution have been taken.

Emergency Procedures – off site vehicle accidents

The Contractor is to use subcontractors and vehicles appropriately licensed for carrying the designated waste streams. The Contractor is to ensure that the subcontractor has an incident management plan in place and that the drivers are aware of the materials that they are carrying.

Emergency procedures will cover actions to be taken in the case of an accident or spill event occurring. In order to ensure that the environmental impact of such an event is minimized, emergency procedures are to be followed. These include:

- The first priority is the safety of any persons either workers or others involved in the events. Whatever reasonable actions necessary to protect safety will be taken,
- Contact the City's Fire Department and inform them of the event and chemicals/materials of concern. Depending on the event the Hazmat Response Unit may be requested to attend. The firefighters attached to this unit will be able to provide expert advice and have the expertise to operate specialised hazmat equipment,
- The second priority is to quickly minimize the environmental damage. All emergency action should take place as soon as possible after the event. Actions to be taken would be directed by the Hazmat Response Unit and would likely include the containment of any pollution by booms and/or foam.

7.3. Environmental Monitoring and Supervision

Construction Phase

Specifically, the contract for the proposed project will include the Monitoring Plan will be attached to the Technical Specifications.

The Employer (AWM OJSC of Azerbaijan) with its authorized environmentally sub-sections (EMU/ECO), and the Supervisory Engineer (or Environmental Specialist of CMF) will monitor the implementation of the EMP during the construction period and Defects Liability Period (DLP). Overall potential environmental and safety impacts are readily avoidable and can be easily mitigated by adopting good engineering practices.

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 AWM OJSC of Azerbaijan 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.

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.

Various types of monitoring activity are currently in practice, and each has some degree of relevance to the EIA study. The main types are briefly described below:

- **Baseline Monitoring:** A survey should be conducted on basic environmental parameters in the area surrounding the proposed project before construction begins (pre-audit study). Subsequent monitoring can assess the changes in those parameters over time against the baseline.
- **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.
- **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.

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.

Operation Phase

Monitoring and audit of the WSS facilities will be performed by the 'Joint SuKanal LLC' (JSK LLC - subsidiary of AzerSu) through the Rayon SuKanal Departments (RSKD) during the operation period. All WSS facilities will be handed over to JSK LLC once the Project is completed (after the end of the Defects Liability Period), and will be operated by RSKD representing JSK LLC. On account of this situation, the RSKD will be responsible the monitoring and audit activities of the WSS facilities in rayon.

However, there is no environmental official in the body of RSKD. It should be noted that an environmental official experienced on the WSS facilities, water and wastewater quality, and treatment technologies, needs to be appointed to the RSKD for the duration of the operation period.

7.3.1. Environmental Monitoring and Audit

The objectives of carrying out Environmental Monitoring and Audit for the Project include the following:

- Providing a database against which any short or long term environmental impacts of the project can be determined.
- 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.
- Verifying the environmental impacts predicted in the EIA Study.
- Determining project compliance with regulatory requirements, standards and government policies.
- Taking remedial action if unexpected problems or unacceptable impacts arise.
- Providing data to enable an environmental audit.
- Providing real-time reporting of monitoring data through a dedicated internet website.

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

7.3.2. Environmental Monitoring and Audit Requirements

The predicted monitoring requirements in the construction phase and operation phase are given in **Exhibit 7,2**.

Institutional factors determining the effectiveness of monitoring should not be underestimated. There needs to be a firm institutional commitment by the agencies and/or ministerial departments responsible for the monitoring process, particularly in regard to the following:

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

7.3.3. Reporting

The Environmental Monitoring and Audit reporting shall be carried out in paper based plus electronic submission upon agreeing the format with the MENR of Azerbaijan. All the monitoring data (baseline and impact) shall also be submitted in CD-ROM.

Types of reports that the EM should prepare and submit include baseline monitoring report, monthly Environmental Monitoring and Audit report, quarterly Environmental Monitoring and Audit report summary report and final Environmental Monitoring and Audit report review report. A copy of the monthly, quarterly summary and final review Environmental Monitoring and Audit reports should be made available to the PIU of AWM OJSC and World Bank.

Baseline Monitoring Report

The EM should prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of the baseline monitoring. Copies of the Baseline Environmental Monitoring Report should be submitted to the Contractor, the PIU of AWM OJSC of Azerbaijan, the MENR of Azerbaijan, MOH of Azerbaijan. The EM should liaise with the relevant parties on the exact number of copies they require. The report format and baseline monitoring data format should be agreed with the MENR prior to submission.

The baseline monitoring report should include at least the followings:

- Up to half a page executive summary,
- Brief project background information,
- Drawings showing locations of the baseline monitoring stations,
- Monitoring results (in both hard and soft copies) together with the following information:
 - Monitoring methodology,
 - Types of equipment used and calibration details,
 - Parameters monitored,
 - Monitoring locations,
 - Monitoring date, time, frequency and duration; and
 - Quality assurance (QA) / quality control (QC) results and detection limits.
- Details of influencing factors, including:
 - Major activities, if any, being carried out on the site during the period,
 - Weather conditions during the period, and
 - Other factors which might affect results.
- Determination of the action and limit levels for each monitoring parameter and statistical analysis of the baseline data, the analysis should conclude if there is any significant difference between control and impact stations for the parameters monitored,

- Revisions for inclusion in the Environmental Monitoring and Audit report prepared by EM, and
- Comments, recommendations and conclusions.

Monthly Environmental Monitoring and Audit Report

The results and findings of all Environmental Monitoring and Audit work required in the Manual prepared by EM should be recorded in the monthly Environmental Monitoring and Audit reports. The Environmental Monitoring and Audit report should be prepared and submitted within 10 working days of the end of each reporting month, with the first report due the month after construction commences. Each monthly Environmental Monitoring and Audit report should be submitted to the following parties: the Contractor, the PIU of AWM OJSC of Azerbaijan, the MENR of Azerbaijan and the World Bank. Before submission of the first Environmental Monitoring and Audit report, the EM should liaise with the parties on the required number of copies and format of the monthly reports in both hard copy and electronic medium.

The EM should review the number and location of monitoring stations and parameters every six months, or on as needed basis, in order to cater for any changes in the surrounding environment and the nature of works in progress.

The monthly Environmental Monitoring and Audit report should include at least the following:

- *Executive summary (1-2 pages):*
 - Breaches of Action and Limit levels,
 - Complaint log,
 - Notifications of any summons and successful prosecutions,
 - Reporting changes, and
 - Future key issues.
- *Basic project information:*
 - Project organisation including key personnel contact names and telephone numbers,
 - Construction programme,
 - Management structure, and
 - Works undertaken during the month,
- *Environmental status:*
 - Works undertaken during the month with illustrations (such as location of works), and
 - Drawings showing the project area, and any environmental sensitive receivers and the locations of the monitoring and control stations (with co-ordinates of the monitoring locations),
- *A brief summary of Environmental Monitoring and Audit requirements including:*
 - All monitoring parameters,
 - Environmental quality performance limits (Action and Limit levels),
 - Event-Action Plans,
 - Environmental mitigation measures, as recommended in the project EIA Final Report, and
 - Environmental requirements in contract documents,
- *Implementation status:*
 - Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report,

- *Monitoring results (in both hard and soft copies) together with the following information:*
 - Monitoring methodology,
 - Name of types of equipment used and calibration details,
 - Parameters monitored,
 - Monitoring locations,
 - Monitoring date, time, frequency, and duration,
 - Weather conditions during the period,
 - Any other factors which might affect the monitoring results, and
 - QA/QC results and detection limits,
- *Report on non-compliance, complaints, and notifications of summons and successful prosecutions:*
 - Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels),
 - Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary,
 - Record of all notification of summons and successful prosecutions for breaches of current environmental protection / pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary,
 - Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures, and
 - Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance,
- *Others:*
 - An account of the future key issues as reviewed from the works programme and work method statements,
 - Advice on the solid and liquid waste management status, and
 - Comments (for examples, effectiveness and efficiency of the mitigation measures), recommendations (for example, any improvement in the Environmental Monitoring and Audit programme) and conclusions.
- *Annex:*
 - Action and limit levels,
 - Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
 - Major activities being carried out on site during the period,
 - Weather conditions during the period, and
 - Any other factors that might affect the monitoring results.
 - Monitoring schedule for the present and next reporting period,
 - Cumulative statistics on complaints, notifications of summons and successful prosecutions, and
 - Outstanding issues and deficiencies.

Quarterly Environmental Monitoring and Audit Summary Report

A quarterly Environmental Monitoring and Audit summary report of around five pages should be produced and should contain at least the following information.

- Up to half a page executive summary,
- Basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of works undertaken during the quarter,
- A brief summary of Environmental Monitoring and Audit requirements including:
 - Monitoring parameters,
 - Environmental quality performance limits (action and limit levels), and
 - Environmental mitigation measures, as recommended in the project EIA Final Report,
- Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the project EIA Final Report, summarised in the updated implementation Schedule,
- Drawings showing the project area, and any environmental sensitive receivers and the locations of the monitoring and control stations,
- Graphical plots of any trends in monitored parameters over the past four months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - The major activities being carried out on site during the period,
 - Weather conditions during the period, and
 - Any other factors which might affect the monitoring results,
- Advice on the solid and liquid waste management status,
- A summary of non-compliance (exceedances) of the environmental quality performance limits (action and limit levels),
- A brief review of the reasons for and the implications of any noncompliance, including a review of pollution sources and working procedures,
- A summary description of actions taken in the event of non-compliance and any follow-up procedures related to any earlier non-compliance,
- A summarised record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken,
- Comments (for examples, a review of the effectiveness and efficiency of the mitigation measures); recommendations (for example, any improvement in the Environmental Monitoring and Audit programme) and conclusions for the quarter, and
- Proponents' contacts and any hotline telephone number for the public to make enquiries.

Final Environmental Monitoring and Audit Review Report

The final Environmental Monitoring and Audit report should include, inter alia, the following information:

- An executive summary,
- Drawings showing the project area, and any environmental sensitive receivers and the locations of the monitoring and control stations,

- Basic project information including a synopsis of the project organisation, contacts of key management, and a synopsis of work undertaken during the entire construction period,
- A brief summary of Environmental Monitoring and Audit requirements including:
 - Monitoring parameters,
 - Environmental quality performance limits (action and limit levels), and
 - Environmental mitigation measures, as recommended in the project EIA Final Report,
 - Event-Action Plans.
- A summary of the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA Report, summarised in the updated implementation Schedule,
- Graphical plots of the trends of monitored parameters over the construction period for representative monitoring stations, including the post-project monitoring annotated against:
 - The major activities being carried out on site during the period,
 - Weather conditions during the period, and
 - Any other factors which might affect the monitoring results.
- A summary of non-compliance (exceedances) of the environmental quality performance limits (action and limit levels),
- A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate,
- A summary description of the actions taken in the event of noncompliance and any follow-up procedures related to earlier noncompliance,
- A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken,
- A summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results,
- A review of the validity of EIA predictions and identification of shortcomings in EIA recommendations, and
- Comments (for examples, a review of the effectiveness and efficiency of the mitigation measures and of the performance of the environmental management system, that is, of the overall Environmental Monitoring and Audit programme),
- Recommendations and conclusions (for example, a review of success of the overall Environmental Monitoring and Audit programme to cost-effectively identify deterioration and to initiate prompt effective mitigation action when necessary).

Data Keeping

No site-based documents (such as monitoring field records, laboratory analysis records, site inspection forms, etc.) are required to be included in the monthly Environmental Monitoring and Audit reports. However, any such document should be well kept by the EM and be ready for inspection upon request. All relevant information should be clearly and systematically recorded in the document. Monitoring data should also be recorded in magnetic media form, and the software copy must be available upon request. Data format should be agreed with MENR of Azerbaijan. All documents and data should be kept for at least one year following completion of the construction contract.

Interim Notifications of Environmental Quality Limit Exceedances

With reference to the Event and Action Plan, when the environmental quality performance limits are exceeded, the EM should immediately notify the AWM OJSC of Azerbaijan and MENR of Azerbaijan, as appropriate. The notification should be followed up with advice to AWM OJSC and MENR on the results of the investigation, proposed actions and success of the actions taken, with any necessary follow-up proposals.

7.3.4. Site Environmental Audit and Environmental Complaints

Site Inspection

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.

The Environmental Manager (EM) of EMU of AWM OJSC 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 AWM OJSC of Azerbaijan for approval.

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:

1. The EIA and EMP recommendations on environmental protection and pollution control mitigation measures (including dust control measures and good site practice measures for ecological impact),
2. Ongoing results of the Environmental Monitoring and Audit programme,
3. Work progress and programme,
4. Individual work methodology proposals (which shall include proposal on associated pollution control measures),
5. Contract specifications on environmental protection,
6. Relevant environmental protection and pollution control laws,
7. Previous site inspection results undertaken by the EM and others.

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 AWM OJSC of Azerbaijan and the Contractor within 24 hours for reference and for taking immediate action.

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.

The EM should also carry out ad hoc 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 and audit.

Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as

environmental protection and pollution control laws in Azerbaijan with which construction activities must comply.

In order to ensure that the works are undertaken in compliance with the contractual requirements on environmental aspects, all works method statements submitted by the Contractor to the ECO for approval should be sent to the EM for vetting to see whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in Chapter 7,2.

The EM should also review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating laws could be prevented.

The Contractor should regularly copy relevant documents to the EM so that works checking could be carried out. The document should at least include the updated Works Progress Reports, updated Works Programme, any application letters for different licence/permits under the environmental protection laws, and copies of all valid licences/ permits, and the site diary should be available for the EM's inspection upon his/her request.

After reviewing the documentation, the EM should advise the AWM OJSC and the Contractor of any non-compliance with contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the EM's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may result in potential violation of environmental protection and pollution control requirements, he/she should also advise the Contractor and the ECO accordingly.

Upon receipt of the advice, the Contractor should undertake immediate action to correct the situation. The ECO should follow up to ensure that appropriate action has been taken to satisfy contractual and legal requirements.

Environmental Complaints

Complaints should be referred to the EM for action. The EM should undertake the following procedures upon receipt of any complaint:

1. Log complaint and date of receipt onto the complaint database and inform the AWM OJSC of Azerbaijan immediately,
2. Investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities,
3. Identify mitigation measures in consultation with the AWM OJSC of Azerbaijan if a complaint is valid and due to Works,
4. Advise the Contractor if mitigation measures are required,
5. Review the Contractor's response on the identified mitigation measure(s) and the updated situation,
6. If the complaint is transferred from the EMU, submit interim report to the EMU on status of the complaint investigation and follow-up action within the time frame assigned by the EMU,
7. Undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur,
8. Report investigation results and subsequent actions to complainant (if the source of complaint is EMU, the results should be reported within the timeframe assigned by the EMU),
9. Record the complaint, investigation, the subsequent actions and the results in the monthly Environmental Monitoring and Audit reports.

A complaint assessment and recording criteria is suggested in Figure 7,3.

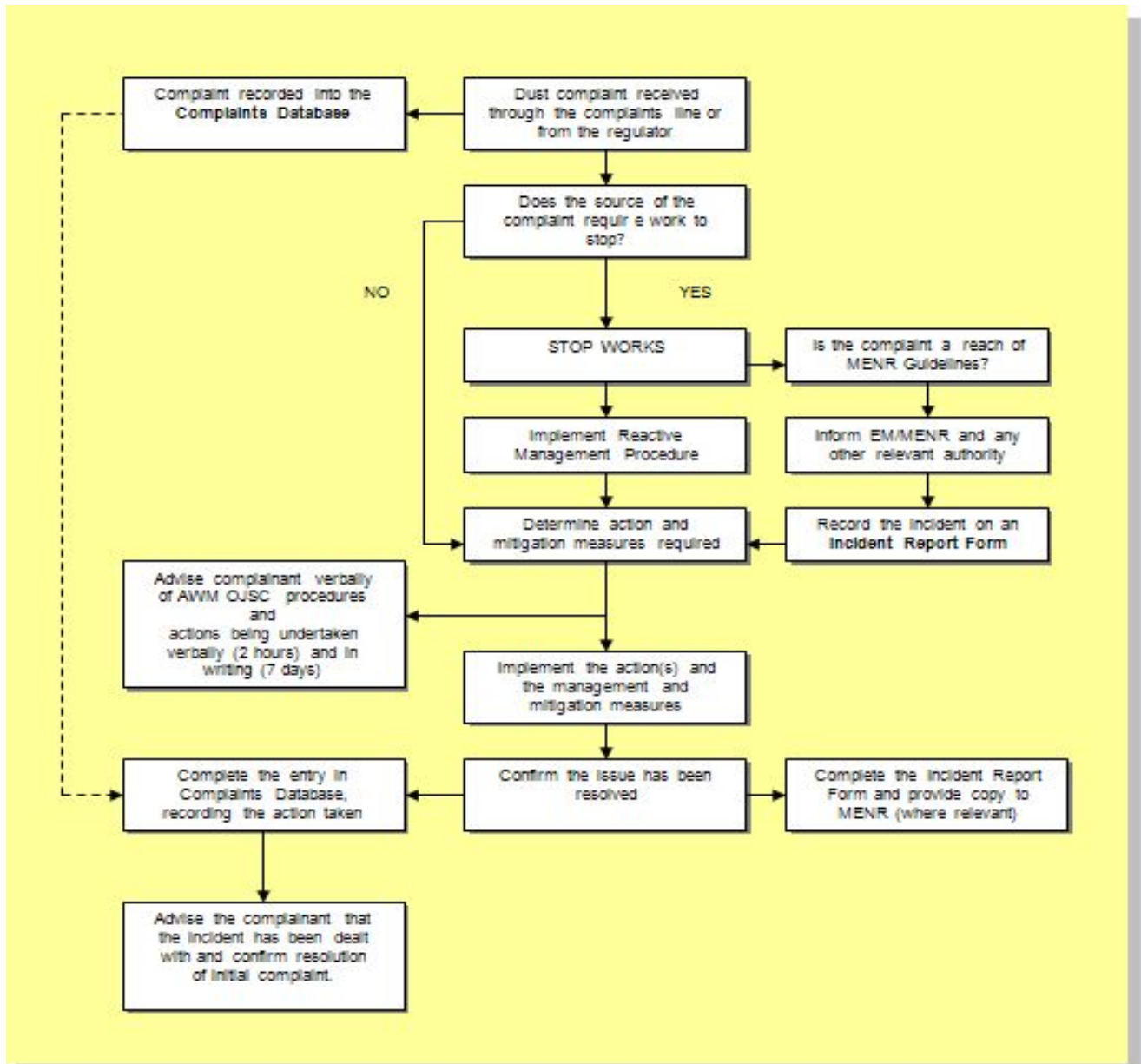


Figure 7,3: Complaint Assessment Criteria

7.3.5. Monitoring Form

A list of environmental issues addressed in the EMP is drawn up. A tick box monitoring form is compiled which makes provision for compliance or non-compliance to the EMP requirements for each environmental issue.

This monitoring form makes room for a brief description of the non-compliance(s). The issues identified on the monitoring form must be discussed in detail with the contractor and the EM. A reasonable date of completion of the remedial action must be jointly agreed upon, between the contractor, ECO and EM.

This monitoring form must be signed by all parties and a copy be provided to the EM and Supervisory Engineer. The following Monitoring Form (Table 7,4 sample form) may serve as an example or point of departure.

Table 7.4: Sample form for Environmental Monitoring Checklist

Name :	
Ref :	Date :
Project :	

ENVIRONMENTAL		MONITORING		CHECKLIST
(NC = Noncompliance, C = Compliance, NA = Non Applicable)				
Item		Rating	Item	Rating
1.	Vehicular access and movement of construction vehicles		13.	Stockpiling, handling and storage of building materials
2.	Movement of construction personnel, labors and equipments		14.	Servicing and re-fuelling of construction equipment
3.	Vegetation clearing		15.	Solid waste management
4.	Protection of fauna		16.	Hazardous materials
5.	Cultural and/or archaeological sites		17.	Run-off from construction camps
6.	Soil management		18.	Fire
7.	Erosion control		19.	Ambient Air and Dust
8.	Slope protection		20.	Noise
9.	Access roads		21.	Crossing at Rivers, Streams, and Wetland
10.	Excavation, backfilling and trenching		22.	Visual
11.	Levelling		23.	Site clean-up and rehabilitation
12.	Sand extraction			
			A	Others
Remedial Action on Non-compliance: (Action and Time Plan)				
Close out: Environmental Control Official (ECO)			Response required by: Contractor	
_____			_____	
<i>(Name and Signature)</i>			<i>(Name and Signature)</i>	
_____			_____	
<i>Date</i>			<i>Date</i>	
Comments				
Records				
<input type="checkbox"/> EMP Manager (EM) <input type="checkbox"/> Contractor's PM <input type="checkbox"/> Supervisory Engineer				

Exhibit 7,1, Environmental Mitigation / Management Plan

EXHIBIT 7,1

Environmental Mitigation / Management Plan

Phase	Issue	Mitigation / Management	Institutional responsibility	Cost Note
Pre-construction Phase	1. Environmentally Related Authorizations, Permits and Licenses	<p>The Supervisory Engineer, EMU and ECO on behalf of AWM OJSC of Azerbaijan, is to ensure that the following has been obtained before the activity commences:</p> <ul style="list-style-type: none"> • Approval from The Government of Azerbaijan, • Approval from MENR of Azerbaijan for borrow pits and quarries, and blasting, • Approval from MENR and AWM OJSC of Azerbaijan for raw water exploitation and river crossings, • A permit from MENR of Azerbaijan should specially protected indigenous plants be affected by construction, • Approval from MoH of Azerbaijan for likely hazards on the public health, • The Supervisory Engineer and EMU/ECO must ensure that the necessary liaison with landowners, land users, community leaders, service providers and other affected parties has taken place prior to construction and where required, the relevant consent obtained. 	EMU/ECO of AWM OJSC, Supervisory Engineer	Official fees will be included into the Project Costs
	2. EMP Training	The Contractor shall arrange for Environmental and Heritage Awareness Training programmes for the personnel on site, to the satisfaction of the AWM OJSC and ECO, and familiarize his employees with the contents of this EMP, either in written format or verbally.	EMU/ECO of AWM OJSC, Supervisory Engineer, and Contractor(s)	Contractor's own expense
	3. Contract Areas	The ECO must indicate/point out to contractors the areas that they will have in their possession for the duration of the contract (this shall include access roads to be used, construction lay-down areas, materials storage and delivery requirements, contractors' offices, operational demarcation etc.). Aspects pertaining to temporary housing for persons involved in the project shall also be included. A material delivery and storage area should be demarcated. The facility must be planned and laid out in such as way that the total footprint area is minimized.	EMU/ECO of AWM OJSC, Supervisory Engineer, and Contractor(s)	Site visits and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

[1]

Exhibit 7,1, Environmental Mitigation / Management Plan

	<p>4. Sensitive Ecology</p>	<p>Prior to the commencement of construction, the proposed site/s and roads, must be inspected by AWM OJSC Scientific Services (where necessary, AWM OJSC can take helps from the Science Departments of well known Universities in Azerbaijan), in order to:</p> <ul style="list-style-type: none"> • Confirm the absence of Red Data Book Species; • Relocate, demarcate or recommend conservation / preservation measures for any identified ecologically “sensitive” and/or protected species and areas, and <p>Point out and/or demarcate all ecologically “sensitive” areas to the contractors (e.g. red data habitats & species, rivers, streams, drainage lines, wetlands, sensitive soils, steep slopes and areas susceptible to erosion).</p>	<p>EMU/ECO/AWM OJSC, Supervisory Engineer, and Contractor(s)</p>	<p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.</p>
	<p>5. Heritage Areas</p>	<p>In known archaeological sensitive areas, Ministry of National Heritage and Cultural Resources must inspect all above-mentioned contract areas, in order to:</p> <ul style="list-style-type: none"> • Confirm the absence of archaeological sites and/or artifacts; • Relocate, demarcate or recommend further conservation / preservation actions and measures for any identified archaeologically “sensitive” area and/or artifacts prior to the commencing of any work at these sites, and • Point out and/or demarcate all archaeologically “sensitive” areas to the contractor. <p>Point out and/or demarcate all architectural memorial “sensitive” areas to the contractor.</p>	<p>EMU/ECO/AWM OJSC, Supervisory Engineer, and Contractor(s)</p>	<p>As there is no relocation, no costs occur.</p> <p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.</p>
	<p>6. Roads</p>	<ul style="list-style-type: none"> • The final alignment of the access routes and internal camp roads shall be planned in conjunction with the PIU of AWM OJSC, Rayon’s Road Patrol Department (RRPD), and ECO and once finalized only the agreed roads must be used. • Roads must be planned to deviate around significant trees and Red Data Species marked out in an approved manner by the ECO. 	<p>EMU/ECO of AWM OJSC, RRPD, Supervisory Engineer, and Contractor(s)</p>	<p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.</p>
	<p>7. Site Establishment</p>	<p>Construction camps and staff accommodation facilities on the site will be required to be established in appropriate locations prior to the commencement of construction, preferably within already disturbed areas. After completion of the contract, these areas will be required to be rehabilitated.</p>	<p>ECO, Supervisory Engineer, and Contractor(s)</p>	<p>Contractor’s own expense.</p>

[2]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> • Site Plan: Before construction can begin, the Contractor shall submit a site layout plan to the ECO for approval, including: <ul style="list-style-type: none"> - Site access (including entry and exit points). - All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals). - Construction offices and other structures. - Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff. - Solid waste collection facilities and waste treatment facilities for litter, kitchen refuse, sewage and workshop-derived effluents. - Storm water control measures. - Provision of potable water and temporary ablution facilities. - Only designated areas may be used for the storage of materials, machinery, equipment and site offices. The site offices should not be sited in close proximity to steep areas, as this will increase soil erosion. Preferred locations would be disturbed areas along routes. Offices (and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles) must be located as far away as possible from any watercourse. Regardless of the chosen site, the Contractor's intended mitigation measures shall be indicated on the plan. 	Contractor(s)	Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> • Throughout the period of construction, the contractor shall restrict all activities to within the designated areas on the construction layout plan. Any relaxation or modification of the construction layout plan is to be approved by the ECO. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Site Camps: The following restrictions or constraints should be placed on the site camp, and construction staff in general: <ul style="list-style-type: none"> - The use of rivers and streams for washing of clothes. - 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. 	ECO, Supervisory Engineer, and Contractor(s)	

[3]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> - 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. 		
		<ul style="list-style-type: none"> • Vegetation clearing: The natural vegetation encountered on the site is to be conserved and left as intact as possible. Only trees and shrubs directly affected by the works, and such others as may be approved by the ECO in writing, may be felled or cleared and replanted. A firebreak shall be cleared and maintained around the perimeter of the site camp/s and office sites where necessary. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Water for human consumption: Water for human consumption should be available at the site offices and at other convenient locations on site. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Sewage Treatment: Sanitary arrangements should be to the satisfaction of the ECO. In no other ablution facilities are available, chemical toilets must be supplied (1 per 15 persons) and must be regularly cleaned and maintained by the contractor. The positioning of the chemical toilets is to be done in consultation with the ECO. The Contractor should arrange for regular emptying of toilets and will be entirely responsible for enforcing their use and for maintaining such latrines in a clean, orderly and sanitary condition to the satisfaction of the ECO. If necessary, the ablution facilities must be screened from the public view. In remote areas, where chemical toilets may not be a viable option, agreement must be reached on alternatives before construction starts. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Cooking Fuel: The Contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings. Collection of firewood is not permitted. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Heating Requirement on the Camp Site:The contractor shall provide A/C units (heat-pump) for his camp facilities to warm up, any other fuel type shall not be allowed on the camp site facilities. 	ECO, Supervisory Engineer, and Contractor(s)	

[4]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> • Waste Management: Solid waste shall be stored in an appointed area within the camp site in covered drums for collection and disposal. Disposal of solid waste shall be at an approved landfill site; this must be agreed to with the ECO. During the construction period, the facilities shall be maintained in a neat and tidy condition, and the site is to be kept free of litter. At all places of work, the Contractor shall provide litter collection facilities for later safe disposal at approved waste disposal sites. 	ECO/RPUD, Supervisory Engineer, and Contractor(s)	
	8. Materials Handling, Use and Storage	<ul style="list-style-type: none"> • The Contractor's management and maintenance of his plant and machinery will be strictly monitored according to the criteria given below, regardless of whether it is serviced on the site (i.e. at the place of construction activity or at a formalized workshop) or not. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense.
		<ul style="list-style-type: none"> • Safety: All the necessary handling and safety equipment required for the safe use of petrochemicals and oils shall be provided by the Contractor to, and used or worn by the staff whose duty it is to manage and maintain the Contractor's and his subcontractor's and supplier's plant, machinery and equipment. Contractor must comply with the Occupational Health and Safety Act of Azerbaijan and Construction Regulations. 	ECO, Supervisory Engineer, and Contractor(s)	Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> • Hazardous Material Storage: Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials will 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 approved by the ECO. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Fuels and Gas Storage: Fuel should be stored in a secure area in a steel tank supplied and maintained by the contractor according to safety procedures. Gas welding cylinders and LPG cylinders should be stored in a secure, well-ventilated area. The contractor must supply sufficient fire fighting equipment in event of an accident and strictly no smoking will be allowed where fuel is stored and used. 	ECO, Supervisory Engineer, and Contractor(s)	
	9. Water Supply	<ul style="list-style-type: none"> • Water supply pipelines will be according to contract specifications, following the most direct ecologically responsible route to be agreed 	ECO, Supervisory Engineer,	Contractor's own expense.

[5]

Exhibit 7,1, Environmental Mitigation / Management Plan

		with the supervisory engineer and as per contract documentation.	and Contractor(s)	Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Point out to contractor(s) where they can obtain water (e.g. water for mixing of cement as well as for drinking). Contractors shall not make use of/collect water from any other source than those pointed out to them as suitable for use by them. 	ECO, Supervisory Engineer, and Contractor(s)	
	10. Power Supply	If generators are to be used, establish generators, motors and stored fuel on a hardened, bunded surface and ensure any associated pollution is controlled.	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense.
	11. Liquid Waste	<ul style="list-style-type: none"> Disposal of wastewaters generated in any waste facility of construction site (such as septic tank system) shall not be allowed within the 100 year flood line of any watercourse, or alternatively, within 100 metres of the edge of a water resource. 	AWM OJSC/ECO, Supervisory Engineer,	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> The treatment and disposal of effluent will comply with all applicable legislation and the relevant permit regarding the disposal of purified effluent into the natural environment. 	AWM OJSC/ECO, Supervisory Engineer,	
		<ul style="list-style-type: none"> The design, installation and operation of septic tanks and soak-aways will conform to Water Act of Azerbaijan. 	AWM OJSC/ECO, Supervisory Engineer,	
Construction Phase	1. Vehicular Access and Movement of Construction Vehicles	During construction, the construction vehicles should use the existing access routes to construction areas where possible. Constructing approved vehicle turning areas by avoiding selected ecological sensitive areas or species, and having turning area routes should be approved by the ECO. Temporary access roads must be rehabilitated after usage as per prior agreement between the ECO/EMU of AWM OJSC and Contractor.	ECO/EMU of AWM OJSC and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	2. Movement of Construction Personnel, Labors	The Contractor must ensure that all construction personnel, labors and equipment remain within the demarcated construction sites at all times. Where construction personnel and/or equipment wish to move outside the boundaries of	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are

[6]

Exhibit 7,1, Environmental Mitigation / Management Plan

	and Equipments	the site, the contractor/ labors must obtain permission from the ECO.		included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	3. Vegetation Clearing	<ul style="list-style-type: none"> The extent of all construction site footprints will be minimized and limited to existing and / or already disturbed areas wherever possible. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> The areas needing to be cleared and the degree of clearing required will be determined and demarcated in consultation with the ECO before clearing begins. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> The Contractor may not deface, paint or otherwise mark and / or damage natural features / vegetation on the site, unless agreed beforehand with the ECO. Any features / vegetation defaced by the Contractor will be restored to the satisfaction of the ECO. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> The ECO must be present during vegetation clearing. 	ECO	
		<p>Plant Search and Rescue:</p> <ul style="list-style-type: none"> Plant search and rescue (i.e. the location and removal of specified plant species, without unnecessary damage, and their transfer to a specified location) and the collection of seed, shall be conducted by the ECO prior to the onset of any site clearing operations, should the ecologist/ AWM OJSC Scientific Services indicate this to be necessary. Sensitive areas and/or species that have been selected for conservation by the ecologist / AWM OJSC Scientific Services, EMU/ ECO, shall be demarcated with danger tape. No activity shall take place at these areas. De-stumping shall only occur at the request of the ECO. Where roots can act as erosion protection, trees should be cut as close as possible to the ground level. During the clearing of woody vegetation no basal cover or grass and topsoil shall be removed and damage to this layer shall be minimized as far as possible. 	ECO, Supervisory Engineer, and Contractor(s)	
			ECO, Supervisory	

[7]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> • Vegetation Removal and Trimming in Watercourses: No heavy machinery shall be permitted within watercourses for any purpose, except emergency procedures, without the prior approval of the ECO. All cleared and trimmed vegetation shall be removed from any watercourse to prevent flooding/snagging hazards being created. 	Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> • Rehabilitation: The ECO, and Contractor must agree on rehabilitation of areas. The Contractor shall be held responsible for rehabilitation for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated for, or from the construction has to be stored temporarily or otherwise within the trench or construction backfill reserve, or at designated or instructed areas outside the backfill reserve. This responsibility shall extend until expiry of the Defects Liability Period. 	ECO, Supervisory Engineer, and Contractor(s)	
	4. Protection of Fauna	<ul style="list-style-type: none"> • Under no circumstances shall any animals be handled, removed, killed or be interfered with by the Contractor, his employees, his subcontractors or his subcontractors' employees. • 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. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	5. Cultural and/or Archeological Sites	<ul style="list-style-type: none"> • Historical and Archeological Sites: If any artifact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the ECO of such discovery. Ministry of National Heritage and Cultural Resources shall be contacted such that an archaeological consultant can be appointed to excavate and record the site. Work may only resume once clearance is given in writing by the archaeologist. No stones/rock or any material may be removed from any site in the Project corridor without approval by the ECO, and after confirmation that materials do not form part of a cultural site. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

[8]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> Protective barriers are to be installed around all heritage and architectural memorial buildings located on the site to ensure protection during the Works. 	ECO, Supervisory Engineer, and Contractor(s)	
		<ul style="list-style-type: none"> Any proposed ground disturbance in areas identified as having archaeological potential should be undertaken in conjunction with or preceded by appropriate archaeological investigation and recording by a suitably qualified archaeologist. 	ECO, Supervisory Engineer, and Contractor(s)	
	6. Soil Management	<ul style="list-style-type: none"> Topsoil: <ul style="list-style-type: none"> The Contractor is required to strip topsoil together with grass / groundcover from all areas where permanent or temporary structures are located, construction related activities occur, and access roads are to be constructed, etc. This must be read together with the contract specifications & conditions. Topsoil must be stockpiled for later use. Topsoil is to be handled twice only - once to strip and stockpile, and secondly to replace, level, shape and scarify. Topsoil stockpiles are not to exceed 1.5 m in height and should be protected to prevent erosion where needed. Topsoil stockpiles are to be maintained in a weed free condition. The ECO can assist with guidance as to which plants are weeds and require removal. Topsoil is to be replaced by direct return where feasible (i.e. replaced immediately on the area where construction is complete), rather than stockpiling it for extended periods. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Spoil Material: <ul style="list-style-type: none"> The location of spoil stockpile sites shall be agreed upon by the ECO prior to the onset of any operations that will generate spoil materials. No spoil material shall be dumped outside the defined site. The Contractor shall ensure that the material does not blow or wash away. If the spoil material is in danger of being washed or blown away, the contractor shall cover it with a suitable material, such as tarpaulin or plastic. 	ECO, Supervisory Engineer, and Contractor(s)	

[9]

Exhibit 7,1, Environmental Mitigation / Management Plan

	7. Erosion Control	<ul style="list-style-type: none"> The Contractor shall protect all areas susceptible to erosion and shall take measures, to the approval of the ECO. The Contractor shall not allow erosion to develop on a large scale before effecting repairs and all erosion damage shall be repaired as soon as possible. The specifics of erosion protection work will vary from situation to situation. These specifics should be cleared with the PIU of AWM OJSC and/or ECO and comply with the contract specifications. Where required, cut-off trenches can be installed to divert substantial run-off and prevent erosion. Storm water drainage measures are required on site to control runoff and prevent erosion. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> During construction, areas susceptible to erosion must be protected by installing temporary or permanent drainage works and energy dispersion mechanisms and could include, agreed with AWM OJSC and Contractor and with considerations of implications on costs: <ul style="list-style-type: none"> - Vegetation, - Mitre drains (aliform), - Benches, - Benches consisting of sandbags, - Packing branches and rocks in small gullies and disturbed areas. 	AWM OJSC/ECO, Supervisory Engineer, and Contractor(s)	
	8. Slope Protection	<ul style="list-style-type: none"> Cut and fill slopes shall be shaped and trimmed to approximate the natural condition and contours as closely as possible and, where possible, be undulating. Levels incongruous to the surrounding landscape, shall be reshaped as per contract specifications. Slopes that need protection shall be identified by the ECO and the specifications needed must be established using the latest approved methods and technology. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	9. Access Roads	<ul style="list-style-type: none"> Construction staff may only use authorized paths and roads. The proclaimed speed limit in the Project Corridor must be strictly adhered to. ECO will monitor the conduct of drivers and report any negative impact to the contractor immediately. If two-way traffic movement is to take place, passing bays are to be used where specified by the ECO to prevent access / detours into the surrounding areas. The drivers delivering construction materials to site 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table

[10]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>are to be made aware of this. They may not drive off the road in order to allow another vehicle to pass.</p> <ul style="list-style-type: none"> Continual use of dirt access roads by heavy machinery and increased transport loads means they will have to be carefully monitored and regularly graded as soon as potholes or rutting occurs. Upon completion of the construction period, the Contractor will ensure that the access roads are returned to a state no worse than prior to construction commencing. 		7,2 and 7,3.
		<ul style="list-style-type: none"> In general, construction roads must follow existing roads and tracks and should not be wider than necessary with a maximum width of 3 m. Should a wider road be required, this will require the approval of the ECO. 	AWM OJSC/ECO, Supervisory Engineer, and Contractor(s)	
	10. Excavating, Backfilling and Trenching	<ul style="list-style-type: none"> Where at all possible, excavations must not stand open longer than 2 days, and should preferably be opened and closed on the same day. They should not be permitted to stand open longer than a week under any circumstances. Excavations must be marked with tape to clearly demarcate the area and warn against access. Excavations must not be undertaken until such time that all required materials / services etc. are available on-site, to facilitate immediate laying of such services or the construction of subsurface infrastructure. Any such excavations should ideally be undertaken within the confines of an established construction site, i.e. a site that is either protected with a peripheral fence, or a site that has a regular / continual human presence. Failing this, regular daily inspections are essential. If need be, spread the rocks in as natural a looking manner as possible in the grassy plain. Excess rocks and sand as a result of excavation activities is not to be dumped along next to construction site – rocks to be spreaded in a natural looking manner in the surrounding area. Removed soil is to be used to backfill areas where required (i.e. such as existing and unrehabilitated gravel pits). Excavated material is to be stockpiled along the trench within the working servitude, unless otherwise authorized. Deficiency of backfill material will not be made up by excavation within the protected area. Where backfill material is deficient, it must be made up by importation from an approved borrow pit area. 	ECO, Supervisory Engineer, and Contractor(s)	<p>Contractor's own expense.</p> <p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.</p>
	11. Levelling	<ul style="list-style-type: none"> Excess sand and soil resulting from levelling activities of the work area 	ECO, Supervisory Engineer,	Contractor's own expense.

[11]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>should be stored in low heaps either on the access road or already disturbed area.</p> <ul style="list-style-type: none"> Excess topsoil is to be spread evenly over the area in a manner that blends in with the natural topography. Once heavy machinery has cleared the bulk of these material stockpiles, the disturbed areas should be levelled and cleared of any foreign material manually e.g. with spades. It is unacceptable to leave foreign material behind with the knowledge that it will become hidden amongst the rejuvenating vegetation with time. 	and Contractor(s)	Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	12. Sand Extraction	There is no sand/gravel extraction area in or nearby the Project corridor. 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 other plants which have the required licenses and permits in or out of the rayon.	AWM OJSC/EMU/ECO, REP, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	13. Stockpiling, Handling, Storage of Building Materials	<ul style="list-style-type: none"> Specific sites should be allocated for construction waste e.g. empty cement bags, discarded planks, etc. A low temporary fence may be erected around such a site in order to contain the waste and assist the effective removal thereof from the site. 	AWM OJSC/ECO, Rayon REP, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Stockpiles and storage yards will be demarcated in areas already disturbed or where they will cause minimal disturbance. Clearly indicate which activities are to take place in which areas within the site e.g. the mixing of cement, stockpiling of materials etc. Limit these activities to single sites only. This may not always be possible for example for heaps of topsoil, but should definitely be the case for other building materials. Stockpiles of expensive materials such as cement bags should be such that they can easily be removed from the site over weekends or during rainy weather. Old cement mixing bags will be placed in wind and spill proof containers as soon as they are empty. The Contractor will not allow closed, open or empty bags to lie around the site. The Contractor will ensure that all operations that involve the use of cement and concrete are carefully controlled. Concrete mixing may only take place in the construction camp or in agreed specific areas on site. Concrete may not be mixed directly on the ground. No mixed concrete 	ECO, Supervisory Engineer, and Contractor(s)	

[12]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>may be deposited directly onto the ground prior to placing. A board or other suitable platform / surface is to be provided onto which the mixed concrete can be deposited whilst it waits placing.</p> <ul style="list-style-type: none"> All visible remains of excess concrete will be deposited in a designated area awaiting removal to an approved landfill site. 		
	14. Servicing and Refueling of Construction Equipment	<ul style="list-style-type: none"> All maintenance and repair work will be carried out at the main construction camp within an area designated for this purpose, equipped with necessary pollution containment measures. The ground under the servicing and refuelling areas must be protected against pollution caused by spills and / or tank overfills (bunded / lined). The Contractor may only change oil or lubricant at agreed and designated locations, except if there is a breakdown or emergency repair, and then any accidental spillages must be cleaned up / removed immediately. In such instances the Contractor will ensure that he has drip trays available to collect any oil or fluid. Construction vehicles are to be maintained in an acceptable state of repair. No vehicles or equipment with leaks or causing spills will be permitted to operate at any of the construction sites. These will be sent immediately back to the maintenance yard for repair. All equipment that leaks must be repaired immediately or must be removed from site. Fuels required during construction must be stored in a central depot at the construction camp. This storage area should be located on a slab and be contained within a bund capable of containing at least the volume of one of the containers. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Temporary fuel storage tanks and transfer areas also need to be located on an impervious surface adequately bunded to contain accidental spills. Appropriate run-off containment measures must be in place. 	Contractor(s)	
	15. Solid Waste Management	<ul style="list-style-type: none"> An adequate number of 'scavenger proof' refuse bins must be provided at the construction sites and at the construction camps. These bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to prevent the animals that may be attracted to the waste. The Contractor will ensure that all personnel immediately deposit waste 	ECO , Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the

[13]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>in the waste bins provided.</p> <ul style="list-style-type: none"> All refuse and solid waste generated at all work sites will be stored in appropriate scavenger proof containment vessels at the relevant site and removed to the main construction camp, where the waste will be sorted and stored within a fenced waste storage area. All waste must be transported in an appropriate manner (e.g. plastic rubbish bags). The Contactor may 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, particularly those wastes or products that could impact on surface or groundwater quality by leaching into or coming into contact with water. The contractor will maintain 'good housekeeping' practises as ensure that all work sites and construction camp are kept tidy and litter free. The Contractor may discharge 'clean' silt laden water overland and allow this water to filter into the ground. However, he must ensure that he does not cause erosion as a result of any overland discharge. No natural watercourse is to be used for the cleaning of tools or any other apparatus. This includes for purposes of bathing, or the washing of clothes etc. All washing operations will take place off-site at a location where wastewater can be disposed of in an acceptable manner. Trucks delivering concrete may not be washed on site or anywhere inside the Project corridor. All soil contaminated, for example by leaking machines, refuelling spills etc. is to be excavated to the depth of contaminant penetration, placed in 200 litre drums and removed to an appropriate landfill site. 		Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> The Contractor must take reasonable precautions to prevent the pollution of the ground and / or water resources on and adjacent to the site as a result of his activities. Adequate ablution facilities are to be provided at each construction site, conveniently located near to work areas to avoid localised water pollution from camp sewerage. 	Contractor(s)	
		<ul style="list-style-type: none"> No spills may be hosed down into a storm water drain or sewer, or into the surrounding natural environment. 	ECO and Contractor(s)	
	16. Hazardous Material	<ul style="list-style-type: none"> The Contractor must comply with all national, regional and local 	Contractor(s)	Contractor's own expense.

[14]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>legislation with regard to the storage, transport, use and disposal of petroleum, chemical, harmful and hazardous substances and materials.</p> <ul style="list-style-type: none"> 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. The Contractor will be responsible for establishing an emergency procedure for dealing with spills or releases of petroleum. Petroleum, chemical, harmful and hazardous waste throughout the site must be stored in appropriate, well maintained containers. Periodic on-site application of timber treatment products (for maintenance purposes) should take place with due care for the nature of the product (toxicity) and for potential spillages that may occur. Areas where timber is to be treated should have secondary containment measures instituted, such as the placement of a plastic layer (some from of covering) over soils, beneath the timber structures to prevent contamination of the soil surface. 		Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Exercise extreme care with the handling of diesel and other toxic solvents so that spillage is minimized. Any accidental chemical / fuel spills to be corrected immediately. Timber products should be treated off-site prior to use in construction. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> Storage of all hazardous material is to be safe, tamper proof and under strict control at the special storage facility to be constructed in Astara city prior to start of the construction activities. 	AWM OJSC/ECO, Contractor(s), and Municipality	Construction cost (\$ 105,000) of Hazardous Waste Disposal Facility is included into the EMP implementation costs of the Project, see Chapter 7, Table 7,3.
		<ul style="list-style-type: none"> ILO asbestos convention requirements should be met during the work with asbestos cement pipe replacement and disposal within this project. 	Contractor(s)	Contractor's own expense.
	17. Run-off from Construction Camp	<ul style="list-style-type: none"> The Contractor must ensure that rainwater containing pollutants does not run-off into natural areas and thus result in a pollution threat. A drainage diversion system is to be installed to divert runoff from areas of potential pollution, e.g. batching area, vehicle maintenance 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are

[15]

Exhibit 7,1, Environmental Mitigation / Management Plan

		area, workshops, chemical and fuel stores, etc.		included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	18. Fire	<ul style="list-style-type: none"> The Contractor must take all the necessary precautions to ensure that fires are not started as a result of activities on site. No open fires for heating or cooking will be permitted on site, unless otherwise agreed and then only in designated areas. The Contractor will supply all living quarters, site offices, kitchen areas, work shop areas, material stores and any other areas identified with suitable, tested and approved fire fighting equipment. 	Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		<ul style="list-style-type: none"> No fuels or chemicals may be stored under trees. Gas and liquid fuel may not be stored in the same storage area. The Contractor must ensure that there is adequate fire-fighting equipment at the fuel stores. The construction site must be protected against fire, and a sufficient fire break must be constructed, on advice by the Section Ranger, around each construction site and the construction camp where necessary. 	ECO, Supervisory Engineer, and Contractor(s)	
	19. Ambient Air and Dust	<ul style="list-style-type: none"> The Contractor shall take precautions to the satisfaction of the ECO and Supervisory Engineer to limit the production of dust and damage caused by dust. Reschedule vegetation clearing activities or earthworks during periods of high wind, if visible dust is blowing off-site. Routing haul routes away from sensitive receivers, wherever possible. Ensure that dust generation from construction roads is managed. Regular watering and other treatment of exposed construction areas subject to vehicle and machinery movement. Ensuring that vehicles and equipment are appropriately maintained or covered to minimize air emissions. Vehicle speeds in construction will be limited to a maximum of 30 km/h. Revegetate disturbed areas as soon as possible. No open burning of wastes to be undertaken. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
	20. Noise	<ul style="list-style-type: none"> Machinery and vehicle silencer units are to be maintained in good working order. Offending machinery and / or vehicles will be banned 	Contractor(s)	Contractor's own expense.

Exhibit 7,1, Environmental Mitigation / Management Plan

		<p>from use on site until they have been repaired.</p> <ul style="list-style-type: none"> Noise levels must be kept within acceptable limits for a protected area, and must not be of such nature as to detract from the natural experience of other visitors to the protected area. The contractor shall take into consideration that the project areas are located within a natural environment and that noise could be a major disturbance/nuisance for the fauna. Project management should endeavour to keep noise generating activities associated with construction activities to a minimum and within working hours. Excessively noisy activities will be conducted between 9 am – 6 pm, if they are likely to be annoyance to local residence. Equipment used on site will be quietest reasonably available. Haul routes for construction traffic entering and leaving the site will be selected to ensure noise levels at noise sensitive receptors are kept at a minimum. 		<p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.</p>
		<ul style="list-style-type: none"> Notify the residents in the Project area prior to commencement of the construction phase. The notification should include the type of Works being undertaken, the duration of the proposed Works, and a contact for any questions or concerns. Ensure that the contractor on the site have effectively controlled noise levels from equipment. Effective noise controls include; <ul style="list-style-type: none"> Regular inspection and maintenance of all vehicles and construction equipment working on-site. Installation of sound suppressive devices (such as mufflers) on all mechanical plant as necessary. Where practicable, vehicles and machinery that are used intermittently should not be left idling condition for long period of time. Best available work practices will be employed on site to minimize occupational noise levels. The adjacent residents will be notified prior to any typical noise events or noisy operations outside of 9 am – 6 pm Monday to Sunday. 	<p>ECO, Supervisory Engineer, and Contractor(s)</p>	
	<p>21. Crossing at Rivers, Streams and Wetlands</p>	<ul style="list-style-type: none"> Work in rivers, streams and wetlands should preferably be done during the low flow season. Remove all wetland and riparian vegetation with their root ball intact (minimum 150mm below soil surface). This vegetation is to be kept moist at all times. It is to be placed in the shade and covered with moistened hessian cloth until replanting, which is to be undertaken immediately surface reinstatement is complete. 		<p>Contractor's own expense.</p> <p>Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table</p>

[17]

Exhibit 7,1, Environmental Mitigation / Management Plan

		<ul style="list-style-type: none"> • Stockpile wetland and riparian topsoil separately to subsoil, with reinstatement of soil material to be in the correct order. • No construction materials may be stockpiled in any riparian or wetland areas. • Ensure that no physical damage is caused to any aspects of a watercourse, other than those necessary to complete the works as specified and in accordance with the accepted method statement. • The pre-construction profile of wetlands shall be returned to one similar as before construction, with no created "ridge or channel" features present. This is to ensure that no depressions remain which could act as channels for preferential water flow thereby affecting the hydrological regime of the wetland. 		7,2 and 7,3.
		<ul style="list-style-type: none"> • Replant plants, as nearly as possible, in areas from which they were removed. Use additional stabilising vegetation on disturbed banks if necessary. • If the crossing is through a wetland, large rocks should be placed below ground level, underneath the structure to allow for seepage to continue post construction. This is to prevent the crossing forming a barrier to water movement. • If the wetland crossing is very wide, culverts should be widely spread to avoid concentration of flow. • Avoid excavation of alternative channels to re-route any watercourse (essentially avoiding unnecessary erosion). 	Contractor(s)	
	22. Visual	<ul style="list-style-type: none"> • Security lighting must be placed such that it is not a nuisance to residents and visitors to the area. Shields may be required to prevent lights from being visible from other parts of the protected areas. • Care will be taken when positioning the lights to ensure the least visual impact, while still providing a safe work environment for construction staff. • The clear signboards must be erected to inform the visitors of the activity taking place. Contractor shall provide and erect the signboards as required at his own expense. • The Contractor shall not establish any activities which, in the opinion of the ECO, are likely to adversely affect the scenic quality of the area. The ECO may direct the Contractor to refrain from such activities or to take ameliorative actions to reduce the adverse effects of such activities. • No painting or marking of natural features shall take place. Marking for surveying and other purposes shall only be done with pegs and 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

Exhibit 7,1, Environmental Mitigation / Management Plan

		beacons. <ul style="list-style-type: none"> All packed rock and exposed rock cuttings shall be treated in order to blend their colour with the colours of the natural weathered rocks of the adjacent environment. 		
	23. Site Clean-up and Rehabilitation	<ul style="list-style-type: none"> The Contractor must ensure that all temporary structures, materials, waste and facilities used for construction activities are removed upon completion of the project. Fully rehabilitate (e.g. clear and clean area, rake, pack branches etc.) all disturbed areas and protect them from erosion. Only indigenous plants which are able to establish easily and will need less maintenance because they have already adapted to the local conditions should be considered. Before final decisions about the choice of plant species are taken, the Section Ranger should be approached for their advice. 	ECO, Supervisory Engineer, and Contractor(s)	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

EMU : Environmental Management Unit of AWM OJSC of Azerbaijan.

ECO : Environmental Control Officer of AWM OJSC of Azerbaijan.

Important note :

This EMP will form a part of the project tender and contract. Pre-construction and construction phase mitigation guidelines and clauses should be written into the construction contract documents as specifications. The contents of this EMP shall be deemed to be included in the rates tendered to execute and complete the works.

Exhibit 7,2, Monitoring Plan for Construction and Operation Phases

Exhibit 7,2

Monitoring Plan for Construction and Operation Phases

Item	Media	Parameter	Frequency	Action Level	Response When Action Level Exceeded	Responsibility	Cost note
<u>Construction Phase</u>							
1	Ambient Air	Dust	Continual	Visual assessment during the Works <u>Control Parameter:</u> PM ₁₀ – 24 hour average: 50 µg/m ³ Annual average: 40 µg/m ³ Impact Monitoring Compliance Monitoring	Periodic measurement, If dust levels are above acceptable levels, implement dust suppression techniques (wetting down area) and/or assess weather conditions and maybe temporarily cease works until conditions ease	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		Dust deposition	Only as required: Continual sampling and analysis at 1 month periods	Monthly dust deposition rate exceeding 4 g/m ² / month Impact Monitoring Compliance Monitoring	If the dust deposition action level is exceeded, review works procedures to suppress dust, including additional watering of work faces generating dust, temporary use of covers.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		Asbestos	During Removal of Asbestos Containing Materials: Daily at site boundaries, dependent on environmental	0.05 fibres/mL Impact Monitoring Compliance Monitoring In accordance with the requirements of ILO Asbestos Convention	Cease works immediately, review work methods including wetting down. Resume work only after a safe work environment has been re-established.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

[1]

Exhibit 7.2, Monitoring Plan for Construction and Operation Phases

			conditions				
		PM₁₀	Only as required: 24 hour monitoring periods on 6 day cycle	Boundary action level of 40 micro g/m ³ (Annual Mean, Directive 99/30/EC) 50 micro g/m ³ , Not to be exceeded more than 35 times in a calendar year Impact Monitoring Compliance Monitoring	If the PM10 action level is exceeded, review works procedures to suppress dust, including additional watering of work faces generating dust, temporary use of covers.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
		TSP	Only as required: 24 hour monitoring periods on 6 day cycle. Analysis as required	90 mg/m ³ (annual average) Impact Monitoring Compliance Monitoring	If the TSP action level (3 month running average) is exceeded, review works procedures.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
2	Noise	(15 minute) Noise Levels	Only as required: Periodic attended monitoring at hourly intervals at nearest potentially sensitive receivers.	+20 dBA for short term (< 4 weeks) according to outdoor criteria +10 dBA for medium term (4 –26 weeks) according to outdoor criteria Impact Monitoring Compliance Monitoring	If noise action level is exceeded then review work practices and noise control procedures, including maintenance of equipment, installation of silencers, provision of noise barriers and modification of work hours.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.
3	Water Quality	Quality/ Contaminant concentrations	As per disposal guidelines require	guideline / licence requirements (whichever is applicable) Impact Monitoring Compliance Monitoring	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.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7,2 and 7,3.

[2]

Exhibit 7.2, Monitoring Plan for Construction and Operation Phases

4	Waste Management Implications	Segregation, Storage and transport of wastes	Monthly inspection	Visual assessment during the Works; - Field inspection, - Report of waste volumes generated Report and record all leakages and spills Impact Monitoring Compliance Monitoring	Solid waste cycled as 0 % of movement of solids or liquid waste through the soil, rocks, water, atmosphere.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7.2 and 7.3.
5	Ground	Soil Monitoring and Erosion Control	Continual	Assess adequacy of sedimentation/ environmental controls on-site. Impact Monitoring	If controls have failed or are considered inadequate, cease works immediately and repair to an acceptable standard.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7.2 and 7.3.
6	Ecological Resources	Terrestrial Fauna, Flora, and Aquatic species	Continual	Minimal ecological impacts Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7.2 and 7.3.
7	Landscape and Visual	Surface treatment of temporary structures	Once at the Completion of work	Minimum disturbance of the original landscape Impact Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7.2 and 7.3.

Exhibit 7.2, Monitoring Plan for Construction and Operation Phases

8	Cultural Heritage	<i>Architectural Memorial buildings in the city</i>	Continual	No structural damage Impact Monitoring Compliance Monitoring	Required to ensure the recommended mitigation measures are properly implemented.	ECO, Supervisory Engineer and Contractor	Contractor's own expense. Site visit and monitoring expenses of EMU/ECO are included into the EMP implementation costs of the Project, see Chapter 7, Table 7.2 and 7.3.
<u>Operation Phase</u>							
10	Water volume in raw water source	<i>Measuring the Water level, and Flow rate</i>	In every 10 days with fluid shot and water meter	Efficient use of water resource Impact Monitoring Compliance Monitoring	Cease the operation Immediate remedial action.	AzerSu, RSKD and WTP Management	-
12	Drinkable water	<i>Drinking water quality</i>	As per EU council directive 98/83 EC	Full compliance to requirements of Council directive 98/83 EC - Target Turbidity 0.04 NTU - Target Chlorin Residuals 0.3-0.6 mg/l - Target Alum residuals 0.02-0.03 mg/l Impact Monitoring Compliance Monitoring	Cease the treatment activity, and continue to disinfection and sedimentation. Immediate remedial action.	AzerSu, RSKD and WTP Management	-
13	Treated Water Effluent	<i>Effluent Discharge Quality</i>	As per EU council directive 91/271 EEC	- Report the quantity of discharge every day - Full compliance to Council Directive 91/271 EEC - Sample analysis comply	Cease the discharge to water body, Immediate remedial action	AzerSu, RSKD and WWTP Management	-

[4]

Exhibit 7.2, Monitoring Plan for Construction and Operation Phases

				with the Directive Impact Monitoring Compliance Monitoring			
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EMU : Environmental Management Unit of AWM OJSC of Azerbaijan.

ECO : Environmental Control Officer of AWM OJSC of Azerbaijan.

Notes _____ :

1. The Employer (AWM OJSC of Azerbaijan) with its authorized environmentally sub-sections (EMU/ECO), and the Supervisory Engineer (or Environmental Specialist of CMF) will monitor the implementation of the EMP during the construction period and Defects Liability Period (DLP).
2. The Employer will ensure that the contract document include the relevant environmental protection clauses.
3. Monitoring and audit of the WSS facilities will be performed by the 'Joint SuKanal LLC' (JSK LLC - subsidiary of AzerSu) through the Rayon SuKanal Departments (RSKD) during the operation period.

Chapter 8

PUBLIC CONSULTATION

Overview

This Chapter describes the outcome of the public consultation sessions held with different stakeholder groups that may be impacted by the project. The consultation process was carried out in accordance with the World Bank Operational Policy (OP 4.01) on public consultation. The objectives of this process were to:

- Share information with stakeholders on the proposed WSS project and expected impact on the physical, biological, and socioeconomic environment of the project corridor.
- Understand stakeholder concerns regarding various aspects of the project, including the existing condition of the water supply and sanitation systems, and the likely impact of construction-related activities and operation of the new WSS systems.

The public consultation forums were:

- Series of meetings that were held with the stakeholders both for scoping the EIA topics and to set forth the environmental issues related to Project options previously preferred. These meetings were held with AWM OJSC, RPUDs, and relevant governmental departments both in rayon level and regional level.
- Scoping sessions that were held with local communities.
- Focus group discussions that were held with general water users, including householders in the towns and villages, farmers, and housewives.

8.1. Scoping Sessions

Series of scoping sessions and focus group discussions were carried out with AWM OJSC, rayon SuKanal Departments, local administrative departments, Local Communities and NGOs. Additional meetings were held at various sites along the project corridor (for details, see Annex-4).

Generally, people were found to be aware of the need to upgrade the WSS systems, and indicated their support for the AWM OJSC. The proposed construction of the new systems met with particular support since it will reduce the health problems of the public in their region.

Local departments of rayon demanded they be part of a continuous consultation process with other stakeholders at different stages of the project including the design, construction, and operation periods.

The most commonly raised concerns are listed below:

- Improving general standards of water supply system,
- Providing sufficient volume of drinkable water to their residents,

- Taking into consideration the requirements of non-residential drinkable water demand on the design of the proposed Project,
- Special concerns were brought up on the protective measures to avoid the loss of productivity on the agricultural lots nearby the Project corridor,
- Special concerns were brought up on the designing the pipe routes to avoid the land acquisition,
- Providing the control mechanisms to control and check the water quality to be distributed,
- Setting up a good traffic condition and transport programme during the construction to avoid the traffic congestion and disruption of the public services, and to avoid traffic congestion related hazards, and dust emissions,
- Ensuring that the contractor does not use private land for parking construction machinery,
- Avoiding undue delays in construction and ensure that project works are carried out in one stretch rather than in piecemeal manner,
- Avoiding dumping construction material along the highway and median,
- Adopting measures to minimize and control spillages from construction machinery,
- Compensation should be fair, and subject to transparency,
- Control over-speeding, overloading, traffic disorders and violations of traffic regulations, and construct speed breakers where required,
- Providing a separate land for contractor's camp in adequate distance from the residential and commercial areas,
- Erecting cautionary and information signs.

8.1.1. Stage 1 Consultation

The first call of an information meeting for scoping consultation attending the representatives of RPUDs and other interested parties, including representative of AWM OJSC, has been forwarded to AWM OJSC at the date of September 01, 2010, see Annex-4. Agenda items of meeting request were as following;

- Distributing of an Environmental Checklist drawn up by the EIA consultant,
- Discussing of the Public review Process for scoping the EIA, and

Since the study areas consist of 12 rayons, two information meetings, each of six rayons, has been planned for scoping consultation process. The first information meeting for the southern six rayons (Astara, Lankaran, Lerik, Yardimli, Jalilabad, and Masalli) were held at September 07, 2010 in Lankaran. The second information meeting for other six rayons (Imishli, Zardab, Kurdamir, Ujar, Gadabay, and Dashkasan) were held at September 17, 2010 in Ujar rayon. See Annex-4.2.

Meanwhile, a series of the consultation meetings with the technical and ecological experts of AWM OJSC continued to explain and discuss the proposals, the consultation and assessment process, and the technical investigations commissioned, as well as to identify information needs of stakeholders and interested parties, and ways to incorporate local knowledge.

8.1.2. Stage 2 Consultation

The objectives of the Stage 2 consultation were to obtain location-specific information about patterns of human use of the rayon and water abstraction figures both for drinking and irrigation in rayon, information from the various investigations previously performed for the stakeholders and interested parties and obtain their views on the adequacy of the investigations, reconcile the findings of the investigations with local knowledge, and engage people in assessing the comparative effects and issues of different alternatives. Over the period September 15 – September 30, 2010, contact lists were checked and interested parties recontacted to offer meetings on the technical findings.

8.1.3. Stage 3 Consultation

The objective of the Stage 3 consultation was to provide information on the preliminary assessment of environmental issues and obtain feedback from the stakeholders and interested parties on it, confirm likely effects and impacts, and identify appropriate mitigation options.

Phase 3 consultation consisted of a meeting with the rayon representatives and interested parties.

In this period, a scoping report has been carried out, and submitted to AWM OJSC at the date of March 25, 2010.

Details of the meetings held are in following table;

Table 8.1: Details of meetings held in the consultation process

<i>Meeting</i>	<i>Department Institution/Interested parties/General Public</i>	<i>Date</i>	<i>Number Attending</i>	<i>of</i>
Information meeting held in Astara for scoping process	- Representatives of AWM OJSC - Representatives of RPUDs of southern rayons (Astara, Lankaran, Lerik, Yardimli, Masalli, and Jalilabad) - Lankaran Representative of MENR - Head of Mamusta Water User Association, Local NGO - Head of Shaglaser Water User Association, Local NGO - Consultant's representatives	Sept. 07, 2010	20	
In Astara city, to explain and discuss the environmental issues, Project details, and to collect and review the on-site informations	- Deputy Governor of Astara - Head of RPUDs of Astara - Head of Water User Association, Astara, Local NGO - Other interested groups from Astara - Consultant Representatives	Sept. 22, 2010	13	
In Astara city, to inform the general public performing a public hearing on the proposed Project, and to get a public feedback	-Deputy Governor of Astara -Mayors of surrounding villages -Interested Parties -Representative of local NGOs -Residents from Astara -Representatives from Local press -Consultant Representatives	Jan. 28.2011	32	

8.1.4. Summary of Feedback

The following table summarizes the issues raised through the consultation programme;

Table 8,2: Summary Feedback issues raised through the consultation programme

Issue Type	Detailed Issues	Response
Technical Scope of the EIA	For the purposes of this EIA Study, Which environmental issues will be adapted?	The discussions on the ToR of EIA revealed, and the following list of issues has been refined and adapted with reference to this EIA process; <ol style="list-style-type: none"> 1. Land Use and Planning (construction camp, soil erosion, soil contamination and surface run-off), 2. Solid Waste, Hazardous Waste Disposal, 3. Water Resources, 4. Ambient Air Quality, Dust and Odor, 5. Noise, 6. Temporary Traffic Management, 7. Ecological Environment (vegetation, terrestrial wildlife, aquatic biology and fisheries), 8. Cultural Environment, 9. Systems' Utilities,
Existing Condition and Scope of the project	<ul style="list-style-type: none"> - The people are suffering for the drinking water presently. Astara city has around 16,000 population. Rayon's population is over 97,000. We would like to know whether the new water supply system would cover some villages surrounding the city. - Will this Project cover the rehabilitation and repairing of existing irrigation ditches and canals? - Astara rayon is one of the most rainy regions together with Lankaran rayon in Azerbaijan. Will this Project cover the city's storm water collection system? 	<ul style="list-style-type: none"> - The proposed project is intended to provide the full service of water supply and sanitation only for Astara city and Selakaran village. However, the branch connection manholes will be provided for the villages on the course of the raw water pipeline, such as Sipiypart, Jukas, Vanashikash, Noyabud and the villages surrounding the Barzuband. The required volume of raw water to be provided for these villages will be included into the amount of water to be diverted from the catchment, so that these villages may have sufficient drinkable water installing an appropriate treatment unit to the connection manholes with the local budget. - This project will cover only the components of the WSS systems, such as raw water capture facility, raw water transmission, construction of WTP and WWTP, construction of water supply and sanitation systems' piped networks in its service area. - Storm water collection is not in scope of this project.

Resettlement Issues	<ul style="list-style-type: none"> - The raw water pipeline will travel on the areas of a number of villages and local municipalities up to WTP, and then to the city. - How will the resettlement issues will be solved, if they arise? How will these types of issues, such as loss of access to farmland, be handled? 	<ul style="list-style-type: none"> - Any potential resettlement issues and issues related to loss of access to farm land will be handled in accordance with the provisions of the Project's Resettlement Policy Framework.
Rehabilitation and Reinstating the existing public Amenities during the Construction	<ul style="list-style-type: none"> - Almost all roads and streets will be excavated in the city. - Many empowered construction equipment will travel inside the city during the construction. Won't this situation create a chaos in the city? - And, Who will rehabilitate and reinstate the roads and streets excavated, or will they be reasphalted after the construction is complete? 	<ul style="list-style-type: none"> - Such large projects involve lots of empowered construction equipments. However, series of mitigation measures and required regulations for application during the construction are given in the EIA study. These measures will begin to apply from the pre-construction phase, and continue to the end of the construction. Naturally, all the pipes will be buried, and therefore, roads and streets will be excavated. All degraded roads and streets within this project will be rehabilitated and reasphalted by the contractor(s). Briefly, after the construction and commissioning of the new systems, the roads, parks and etc., will be returned to their original condition.
Raw Water Source	Acceptance of the surface water diversion from Tengeruchay river, and constructing a WTP for Astara city at the lower levels of Barzuband village.	The Feasibility Consultant and AWM OJSC envisage to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement. Total length of the raw water pipeline will be 14.4 km to WTP in this alternative.
WTP and WWTP, and replacement of the existing sewage lines	We would like to know whether treatment plants are also envisaged.	<p>Naturally, all the environmental and engineering issues will be properly approached during the construction.</p> <p>The raw water obtained from Tengerudchay river will be distributed to the end users after treatment.</p> <p>Similarly, a wastewater treatment plant has been envisaged for the sewerage system.</p>
Treated Water Discharge from WWTP	Where will the treated water generated in WWTP will be disposed?	The treated waste water will be discharged into the nearest irrigation canal north of the WWTP site.

Compensation Issues	In case the lines are constructed through the private lands, will they be compensated?	If the private lands and/or amenities are affected from the construction activities, the losses of the individuals will be compensated according to Project Resettlement Policy Framework (RPF) to be prepared specific for this project by AWM OJSC.
Design and maintenance of the proposed sewerage system	Risk assessment to include possible earthquakes and severe flooding affecting pipelines and sewerage system capacity.	Earthquakes and flooding risks are no different to those for all infrastructure.
Future Planning	The ability of WTP and WWTP to cope with expected in the service area's population and visitors. Contingency plans for natural hazards including earthquakes and flooding. The ability to adapt the system for changes in environmental standards in the future.	To be covered in project design with projected future growth to 2030. To be covered in project design. Possible to growth to at least double capacity projected with additional facilities in future both for WTP and WWTP.

8.2. General Public

The general public were consulted through all three phases of the consultation process as described above. A contact list of individuals and groups that were considered or known to be interested in the process and/or had identified themselves as having an interest, was created and maintained with EMU of AWM OJSC and Rayon Irrigation Department throughout the consultation process. Individuals and organizations on the list were contacted.

Context : The "Astara Public" is divided into two groups;

- The "engaged public" as represented by the various NGOs in Astara rayon who comments, and
- The "general public" being the general public who may at this time have very little information on the proposed Project.

Objectives

1. To fulfill all obligations of public consultation as per the EIA regulations of Azerbaijan (Handbook on the EIA Process in Azerbaijan, 1996 and Law on Environmental Protection, 1999).
2. To provide basic information to the public of Astara rayon.
3. To provide opportunities for public discussion and record public feedback on the concerns for the proposed project.
4. To encourage public awareness and feedback opportunities for public input and discussion on the development of the proposed Project.

The general public consultation included a two-part process;

1. **Phase 1;** Creation of a background information package (hard copy questionnaires), and obtaining of public feedback both from the 'engaged public' and 'general public' with the notification and dissemination of the questionnaires set to Astara Public. See Table 8,4.
2. **Phase 2;** Arranging a general public meeting in Astara city as an open public forum. Notice for the forum has been posted in local municipal Office through EMU of AWM OJSC and Rayon Irrigation Department. Interested parties included, but were not limited to residents and residents groups, NGOs, business groups including farmers, and environmental groups. A general public consultation meeting was held in January 28, 2011 at Deputy Governor's Office in REP Building. See Table 8,2 and Annex-4.

Summary Public Feedback**Table 8,3: Summary Public Feedback issues raised through the consultation programme**

Issue Type	Detailed Issues	Response
Volume of water to be provided	<ul style="list-style-type: none"> - What kind of a structure is to be built and measures to be taken in order prevent the water decrease, so that our city is not left without water when seasons change? 	<ul style="list-style-type: none"> - The current raw water collection facilities near the Alasha village will not be used in the project. The Feasibility Consultant and AWM OJSC envisaged to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement.
Alternatives of Raw Water Catchment	<ul style="list-style-type: none"> - We have heard that the raw water will be delivered to Lankaran city from the Yukhari Xanbulan Water Reservoir (YXWR). Would it not be possible to provide drinking water to Astara from the same source as well? - We know from the climate and environmental attributes of our rayon that Tengerudchay river shows the least fluctuations in its surface flow. This is the result of sustainance of the spring waters in the upper parts of Sim village. Wouldn't it be more appropriate if the water was provided directly from these sources? 	<ul style="list-style-type: none"> - According to our researches, YXWR also gives irrigation water to the northern parts of Astara rayon. It is true that the reservoir may also accommodate the Astara's water demand. However, the new improvement projects about the irrigation systems in this area have been considered by AWM OJSC and the Feasibility Consultant, but not chosen as an alternative. Besides, YXWR is an important water storage facility for Lankaran and Astara region and, regarding future improvement and expansion projects, should not be considered for providing additional drinking water to anywhere else. - The water resources you mentioned is in a mountainous region of 1300-1400 meters height, and approximately 30-35 km away from Astara city. According the population increase by 2030 set forth by Feasibility Consultant the daily water requirement os Astara city is calculated as 4000-4500 m3/day. Since bringing such amount of water from Sim resources would not be economic, the lower basin of Tengerudchay river has been chosen by the Feasibility Consultant and AWM OSJC as an economic and sustainable solution.
Ecological Issues for Water Catchment	<ul style="list-style-type: none"> - Has the minimum ecological flow of Tengerudchay river been examined thoroughly? Because there is a long distance from the catchment area to Astara lowland, and this discharge area of the river has the valued ecological environment in both sides of the river's flow channel. When an amount of water that is sufficient for 	<ul style="list-style-type: none"> - We have seen on our research that the previous flow amounts of Tengerudchay river has been measured by the measuring stations in both Sim and Vaqo for approximately 65-70 years. We obtained these records and researched in respect of the water balance in the upstreams

the city is taken, will it not cause insufficiency in the amount needed for the survival of the flora and the fauna around the river?

of the river for required minimum ecological flow. And it has been determined that the raw water to be diverted for Astara city will not create any negative effect on the minimum ecological flow.

Raw Water Quality	<ul style="list-style-type: none"> - Has the chosen water source researched thoroughly? The villages on the upstreams of the river are more occupied with livestock. The river may contain microbes that those animals carry. 	<ul style="list-style-type: none"> - The water of Tengerudchay river is continually being tested by AWM OJSC's laboratories. Besides, the surface water of the river has been thoroughly tested in a certified Laboratory by the Feasibility Consultant, and according to the test results, certain advices have been made.
Damages of Existing Public Amenities during Construction	<ul style="list-style-type: none"> - Will there be any damage done to the existing gas lines in the beginning of this project? Or will some of them be relocated? 	<ul style="list-style-type: none"> - Before the construction begins, engineers and the environmental specialists of the Contractor(s) and AWM OJSC, along with the supervisor, will make sure that all the infrastructure including the gas lines are analysed, and lead the design group of contractor so that they can do the works without damaging them.
Wishes	<ul style="list-style-type: none"> - Needing the Project - Most important issue for the city 	<ul style="list-style-type: none"> - We support this project. We hope that this project is not left unfinished and our city is prepared for a clean and healthy future. At the moment, the whole city has a water problem, and since our city doesn't have a proper waste water system it is not able to form a healthy environment. - As a border city, we await and acclaim the immediate start and finish of the project that will make so that Astara, a city that welcomes both domestic and foreign tourists, enters the future years having solved his infrastructure. - The most important issue of our city is the renovation of our water and sewage systems that are messy and no longer operational. Since the population increase until 2030 has been taken considered, the project components have been planned according to the population increase of our city until 2030.
Timescales for the completion of the project	<ul style="list-style-type: none"> - When is it envisaged for the project to start and finish? 	<ul style="list-style-type: none"> - The project is envisaged to start around the summer months of 2011, and finish around the end of the second quarter of 2013.

Table 8,4: Summary Public Feedback (scores are obtained from the results of hard copy interview questionnaires disseminated to Astara Public, between October and December, 2010)

Questionnaires		Answers																
		By Tap	Walking to water truck or source	Delivery to house by water truck	Up to 50 meters	Up to 100 meters	More than 100 meters	Not at all / in no case	Sometime	All the time	Never	3 hours out of the day	12 hours out of the day	For some days	Nothing	Yes	No	How much
1	How do you obtain your water ?	13%	64%	23%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	If you have to walk for obtaining your water, how far do you have to walk?	-	-	-	29%	33%	26%	12%	-	-	-	-	-	-	-	-	-	-
3	Are you satisfied with the quality of the water?	-	-	-	-	-	-	78%	12%	10%	-	-	-	-	-	-	-	-
4	How often do you lack water supply?	-	-	-	-	-	-	-	-	-	6%	12%	61%	21%	-	-	-	-
5	Is there sufficient water pressure in your water supply system?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8%	92%	-
6	Have you ever suffered any kind of waterborn diseases?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16%	84%	-
7	How much do you pay now for your water?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0 AZN/ Month
8	Are you willing to pay water? If 'Yes', please state how much?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	91%	9%	2-4 AZN/ Month
9	Are you connected with the Municipal sewage system?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9%	91%	-
10	Do you have sewage problems on your property or around	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	1%	-

	your house?																	
11	Are you willing to pay for sewage collection?	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19%	81%	-
12	If you are an industry and are not connected to the Municipal water supply system currently, would you want to be connected?	-	-	-	-	-	-	-	-	-	-	-	-	-	99%	1%	2-4 AZN/ Month	
13	If you are an industry and are not connected to the Municipal sewage system currently, would you want to be connected?	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	0%	1-2 AZN/ Month	

- Number of Interviewers is 50.

8.10

Chapter 9

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ANNEX-1

1.1 Tor of EIA

1.2 World Bank Operational Policy 4.01

Annex-1.1

Terms of Reference of EIA

APPENDIX A – DESCRIPTION OF SERVICES**TERMS OF REFERENCE FOR THE ENVIRONMENTAL ASSESSMENT FOR
WATER SUPPLY AND WASTEWATER SYSTEM INVESTMENTS IN 12 RAYONS
(IMISHLI, KURDAMIR, UJAR, ZARDAB, LANKARAN, MASALLI, ASTARA,
JALILABAD, YARDIMLI, LERIK, DASHKASAN AND GADABAY) WITHIN
SECOND NATIONAL WATER SUPPLY AND SANITATION PROJECT****I. PROJECT BACKGROUND**

The Government of Azerbaijan is implementing the Second National Water Supply and Sanitation Project. The objective of the project is to improve access to safe, reliable, and sustainable water supply and sanitation (WSS) services in 16 regions (rayons) across Azerbaijan. The project is part of the Government's efforts to improve infrastructure services in order to improve the living conditions of people in secondary towns and cities and to support local economic growth and poverty reduction.

Investments under this project will be implemented in two phases. Phase 1 is expected to cover 4 (four) Rayons (Agsu, Ismayilli, Shabran and Siyazan), and Phase 2 to cover additional 12 (twelve) Rayons (Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay). The strategic approach being adopted under the project is based on two complementary interventions: (i) rehabilitation and construction of WSS infrastructure in the Rayons' centers plus the villages located in close proximity to them, or along the transmission lines for the water supply; and (ii) implementation of a comprehensive Institutional Development Plan to strengthen the WSS sector's capacity to manage WSS services in an efficient, effective, and sustainable manner.

For purposes of the World Bank Operational Policy (OP) 4.01, the project was rated under Environmental Category A in view of the nature of water supply and sewerage. At the time of project appraisal designs for the investments had not been prepared. Designs for the investments in these selected rayons will be prepared as part of Design and Build contracts with qualified contractors, who will as the name indicates prepare the designs and carry out the construction of the investments. An Environmental Framework was prepared for the project during appraisal, based on the anticipated investments, and a framework Environmental Management Plan (EMP) was prepared outlining general environmental mitigation measures and a monitoring and management plan.

Consultancy services under these terms of reference involve the preparation of the detailed Environmental Impact Assessments (EIA) and the Environmental Management Plan (EMP) of the proposed investments for 12 Rayons only (Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay). The EIA will identify the potential impacts of the project, both positive and negative and review alternatives, and the EMP will include implementation procedures and arrangements for ensuring full consideration of Environmental Safeguards in the investments in project rayons, in accordance with OP 4.01 and the relevant Azerbaijani environmental procedures.

III. Special Conditions of Contract Annex II – Lump-Sum Contract

II. OBJECTIVE

The objective of this assignment is to conduct individual Environmental Impact Assessments for Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay Rayons investment components to be carried out under the project, in accordance with the requirements of the World Bank Operation Policy 4.01 on “Environmental Assessment”.

III. SCOPE OF SERVICES

The consultant will carry out the following tasks:

- Task 1: Assist the project implementing agency – State Amelioration and Water Management Open Joint Stock Company (SAWMC) – to hold the public consultations prior to the commissioning of the EA. The purpose of the consultation meeting would be to obtain public feedback on these Terms of Reference.
- Task 2: Screen the proposed investments in project rayons in order to categorize them as Category, A, B, or C and identify relevant Environmental Assessment Procedures to be followed in accordance with the requirements of OP 4.01.⁵
- Task 3: Review proposed investment designs, and existing studies and information related to the environmental conditions in and around the project areas, with special emphasis on surface and ground water resources quality and quantity, water regime and biodiversity in the marshlands, human health, impact of wastewater disposal practices, land use and siting, socio-economic issues, etc. Identify important areas for which insufficient information is available, if any, and collect needed information.
- Task 4: Assess and summarize the current available baseline data on the major environmental characteristics of the project areas: water, air, land, biological, socio-economic, health and cultural aspects.
- Task 5: Assess potential environmental impacts of alternative scenarios including the “no project” alternative. Potential impacts would include, but not limited to the following:
- a) Impacts on the existing infrastructure.
 - b) Impacts on the globally significant ecosystems, including wetlands, aquifers, rivers, lakes, forests, protected areas in the vicinity of the project site, etc.
 - c) Possible impacts on public health (i.e., waterborne disease and pollution risk), including sanitation and public benefits anticipated;
 - d) Impacts of the construction phase on biodiversity, traffic, amenities, etc.

⁵ The consultant is provided for the Feasibility Study

Annex II – Lump-Sum Contract

III. Special Conditions of Contract

- e) Impacts of the deposition of excavation soils in drainage channels
- f) Projected quantitative changes in beneficial uses (for example, fisheries, recreation and tourism)

Task 6: Carry out consultation with the key stakeholders. Consultation activities will include:

- a) meetings with public authorities, municipalities and other institutional stakeholders;
- b) public meetings at which stakeholders will be brought together and discuss issues; and
- c) meetings with members of local communities, civil society, including NGOs and other stakeholders.

Task 7: Prepare the Environmental Management Plan. The EMP should identify potential impacts of the project, both positive and negative, on various environmental components during the pre-construction, construction and operational phases of the project. It should outline control strategies for mitigating adverse impacts at every phase of the project, and indicate implementation and reporting arrangements and estimated costs of the proposed mitigation measures. The EMP should provide details regarding any environmental monitoring consistent with the mitigation plan and based on relevant parameters and monitoring methodology. The EMP should analyze institutional capacity for implementation of the management plan and make recommendations for institutional strengthening and capacity building, if needed.

IV. REPORTING REQUIREMENTS

The Consultant shall closely support the Client in approval of the Environmental Impact Assessment Report through the relevant Government authorities and shall make necessary revisions in the Reports in accordance with the comments and suggestions of the the relevant Government authorities.

The Environmental Impact Assessment Report (EIAR) should be prepared by the consultant in English and in Azerbaijan languages 5 copies of draft in each language and 8 copies of the final report in each language and submitted to the Client.

The EAR will be organized according to the outline below:

1. Executive Summary
2. Policy, legal and Administrative Framework
3. Objectives and Description of the Proposed Project
4. Baseline Data
5. Environmental Impacts
6. Analysis of Alternatives

III. Special Conditions of Contract Annex II – Lump-Sum Contract

7. Environmental Management Plan
Annex A: Mitigation Plan
Annex B: Monitoring Plan
8. References Record of Interagency/ Consultation Meetings
9. Appendices (any reference and supporting information deemed necessary)

Annex-1.2

World Bank Operational Policy 4.01

Operational Manual

OP 4.01 - Environmental Assessment

These policies were prepared for use by World Bank staff and are not necessarily a complete treatment of the subject.

OP 4.01

January, 1999

This Operational Policy statement was updated in March 2007 to reflect issuance of [OP/BP 8.00, Rapid Response to Crises and Emergencies](#), dated March 2007. Previously revised in August 2004 to ensure consistency with the requirements of [OP/BP 8.60](#), issued in August 2004. These changes may be viewed [here](#)

Note: OP and [BP 4.01](#) together replace OMS 2.36, *Environmental Aspects of Bank Work*; OD 4.00, Annex A, *Environmental Assessment*; OD 4.00, Annex B, *Environmental Policy for Dam and Reservoir Projects*; OD 4.01, *Environmental Assessment*; and the following Operational Memoranda: *Environmental Assessments: Instructions to Staff on the Handling of the Borrower's Consultations with Affected Groups and Relevant Local NGOs*, 4/10/90; *Environmental Assessments: Instructions to Staff on the Release of Environmental Assessments to Executive Directors*, 11/21/90; and *Release of Environmental Assessments to Executive Directors*, 2/20/91. Additional information related to these statements is provided in the *Environmental Assessment Sourcebook* (Washington, D.C.: World Bank, 1991) and subsequent updates available from the Environment Sector Board, and in the *Pollution Prevention and Abatement Handbook*. Other Bank statements that relate to the environment include OP/BP 4.02, *Environmental Action Plans*; OP/BP 4.04, *Natural Habitats*; OP 4.07, *Water Resources Management*; OP 4.09, *Pest Management*; OP/BP 4.10, *Indigenous Peoples*; OP/BP 4.11, *Physical Cultural Resources*; OP/BP 4.12, *Involuntary Resettlement*; OP/BP 4.36, *Forests*; and OP/BP 10.04, *Economic Evaluation of Investment Operations*. These OP and BP apply to all projects for which a PID is first issued after March 1, 1999. Questions may be addressed to the Chair, Environment Sector Board.

1. The Bank¹ requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.
2. EA is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence;² examines project alternatives; identifies ways of improving project selection, siting, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The Bank favors preventive measures over mitigatory or compensatory measures, whenever feasible.
3. EA takes into account the natural environment (air, water, and land); human health and safety; social aspects (involuntary resettlement, indigenous peoples, and physical cultural resources);³ and transboundary and global environmental aspects.⁴ EA considers natural and social aspects in an integrated way. It also takes into account the variations in project and country conditions; the findings of country environmental studies; national environmental action plans; the country's overall policy framework, national legislation, and institutional capabilities related to the environment and social aspects; and obligations of the country, pertaining to project activities, under relevant international environmental treaties and agreements. The Bank does not finance project activities that would contravene such country obligations, as identified during the EA. EA is initiated as early as possible in project processing and is integrated closely with the economic, financial, institutional, social, and technical analyses of a proposed project.
4. The borrower is responsible for carrying out the EA. For Category A projects,⁵ the borrower retains independent EA experts not affiliated with the project to carry out the EA.⁶ For Category A projects that are highly risky or contentious or that involve serious and multidimensional environmental concerns, the borrower should normally also engage an advisory panel of independent, internationally recognized environmental specialists to advise on all aspects of the project relevant to the EA.⁷ The role of the advisory panel depends on the degree to which project preparation has progressed, and on the extent and quality of any EA work completed, at the time the Bank begins to consider the project.
5. The Bank advises the borrower on the Bank's EA requirements. The Bank reviews the findings and recommendations of the EA to determine whether they provide an adequate basis for processing the project for Bank financing. When the borrower has completed or partially completed EA work prior to the Bank's involvement in a project, the Bank reviews the EA to ensure its consistency with – 8 – this policy. The Bank may, if

appropriate, require additional EA work, including public consultation and disclosure.

6. The *Pollution Prevention and Abatement Handbook* describes pollution prevention and abatement measures and emission levels that are normally acceptable to the Bank. However, taking into account borrower country legislation and local conditions, the EA may recommend alternative emission levels and approaches to pollution prevention and abatement for the project. The EA report must provide full and detailed justification for the levels and approaches chosen for the particular project or site.

EIA Instruments

7. Depending on the project, a range of instruments can be used to satisfy the Bank's EA requirement: environmental impact assessment (EIA), regional or sectoral EA, environmental audit, hazard or risk assessment, and environmental management plan (EMP).⁸ EA applies one or more of these instruments, or elements of them, as appropriate. When the project is likely to have sectoral or regional impacts, sectoral or regional EA is required.⁹

Environmental Screening

8. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA. The Bank classifies the proposed project into one of four categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental impacts.
 - a) *Category A*: A proposed project is classified as Category A if it is likely to have significant adverse environmental impacts that are sensitive,¹⁰ diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EA for a Category A project examines the project's potential negative and positive environmental impacts, compares them with those of feasible alternatives (including the 'without project' situation), and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For a Category A project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive regional or sectoral EA) that includes, as necessary, elements of the other instruments referred to in para. 7.
 - b) *Category B*: A proposed project is classified as Category B if its potential adverse environmental impacts on human populations or environmentally important areas--including wetlands, forests, grasslands, and other natural habitats--are less adverse than those of Category A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigatory measures can be designed more readily than for Category A projects. The scope of EA for a Category B project may vary from project to project, but it is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. The findings and results of Category B EA are described in the project documentation (Project Appraisal Document and Project Information Document).¹¹
 - c) *Category C*: A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category C project.
 - d) *Category FI*: A proposed project is classified as Category FI if it involves investment of Bank funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.

EA for Special Project Types

Sector Investment Lending

9. For sector investment loans (SILs),¹² during the preparation of each proposed subproject, the project coordinating entity or implementing institution carries out appropriate EA according to country requirements and the requirements of this policy.¹³ The Bank appraises and, if - 9 - necessary, includes in the SIL

components to strengthen, the capabilities of the coordinating entity or the implementing institution to (a) screen subprojects, (b) obtain the necessary expertise to carry out EA, (c) review all findings and results of EA for individual subprojects, (d) ensure implementation of mitigation measures (including, where applicable, an EMP), and (e) monitor environmental conditions during project implementation.¹⁴ If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A subprojects and, as appropriate, Category B subprojects--including any EA reports--are subject to prior review and approval by the Bank.

Financial Intermediary Lending

10. For a financial intermediary (FI) operation, the Bank requires that each FI screen proposed subprojects and ensure that subborrowers carry out appropriate EA for each subproject. Before approving a subproject, the FI verifies (through its own staff, outside experts, or existing environmental institutions) that the subproject meets the environmental requirements of appropriate national and local authorities and is consistent with this OP and other applicable environmental policies of the Bank.¹⁵
11. In appraising a proposed FI operation, the Bank reviews the adequacy of country environmental requirements relevant to the project and the proposed EA arrangements for subprojects, including the mechanisms and responsibilities for environmental screening and review of EA results. When necessary, the Bank ensures that the project includes components to strengthen such EA arrangements. For FI operations expected to have Category A subprojects, prior to the Bank's appraisal each identified participating FI provides to the Bank a written assessment of the institutional mechanisms (including, as necessary, identification of measures to strengthen capacity) for its subproject EA work.¹⁶ If the Bank is not satisfied that adequate capacity exists for carrying out EA, all Category A subprojects and, as appropriate, Category B subprojects--including EA reports--are subject to prior review and approval by the Bank.¹⁷

Emergency Operations Under OP 8.00

12. The policy set out in OP 4.01 normally applies to emergency operations processed under *OP/BP 8.00, Rapid Response to Crises and Emergencies*. However, when compliance with any requirement of this policy would prevent the effective and timely achievement of the objectives of an emergency operation, the Bank may exempt the project from such a requirement. The justification for any such exemption is recorded in the loan documents. In all cases, however, the Bank requires at a minimum that (a) the extent to which the emergency was precipitated or exacerbated by inappropriate environmental practices be determined as part of the preparation of such projects, and (b) any necessary corrective measures be built into either the emergency operation or a future lending operation.

Institutional Capacity

13. When the borrower has inadequate legal or technical capacity to carry out key EA-related functions (such as review of EA, environmental monitoring, inspections, or management of mitigatory measures) for a proposed project, the project includes components to strengthen that capacity.

Public Consultation

14. For all Category A and B projects proposed for IBRD or IDA financing, during the EA process, the borrower consults project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and takes their views into account.¹⁸ The borrower initiates such consultations as early as possible. For Category A projects, the borrower consults these groups at least twice: (a) shortly after environmental screening and before the terms of reference for the EA are finalized; and (b) once a draft EA report is prepared. In addition, the borrower consults with such groups throughout project implementation as necessary to address EA-related issues that affect them.¹⁹

Disclosure

15. For meaningful consultations between the borrower and project-affected groups and local NGOs on all Category A and B projects proposed for IBRD or IDA financing, the borrower provides relevant material in a timely manner prior to consultation and in a form and language that are understandable and accessible to the groups being consulted.
16. For a Category A project, the borrower provides for the initial consultation a summary of the proposed project's objectives, description, and potential impacts; for consultation after the draft EA report is prepared, the borrower provides a summary of the EA's conclusions. In addition, for a Category A project, the borrower makes the draft EA report available at a public place accessible to project-affected groups and local NGOs. For SILs and FI operations, the borrower/FI ensures that EA reports for Category A subprojects are made available in a public place accessible to affected groups and local NGOs.
17. Any separate Category B report for a project proposed for IDA financing is made available to project-affected groups and local NGOs. Public availability in the borrowing country and official receipt by the Bank of Category A reports for projects proposed for IBRD or IDA financing, and of any Category B EA report for projects proposed for IDA funding, are prerequisites to Bank appraisal of these projects.
18. Once the borrower officially transmits the Category A EA report to the Bank, the Bank distributes the summary (in English) to the executive directors (EDs) and makes the report available through its InfoShop. Once the borrower officially transmits any separate Category B EA report to the Bank, the Bank makes it available through its InfoShop.²⁰ If the borrower objects to the Bank's releasing an EA report through the World Bank InfoShop, Bank staff (a) do not continue processing an IDA project, or (b) for an IBRD project, submit the issue of further processing to the EDs.
19. During project implementation, the borrower reports on (a) compliance with measures agreed with the Bank on the basis of the findings and results of the EA, including implementation of any EMP, as set out in the project documents; (b) the status of mitigatory measures; and (c) the findings of monitoring programs. The Bank bases supervision of the project's environmental aspects on the findings and recommendations of the EA, including measures set out in the legal agreements, any EMP, and other project documents.²¹

1. 'Bank' includes IBRD and IDA; 'EA' refers to the entire process set out in OP/BP 4.01; 'loans' includes IDA credits and IDA grants; 'borrower' includes, for guarantee operations, a private or public project sponsor receiving from another financial institution a loan guaranteed by the Bank; and 'project' covers all operations financed by Bank loans or guarantees except development policy lending (for which the environmental provisions are set out in OP/BP8.60, *Development Policy Lending*), and also includes projects under adaptable lending-adaptable program loans (APLs) and learning and innovation loans (LILs)- and projects and components funded under the Global Environment Facility. The project is described in Schedule 2 to the Loan/Credit Agreement. This policy applies to all components of the project, regardless of the source of financing
2. For definitions, see [Annex A](#). The area of influence for any project is determined with the advice of environmental specialists and set out in the EA terms of reference.
3. See OP/BP 4.12, *Involuntary Resettlement*; OP/BP 4.10, *Indigenous Peoples*; and OP/BP 4.11, *Physical Cultural Resources*.
4. Global environmental issues include climate change, ozone-depleting substances, pollution of international waters, and adverse impacts on biodiversity.
5. For screening, see para. 8.
6. EA is closely integrated with the project's economic, financial, institutional, social, and technical analyses to ensure that (a) environmental considerations are given adequate weight in project selection, siting, and design decisions; and (b) EA does not delay project processing. However, the borrower ensures that when individuals or entities are engaged to carry out EA activities, any conflict of interest is avoided. For example, when an independent EA is required, it is not carried out by the consultants hired to prepare the engineering design.
7. The panel (which is different from the dam safety panel required under OP/BP 4.37, *Safety of Dams*) advises the borrower specifically on the following aspects: (a) the terms of reference for the EA, (b) key issues and methods for preparing the EA, (c) recommendations and findings of the EA, (d) implementation of the EA's recommendations, and (e) development of environmental management capacity.

8. These terms are defined in [Annex A](#).
9. Annexes Guidance on the use of sectoral and regional EA is available in [EA Sourcebook Updates 4 and 15](#).
10. A potential impact is considered 'sensitive' if it may be irreversible (e.g., lead to loss of a major natural habitat) or raise issues covered by [OP 4.04](#), *Natural Habitats*; [OP/BP 4.10](#), *Indigenous Peoples*; [OP/BP 4.11](#), *Physical Cultural Resources* or [OP 4.12](#), *Involuntary Resettlement*.
11. When the screening process determines, or national legislation requires, that any of the environmental issues identified warrant special attention, the findings and results of Category B EA may be set out in a separate report. Depending on the type of project and the nature and magnitude of the impacts, this report may include, for example, a limited environmental impact assessment, an environmental mitigation or management plan, an environmental audit, or a hazard assessment. For Category B projects that are not in environmentally sensitive areas and that present well-defined and well-understood issues of narrow scope, the Bank may accept alternative approaches for meeting EA requirements: for example, environmentally sound design criteria, siting criteria, or pollution standards for small-scale industrial plants or rural works; environmentally sound siting criteria, construction standards, or inspection procedures for housing projects; or environmentally sound operating procedures for road rehabilitation projects.
12. SILs normally involve the preparation and implementation of annual investment plans or subprojects as time slice activities over the course of the project.
13. In addition, if there are sectorwide issues that cannot be addressed through individual subproject EAs (and particularly if the SIL is likely to include Category A subprojects), the borrower may be required to carry out sectoral EA before the Bank appraises the SIL.
14. Where, pursuant to regulatory requirements or contractual arrangements acceptable to the Bank, any of these review functions are carried out by an entity other than the coordinating entity or implementing institution, the Bank appraises such alternative arrangements; however, the borrower/coordinating entity/implementing institution remains ultimately responsible for ensuring that subprojects meet Bank requirements.
15. The requirements for FI operations are derived from the EA process and are consistent with the provisions of para. 6 of this OP. The EA process takes into account the type of finance being considered, the nature and scale of anticipated subprojects, and the environmental requirements of the jurisdiction in which subprojects will be located.
16. Any FI included in the project after appraisal complies with the same requirement as a condition of its participation.
17. The criteria for prior review of Category B subprojects, which are based on such factors as type or size of the subproject and the EA capacity of the financial intermediary, are set out in the legal agreements for the project.
18. For the Bank's approach to NGOs, see [GP 14.70](#), *Involving Nongovernmental Organizations in Bank-Supported Activities*.
19. For projects with major social components, consultations are also required by other Bank policies--for example, [OP/BP 4.10](#), *Indigenous Peoples*, and [OP/BP 4.12](#), *Involuntary Resettlement*.
20. For a further discussion of the Bank's disclosure procedures, see *The World Bank Policy on Disclosure of Information*. Specific requirements for disclosure of resettlement plans and indigenous peoples development plans are set out in [OP/BP 4.10](#), *Indigenous Peoples*, and [OP/BP 4.12](#), *Involuntary Resettlement*.
21. See [OP/BP 13.05](#), *Project Supervision*.

[Annex A - Definitions](#)

[Annex B - Content of an Environmental Assessment Report for a Category A Project](#)

[Annex C - Environmental Management Plan](#)

ANNEX-2

Waste Water Effluent Discharge Quality Standards

Table 1: EU Council Directive 97/271/EC (UWWTP Directive)

Parameters	Maximum Effluent Concentration
BOD ₅ - Biochemical Oxygen Demand	25 mg / l
COD – Chemical Oxygen Demand	125 mg / l
TSS – Total Suspended Solids	35 mg / l
TN- Total Nitrogene	15 mg / l
TP – Total Phosphorus	2 mg / l

Table 2: Comparison of Effluent Discharge Quality Standards (National and EU)

Parameters	AZERBAIJAN Social and Sanitary Needs	EU Wastewater Effluent Discharge Quality Standards
pH	-	-
Chemical oxygen demand, mgO/l	-	125
Biochemical oxygen demand (BOD ₅), mg/l	>3.0-6.0	25
Total Suspended solids, mg/l	-	35
Ammonia (N-NH ₄), mgN/l	2	
Nitrite (NO ₂), mg/l	1	
Nitrate (NO ₃), mg/l	1	
Nitrogen, Total as N, mg/l	-	10 (>100,000 pe)
Nitrogen, Total as N, mg/l	-	15 (10 000-100,000 pe)
Phosphate (P04 ⁻³), mg/l	-	
Phosphorus, Total as P, mg/l	1	1 (>100,000 pe)
Phosphorus, Total as P, mg/l	-	2 (10,000-100,000 pe)
Suspended matter	0.75	
Dissolved oxygen	>4.0	
Oil products	0.3	
Phenol	0.001	
Iron	0,5	
Copper	1	
Zink	1	
Chrome+3	0.5	
Chrome+6	0.1	
Nickel	0.1	
Cobalt	0.1	
Lead	0.03	
Mercury	0.0005	
Molybdenum	0.25	

Table 3: Microbiological and parasitological indications of waste water quality, relevant for irrigation

Indicators	Admissible Composition in 1 cubic decimeter
Number of LPB (lactose positive bacillus)	<10000
Pathogenic microorganisms	Absence
Viable eggs of geohelminths, ascarid, whipworm, hookworm	<1
Viable eggs of biohelminths (oncosphere, heniide, eggs of liver fluke)	<1
Viable cyst of intestinal pathogenic protozoa (cyst of lamblias, Balantidium, oocyst, cryptosporidium)	<1

ANNEX-3

Hydrology, Hydrogeology, Water Quality and Water Balance in the Proposed Catchment And Relevant National / International Standards

Table of Contents

Overview	3
1 Topography of the Proposed Catchment Area	3
2 Water Quality in the Proposed Water Source	3
2.1 Water Quality Assessment	5
3 Hydrogeology in the Proposed Catchment Area	10
3.1 Hydrology in the Proposed Catchment	11
3.1.1 Tengerudchay River	11
3.2 Water Balance in the Proposed Catchment	12
4 National / International Drinking Water Quality Standards	14

List of Tables

Table 1	Test Results of the water samples from Surface Water of Tengerudchay River, Sipyapard Bridge (Akkorpu) level	3
Table 2	Flow Rates Probabilities for time series of 70 years, Tengerudchay River, Vaqo HS (1938 – 2006) level	12
Table 3	Probable flow rates of Tengerudchay Vaqo Level	12
Table 4	Comparative Table of National and International Drinking Water Standards	14
Table 5	EU Council Directive 98/83/EC	15
Table 6	Maximum Allowable Concentrations (MAC) in Drinking Water (National)	16

List of Figures

Figure 1	Peculiarities of Hydrogeology of anticlinal structures of fold mountain systems of Minor Caucasus – Talish Region (A.V. Kudelsky, Minsk 1990)	11
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Hydrology, Hydrogeology, Water Quality and Water Balance in the Proposed Catchment, and Relevant National / International Standards

Overview

The water balance calculation and water quality are very important matters in the water resource management. The water balance includes two parameters: input and output. The input parameter is consisted from surface recharge (precipitation, irrigation return water, surface runoff recharge) and under ground inflow (flow from adjacent aquifers).

Although, the area is rich in respect of the spring water sources, there is no one which has sufficient water release in or nearby the Project service area. The ground water resources and alluvial river basins which can provide sufficient sub-surface groundwater are limited in the region.

The Surface Water Diversion (SWD) from Tengeruchay river has been selected for the raw water requirements of the project by the Feasibility study team in consultation with the AWM OJSC and relevant Public Utility Departments of the rayon.

Currently, 10 % of population of Astara city is provided by drinking water, which is infiltrated from Astarachay river north bank by horizontal infiltration gallery diversion (HIGD) unit located nearby Alasha village.

1. Topography of the Proposed Catchment Area

The catchment area is a section of Tengerudchay river valley between Lomin and Vovoda villages. The relief of catchment varies between 295 and 290 masl nearby the bridge. The valley is surrounded the hills of midhighland of south Talish ranges. The area is located in Hirkan National Park (HNP), and approximately 25.4 km far from Astara city. The proposed raw water pipeline will travel approximately 3.5 km nearby HNP along the Sim – Astara road.

2. Water Quality of the Proposed Water Source

A water sampling campaign is conducted on the surface waters of Tengerudchay river obtained from this section by the Feasibility Consultant. The water sampling campaign with the surface water of Tengerudchay river has been completed in September 27, 2010.

The water samples have been tested by Azecolab Company registered in Azerbaijan, and the results are in the following table;

A water quality assessment regarding the surface water quality of the reservoir according to the results obtained from the Feasibility Consultant, is given below.

Table 1: Test results of the water samples from surface water of Tengerudchay river, Sipiypard bridge level

Parameters	Unit	Standards				Test Result
		EU 98	WHO	Gost 2874-82	USEPA	
Microbial Parameters						
Escheria Coli	c/100 ml	0/250 ml	-	0	-	11
Coliform Pathogens	c/100 ml	0/100 ml	-	3	-	38
Enterococci	c/100 ml	0/250 ml	-	-	-	20
Pseudomonas Aeruginosa	c/100 ml	0/250 ml	-	-	-	6
Clostridium Perfringens	c/100 ml	0/100 ml	-	-	-	22
Colony Count at 22 ^o	c/1 ml	100 ml	-	100	-	140
Colony Count at 36 ^o	c/1 ml	20 ml	-	-	-	105

Organoleptic Parameters						
Odor	ton	no abnormal change	Acceptable to consumer	2	3	1
Taste	Dillution number	no abnormal change	Acceptable to consumer	2	3	1
Turbidity	NTU	no abnormal change	Acceptable to consumer	1.5	4	4
Suspended Solids	mg/l	no abnormal change	Acceptable to consumer	1.5	Acceptable to consumer	<1
Physical and chemical parameters						
Colour	mg/lPt/Co	no abnormal change	Acceptable to consumer	20	15	<5
Electrical conductivity - 25 ^o	uS/cm	2500	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	248
Oxydation - 25 ^o	mV	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	266
pH – 25 ^o		6.5 – 9.5		6 – 9	6.5 – 8.5	7.71
Dissolved oxygene - DO	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	8.37
Hardness as CaCO ₃	mgCaCO ₃ /l	Acceptable to consumer	Acceptable to consumer	7 mol/m ³	Acceptable to consumer	93
Alkalinity as CaCO ₃	mgCaCO ₃ /l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	90
Brom	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	0.02
Major Anions						
Chloride	mg/l	250	Acceptable to consumer	350	250	1.5
Sulphate	mg/l	250	Acceptable to consumer	500	250	63
Bicarbonate – HCO ₃	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	110
Nitrite – NO ₂	mg/l	0.5	Acceptable to consumer	Acceptable to consumer	1	0.009
Nitrate – NO ₃	mg/l	50	Acceptable to consumer	45	10	5.8
Fluoride -F	mg/l	1.5	Acceptable to consumer	0.7	4.0	0.66
Free Cyanide -Cn	mg/l	0.05	Acceptable to consumer	Acceptable to consumer	0.2	0.003
Major Cations						
Natrium - Na	mg/l	200	Acceptable to consumer	Acceptable to consumer	200	15.4
Kalium - K	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	0.24
Calcium - Ca	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	17.25
Magnesium - Mg	mg/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	2.13
Ammonium – NH ₄	mg/l	0.5	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	0.04
Bor - B	mg/l	1.0	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	0.19
Radioactive isotops						
Radium 226	Bq/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	180	<0.41
Radium 228	Bq/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	180	<0.29
Lead - Pb	Bq/l	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	<2.7
Tritium	Bq/l	100	Acceptable to consumer	Acceptable to consumer	Acceptable to consumer	<1
Heavy Metals						
Aluminum - Al	µg/l	200	200	500	50	20.9
Arsenic - As	µg/l	10	10	50	10	1.76

Chrome - Cr	µg/l	50	50	500	100	0.37
Nickel - Ni	µg/l	20	20	100	100	0.06
Selenium - Se	µg/l	10	10	10	50	<0.5
Mercury - Hg	µg/l	1	1	1	2	<0.2
Antimony - Sb	µg/l	5	5		6	0.14
Iron – Fe (total)	µg/l	200	No guideline	300	300	77.9
Manganese - Mn	µg/l	50	50	100	50	19.3
Copper - Cu	µg/l	2000	2000	1000	1300	0.25
Cadmium - Cd	µg/l	5	3	1	5	<0.01
Lead - Pb	µg/l	10	10	30	15	<0.01

Source : Water quality test report, Lankaran Region, Qrunt Geo Ltd. Azecolab, Sept 27, 2010

: Exceedance Parameters.

2.1 Water Quality Assessment

Mainly, the aim of the water sampling campaigns and testing processes are to determine the nature and the impact of pollution on the water quality of proposed water source.

According to reports of above mentioned Study Group, Samples have generally be collected in good quality polyethylene bottles of 0.33 liter capacity. Sampling has been carried out directly without adding any preservatives in clean bottles to avoid any contamination and brought to the laboratory. No parameter has been determined at the site with the help of digital portable water analyzer kits, and measured in situ by the practitioner of the groups.

Assessment

pH

Findings from	Test Results	Standards Gost 2874.82	EU	WHO
	7.71	6-9	6.5-9.5	6.5-8.5

The pH of the water is important because it affects the solubility and availability of nutrients and how they can be utilized by aquatic organisms. According to the potability standards of natural water the pH value varies usually between 7.2 and 7.6. Although, a slight increase is observed in the pH value (7.71) of samples tested, it is between the limits of the standards prescribed by Gost and EU 98 and WHO standards.

Odor, threshold Odor number

Findings from	Test Results	Standards Gost 2874.82	EU	WHO
	1	2	Acceptable to consumers	-

2 threshold odor numbers are recommended only in Gost, and any recommendation does not exist in the WHO. Besides that, Directive of EU 98/83 uses the statement 'Acceptable to consumers' for this parameter. An undesirable odor is not detected in the tests.

Taste

Findings from	Test Results	Standards Gost	EU	WHO
---------------	--------------	----------------	----	-----

2874.82

1	-	Acceptable to consumers	-
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There is no threshold limit value on the base standards, Gost or WHO. Besides that, Directive of EU 98/83 uses the statement 'Acceptable to consumers' for this parameter. However, any unacceptable taste is not detected in the tests.

Color, mgPt/L

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	<5	<20	Acceptable to consumers	-

The WHO does not recommend any limit values. However, Gost recommends for this parameter needs to be less than 20 color unit. Besides that, Directive of EU 98/83 uses the statement 'Acceptable to consumers' for this parameter.

Colorful water is not preferred in terms of health and aesthetic. Dissolved or dispersible minerals and organic elements make the water colorful. The sample tested has the value well below the standard prescribed by GOST.

Turbidity, NTU

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	4	<1.5	Acceptable to consumers	-

The WHO does not recommend any limit values. However, Gost recommends for this parameter needs to be less than 1.5 NTU. Besides that, Directive of EU 98/83 uses the statement 'Acceptable to consumers' for this parameter.

Turbidity is a measure of the clarity of the water. Turbidity is measured in Nephelometric Turbidity Units (NTU). It is the amount of solids suspended in the water. It can be in the form of minerals or organic matter. Turbidity is caused by the existence of clay, silica, organic matter, microscopic organisms, precipitated calcium carbonate, aluminum hydroxide, ferrous hydroxide and similar materials.

According to test results, the sample tested has higher value than the standard prescribed by GOST.

Conductivity, uS/cm

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	248	<1500	1500	1500

Conductivity is the ability of the water to conduct an electrical current, and is an indirect measure of the **ion concentration**. The more ions present, the more electricity can be conducted by the water. This measurement is expressed in microsiemens per centimeter (uS/cm) at 25 degrees Celsius.

The value of conductivity of the raw water is below the standard prescribed by GOST, EU 98, and WHO.

TSS (Total Suspended Solids), mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	<1	1.5	-	Not mentioned

Total suspended solids is a measure of the amount of particulate solids that are in solution. This is an indicator of nonpoint source pollution problems associated with various land use practices. The TSS measurement should be obtained with the conductivity meter and is expressed in (mg/L). The detected amount of TSS in the samples is well below the standards prescribed by Gost.

Hardness as CaCO₃, mg CaCO₃/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	90	Not mentioned	Not mentioned	Not mentioned

Appropriate hardness for drinking water is 75-100 mg CaCO₃/l. This parameter is not mentioned in the relevant standards. If measured value exceeds 300 mg CaCO₃/l, it corresponds to the "very hard" class which means that the water shall be subjected to the softening process for the removal of hardness. However, the hardness of the raw water is appropriate for drinking water.

Iron (Fe), mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	0.0779	0.3	0.2	No Guideline

There is no guideline in the WHO for this parameter. Iron content in drinking water causes to increase the corrosion in the network. However, a certain amount of iron in drinking water do not cause the negative effects on human health, contrarily, a certain amount of iron is required for alimentation.

The detected amount of Iron in the samples is well below the standards prescribed by Gost and EU 98.

Manganese (Mn), mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	0.0193	0.1	0.05	0.05

Manganese is generally observed in under ground water and water reservoirs that is close to base. Increasing the pH in water causes manganese compounds to settle in insoluble forms. However, a certain amount of Mn in drinking water do not cause the negative effects on human health, and it is not

an aesthetic concern to drink. Nevertheless, excess manganese in water network accelerates microorganism growth as “Crenotrics”.

The detected amount of Manganese in the samples is well below the standards prescribed by Gost, WHO, and EU 98.

Mg (Magnesium), mg/l

Findings from	Test Results	Standards		
		Gost 2874.82	EU	WHO
	2.13	50	50.05	-

The sample has the value below the standards prescribed by Gost and EU 98.

Calcium (Ca), mg/l

Findings from	Test Results	Standards		
		Gost 2874.82	EU	WHO
	17.25	250	100.06	-

The sample has the value below the standards prescribed by Gost and EU 98.

Natrium (Na), mg/l

Findings from	Test Results	Standards		
		Gost 2874.82	EU	WHO
	15.4	-	200	-

The value of Natrium of the samples is below the standard prescribed by EU 98.

Ammonium (NH₄), mg/l

Findings from	Test Results	Standards		
		Gost 2874.82	EU	WHO
	0.04	-	0.5	-

The value of Ammonium of the samples is below the standards prescribed by EU 98.

Nitrite (NO₂), mg/l

Findings from	Test Results	Standards		
		Gost 2874.82	EU	WHO
	0.009	Traces	0.5	-

The sample has the value below the standards prescribed by EU 98.

Nitrate (NO₃), mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	5.8	45	50	-

The sample has the value below the standards prescribed by the relevant standards.

Sulphate (SO₄), mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	63	500	250	500

The sample has the value of Sulphate below the standards prescribed by EU 98, GOST and WHO.

Chloride, mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	1.5	350	250	250

The sample tested, has the value below the standard prescribed by GOST, EU 98 and WHO.

Fluoride, mg/l

<i>Findings from</i>	<i>Test Results</i>	<i>Standards Gost 2874.82</i>	<i>EU</i>	<i>WHO</i>
	0.66	1.5	1.5	1.5

In order to control tooth diseases, this value shall be increased to the 1 mg/l by fluoride dosing. The sample has the value below the standards prescribed by the relevant standards.

Microbiological Parameters

Number of colony per each ml at 22°C is 140, and 105 at 36°C. Number of Enterococi per each 250 ml is 20, and Escheria coli per each 250 ml is 11 in the river water. Number of Coliform Pathogenes per each 100 ml is 38, and Clostridium Perfiringens per each 100 ml is 22.

Conclusion

The above test results show that the surface water of Tengerudchay river is highly contaminated by the Enterococs and other microbial indicators because of breeding of stocks and grazing activities at the upstreams of river. By means of pre-chlorination and sand filter processes, these values are decreased to the required limit values.

Fluoride anions should exist in values of 1 mg/L for the control of tooth diseases. Before supply of water to the network, fluoride should be dosed by considering this value.

The river water tested is fully in compliance with the limit values defined in the EU standards for the other physical, chemical and organic parameters.

In addition, not only water quality analysis should be performed at regulated frequencies but also should be monitored routinely.

3. Hydrogeology in the Proposed Catchment Area

The theoretical concepts of classical hydrogeology which result from the experience obtained in this field of science in the eighteenth-nineteenth centuries in pre-Alpine countries considered mountainous structures including fold-mountain ones as areas of "catchment" and "pressure creation" for water bearing horizons of the entire sedimentary rock profile of adjacent hydrogeological basins.

The directions of movement of under ground waters were considered to be centrifugal relative to fold-mountain systems. Along with this, the washing out down to the basement and homogeneity of the hydrogeochemical profile represented mainly by fresh waters were attributed to the latter.

Such ideas neglecting frequent and widely known shows of mineral and thermal waters, the presence of oilgas fields in the profiles of intramountain depressions and on subsided fold-mountain depressions and on subsided fold-mountain megastructures disoriented for many decades. The development of theoretical hydrogeology and hydrogeochemistry and, naturally, did not promote the elaboration of rational water supply systems on the territory of mountainous countries and foothills.

Peculiarities of hydrogeology of anticlinal structures of fold-mountain systems at the summits of this Minor Caucasus ranges (Talış zone) is shown in Figure 1. A rapid movement of under ground crack-confined waters involves water-bearing horizons of steep and highly raised slopes. The under ground waters show the fastest velocity along the rock stratification, and the filtration rate sharply decreases in a direction perpendicular to this stratification.

Therefore, the "washout" of this anticlinal structures of ranges made up of volcanogenic sedimentary rocks, occurs "scalewise". The vertical filtration of atmospheric waters in anticlinal arches is quite feeble.

Deposits in the central parts of even very large and highly raised anticlines, which are not exposed by erosion, are often not washed out and contain highly mineralized waters (See Figure 1).

Infiltration waters of the slopes of these mountain ranges migrate to short distances, and a major portion of them leaks in situ, on monoclines, as hillside contact springs, or those confined to the contact lines of water-bearing rocks with water-resisting ones at the foot of the slopes.

Since thick regional leakage areas of fresh under ground waters have been known in the outlying areas of this Alpine zone. Basing on this fact, some researchers concluded that there was a connection between the under ground waters of this folded regions of Minor Caucasus and the middle waters of associated areas of alluvial, intermountain troughs and depressions.

Therefore, the leakage of fresh under ground waters at the boundary of these mountain structures and associated depressions should be considered not as an evidence of the relationship between the former and the latter, but as an indication of their hydrodynamic disconnection and hampered water exchange within depressions.

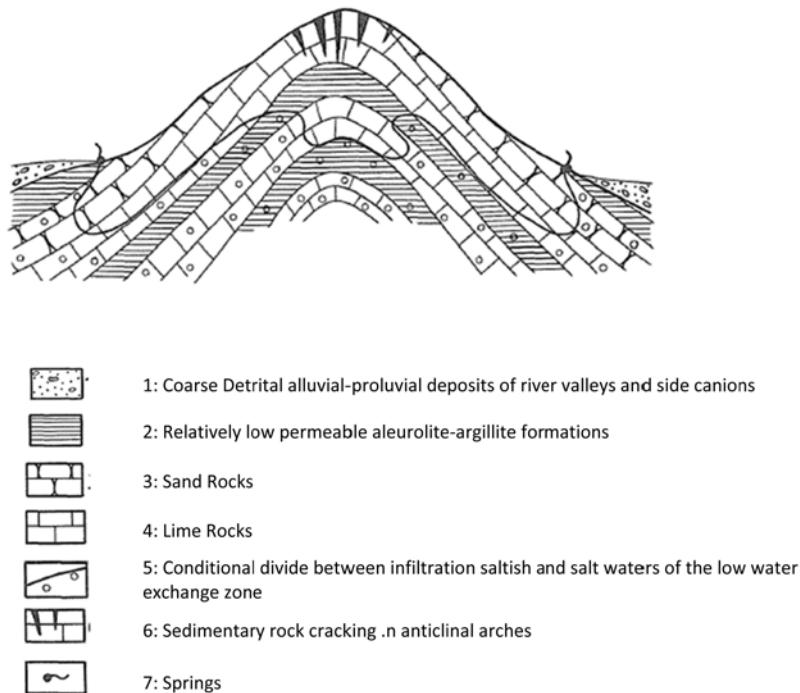


Figure 1, Peculiarities of Hydrogeology of anticlinal structures of fold mountain systems of Minor Caucasus – Talish Region (A.V. Kudelsky, Minsk 1990)

3.1 Hydrology on the Proposed Catchment

3.1.1 Tengerudchay River

The Tengerudchay is sourced from the several springs at the highlands of the northwest declivities of Shandanqala mountain (1620 masl). The river travels northeasterly up to Caspian Sea. Its length is 36 km, the basin area 239 square km. A 21 km upstream of the river travels at a mid highland zone up to Vanashikash village. A section of approximately 6.2 km of the river basin falls into the Hirkan National Park from Vovoda to Vanashikash village in the area of Astara rayon. The rest 11 km section of the river travels in the Lankaran lowland northeasterly. The main branches of the river are Siyakuchay and Pelikeshchay rivers which join Tengeruchay nearby Pelikesh and Siyaku villages.

The river has a flooded regime. The Tengeruchay river is fed mostly by several springs (5 %) along its basin, storm water (70 %), partially subsurface (20%), and snow (5%) in its upstreams.

The Tengeruchay flow was routinely measured on three Hydrometeorological Stations (HS), which are Vaqo in Astara rayon, Riqnakesh, and Sim in Astara rayon. Vaqo Hydrometeorological Station is being operated since 1938, Riqnakesh HS was operated from 1963 to 1995, and Sim HS from 1960 to 1962.

Hydrological team of the Feasibility Consultant has conducted a preliminary calculation for estimating the possible annual and perennial average flow rates of the river using analogue method with the historical data obtained from Vaqo HS.

The results obtained with this method may be acceptable with an allowable amount of variation. Typically, the interval may be as high as +/- 15-20 % due to potential variability of the runoff from the seasonal rainfall and snow on the region.

Presuming the results of the Feasibility Consultant's hydrological team is valid, the Tengerudchay river's annual average flow rates will be as follows;

Table 2: Flow Rates Probabilities for time series of 70 years, Tengerudchay Vaqo HS (1938-2006)

Probability, %	1	5	10	50	75	95
Flow Rates, m3/s	7,07	5,39	4,71	2,88	2,23	1,52

The Feasibility Consultant's hydrological team has calculated the average monthly flow rates for monthly mean values of flow rates (1938-2006) of the river extending the time series up to backwards of approximately 69 years. The long term characteristic data of the region has been taken into account on the calculations.

Table 3: Probable flow rates of Tengerudchay Vaqo Level

Months	1 (cum/ s)	2 (cum/ s)	3 (cum/ s)	4 (cum/ s)	5 (cum/ s)	6 (cum/ s)	7 (cum/ s)	8 (cum/ s)	9 (cum/ s)	10 (cum/ s)	11 (cum/ s)	12 (cum/ s)	Annual Mean Values (cum/s)
Monthly perennial mean values of 69 years	2.24	2.67	4.72	4.08	2.21	1.37	0.84	1.42	4.38	6.07	4.25	2.81	3.10
95 % (1998)	1.05	1.80	2.10	1.64	0.35	0.54	0.57	1.09	3.00	3.59	1.40	2.15	1.60

The annual average water flow is 37.06 cum/s. Its 30% passes in spring, 10% in summer, 40% in autumn, and 20% in winter. However, at its low streams in Lankaran lowland, surface run-off from the atmospheric precipitation (70-75 %) and sub-surface lateral inflows (20-25 %) play the main role in its flow volume.

There is no water reservoir on its upstreams for flood control, irrigation purposes, or water supply. However, the huge volume of water of the river is used in Astara irrigation scheme connecting Penserchay – Caladahna canal network after Lelekepeshte village. The river falls into Caspian Sea nearby Shahagach village. Unfortunately, no information exist that how many volume of river's water is diverted for irrigation purpose.

The river's water is being tested routinely by MENR of Azerbaijan. According to the test results obtained from MENR for 2010, the total mineralization of river's water varies between 467.4 (in February) and 684.1 (in June) mg/l in Vaqo level. DO levels vary between 6.94 mg/l (in June) and 7.91 mg/l (between Feb. and April), and TSS between 4 mg/l (in February) and 69 mg/l (in June) at the same point. However, the test results show that the river's water does not contain high heavy metal concentrations in respect of Fe, Cu, and Zn.

3.2 Water Balance in the Proposed Catchment

Native streamside vegetation in the riparian zone must have natural flow in order to survive and reproduce. The plants, fish, and wildlife in any given river have evolved to adapt to that river's unique rhythms. Altering natural flow can harm these species. The minimum desirable streamflows must always be satisfied.

Minimum stream flow is a level which the amount of flow in a specified stream should not drop. The amount of water that can be approved for a minimum stream flow is the minimum -not the most desirable- flow necessary to protect the fish and wildlife habitat, aquatic life, water quality, recreation, aesthetic beauty, navigation or transportation.

In most of the smaller rivers (such as Tengerudchay river), habitat/flow relationships are linear, so that the flow that retained two-thirds habitat at median flow is two-thirds the median flow, or approximately 30% of average flow (Tennant, 1976). 30% of average flow or higher provides average depth and velocity, and is considered to be in the good to optimum range for aquatic organisms.

In Astara case, water planning quantitative evaluations of 'Ecological Flows' considered as minimum instream flows are patterned with limnological and hydrogeological knowledge of the proposed

catchment on the course of Tengerudchay river. We generally select as an indicator a large native fish species of the stream reach that is at the top of the trophic pyramid (trout, barbell, salmon, nase). However, this section of Tengerudchay river has the torrential stream; it does not naturally sustain much fish species up to Lankaran lowland. As this situation does not predict fish densities or biomass, we are interested only in the physical habitat that is controlled by instream flows.

Because of this reason, the water balance for this section of Tengerudchay river is examined from the perspective of required minimum ecological flow (30 % of average flow of the river) for the aim of this Project. Quantitative instream flow method is used patterning the results of international investigations for the required ecological minimum flow balance.

The following figures are assumed as the worse case scenario for the section of the proposed raw water catchment on the Tengerudchay river course, and those are as follows;

- Minimum required ecological flow (30 % of average flow of the river) is $1600 \text{ l/s} \times 0.30 = 480 \text{ l/s}$ see Table 4 of this Annex.
- Water Supply Requirement of Astara by 2030 is **65.85 l/s**, see Chapter 2, Table 2,6.
- Surplus flow after meeting the requirement of water supply and minimum required ecological flow is $(480 + 65.85 - 1600) = 1054.15 \text{ l/s}$.

Accordingly, constructing a diversion unit to divert the required raw water at this section of Tengerudchay river will disturb neither the river's ecological environment nor natural flow of the river.

4. National / International Drinking Water Quality Standards

Table 4: Comparative Table of National and International Drinking Water Standards

Environmental Parameter	WHO	US EPA	EC	Azerbaijan (SanPin,GO ST)
Inorganic components, mg/dm³				
Ammonium, (N-NH ₄ ⁺),	1.5	-	0.54	-
Chlorine:	0.5-5.0-			
-Residual free		-	-	0.3-0.5
-Residual connected				0.8-1.2
Nitrates (NO ₃)	50.0	44.01	50.03	45.0
Nitrites (NO ₂)	3.0	3.31	0.53	3.0
Sulfates (SO ₄)	250.0	250.02	250.04	500.0
H ₂ S	0.05	-	-	0.03
AL	0.2	0.22	0.24	0.5
AL	0.2	0.22	0.24	0.5
Ba	0.7	2.01	0.16	0.1
Be	-	0.0041	-	0.0002
B	0.3	-	1.03	0.5
V	-	-	-	0.1
Bi	-	-	-	0.1
W	-	-	-	0.05
Eu	-	-	-	0.3
Fe	0.3	0.32	0.24	0.3
Cd	0.003	0.0051	0.0053	0.001
K	-	-	12.05	-
Ca	-	-	100.06	-
Co	-	-	-	0.1
Si	-	-	-	10.0
Li	-	-	-	0.03
Mg	-	-	50.05	-
Mn	0.5 (0.1)	0.052	0.054	0.1
Cu	2.0 (1.0)	1.02-1.31	2.03	1.0
Mo	0.07	-	-	0.25
As	0.01	0.051	0.013	0.05
Na	200.0	-	200.04	200.0
Ni	0.02	-	0.023	0.1
Nb	-	-	-	0.01
Hg	0.001	0.0021	0.0013	0.0005
Rb	-	-	-	0.1
Sm	-	-	-	0.024
Pb	0.01	0.015	0.01	0.03
Se	0.01	0.05	0.01	0.01
Ag	-	0.12	0.015	0.05
H ₂ S	0.05	-	-	0.03
Sr	-	-	-	7.0
Sb	0.005	0.006	0.005	0.05
Tl	-	0.002	-	0.0001
Te	-	-	-	0.01
P	-	-	-	0.0001
F	1.5	2.0-4.0	1.5	1.5
Chlorine:				
-Residual free	0.5-5.0-	-	-	0.3-0.5
-Residual connected				0.8-1.2
Cl ⁻)	250.0	250.0	250.0	350.0
Cr ³⁺	-	-	-	0.5
Cr ⁶⁺	0.05	0.1	0.05	0.05
CN	0.07	0.2	0.05	0.035
Zn	3.0	5.0	5.0	5.0
Organic components, ug/dm³				
<i>chlorinated alkanes</i>				

Environmental Parameter	WHO	US EPA	EC	Azerbaijan (SanPin,GO ST)
carbon tetrachloride	2	5	-	6
dichloromethane	20	5	-	7.5
1,2- dichloroethane	30	5	3	-
chlorinated ethylene				
vinyl ehloride	5	5	0.5	50
1,1-dichloroethylene	30	7	-	-
1,2-dichloroethylene	50	170	-	-
trichloroethylene	70	5	10	-
tetrachloroethylene	40	5	10	-
<i>aromatic hydrocarbons</i>				
benzol	10	5	-	10
toluol	700	1000	-	500
xylene	500	10000	-	50
ethylbenzene	300	700	-	10
styrene	20	100	-	100
polycyclik aromatic hydrocarbons	-	-	0.1	-
benzpyrene	0.7	0.2	0.01	0 – 5
Benzpyrene benzol				
Mono chlorbenzene	300	100	-	20
1,2- dichlorobenzene	1000	600	-	2
1,4- dichlorobenzene	300	-	-	-
Trichlorbenzol	20	70	-	30
<i>Next compo</i>				
acrolein	-	-	-	20
Di (2-ethylhexyl)adipate	80	400	-	-
Di (methyleptyl)ftalaat	8	6	-	-
acrylamide	0.5	-	-	10
epichlorhydrin	0.4	-	0.1	10
hexachlorobutadiene	0.6	-	-	10
hexachlorochiklopendadiene	-	50	-	1
EDTA	200	-	-	-
Nitrioltriactic acid	200	-	-	-
Surface active substances (SSAS)	-	-	-	500

Source: EIA report for NWSSP, Azersu, Feb. 2008, Baku.

Table 5: EU Council Directive 98/83/EC

Parameters-Drinking Water	Council Directive 98/83/EC
Aluminum (only if used as flocculants)	0,2 mg /lit
Ammonium	0,5 mg / lit
Color	Record observation
Clostridium perfiringens (including spores) (only if water originates from or is influenced by surface water)	0 per 250 ml
Escherichia coli	0 per 250 ml
Hydrogen ion concentration	6-9
Iron (only if used as flocculants)	0,2 mg /l
Nitrite (only when chloramination is used as a disinfectant)	0,5 mg /l
Odour	Record observation
Taste	Record observation

Table 6: Maximum Allowable Concentrations (MAC) in Drinking Water (National)

No	Substances	Maximum Limits (mg/l)
1	Smell at 20 °C temperature	<2 threshold odor number
2	Color	<20 color units
3	Turbidity	<1.5 NTU
4	pH	6-9
5	HCO ₃ ⁻	>3
6	Ca ²⁺	180
7	Mg ²⁺	40
8	Na ⁺	170
9	Polyphosphate residual (PO ₄ ⁻)	3.5
10	Hardness	7 mg-equiv.
11	Mineralization	<1000 (1500)
12	Total Dissolved Solids	1,000
13	N ₂ O ₅	29
14	NO ₂	traces
15	NH ₄	traces
16	NO ₃	10
17	Cl ⁻ (chlorine)	25-50
18	Cl ₂ (chloride)	350
19	SO ₄ ²⁻	100
20	both iron oxides Fe ²⁺ and Fe ³⁺	0.3
21	total content of Fe ⁺ and Mn	0.5-1.0
22	Oxidation	O ₂ 2.5-3 KMnO ₄ 10
23	Pb (lead)	0.03
24	As (arsenic)	0.05
25	Cu (copper)	1.0
26	F ⁻ (fluoride)	1.5
27	Al (aluminum)	0.5
28	Be (beryllium)	0.0002
29	Mo (molybdenum)	0.25
30	Se (selenium)	0.001
31	Sr (strontium)	7.0
32	Zn (zinc)	5.0
33	H ₂ S	0.0
34	Hg, Ba, hexavalent Cl and other poison contaminations	0.0
35	TVC@ 37°C	100 in 1 cm ³
36	Total Coliforms in 1000 ml water (E coli-index) (MPN)	3

Source: Maximum Allowable Concentrations, GOST 2874-8, MOH

Note : There are some exclusions for drought regions: content of total dissolved solids can be up to 2,500-3,000 mg/l; Cl₂ up to 400-800 mg/l; SO₄²⁻ up to 1,000-1,500 mg/l; and general water hardness up to 21-40 mg-equiv.

ANNEX-4

Minutes of Meetings of Scoping Consultations

Session I,

**Session II,
&**

**Minutes of Meeting of General Public Consultation Meeting
(Session III)**

Minutes of Meeting Session I for Scoping the EIA

Date: September 7, 2010

Agreement:	EIA studies for 6 rayons (Lerik, Lankaran, Masalli, Astara, Jalilabad and Yardimli)
Project	:EIA Studies in 12 Rayons (Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay) of Azerbaijan for water supply and sanitation systems, Second National Water Supply and Sanitation Project (SNWSSP), Phase II
Consultant	: Aim Texas Trading LLC
Subject	:Consultations Process with Community
Session	: 1
Issues in agenda	: 2
	<u>Articles</u>
	1. Draw up an Environmental Checklist by the Consultant,
	2. Public Review Process for Scoping the EIA,
Venue	:Lankaran city, Upper Khanbulanchay Headworks Exploitation Unit, Conference Hall, Lankaran city, Azerbaijan

This meeting was held in accordance with Task 6 of the ToR signed in September 3, 2010 between the Amelioration and Water Management Open Joint Stock Company (the Client) and Aim Texas Trading LLC (the Consultant).

Environmental Specialist of the SNWSSP, Mr. Panah Abdullayev, while opening ceremony, provided detailed information about the Project, and informed on the works to be carried out with regard the improvement of water supply and reconstruction of waste water systems to be implemented in 4 central Azerbaijan rayons (Imishli, Kurdamir, Ujar, Zardab), two western rayons (Dashkasan and Gadabay), and 6 southern rayons (Lankaran, Astara, Lerik, Yardimli, Masalli, and Jalilabad). P. Abdullayev introduced Mr. Abdurrahim Tan, Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC, who will prepare the Environmental Impact Assessment Reports (EIARs) for 12 rayons of Azerbaijan.

Mr. Abdurrahim Tan, Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC, informed the participants on the main issues of EIA process, relevant environmental procedures to be implemented during the project, and specifically on the ambient air quality, and noise effects of the construction activities. He stated that this studies will contain the comprehensive information regarding the mitigation measures to avoid the negative impacts to be arisen on the cultural and archeological sites within the project corridor referring to certain examples.

Mr. Tan noted that the specialists (representatives) of the company will arrange the scoping consultation meetings with the Rayon Public Utility Departments (RPUDs), other intrested NGOs (specifically Water User Associations), individuals from the general public, even businessmen, housewives, farmers, an/or villagers. he was representing would have separate meetings with the community, population, relevant state and non-governmental

organizations, activists of Water Users Associations in every mentioned rayon. The Team Leader informed the participants that their opinions, suggestions and claims would be used while drafting the Final Report, and therefore asked the latter to be more active in providing their thoughts and suggestions.

The speaker also stated that the monitoring should be carried out not only during the construction period, and also it should continue during the operation period. The main objective of this study is to provide the site-specific environmental rules and regulations to be applied for the duration of the project, to minimize the negative effects of the activities on the human and natural environment.

And, the questions of the participants of the meeting were replied.

Mr. Alizaman Hamidov, deputy head of Areal department No 1 of the Ministry of Environment and Natural Resources of Azerbaijan Republic:

- Has the Ministry of Environment and Natural Resources approved the construction and project implementation?

Mr. P. Abdullayev, SNWSSP Environmental Specialist answered the question:

- This issue will be agreed with all the relevant ministries (including the Ministry of Health, Ministry of Environment and Natural Resources and etc.) prior to start of the construction. Additionally, the assessment that is being implemented, is under the direct control of the government. The specialists of Aim Texas Trading LLC planned to visit Jalilabad, Masalli, Lankaran, Astara, Lerik and Yardimli rayons in the next period should be highly supported on all matters. Similar activities shall be implemented in other 6 rayons (Imishli, Kurdamir, Ujar, Zardab, Dashkasan and Gadabay) of the Republic. Relevant committees have been established headed by the deputies of the governors in all 12 rayons.

Mr. Hamil Hadiyev, head of Masalli rayon Department of the State Land and Mapping Committee of Azerbaijan Republic:

- I would request you to provide some information on the ways of solution of any potential problems related with the private lands and compensation during the construction.

Mr. Abdurrahim Tan, Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC answered the question:

- During the surveys it will be attempted to avoid interference to private lands for the construction purposes, the hazard and damages on the private lands shall be compensated with the adequate compensation methods in accordance with the relevant Laws of Azerbaijan and Resettlement Policy Framework to be prepared for the project. The compensation may be in-kind and/or monetary.

Mr. P. Abdullayev, SNWSSP Environmental Specialist added:

- The specialists will also survey the project corridor proposed by the Feasibility Consultant and AWM OJSC, and also remark the inconsistencies from the perspective of the environmental indicators.

After the questions and answers session, the participants were distributed draft environmental checklist drawn by the Consultant, and the method of their filling was explained. It was decided to fill the questionnaires and submit to Project officials after a few days.

Date: September 7, 2010

Fuad Dergahli

(Secretary of the meeting)

#	Name of the participant	Representing entity	Contact details
1	Panah Abdullayev	Environmental Specialist of the SNWSSP from AWM OJSC	050 373 75 51
2	Abdurrahim Tan	Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC	050 331 23 59
3	Fuad Dergahli	Public Awareness Specialist, from Environmental Consultant, Aim Texas Trading LLC	055 657 42 70
4	Enver Safarzadeh	Environmental Specialist, Site Team Leader, from Environmental Consultant, Aim Texas Trading LLC	055 779 02 07
5	Alizaman Hamidov	Deputy head of Areal department No 1 of the Ministry of Environment and Natural Resources	050 370 20 77
6	Allahyar Salayev	Head of Lankaran Upper Khanbulan Headworks Exploitation Unit	050 545 83 05
7	Fahraddin Babayev	Chief engineer of Lankaran Upper Khanbulan Headworks Exploitation Unit	050 492 42 92
8	Seyidaga Aliyev	Chief specialist of Lankaran Upper Khanbulan Headworks Exploitation Unit	050 610 80 41
9	Rovshan Tahmazov	Head of Lankaran rayon "Su Kanal" Department	0171 4 29 81
10	Hanifa Babayev	Chief adviser of State Land and Catography Committee for Lankaran rayon	050 370 44 45
11	Miraddin Ismayilov	Head of "Saglaser" Water Users Association	050 621 94 37
12	Maharram Ibrahimov	Head of "Mamusta" Water Users Association	050 568 49 68
13	Rahib Shahbazov	Chief accountant of Jalilabad rayon Irrigation Systems Department	050 379 70 80
14	Muzaffar Jahangirov	Head of Masalli rayon "Su Kanal" Department	050 553 37 70
15	Aghabey Aghayev	Head of Masalli rayon Vilashchay	050 325 58 91

		Water Reservoir Exploitation Unit	
16	Hamil Hadiyev	Head of Masalli rayon Department of the State Land and Cartography Committee	050 330 72 10
17	Fizuli Babayev	Head of Yardimli rayon "Su Kanal" Department	050 631 44 59
18	Ali Aliyev	Head of Yardimli rayon division of the State Land and Cartography Committee	050 796 86 10
19	Asif İmanov	Head of Lerik rayon "Su Kanal" Department	050 323 70 14
20	Azadkhan Asadullayev	Head of Lerik rayon division of the State Land and Cartography Committee	050 414 04 17
21	Agamoglan Huseynov	Head of Astara rayon "Su Kanal" Department	050 363 51 00
22	Habil Manafov	Head of Astara Irrigation Systems Department	050 392 46 71 0171 5 25 28
23	Eldar Guliyev	Head of Astara rayon division of the State Land and Cartography Committee	0171 5 14 44

Çallıbad, Masallı, Lənkəran, Astara, Lerik və Yardımlı şəhərlərinin
su təchizatı və kanalizasiya sistemləri layihəsi üçün Ətraf Mühitə Təsirlərin Qiymətləndirilməsi
(ƏMTQ) Sənədinin işlənilməsi üzrə



GÖRÜŞ

7 sentyabr 2010

Lənkəran şəhəri

#	İştirakçının soyadı, adı	Təmsil etdiyi təşkilat	Əlaqə məlumatları	İmza
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4	Babəyev Əkrəddin	Lənkəran YKH.L.L	Baş mətbəxə 050.492-42-92	
5	Əmədov Əliqan Nəbiyev	1 saylı orzu üzrə Ecology və Təbii Sənədlər şöbəsi	Ris məlumat 050 369 20 77	
6	Babəyev Əmir Nəbiyev	Dövlət torpaq VİP Xizmətinin rəhbəri	Baş mətbəxə 050 370 44 45	
7	Əliyev Əli Məhəmmədov	Dövlət torpaq VİP mərkəzinin rəhbəri	Müdiri 050 796-86-10	
8	Hadiyev Fəxrət Məhəmmədov	ƏT-00 XK-nin Masallı rayon şöbəsi	Müdiri 050 330 72 10	

9	Cahangirov Muzaffar Quliyev Eldar	Masalle Su-Kanal idarəsi AT v. XK - Astara rayon səhəsinin mədirləri	Zəris (050) 553-37-70 5.14.44	[Signature]
10	Manolov Habil	Astara SSI-nin Zərisi	5-25-28 0392-46-71	[Signature]
11	İsmailov Əmir Əli oğlu	Kərim Su-nəməli kəndinin məsuli ƏM v. XK-nin Zərisi cayın söhbətinin məsuli	50383 70-14 70 050 414 04 17	[Signature]
12	Fəxrəddinov Əhməd Əli oğlu	Astara Su-Kanal idarəsinin Zərisi	050 363-51-00	[Signature]
13	Əhmədov Rövşən	Pankovon Su-Kanal idarəsi, Zəris	4-28-81	[Signature]
14	Əhmədov Fəxrət	Fəxrətli Su-nəməli idarəsi, Zəris	050 631-44-59	[Signature]
15	Səlimov Əhməd Əli oğlu Əhmədov Əhməd Əli oğlu	Yuxarı Qəm bələdiyyəsi hidroponuqun idarəsi	050-515-82-05 4-21-29	[Signature]
16	Əhmədov Əhməd Əli oğlu	ƏM v. XK-nin Ekolojiya məntəxəsinin	050 373-75-57	[Signature]
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21				
22				
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Session II for Scoping the EIA Astara Rayon

Date: September 22.2010

Project :EIA Studies in 12 Rayons (Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay) of Azerbaijan for water supply and sanitation systems, Second National Water Supply and Sanitation Project (SNWSSP), Phase II.

Consultant : Aim Texas Trading LLC
 Subject : Scoping Consultation Process with Community
 Session : 2
 Issues in agenda : 3

Articles

3. Discussion of environmental problems informed during the meeting held in Upper Khanbulanchay Intake Maintenance Unit in Lankaran city held in September 7, 2010.
4. Questions & Answers on Environmental issues.
5. Technical site of the Survey for EIA study

Venue : Deputy Governor's office, Astara city, Azerbaijan

Scoping Consultation on TOR/EIA Stage 2, for Astara Rayon

Several potential items are taken into account in the second stage of EIA consultations. Meetings were held with Deputy Governor, Head of rayon SuKanal Department, Head of Astara Land and Cartography Department, Chief Editor of Astara Newspaper, Heads of other Public Utility Departments, Mayors of villages surrounding Astara city, and Heads of Water User Associations of Astara region, including local Non-Governmental Organizations. Besides, road-side consultations were held with the people from the city, to get their opinions on the existing WSS systems and the proposed Project.

Evaluation has been divided into long list and short list evaluations. Review target, review area, potential points and evaluation framework are as follows. The evaluation framework (Short list of Environmental Checklist) was determined in stakeholder meeting from 6 rayons (Jalilabad, Masalli, Lankaran, Astara, Lerik and Yardimli) conducted in YXID in September 7, 2010. The evaluation results were discussed in this stakeholder meeting.

Long List

- Target: Second National Water Supply and Sanitation Project, Phase II.
- Review Area: Astara rayon
- Way of Consultation: Meetings and Questionnaires with interested people
- Venue of Activity: Deputy Governor's Office, Astara city, Azerbaijan
- Date of Activities : September 22, 2010

Item No	Impacts		Impact Levels			
			Potentially Significant Impact	Less Than Significant with Mitigation incorporated	Less Than Significant Impact	No Impact
			Level 1	Level 2	Level 3	Level 4
1	Aesthetics					✓
2	Agricultural Resources			✓		
3	Air Quality			✓		
4	Biological	Terrestrial			✓	
		Aquatic			✓	
5	Cultural Resources					✓
6	Geology and Soils				✓	
7	Hazards and Hazardous Materials	Vectors				✓
		Contamination			✓	
8	Hydrology and Water Quality				✓	
9	Land Use and Planning				✓	
10	Mineral Resources					✓
11	Noise				✓	
12	Population and Housing					✓
13	Public Services				✓	
14	Recreation					✓
15	Transportation and Traffic				✓	
16	Systems' Utilities					✓

Initial Project Evaluation

The Feasibility Consultant and AWM OJSC envisaged to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement. Total length of the raw water pipeline will be 14.4 km to WTP.

As required by EIA regulations, the main alternatives are described in Chapter 2 (Project Description) of Draft EIA Report according to the information obtained from Project Feasibility Study Team and AWM OJSC.

Technical Scope of the EIA

The discussions on the ToR of EIA revealed the following range of environmental issues and they should be addressed as the part of EIA.

For the purposes of this EIA Study, the following list of issues has been refined and adapted with reference to this EIA process:

1. Land Use and Planning (construction camp, soil erosion, soil contamination and surface run-off),
2. Solid Waste, Hazardous Waste Disposal,
3. Water Resources,
4. Ambient Air Quality, Dust and Odor,
5. Noise,
6. Temporary Traffic Management,
7. Ecological Environment (vegetation, terrestrial wildlife, aquatic biology and fisheries),
8. Cultural Environment,
9. Systems' Utilities,

Question and answer session followed.

Questions and Answers:

Question – Heydar Dadashov (Astara, Water User Association, Local NGO):

- The people are suffering for the drinking water presently. Astara city has around 16,000 population. Rayon's population is over 97,000. We would like to know whether the new water supply system would cover some villages surrounding the city.

Answer – Anvar Safarzadeh (Environmental specialist from AIM Texas Trading LLC):

- The proposed project is intended to provide the full service of water supply and sanitation only for Astara city and Selakaran village. However, the branch connection manholes will be provided for the villages on the course of the raw water pipeline, such as Sipiypart, Jukas, Vanashikash, Noyabud and the villages surrounding the Barzuband. The required volume of raw water to be provided for these villages will be included into the amount of water to be diverted from the catchment, so that these villages may have sufficient drinkable water installing an appropriate treatment unit to the connection manholes with the local budget.

Question – Eldar Guliyev (Head of Land and Cartography Department of Astara):

The raw water pipeline will travel on the areas of a number of villages and local municipalities up to WTP, and then to the city. How will the resettlement issues will be solved, if they arise? How will these types of issues, such as loss of access to farmland, be handled?

Answer – Fuad Dargahli (Public Awareness Specialist from AIM Texas Trading LLC):

- Any potential resettlement issues and issues related to loss of access to farm land will be handled in accordance with the provisions of the Project's Resettlement Policy Framework.

Question – Rahmatulla Ruffullayev (Head of Urban Architecture Department of Astara):

- As I understand, Almost all roads and streets will be excavated in the city. Many empowered construction equipment will travel inside the city during the construction. Won't this situation create a chaos in the city? And, Who will rehabilitate and reinstate the roads and streets excavated, or will they be reasphalted after the construction is complete?

Answer – Fuad Dargahli:

- Of course, such large projects involve lots of empowered construction equipments. However, series of mitigation measures and required regulations for application during the

construction are given in the EIA study. These measures will begin to apply from the pre-construction phase, and continue to the end of the construction. Naturally, all the pipes will be buried, and therefore, roads and streets will be excavated. All degraded roads and streets within this project will be rehabilitated and reasphalted by the contractor(s). Briefly, after the construction and commissioning of the new systems, the roads, parks and etc., will be returned to their original condition.

Question – Rafiq Jafarov (Mayor of Arjivan village):

- Will this Project cover the rehabilitation and repairing of existing irrigation ditches and canals?

Answer – Anvar Safarzadeh:

- No, This project will cover only the components of the WSS systems, such as raw water capture facility, raw water transmission, construction of WTP and WWTP, construction of water supply and sanitation systems' piped networks in its service area.

Question – Huseynaga Aliyev (Chief Eng. of Irrigation Department of Astara):

- Astara rayon is one of the most rainy regions together with Lankaran rayon in Azerbaijan. Will this Project cover the city's storm water collection system?

Answer – Fuad Dergahli:

- No, storm water collection is not in scope of this project.

Conclusion:

In line with all said, Astara population welcome the construction of new water supply and sanitation systems. The participants were reminded that the precise and detailed designs of the proposed project will be undertaken by the Design and Build Contractor(s) after the bidding process under authority of AWM OJSC of Azerbaijan, in accordance with the current meticulous technical and environmental studies.

Date: September 22, 2010

Fuad Dergahli

(Attendant and Meeting Secretary)

#	Name of Attendant	Organization	Contact Details
1	Fuad Dergahli	Public Awareness Specialist from Aim Texas Trading LLC	055 657 42 70
2	Anvar Safarzadeh	Environmental Specialist from Aim Texas Trading LLC	055 779 02 07
3	Allahveran Mahmudov	Deputy Governor of Astara rayon	0195 5 26 95 050 329 48 65
4	Sultannagi Baxshiyev	Representative of the Executive department of Arjivan village	050 340 35 78
5	Afgan Shafiyev	Consultant for Astara rayon Culture and Tourism Department	0195 5 15 31 050 513 46 03
6	Huseynaga Aliyev	Chief engineer of Astara rayon	0195 5 25 28

		Irrigation Systems Department	050 245 69 83
7	Kazimov Adalet	Astara city Administrative Area representative	0195 5 18 00 050 661 76 92
8	Eldar Guliyev	Head of State Land and Cartography Department of Astara	0195 5 14 44
9	Rahmatulla Ruffullayev	Head of Urban Architecture Department of Astara	0195 5 15 99 050 372 00 58
10	Rafiq Jafarov	Mayor of Arjivan Village	050 212 17 16
11	Sakitaga Karimov	Editor in chief of "Astara" newspaper	050 573 04 50
12	Vali Rajabov	Chief Eng. In rayon SuKanal Department	050 344 42 61
13	Heydar Dadashov	Head of Astara Water User Association, Local NGO	0195 5 12 95





Milli Su Təchizatı və Kanalizasiya İkinci Layihəsi, II Faza Azərbaycanın 12 rayonunun (İmişli, Kündəmir, Ucar, Zərdab, Lənkəran, Masallı, Astara, Cəlilabad, Yardımlı, Lerik, Daşkəsən və Gədəbəy) Ətraf Mühitə Təsirlərin Qiymətləndirilməsi (ƏMTQ) prosesi üzrə

İCTİMAİ MƏSLƏHƏTLƏŞMƏLƏR

Astara şəhəri

22 sentyabr 2010

#	İştirakçının soyadı, adı	Təmsil etdiyi təşkilat	Əlaqə məlumatları	İmza
1	Şahmurov Əlihüseyn Ələmovağulu	İctimai təşkilatın üzvləri	5-26-98 050 530 48 65	Şahmurov
2	Baxıyev İsmayıl Yusif	22912000 k. 1084	050.340.35.78	İsmayil
3	Səfiyev Əfqan Cəfər oğlu	Nümayəndə	5-15-51 050-515-46-03	Əfqan
4	Əliyev Əlişeyxov Fəxrəddin oğlu	Astara rayon məclisi	5-21-28 045-69-83	Əliyev
5	Kərimov Əlişeyxov Fəxrəddin oğlu	Astara rayon məclisi	5-18-00 601.76-92	Əliyev
6	Quliyev Ələm Əliyev oğlu	Astara rayon məclisi	5-14-46	Əliyev
7	Rəhmanov Əhməd Əhməd oğlu	Astara rayon məclisi	5-16-99 372-00-08	Əliyev
8	Bəyquliyev Əhməd Əhməd oğlu	Astara rayon məclisi	212 17-16	Əliyev
9	Kərimov Əlişeyxov Fəxrəddin oğlu	Astara rayon məclisi	050 515-08-50	Kərimov

10	Радабон Вибли аэропортунун	Астанадагы аэропорттун инженердик баарамчалыгы	344-42-61	
11	Продовольственный рынок	Солон саклини	5-12-95	
12				
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Session III

General Public Consultation Meeting for EIA Process in Astara Rayon

Date: January 28, 2011

Project :EIA Studies in 12 Rayons (Imishli, Kurdamir, Ujar, Zardab, Lankaran, Masalli, Astara, Jalilabad, Yardimli, Lerik, Dashkasan and Gadabay) of Azerbaijan for water supply and sanitation systems, Second National Water Supply and Sanitation Project (SNWSSP), Phase II

Consultant : Aim Texas Trading LLC
Subject : Consultation Process with Community
Session : 3
Issues in agenda : 5

Articles

6. Presentation of the Proposed Project
7. Technical Scope of the Project
8. Discussions on the Environmental Impacts of the Project during Construction
9. Discussions on the proposed Mitigation Measures
10. Question and Answer Session

Venue : Deputy Governor's office, Astara city, Azerbaijan

The meeting was opened by Mr. **Allahverden Mahmudov**, Deputy Governor of Astara rayon. Mr. Mahmudov gave a short information about the purpose of the meeting, and he encouraged the participants that they can bring their concerns or ask their questions on the Project and/or Project related activities to be performed.

Then the Consultant's representative Mr. Abdurrahim Tan, Sr. Environmental Specialist and Team Leader of the Consultant's EIA Team, stated that this meeting is the public hearing for the Project's EIA process, and so that explaining their opinions about the Project or asking a question for their concerns about the Project related activities from the perspective of environmental and social impacts or benefits would be a very useful practice for EIA process. Please be sure that all concerns voiced by the participants will be taken into consideration or handled on the course of the Project, if it is relevant. See Annex-6.

Question and answer session followed.

Questions and Answers;

Question – Habil Manafov, Resident (Head of Rayon Irrigation Department):

- The water is currently being provided to our city from horizontal infiltration gallery on the Astarachay river's flood plain, below the Alasha village. Also the amount of the provided by the infiltration gallery varies with the seasons, almost to the point of not being able to provide water in summer. What kind of a structure is to be built and measures to be taken in order prevent the water decrease, so that our city is not left without water when seasons change?

Answer – Mr. Tan (EIA Team Leader of Consultant):

- The raw water collection facilities near the Alasha village will not be used in the project. The Feasibility Consultant and AWM OJSC envisaged to provide the raw water from Tengerudchay diverting surface water of the river with an appropriate Surface Water Diversion Unit (SWDU) to be constructed in the lower levels of Lomin village at about 290 masl. This alternative offers a WTP which will be constructed at the lower levels of Barzuband village on a public easement.

Question – Habil Manafov, Resident (Head of Rayon Irrigation Department):

- Has the minimum ecological flow of Tengerudchay river been examined thoroughly? Because there is a long distance from the catchment area to Astara lowland, and this discharge area of the river has the valued ecological environment in both sides of the river's flow channel. When an amount of water that is sufficient for the city is taken, will it not cause insufficiency in the amount needed for the survival of the flora and the fauna around the river?

Answer – Mr. Tan (EIA Team Leader of Consultant):

- We have seen on our research that the previous flow amounts of Tengerudchay river has been measured by the measuring stations in both Sim and Vaqo for approximately 65-70 years. We obtained these records and researched in respect of the water balance in the upstreams of the river for required minimum ecological flow. And it has been determined that the raw water to be diverted for Astara city will not create any negative effect on the minimum ecological flow.

Question – Sedail Qasimov, Resident (from Tulekuvan village):

- We know from the climate and environmental attributes of our rayon that Tengerudchay river shows the least fluctuations in its surface flow. This is the result of sustainance of the spring waters in the upper parts of Sim village. Wouldn't it be more appropriate if the water was provided directly from these sources?

Answer – Mr. Tan (EIA Team Leader of Consultant):

- The water resources you mentioned is in a mountainous region of 1300-1400 meters height, and approximately 30-35 km away from Astara city. According the population increase by 2030 set forth by Feasibility Consultant the daily water requirement of Astara city is calculated as 4000-4500 m³/day. Since bringing such amount of water from Sim resources would not be economic, the lower basin of Tengerudchay river has been chosen by the Feasibility Consultant and AWM OSJC as an economic and sustainable solution.

Question – Allahveren Mahmudov, Deputy Governor of Astara rayon:

- We have heard that the raw water will be delivered to Lankaran city from the Yukhari Xanbulan Water Reservoir (YXWR). Would it not be possible to provide drinking water to Astara from the same source as well?

Answer – Mr. Tan (EIA Team Leader of Consultant):

- According to our researches, YXWR also gives irrigation water to the northern parts of Astara rayon. It is true that the reservoir may also accommodate the Astara's water demand. However, the new improvement projects about the irrigation systems in this area have been considered by AWM OJSC and the Feasibility Consultant, but not chosen as an alternative. Besides, YXWR is an important water storage facility for Lankaran and Astara region and, regarding future improvement and expansion

projects, should not be considered for providing additional drinking water to anywhere else.

Question – Allahverden Mahmudov, Deputy Governor of Astara rayon:

- Has the chosen water source researched thoroughly? The villages on the upstreams of the river are more occupied with livestock. The river may contain microbes that those animals carry.

Answer – Mr. Tan (EIA Team Leader of Consultant):

- The water of Tengerudchay river is continually being tested by AWM OJSC's laboratories. Besides, the surface water of the river has been thoroughly tested in a certified Laboratory by the Feasibility Consultant, and according to the test results, certain advices have been made.

Question – Cebrayil Salmanov, Resident:

- Will there be any damage done to the existing gas lines in the beginning of this project? Or will some of them be relocated?

Answer – Mr. Tan (EIA Team Leader of Consultant):

- Before the construction begins, engineers and the environmental specialists of the Contractor(s) and AWM OJSC, along with the supervisor, will make sure that all the infrastructure including the gas lines are analysed, and lead the design group of contractor so that they can do the works without damaging them.

Allahverden Mahmudov, Deputy Governor of Astara:

- Please be sure that the subjects we have discussed here will be analysed in the reports regarding this project and be taken into consideration. The most important issue of our city is the renovation of our water and sewage systems that are messy and no longer operational. Since the population increase until 2030 has been taken considered, the project components have been planned according to the population increase of our city until 2030.

Hamlet Aliyev, Resident (Head of Elders Society of Astara, Local NGO):

- We support this project. We hope that this project is not left unfinished and our city is prepared for a clean and healthy future. At the moment, the whole city has a water problem, and since our city doesn't have a proper waste water system it is not able to form a healthy environment. As a border city, we await and acclaim the immediate start and finish of the project that will make so that Astara, a city that welcomes both domestic and foreign tourists, enters the future years having solved his infrastructure.

Mr. Tan (EIA Team Leader of Consultant):

- The project is envisaged to start around the summer months of 2011, and finish around the end of the second quarter of 2013.

Conclusion:

The queries revealed that the people seriously suffer from water shortage, and the majority of population in Astara city is provided with drinkable water just 2-3 hours a day.

In line with all said, Astara's people welcomed the construction of new water supply and sanitation systems taking into account the mitigation measures for some potential negative impacts, and the noise which will be emerged from the use of machinery, excavation of roads and, etc. during the construction as temporary disturbance.

January 28, 2011

Hokman Mahmudov

(Attendant and Meeting Secretary)

Attendants

#	Name	Organization	Phone numbers
1.	Abdurrahim Tan	Team Leader of EIA Study Team, Aim Texas Trading LLC	050 331 2359
2.	Hokman Mahmudov	Environmental Specialist, Aim Texas Trading LLC	050 622 42 50
3.	Allahveren Mahmudov	Deputy Governor	52695
4.	Rufullayev Rahmatulla Oglu	Resident, Director from REP	51599
5.	Hacizade Marasim Aliaga	Resident, Consultant in REP	51754
6.	Babayev Rafail Ibrahim	Resident, REP	35171
7.	Latifov Aydin Naibulla	Resident in Kijaba town (Mayor)	503812945
8.	Qasimov Sadail Shafi	Resident in Tulekuvan village (Mayor)	502456927
9.	Babayev Rafail Ibrahim	Resident in Tengerud village (Mayor)	507426670
10.	Iskendarov Xanverdi İbad	Resident, (Hydrometeorology Department of Astara)	51560
11.	Aliyev Hamlet Murtuza	Resident, (Head of Elder Society of Astara, Local NGO)	52220
12.	Baxshiyev Mirzaga	Resident, REP	51218
13.	Salmanov Cebayil	Resident, (Astara Gas Department)	
14.	Huseynov Agamoglan	Resident, (Astara SuKanal Dept.)	
15.	Ibadov Aydemir	Resident	
16.	Karimov Sakitaga	Resident, (Chief Editor, Astara Newspaper)	
17.	Quliyev Eldar	Resident	
18.	Mammadova Yegana	Resident	
19.	Farzullayeva Raqibe	Resident	
20.	Bagirov Arif	Resident, (Chief Doctor in Astara central Hospital)	
21.	Mirzayev Azer Valiaga	Resident	
22.	Maliyev Ilqar Cafar	Resident	
23.	Mammadov Rasim Zakir	Resident	
24.	Akbarov Agasalim A.	Mayor of the city	
25.	Kazimov Adalet Muxtar	Resident	
26.	Mahmudov Rufat Nabi	Resident	
27.	Manafov Habil O.	Resident, (Head of Irrigation Department)	
28.	Aliyev Huseyaga F.	Resident (Eng. in Irrigation Department)	

29.	Nazirov Cabvbar I.	Resident (member of Astara WUA, Local NGO)	
30.	Mammadov Mammad	Resident	
31.	Kadimov Adalet	AIM Texas Trading LLC, member of public awareness team	
32.	Rzayev Emin	AIM Texas Trading LLC, member of public awareness team	



Astara rayonunda təklif olunan Su Təchizatı və Kanalizasiya (STK) layihəsi üzrə bu Ətraf Mühitə Təsirlərin Qiymətləndirilməsi (QMTQ) hesabatının müzakirəsi üzrə

GÖRÜŞ

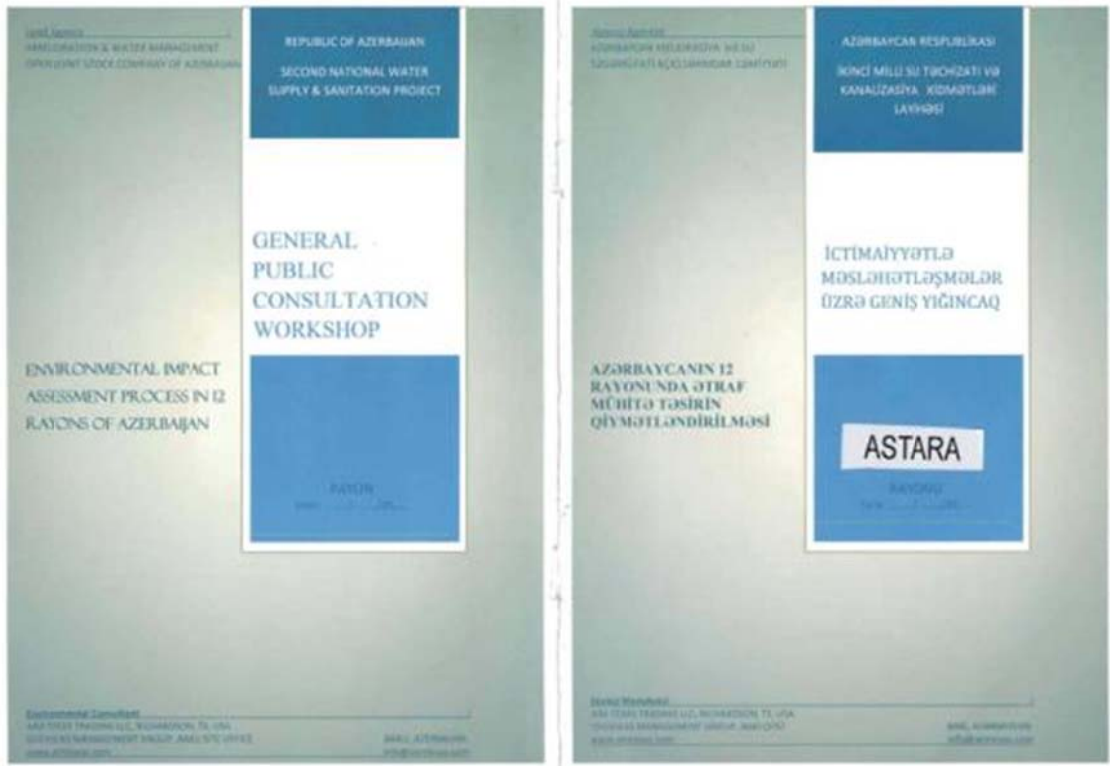
Astara şəhəri

" " yanvar 2011

Nö	İştirakçının soyadı, adı	Təmsil etdiyi təşkilat	Əlaqə məlumatları	İmza
1.	Rufullayev Rəhimulla Oğuz oğlu	Astara RİH-nin Mərkəzi ofisi	5-15-99	[Signature]
2.	Hacızadə Mərasim Xiyə oğlu	Astara RİH-nin Böyük mərkəzi ofisi	5-17-54	[Signature]
3.	Babayar Rəşad Fərhad oğlu	Astara RİH-nin Mərkəzi ofisi	35-171	[Signature]
4.	İslimov Aydın Nəriman oğlu	Kəpəz bələdiyyəsi sədri	010381-24-45	[Signature]
5.	Pərimov Səadət Səfi oğlu	Güləvün bələdiyyəsi sədri	010285-62-12	[Signature]
6.	Babayar Ruzib Colayev	Səyqəvil bələdiyyəsi sədri	050-742-66-70	[Signature]
7.	İsmayilov Xəlvərli Həsən oğlu	Hidrometeoroloji stansiya	5-15-60	[Signature]
8.	Əliyev Rəşad Murtuz	Rayon cəsarətlilər bələdiyyəsi	5-22-20	[Signature]
9.	Əliyev Əliyev	RİH xidməti	5-13-16	[Signature]
10.	Məmmədov Əliqası	RİH-nin Mərkəzi ofisi	5-26-95	[Signature]
11.				
14.	Səlimov Əliqası	Astara RİH-nin Mərkəzi ofisi	[Signature]	[Signature]
15.	Əliyev Əliyev	Astara TƏRİ	[Signature]	[Signature]
16.	Fəxrəddin Əliyev	Astara S.U. Rayon	[Signature]	[Signature]
17.	Məmmədov Səadət	Astara qəzəbi redaksiyası	[Signature]	[Signature]
18.	Əliyev Eldar	Astara TX-şöbəsi müdiri	[Signature]	[Signature]
19.	Məmmədov Fəxrəddin	Astara S.U. Rayon	[Signature]	[Signature]
20.	Fəxrəddin Əliyev	Astara RİH	[Signature]	[Signature]
21.	Əliyev Əliyev	Astara RİH	[Signature]	[Signature]
22.				
31.	Məmmədov Əliqası			[Signature]
32.	Əliyev Əliyev	Rayon İH-nin Mərkəzi ofisi		[Signature]
33.	Məmmədov Rəşad			[Signature]
34.	Zübrüv Əliqası	Bələdiyyə Sədri		[Signature]
35.	Kərimov Əliyev Əliyev	Səyqəvil bələdiyyəsi sədri		[Signature]
36.	Məmmədov Əliyev Əliyev	Astara RİH-nin Mərkəzi ofisi		[Signature]
37.	Məmmədov Əliyev Əliyev	Astara SSI-MƏSİ		[Signature]
38.	Əliyev Əliyev	Astara SSI Mərkəzi ofisi		[Signature]
39.	Məmmədov Əliyev Əliyev	Astara SSI Mərkəzi ofisi		[Signature]
40.	Məmmədov Əliyev Əliyev	Astara bələdiyyəsi		[Signature]

Disseminated Booklet for General Public Consultation Workshop
Astara - Session III, January 28, 2011

Front and Back Covers



Interior Pages



VƏTƏNSEVƏRLİK "Qarabağ gündəlikləri"ndən

Hər bir insanın vətənpərvərliyi doğulduğu ölkənin gələcəki və sənaye baxımından vəziyyəti ilə bağlıdır. Əlbəttə ki, bu günkü Azərbaycanın vəziyyəti ilə əlaqədar "Yeni Sözlərdə" yazılan məqalələr, o cümlədən "Qarabağ gündəlikləri"ndəki yazılar, vətənpərvərliyi artırmaq üçün böyük töhfə verir. Bu yazılarda vətənpərvərlik anlayışının genişləndirilməsi üçün töhfə verən yazılar təqdim olunur. Bu yazılarda vətənpərvərlik anlayışının genişləndirilməsi üçün töhfə verən yazılar təqdim olunur.

Əgər vətənpərvərlik anlayışını genişləndirmək üçün töhfə verən yazılar təqdim olunur, o cümlədən "Qarabağ gündəlikləri"ndəki yazılar, vətənpərvərliyi artırmaq üçün böyük töhfə verir. Bu yazılarda vətənpərvərlik anlayışının genişləndirilməsi üçün töhfə verən yazılar təqdim olunur.

Əgər vətənpərvərlik anlayışını genişləndirmək üçün töhfə verən yazılar təqdim olunur, o cümlədən "Qarabağ gündəlikləri"ndəki yazılar, vətənpərvərliyi artırmaq üçün böyük töhfə verir. Bu yazılarda vətənpərvərlik anlayışının genişləndirilməsi üçün töhfə verən yazılar təqdim olunur.

Karateçi 16 yaşlı Ruslan öz gücünə və idman xoşbəxtliyinə inanır

16 yaşlı Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır. Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır.



Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır. Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır.

Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır. Ruslanın karateçisi kimi adını qazanması onun öz gücünə və idman xoşbəxtliyinə inanmasıdır.

İŞ AXTARAN VƏTƏNDAŞLARIN, İŞƏ QOYULAN MÜƏSSİSƏ, İDARƏ, TƏŞKİLAT RƏHBƏRLƏRİNİN, İŞ ADAMLARININ NƏZƏRİNDƏ

30 sentyabr 2010-cu il tarixdə Ucar rayon məşğulluq mərkəzinin təşkil etdiyi "ƏMƏK YARMARKASI"

Əmək yarmarkası saat 10.00-də rayon mədəniyyət evinin binasında keçiriləcək.

Siz yarmarkaya dəvət edirik.

TƏŞKİLAT KOMİTƏSİ

DÖVLƏT PROGRAMI İCRA OLUNUR

Kanalizasiya sistemi və su xətləri yenidən qurulacaq

Ucar rayonu ərazisində kanalizasiya sistemi və su xətləri yenidən qurulacaq. Bu işlər dövlət proqramı çərçivəsində icra olunur.

MÜFLİSLƏŞMƏ VƏ İFLAS HAQQINDA

Azərbaycan Respublikasının Məhkəmə Tərəfçisi və İflas Haqqında Qanununa əsasən, müflislik və iflas haqqında məlumatlar təqdim olunur.

REDAKTOR SƏBUHİ VƏLİYEV	RİZİN ÜNVANKİZ Az. 4300 UCAR şəhəri, Heydər Əliyev küçəsi əlaqə 3 N107 TELEFONLAR: redaktor 0 (112) 8-13-40	Mətbuat və informasiya mərkəzində qaydalaşın QƏHADQTNAMƏ № 444 İNDERS 66908	"Mingəçevir Poliqrafya Mərkəzi" MMC-nin kompüter mərkəzində çap olunmuşdur, rəhbər Şahin İsmayilov.
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ANNEX-5

Biological Investigation in or nearby the Project Corridor

Biological Research within the Project Corridor in Astara Rayon for WSS Investment

Project Name	: Second National Water Supply and Sanitation Project (SNWSSP II) of Azerbaijan
Name of Proponent	: Republic of Azerbaijan
Lead Agency	: Amelioration and Water Management Open Joint Stock Company (AWM OJSC) of Azerbaijan
Consultant	: Aim Texas Trading LLC, Overseas Management Group, Richardson, Texas, USA
Consultant's Project ID	: \Az\12Rayons_EIA\387-09\EIA_Reports, Lerik
Subconsultants for the Research	: Society Protection and Ecology of Birds (SPEB), NGO, Baku, Azerbaijan Azerbaijan Mammals Society (AMS), NGO, Baku, Azerbaijan
Agreement Date	: 15.09.2010
Research Performance Period	: On-site; October 23-24, 2010 Desk Studies: October 25-26, 2010
Research Theme	: Preparing the biological report for the proposed project corridor of the WSS investment to be implemented in Astara rayon, performing the on-site investigations within and around the proposed project corridor.

General

A walk-through research was carried out on October 23-24, 2010 along treated water transmission main, at and around the proposed WTP site, and at the both side of the river-front area of Kulerichay river basin in north part of the city of the city. The research corridor roughly comprised of the settled areas of Sim, Sepnakaran, Palikash, Vovoda, Lomin, Durriye, Jukas, Sipiypart, Vanashikash, Barzuband, Noyabud, Deqadi, Sarak, Tulekuvan, Kijoba, Mashxan, Tengerud, Archivan, Artupa, Sancaradi, Alasha, Qapicimahalla, Meschitmahalla, Suparibag, Rudakanar, Selakaran and Shiyakaran villages. The Research Corridor also comprised of the coastline of Caspian Sea in front of Astara city, and along the basins of the Tengerudchay, Istisuchay and Astarachay rivers.

A visual surveillance method has been attempted to detect, determine, recognize and track the biological communities along the project corridor and in / around the said above districts. The results of the research are given in this text and the attached tables (Table 1 – 7).

It is observed that only Brown trout, Goshawk, Golden Eagle and Falcon living in the area of the proposed project corridor are included into the Red Book of Azerbaijan, and Black Vulture is included into the Red List of International Nature Protection Union (it's shown by the sign * and ** in the following tables). These species are occasionally encountered in the project area for feeding. No migration path of the avian and terrestrial species gets across the project corridor.

Therefore, no endemic or common avian and/or terrestrial biological community is vulnerable to hazard to be occurred during the construction period.

All animal species, except the woodcock indicated in the Table-6, have a fixed mode of life in Lankaran Natural area. It has been determined that the forests and shrubberies have been under serious pressure as a source of fuel for heating and timber products, and as forest pastures for the numerous privately owned herds of cattle and other livestock.

The breeding season for most bird species is from September to December and April to June.

No rare, endangered, and threatened population recorded in the Red Data Book of Azerbaijan inhabit in or nearby the Project corridor.

First and last name: Ilyas Babayev
 Position: Head of the Society Protection and Ecology of Birds (SPEB, Local NGO), Dr. on Environmental Biology
 Address: Baku, Bina set., I.Ahmadov str., 2/12

(Name and title) (signature) (date)

First and last name: Sujaddin Guliyev
 Position: The secretary of Azerbaijan Mammals Society (AMS, Local NGO),
 Dr. on Environmental Biology, professor
 Address: Baku, QSP, crossing 1128, block 504

(Name and title) (signature) (date)

Appendices 4 pages.

1. Table 1: Plant species in the project corridor
2. Table 2: Insect species in the project corridor
3. Table 3: Fish species in the project corridor
4. Table 4: Amphibians in the project corridor
5. Table 5: Reptiles in the project corridor
6. Table 6: Bird species in the project corridor
7. Table 7: Mammals in the project corridor

Table 1: Plant species in the project corridor

N	Local name	Common name	Latin
1	Ağcaqayın	Maple	Acer L.
2	Alma	Apple	Malus Mill
3	Bağayarpağı	Plantain, Bunting	Plantago
4	Əməköməci	Mallov	Malva L.
5	Bənövşə	Violet	Viola L.
6	Alça	Alycha, Marovbalan Plum	Prunus Divaricata
7	Böyürtkən	Deberry, Blackberry	Rubus L.
8	Balıyonca	Veet clover, Melilot	Melilotus L.
9	Acıyonca	Crown Vetch	Cornilla L.
10	Adi göyrüş	European Ash, Common Ash	Farxinus Excelsior L.
11	Çayır	Dogis tooth grass	Cynodon dactylon v.pers
12	Çəpər sarmaşığı	Beadrina	Galustegia R.Br
13	Andız,Zökəm otu	Elecampani,inula	İnula L.
14	Ayı qulağı	Bear berry	Aretostaphylos uvuars L.
15	Dovşanalması	Cotoneaster	Cotoneaster Med.
16	Fındıq	Hazel, hazelnut	Corulus avellana L.
17	Pişik quyruğu	Timothu	Phleum L.
18	Tarla otu	Bent grass	Gatura L.
19	Üçyarpaq yonca	Clover	Trifolium L.
20	Zəncirotu, acıqovuş	Gandelion	Taraxacum L.
21	Vələs	Hormbean	Carpinus L.
22	Qanqal	Bcotch thistle, cotton thistle	Onopordon L.
23	Qarayonca	Alfalfa, medicock	Medicago L.
24	Qızılağac	Alder	Alnus Gaerth
25	Quşəppəyi	Shepherdes puru	Capsella bursapastoris
26	Dağ keşnişi	Coriander	Coriandrum L.
27	İtburnu (tüklü)	Doq-rose	Rosa canina
28	Yemişan	Howthorn	Crataegus L.
29	Dağ lələsi	Tulip	Tulipa L.
30	Gəndələş	Elder	Sambucus L.
31	Gicitkan	Nettle	Urtica L.
32	Dalamaz gicitkan	Dead nettle	Lamium L.
33	Əzgil	Medlar	Mespilius L.
34	Zirinc	Barberry	Berberis L.
35	Qamış	Bulruch	Scirpus acutus L.
36	Yaddaş çiçəyi	Forget-me-not	Myosotis L.
37	Lalə (xaş-xaş)	Poppy	Paraver L.
38	Palıd	Oak	Quercus L.
39	Pencər	Tassel flower, Amaranth	Amaranthus L.
40	Əvəlik	Sorrel	Rumex L.
41	Səhləb	Orchis	Orchis L.
42	Söyüd	Willow	Salix L.
43	Turşəng	Ocuntain-sorrel	Oxuria Rill
44	Fıstıq	Bech	Fagus L.

45	Çiyələk	Strawberry	Fragaria L/
46	Cincilim	Starwort	Stellaria L/
47	Cökə	Linden, Lime	Tille L.
48	Şibyə	Lichen	Lichen
49	Yarpız	Mint	Mentha L.
50	Mamır	Moss	Museus L.
51	Meşə albalısı	Persumed cherry	Cerasus mahaleb (L.)
52	Meşə gilası	European birdcherry	Padus Mill.
53	Moruq	Raspberry, bramble	Rubus idalus L.

Table 2: Insect species in the project corridor

N	Local name	Common name	Latin
1	Qaraqurd	Balck-widow	Hairadectus
2	Yaşıl şala		Tetigonia viridisima

Table 3: Fish species in the project corridor

N	Local name	Common name	Latin
1	Adi qızılxallı	Brown trout	Salmo fario*

Table 4: Amphibians in the project corridor

N	Local name	Common name	Latin
1	Adi quru qurbağası	Common toad	Bufo bufo
2	Yaşıl quru qurbağası	Green toad	Bufo viridis

Table 5: Reptiles in the project corridor

N	Local name	Common name	Latin
1	Qafqaz kələzi	Lizard lizard	Agama caucasica
2	Koramal	Europa glass lizard	Helioscopus
3	Sarıqarın təlxə və ya qızıl ilan	Large Whip snake	Eumeces Schmalider Coluber juglaris

Table 6: Bird species in the project corridor

N	Local name	Common name	Latin
1	Böyük qırğı	Goshawk	Accipiter gentilis*
2	Adi sar	Buzzard	Buteo buteo
3	Berkut qartal	Golden eagle	Aquila chrysaetor*
4	Ağbaş kərkəs	Griffon vulture	Gyps fulvus
5	Keçəl qarakərkəs	Black vulture	Algiypius monachus**
6	Adi qızılquş	Peregrine falcon	Falco peregrinus*
7	Ördəktutan qızılquş	Merlin	Falco columbarius
8	Adi buruqboyun	Wryneck	Junx torquilla
9	Adi qaraağacdələn	Black woodpecker	Dendrocopus martius

10	Suriya əlvanağacdələni	Sirian woodpecker	Dendrocopus siriacus
11	Boz yapalaqca	Towny owl	Strix aluco
12	Qulaqlı bayquş	Long-eared owl	Asio otus
13	Kişnəyən yaşılağacdələn	Green viridis	Picus viridis
14	Çöl göyərçini	Roch dove	Columbia livia
15	Adi meşəturağayı	Woodlark	Lullula arborea
16	Kiçik əlvanağacdələn	Lesser woodpecker	Dendrocopus minor
17	Galerida cristata	Crested lark	Galerida cristata
18	Böyük əlvanağacdələn	Great spotted woodpecker	Dendrocopus major
19	Ağ titrəkquyruq	Pied wagtail	Motacilla alba
20	Adi bilibitdan	Wren	Troglodutes troglodutes
21	Qara qaratomyuq	Blackbird	Turdus merula
22	Böyük arıquş	Great tit	Parus major
23	Abıca arıquş	Blue tit	Parus caeruleis
24	Adi zığ-zığ	Jay	Garrulus glandarius
25	Adi çaydaçapar	Dipper	Cinclus cinclus
26	Qırmızıqanad dirmanc	Wallezeeper	Tixodroma muraria
27	Adi hörücü (meşə sərçəsi)	Chaffinch	Fringilla coelebs
28	Adi payızbülbulü	Goldfinch	Carduelis carduelis
29	Dam sərçəsi	House sparrow	Passer domesticus
30	Çöl sərçəsi	Tree sparrow	Passer montanus
31	Ala sağsağan	Magpie	Pica pica
32	Boz qarğa	Hooded crow	Corvus cornix
33	Quzğun qarğa	Raven	Corvus corax
34	Adi pəsnəkquş	Penduline tit	Remiz pendulinus
35	Oxuyan qaratoruq	Song thrush	Turdus philomelos
36	Adi yaşılca	Green finch	Chloris chloris
37	Adi payızbülbulü	Goldfinch	Carduelis carduelis
38	Meşə çilingimdiyi	Woodcock	Scolapax rusticola

Table 7: Mammals in the project corridor

N	Local name	Common name	Latin
1	Cənub kirpisi	Southern hedgehog	Erinaclus roumanclus
2	Xırda kösdəbək	Levant mole	Talpa levantis
3	Cırtan şəbpərə	Common pipistrelle	Pipistrellus pipistrellus
4	Canavar	Wolf	Canis lupus
5	Bozdovşan	Brown hare	Lepus europaeus
6	Çaqqal	Golden jackal	Canis aureus
7	Tülkü	Red fox	Vulpes vulpes
8	Çöl donuzu	Wild boar	Sus scrofa
9	Cüyür	Roe deer	Capreolus capreolus

Note: * species are included into Red Book of Azerbaijan.
 ** species are included into the Red List of International Nature Protection Union

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ANNEX-6

Photos, Site Surveyings, Scoping and General Public Consultation Activities

Scoping and General Public Consultation Photographs for Astara Rayon

Consultation	Session	Date	Venue	Pages
Scoping Consultation	1	07.09.2010	Conference Hall of YXID of Lankaran Rayon	2, 3, 4, 5
Scoping Consultation	2	22.09.2010	Deputy Governor's Office, Astara city	6, 7, 8, 9
Road Side Consultation with General Public	-	22.09.2010	Astara city	10, 11, 12
General Public Consultation	3	28.01.2011	Deputy Governor's Office, Astara city	13, ..n, 18

Scoping Consultation, Session I



**Scoping Consultation, Session 1 in Lankaran Rayon,
07.09.2010**

Attendants : For attendants list, see Annex-4, Minutes of Meeting for Scoping Session I



**Scoping Consultation, Session 1 in Lankaran Rayon,
07.09.2010**



**Scoping Consultation, Session 1 in Lankaran Rayon,
07.09.2010**

Attendants : For attendants list, see Annex-4, Minutes of Meeting for Scoping Session I



**Scoping Consultation, Session 1 in Lankaran Rayon,
07.09.2010**



**Scoping Consultation with Allahyar Salayev in Lankaran Rayon,
07.09.2010**

Attendants :

Allahyar Salayev, Head of Lankaran Upper Khanbular Headworks Exploitation Unit, Panah Abdullayev, Environmental Specialist of the SNWSSP from AWM OJSC, Abdurrahim Tan, Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC, Enver Safazadeh, Environmental Specialist, Site Team Leader, from Environmental Consultant, Aim Texas Trading LLC



**Scoping Consultation with Mohibbet Babayev, Deputy Governor of
Lankaran, in Lankaran Rayon,
07.09.2010**

Mohibbet Babayev, Deputy Governor of Lankaran, Allahyar Salayev, Head of Lankaran Upper Khanbular Headworks Exploitation Unit, Panah Abdullayev, Environmental Specialist of the SNWSSP from AWM OJSC, Abdurrahim Tan, Senior Environmental Specialist and Team Leader of AIM Texas Trading LLC, Enver Safazadeh, Environmental Specialist, Site Team Leader, from Environmental Consultant, Aim Texas Trading LLC

Scoping Consultation, Session II



Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010

Attendants : For attendants list, see Annex-4, Minutes of Meeting for Scoping Session II



Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010



Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010

Attendants : For attendants list, see Annex-4, Minutes of Meeting for Scoping Session II



Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010



*Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010
Question & Answer session*



*Scoping Consultation, Session II in Deputy Governor's Office, Astara Rayon, 22.09.2010
Question & Answer session*



Road Side Consultation with General Public



**Road Side Consultation with General Public in Astara City
Fuad Dergahli, Public Awareness Specialist from EIA Team
22.09.2010**



**Road Side Consultation with General Public in Astara City
Fuad Dergahli, Public Awareness Specialist from EIA Team
22.09.2010**



**Road Side Consultation with General Public in Astara City
Fuad Dergahli, Public Awareness Specialist from EIA Team
22.09.2010**



**Road Side Consultation with General Public in Astara City
Fuad Dergahli, Public Awareness Specialist from EIA Team
22.09.2010**

General Public Consultation, Session III



General Public Consultation, Session III in Deputy Governor's Office of Astara Rayon, 28.01.2011



General Public Consultation, Session III in Deputy Governor's Office of Astara Rayon, 28.01.2011

Allahverden Mahmudov, Deputy Governor of Astara, opening speech

Attendants : For attendants list, see Annex-4, Minutes of Meeting for General Public Consultation, Session III



***General Public Consultation, Session III in Deputy Governor's Office of
Astara Rayon,
28.01.2011***

Attendants : For attendants list, see Annex-4, Minutes of Meeting for General Public Consultation, Session III



***General Public Consultation, Session III in Deputy Governor's
Office of Astara Rayon,
28.01.2011***



*General Public Consultation, Session III in Deputy Governor's Office of
Astara Rayon,
28.01.2011*

Attendants : For attendants list, see Annex-4, Minutes of Meeting for General Public Consultation, Session III



*General Public Consultation, Session III in Deputy Governor's
Office of Astara Rayon,
28.01.2011*



*General Public Consultation, Session III in Deputy Governer's Office of Astara Rayon,
28.01.2011*

Attendants : For attendants list, see Annex-4, Minutes of Meeting for General Public Consultation, Session III



*General Public Consultation, Session III in Deputy Governer's Office of Astara Rayon,
28.01.2011*



General Public Consultation, Session III in Deputy Governer's Office of Astara Rayon, 28.01.2011

General Public Consultation, Session III in Deputy Governer's Office of Astara Rayon, 28.01.2011

Attendants : For attendants list, see Annex-4, Minutes of Meeting for General Public Consultation, Session III

Survey Study Pictures for Astara EIA Report

Date between October 10, 2010 and January 25, 2011



Entrance of the city from Baku-Astara Highway



Astara REP Building in Hayder Aliyev Plaza



H. Aliyev Plaza



A Day Care in Astara



Shindan Fitness Club in Astara city



Hotel Shindan in Astara



Astara Rayon REP Building



H. Aliyev Museum



An institutional Building in the city



Custom Building in Custom Area



Custom Building in Custom Area



A house near Caspian coast, in the city



An elevated water reservoir in Astara



Flaming hill in Astara, Restaurant and spring



Telecommunication Building in the city



School Number 5



A public tap in the city



A public tap in the city



Another public tap in the city



Central Library



Olympia Sportshall in the city



Road side open drainage canals in the city



A sub-artesian well and pump manhole in a private plot



An elevated water reservoir in Astara



Existing drinkable Water Reservoir



Newly constructed drinkable Water Reservoir in the city



Solid Waste Disposal Site of the city



Solid Waste Disposal Site of the city



Solid Waste Disposal Site of the city



Seaport in front of the city and Caspian Sea



Shorline in front of the city and Caspian Sea



M. Hanefi Mosque, in Archivan village



A thermal spring in Istisu valley



Istisuchay river



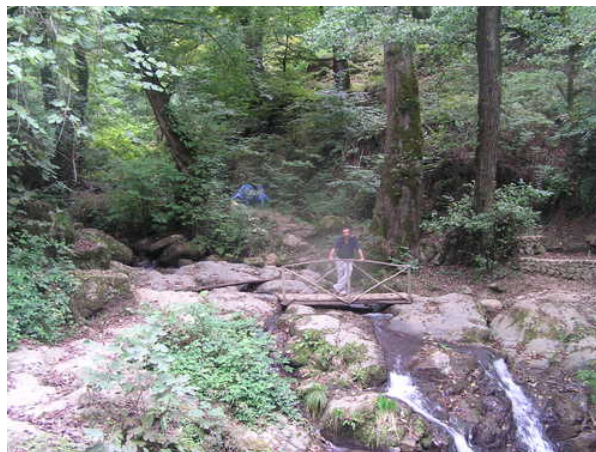
Istisuchay river nearby Alasha village



A worship in the city



A house in Barzuband Village



Hircanian Forest and springs, upper levels of Vanashikash village



Landscape, upper levels of Lomin village



Astara city – Sim village asphalt paved secondary road



Beech trees upper levels of Noyabud village, in winter



Upper levels of Sim Village



Astara lowland from Kijoba village



Noyabud village and Astara lowland



Tea Plantation in Astara



Tea Plantation in Astara



Grazing activities in the upstreams of Tengerudchay river



Bridge on Astarchay river, which provides the connection between Azerbaijan and Iran, South of Astara city



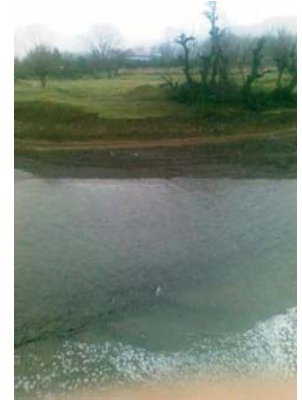
Bee keeping in Tulekuvan Village



A sipring and waterfall, upper level of Sim Village



Tengerudchay river



The proposed site for location of WWTP South of Shiyakaran village



A pump station in Astara city



Existing Water reservoir nearby Alasha village